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*St.Mary's College (Autonomous)
(Re-accredited with 'A' Grade by NAAC)
Thoothukudi*



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High *quality research* is the backbone for advances in science and technology and will provide a fillip to economic growth of the country as well .Today the world is driven by a knowledge based economy and human capital in terms of intellectual potential of the citizens of a nation is crucially important for its progress. Therefore, there is a dire need to focus attention on the development of intellectual eminence. This is possible only with high quality research done in institutions of higher learning.

India is one of the major higher education systems in the world with a history of large research reserves and today it is emerging as one of the world's largest economies by its increasing contribution to the world's high-quality research publications. Realising this imperative need, St. Mary's College (Autonomous), has envisioned to prioritise research as one of its strategic plans for academic growth. It facilitates the Research Forum to function as a core research quality enhancing system.

In order to fulfil the vision of the nation and achieve the mission of the college, the forum organizes seminars, workshops and conferences periodically. It provides a suitable platform for the target students, to orient towards quality research concerns. This present issue is a compendium of 26 research papers of the students reflecting their research acumen. The analytical studies were peer reviewed by experts at multidisciplinary level.

At this juncture, we express our heartfelt thanks to the management for their support and encouragement. We wholeheartedly thank the reviewing panel, for their valued expertise. We acknowledge the contributions made by the scholars and thank the members of the research forum for their meticulous effort to make this issue of Marian Quest a special one.



Guidelines for Submission of Articles

Marian Quest the Bi-annual Multidisciplinary Research Journal of St. Mary's College (Autonomous), Thoothukudi, publishes articles of high reputation and innovation. The articles intended for publication must be typed in A4 size format, 1.15 line space and Times New Roman Font 12. Tamil papers should be in Bamini Font. The latest writing manual for MLA Hand book should be followed in Literature articles. Footnotes, References, Citation Marks should also be included in the research paper.

For reviewing and correction purpose, kindly send one hard copy with the soft copy. Full paper generally consists of the title, pictures, charts, graphs etc., along with Footnotes.

Instructions to contributors (for Science Articles)

Title : It should be short & informative

Keywords : Five or six keywords indicating the contents of the manuscript.

Address of Authors : It includes author's name, institution name, telephone number (office only), and e-mail address.

Main Heading : Each article should be divided into the following main headings: Abstract, Introduction, Materials and Methods, Results and Discussion, Conclusion, Acknowledgement and References.

All articles are, as a rule, referred to experts in the subject concerned. Those recommended by the referees alone will be published in the journal.



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Socio-Political Dilemma in Nayantara Sahgal's *Rich Like Us*

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Abstract

This paper examines how Sahgal placed women in the socio-political topsy-turvy state, especially before and after emergency in India. Basically Sahgal's novels study the deeper complexities of human existence. She is a socio-feminist with a tremendous realization of prevailing social and political conditions. Her works mainly focused on the actions and belief of the people during and after independence. *Rich Like Us* is also a story of an older India, of a generation who remember the British Raj and Partition, of the continuities and the ties of family, caste and religion. *Rich Like Us* deals with the political events of the midseventies, the authoritarian pattern which was followed, and the isolation it imposed. It is also about the causes which led to it. The novel opens in the post-Emergency period but travels back to more than a hundred and fifty years analyzing and questioning the political relationship and value systems of the past. Therefore, this paper explores cross-cultural vision, cultural transformation and cultural trajectory which are imbibed in the novel *Rich like Us*. It reveals the plight of the womanhood and their survival. It also analyses gender issues, marginalisation and victimization in this patriarchal society.

Key Words: Feminism, Cultural Transformation, Gender Issues, Marginalisation and Victimization.

This paper examines how Sahgal placed women in the socio-political topsy-turvy state, especially before and after emergency in India. Basically Sahgal's novels study the deeper complexities of human existence. She is a socio-feminist with a tremendous realization of prevailing social and political conditions. Her works mainly focused on the actions and belief of the people during and after independence. *Rich Like Us* is also a story of an older India, of a generation who remember the British Raj and Partition, of the continuities and the ties of family, caste and religion. *Rich Like Us* deals with the political events of the midseventies, the authoritarian pattern which was followed, and the isolation it imposed. It is also about the causes which led to it. The novel opens in the post-Emergency period but travels back to more than a hundred and fifty years analyzing and questioning the political relationship and value systems of the past.

For Sahgal, one of the main aspects of fiction is her traditional faith. Tradition in India is mainly a religious one and it is a way of life. Religion interferes in almost all the facets of an individual's life and in every juncture of human life. She is also greatly concerned with the need for freedom for women which society has normally denied them. Sahgal's novelistic world is dominated by the selected upper crust of our society, which includes bureaucrat politicians, businessmen, big officials, and women, mostly from higher

classes. Suffering and loneliness in her childhood mellowed Sahgal and she has been able to transform these into understanding and compassion.

In all the eight novels that she has published she has deeply explored the female psyche. In every novel she explores the nature and scope of the trauma of womenfolk. Her first literary work was in fact her autobiography *Prison and Chocolate Cake* published in 1954. Subsequently, her first novel, *A Timeto be Happy*, appeared in 1957. The second autobiographical book is *From Fear Set Free* which is about her marriage and consequent entry into an unfamiliar part of India. *This Time of Morning*, *Storm in Chandigarh* and *The Day in Shadow* are novels of social portrayal with elements of personal experience. *A Situation in New Delhi* is a novel of ideas. In all her novels, political development remains a common factor. *Rich Like Us* and *Mistaken Identity* also have social and political themes.

The theme of her novels shapes the form with real life situations. Sahgal invests reality as a springboard to realize her vision of fulfilment in the life of her characters. Thus, the content, form and life become inseparable in her fiction. She explores the spirit of freedom through the consciousness of the heroine. In Sahgal, the struggle is for abolishing gender discrimination and seeking reciprocity, mutuality and harmony in life. She asserts women's strength and values and she does not want to propagate a separate 'female world' but envisions an organized whole world blending female virtues, morality and values with male culture so as to save it from catastrophe and doom. Her attitude and ideas come closer to Simon de Beauvoir's. However, she is not a strident feminist. She believes in the potentialities of women. She strives towards the goal of women's emancipation. Through her exemplary works on post-colonial developments, she upholds a new humanism which will eradicate the inherent evils of society. Sahgal's attitude towards the upliftment of women through her novel *Rich Like Us* is a totally novel experience. She urges women to give up their sacrificial roles and take courage as a weapon to face the world and its challenges.

Rich Like Us is set in the seventies where the sacrifices and visions of freedom fighters had been all but forgotten. It is a complex novel with plurality of narrative voices and enigmatic endings and does not lend itself to simple, straightforward interpretations. This novel depicts the life of a white girl in India. Rose, the London born second wife of a rich businessman Ram, could be seen as epitomising this ideal of redemption through personal courage. She risks marrying Ram despite knowing that he is already married and comes to India with him. She saves Mona, Ram's first wife from suicide and in spite of their initial antagonism, soon develops friendly terms with her. The crippled beggar, completely neglected by the family, is also helped by her. Her outspokenness and cockney bluntness make her unacceptable to her step-son Dev. Though Rose is a brave woman she is doomed by her honesty and by her uncertain position in Dev's household after her husband is incapacitated by illness. Sonali following Rose, whom she had always seen as a friend and mentor, takes the beggar to safety place after he has witnessed Rose's murder. And KishoriLal who is at first prepared to renounce his political allegiance to obtain his release from prison, finally refuses to be released and leaves his young cell-mate behind. The brave, the honest, the outspoken in the face of evil are admirable and inspiring, although they may not be rewarded. In the portrayal of these relationships, Sahgal does not display any contempt or superiority.

Another important aspect of this novel is Colonialism or colonial. In *Orientalism* Edward Said highlights the limitation imposed on a nation by colonial consciousness. One perceives oneself through the eyes of others and judged one by their standards by measuring oneself against their yardsticks. It is suggested that colonial consciousness consists of three stages, that one of acceptance of the imperial model and the other turning away from it. These two stages have a mutually dependent and an unbalanced relationship. The third and final stage is a moving away from these secondary positions to a position of critical identification of one's own culture, of being in a position to sift and criticise, a stance which is marked by an adult maturity. This transition to a post-colonial awareness is characterized by an ability to step outside the given definition and to reject the simplistic division of the 'good' and the 'bad' to forge an independent identity.

Sahgal is also a successful figure of Feminist Writing. Immensely influenced by feminism, Sahgal questions the roles hitherto accorded to woman and stress the discrepancy between the reality of woman's existence and the image to which she has to conform. She realizes that the status of Woman Power is far removed from Indian society. She reflects the contemporary women's predicaments in Indian society. Sahgal is concerned with the need for freedom for women to become aware of themselves as individual. She remembers her childhood as a time of freedom when, "I was conscious of being continually stretched in mind and spirit, of being encouraged to be venturesome, of doing the daring rather than the timid things, of taking risks rather than playing safe, and I was keenly aware of the Joy of being myself, like every other person-a unique human being" (qtd. in Mishra 39). Sahgal is of the view that a woman is not to be taken as mere toy, object of lust and momentary pleasure but as man's equal and recognized as individual, not as possession. So as a writer she used her own experience as a spring board in order to explain this discrepancy.

She beautifully probes the psyche of her women characters to reveal the trauma, insecurity and agony that lies beneath the gloss and glitter of modern life. She reveals her feminine sensibility more overtly in her choice of characters and concerns than in her style and language. She has tried to depict women suffering due to sexist bias in patriarchal society and she envisions a world which should be based on equality and harmony between the two sexes.

Sahgal presents in her *Rich Like Us* the problems that the contemporary women face in society and in their struggle towards self-realization. She not only deals with the questions of marriage, sexuality and women's equality with man but also raises the question of love, hatred, jealousy and certain other human emotions and values. Moreover, she also presents an antithesis between idealism and pragmatism, illusion and reality. Sahgal has a humanitarian approach towards womanhood. She reflects the tension between the predicament of the contemporary Indian woman and the traditional Hindu culture. She studies the social forces working on the psychology of the Indian women. She renders a living picture of the oppressed, depressed and suppressed life of women in India. In this novel, there is also a juxtaposition of two worlds, the personal world of man-woman relationship and the impersonal world of politics. In this novel, she reflects the tension between the predicament of the contemporary Indian woman and the traditional Hindu culture. She studies the social forces working on the psychology of the Indian woman.

In *Rich Like Us*, Sahgal tries to make the narrative look more than merely a story of a woman by referring to Hinduism and Christianity and contemporary political scene. There are three women characters who dominate the plot of the novel. They are Rose, Mona and Sonali. These three women are of different nature and upbringing. However, they are similar in one aspect, that is, their courage to face things. In Sahgal's novels, as the women's quest for identity and social conventions are at cross-roads, they have to face many problems, conflicts, frustrations and inner stress in their married lives through which the individuals mature and eventually find a stable identity of their own. The women in this novel are certainly more aware of the injustice done to them by man, but habit makes them a willing prisoner in this world of exploitation and injustice. Knowing completely about Ram, Rose loves him and she could not move away from him. Despite her sufferings she can't get the idea of divorce and continues her life with Ram. This shows that women accept the order of life carried for them by men without any protest.

She further points out that no human problems will be understood or solved unless human beings regard one another as equals. In India, marriage has been regarded more as an institution and less as a partnership of two equals, and has proverbially meant, the domination of men over women, in matters of sexual relationship, childbirth, adultery and divorce. Sahgal believes that it is the power oriented approach to marriage that has reduced the Indian women to passivity. Female characters in this novel bear testimony to the fact that a woman should encounter resistance whenever she tries to assert herself.

The scrutiny of the reflections of history, politics and change in the writings of Sahgal, by releasing them from the moorings of her providential genealogy and the narrow confines of intensive gynocriticism, brings to focus the consummate artistry and the well-schooled political rationale of a uniquely placed major post-colonial writer. While writing about the emergency as a dictatorial regime concealed as democracy, Sahgal is criticizing the beginning of the capitalist turn in Mrs. Gandhi's policies, and beyond that, her violent behaviour in 1957-1977, concerning the censorship, the imprisonment of the political dissidents, and the huge sterilization campaigns. Unlike the other political writers, she never professes any specific political ideology or favouring any political creed or political movement.

In this novel *Rich Like Us*, the action of the novel revolves around “. . . many little victims the snapping jaws of the Emergency were claiming in the course of an ordinary working day” (252). The novel brings to light the deterioration in public life during the Emergency of 1975-77. It demonstrates, how in a single sweep, the whole value system is totally erased. Jasbir Jain writes, “*Rich Like Us* offers no easy solutions to mankind's problems, on the contrary it challenges all known solutions . . . finally *Rich Like Us* is about the complex nature of reality” (73) and he comments that Sahgal analyses and interprets variegated aspects of political life in depth and through her active involvement in politics she emphasizes the humanistic values she upholds, and the novel becomes a concern for the quality of life. Her concern with politics is just a part of her humanistic concern because each of her explorations into political life reveals her newer and deeper insight into the human psyche.

The historical framework of *Rich Like Us*, far from appearing burdensome or constraining to the imaginative flights of the writer, lends them a substance that gives her

aesthetics a purpose beyond mere craftsmanship. The fictional canvas unrolls a panorama of about a century of Indian history, fore grounded against the backdrop of the game-changing events from world history. The literary device of narration makes us view the emergency as it operates in the lives of women like Rose and Sonali, bringing out the difference between their rich personalities and the bleak ugliness of the world. The strength and spirit of an individual like Sonali is established by the fact that the oppressive environment can only repel but not change her. The combination of the past and the present highlights the relative insignificance and paradox of the Emergency against the vast backdrop of time and the glorious struggle for independence. Sahgal's *Rich Like Us* depicts the story of India of Mrs. Gandhi's Emergency, when power becomes arbitrary once more, when the corrupt and the opportunists flourish. It deals with the impingement of politics on the personal lives of people and studies the impact of Emergency on huge scenery of characters. Thus, the parallel reading of the novel helps to examine the relation between the historic events and the historical representation of the events in the novel. Thus her involvement in Indian politics is embedded in her mind and actions. She finally points out that there is a need to study the history of pre-Independence India to look for a solution to the present situation. Sahgal seems:

. . . to suggest that in situations of oppression and tyranny, history can provide a means of hope, not just for surviving, but for getting enthused to fight, for the worst of tyrants had ultimately to yield to popular will. . . because it affirms that the forces of resistance ultimately triumphed. (Dhar 156)

The confluence of fiction, history and autobiography in Sahgal's imagination makes her writing an irreplaceable strand in the country's artistic narrative. Although a colonial or post-colonial setting dominates in each of her works, yet they do not operate within a clear-cut time frame, underscoring the vast vista of her intimate historical reflections and cultural scrutiny. In the kaleidoscopic range of her fiction, the characters cross the threshold of historical eras, political boundaries and ideological structures, back and forth, with contemplative ease. The euphoric snapshots of new India and heartfelt reverence for Nehruvian idealism set the optimistic note of her writing without slackening her moral intelligence into political amnesia as the politics of the country continued to change drastically. As a positive aspect of the represented social world, Sahgal writes a plot around bonds of friendship between women, Sonali and Rose, which is the first site of support, advice and encouragement. Sati becomes a political weapon in the hands of men to subjugate women. Thus, this novel deals with the power distribution between the male and the female, as well as between the rich and poor. The application of brute force to stifle the democratic freedom of the print media, and to simultaneously manufacture opinion to support authoritarianism during the Emergency is a classic case of cross cultural materialism crystallized in Sahgal's fiction and helps to find the historicity in *Rich Like Us*.

The socio-political dilemma in *Rich Like Us* has aided on the exploration of the emotional intelligence. To precisely state the emotional intelligence of the characters are assessed by perceiving their emotions with a view to substantiate the prevalence of emotional intelligence. Female psyche and the challenges faced by the modern women are dealt with the hybrid identity and ambivalence experienced by the protagonist. The influence of the Indian past, with its multicultural aspects, creates an impact on every Indian psyche. This paper explores cross-cultural vision, cultural transformation and cultural trajectory which are

imbibed in the novel *Rich like Us*. It reveals the plight of the womanhood and their survival. It also analyses gender issues, marginalisation and victimization in this patriarchal society.

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Ascension to Maturation: An Analysis of Adolescence in Carson McCullers' *The Member of the Wedding*

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ABSTRACT

Carson McCullers's *The Member of the Wedding* (1946) tend to be read as a typical coming-of-age story. McCullers sheds light on the hidden aspects of the novel that contain the beginning of imagining alternative forms of attachment, belonging and understanding. The novel depicts the futile attempt to escape from conventional femininity, which is perceived as a trap of impotence and submissiveness, in an adolescent and an adult character. Carson McCullers' sexual ambivalence and her identification with masculinity were reflected through the protagonist of the novel in which she explored the identity of women in the conservative patriarchal society.

KEYWORDS: Alienation, obsession, belongings, identity, maturation.

Ascension to Maturation: An Analysis of Adolescence in Carson McCullers' *The Member of the Wedding*

In Carson McCullers's *The Member of the Wedding*, a twelve year old white southern tomboy named Frankie Addams all of a sudden falls in love with the idea of her brother's wedding one summer during World War II. From the beginning, Frankie dreams about joining the wedding. The novel mainly describes Frankie's desire to fit with others and her vital disappointment and failure. With prevalent images of proper femininity, Frankie's tomboyishness marks her as a type of alien and eliminates her from obtaining any membership. Her sense of not belonging to any group causes her a lot of pain that summer: "This was the summer when for a long time she had not been a member. She belonged to no club and was a member of nothing in the world"(7). Frankie becomes an "unjoined person who hung around in doorways"(7). Her only companions are her feminine, her six year old cousin, John Henry West, and Berenice Sadie Brown, the black cook and housekeeper who has taken care of Frankie since her mother's death. Being lonely and anxious she dreams of escaping the boring dullness of the Deep South.

In *The Member of the Wedding*, McCullers portrays a bolted Southern world in which an adolescent expresses her awkwardness and loneliness over the progression of limited months. The main character, Frankie desires to be something, but turned out to be something different. She has a boy's name and feels as if she does not belong anywhere. She has grown so tall that she looks like a freak among her peers. Throughout Frankie finds herself oscillating between the strange worlds of childhood and adulthood. She then feels that she has a hidden similarity with the members of the Freak show. In fact Frankie's identification

with freaks comes from her increased height. Every October, a traveling circus with freak show comes to the town. When Frankie enters the Freak Pavilion, she is confused by the freaks, for “it seemed to her that they had looked at her in a secret way and tried to connect their eyes with hers, as though to say: we know you”(27). Sensing her connection with freaks, Frankie asks nervously: “do you think I will grow into a Freak?”(28). Instead of drawing a firm line stating her normality and distinguishing her difference from the unfortunate beings such as The Giant, the Fat Lady, the Midget, the Wild Nigger, the Pin Head, the Alligator Boy, the Half-Man, the Half-Woman who pose their physical peculiarities in front of her, Frankie feels their secret association and she is horrified.

Freaks remind Frankie of her loneliness, fear, and unbearable experiences of segregation. The freak show in *The Member of the Wedding* represents the temporal straddling of traditional delight of bodily difference as awesome spectacle and the modern disillusionment of the pre-enlightenment body as medical specimen. Other than Frankie, John Henry is also obsessed with freaks. He likes to put on Berenice’s hat and tries to walk in her high-heeled shoes. Another time he tries on Frankie’s dress and the pink hat with the plume. Frankie has been violent against herself and the world: “I just wish I could tear down this little town. I am sick unto death. I feel exactly like somebody has peeled all the skin off me”(47). “It was the summer when Frankie was sick and tired of being Frankie. She hated herself and had become a loafer and a big no good who hung around the summer kitchen; dirty and greedy and mean and sad”(29). Frankie is also worried by the specters of being a freak and a criminal. She thinks that the world is full of strange people who don’t want to fulfill her desires.

Even her father does not care about her. When she wants to sleep with her father, he politely rejects her, “Who is this great big long-legged twelve-year-old blunderbuss who still wants to sleep with her old papa”(32). Frankie is considered to be too big to sleep with her father any more. She began to feel bitterness against her father. She hates even to stay at her home.

Frankie is a girl without a place, a “member of nothing in the world”(7) her behavior and looks shows her as a stranger and awkward as she was grown “so tall that she was almost a big freak, and her shoulders were narrow, her legs too long”(11). It is very hard for her to receive the physical changes and growth poses many problems in front of her. Frankie is now afraid as she thinks her growth is also abnormal. She begins to measure her height. Frankie asks Berenice: “Do you think I will grow into a freak?”(28) Berenice answers: “Certainly not, I trust Jesus”(28). Frankie is too tall to play with children, but too young and mean to join the neighbourhood club house in which she was not a member and she watches them from the kitchen window. The member of the club were teenage girls “who were thirteen and fourteen years old. They had parties with boys on Saturday night”(17). These girls refuse Frankie’s entry into their club as a result of her tomboy nature. Frankie worries that she will grow into a freak. Frankie’s confusion about her budding identity made her to feel isolated and lonely; to others she appears as an “unjoined person who hung around in doorways”(7) anxious for someone to invite her in. Frankie is oscillating between the freedom of childhood and the clearly defined sexual world of adults where she is unwillingly being forced to enter.

Frankie's adolescence identifies with the freaks and the grotesque, and that grotesque cannot bear the outline of normal identity.

Then, one day, Frankie comes to understand that she can only grow and mature by coming into contact with others. Frankie's consciousness that she is a member of nothing in the world increases the isolation in her. In April, Frankie reads the war news in the paper about the world and dreams of running away from home. Her dream of adventure, which is denied to her because of her gender, is powerfully expressed: "She wanted to be a boy and go to the war as a Marine. She thought about flying aeroplanes and winning gold medals for bravery. But she could not join the war, and this made her sometimes feel restless and blue"(31). She then decides to join her brother's wedding and honeymoon. She finds her existence meaningful only in connection with the bridal pair. She falls in love with the very idea of a wedding and accepts the bride and the bridegroom as her "we of me"(172). But at the wedding itself, she is a mute onlooker, and the newlyweds rather violently rejects her from their honeymoon.

Instead of yearning a boyfriend or husband, McCullers chooses to have Frankie fall in love with the wedding itself. As Berenice teases, "Frankie got a crush!/ Frankie got a crush!/ Frankie got a crush!/ On the Wedd-ing!"(44). This queer desire to be not a "bride" but a "member" challenges the traditional idea of heterosexual matrimony. Frankie believes that the wedding can liberate her from the stifling South, take her with the newlyweds to Alaska and the rest of the world.

Carson McCullers has conveyed the crisis of identity of Frankie Addams through the symbol of the wedding. The wedding which is an obsession for Frankie is an obsession for all humanity which tries to join together various identities into self-created false pictures. Jeromes Burner says "when the prevailing myths fail to fit the varieties of man's plight, frustration expresses itself first in mythoclasm and then in the lonely search for internal identity"(83). Obsessions are McCullers stylistic choice to express the intense search for an internal identity where several identities merge in order to create harmony. Wedding, Frankie's obsession is a symbol of such an internal identity and it is also the harmony achieved with the mixture of various identities. In wedding Frankie – the child and Frankie – the adult merge as well as Frankie the male and the female merge. In wedding Frankie as a lonely individual combines with her transindividual identity. Wedding as an obsession enables McCullers to expose many critical issues concerning human beings in general and girls in particular.

Wedding enables McCullers to forefront feminine issues. Frankie does not want to be a girl instead she wants to behave and act like boys against her outward identity of the female, and against social wishes. She seeks an internal identity through the wedding where she mingles her male and female aspects. As Barbara White has put it: "Frankie's plan to join the wedding is also a desperate attempt to preserve her identity. Her wedding fantasy is a symbolic way of resolving her conflict of wanting to be an adult but not wanting to be a woman"(138). Frankie transmits her "androgyny" into a "fantasy"(138). Wedding is a symbolic struggle of Frankie against the inferior status of women. Simone de Beauvoir while

commenting on feminist issues remarked that the young girl “is too much divided against herself to join battle with the world; she limits herself to a flight from reality or a symbolic struggle against it”(133). Along with Frankie’s odd eating habits, her self disfigurement and her running away from home are all representatives of this symbolic struggle.

After the Wedding, John Henry dies a horrible death from meningitis, Honey Brown is arrested, Berenice is forced to quit her job because Frankie and her father decides to move to the new colony of town, and Frankie herself is restored to her legal name and becomes “Frances”. When Frankie leaves home after the wedding, she is trying to escape her “shabby” home and lonely existence. Frankie wants to find something or someone to fulfill her identity, and she cannot find it within herself. Frankie sees marriage as a way out of her house, a way to achieve wholeness. However, Frankie is only twelve, and marriage is not an option for her, so her escape ends when Officer Wylie identifies her as missing and calls her father to come and get her. When the officer asks what she is doing in the Blue Moon Bar, Frankie replies, “I don’t know”(147). At this point, Frankie begins to transform into someone else, feeling as if “the world was too far away, and there was no way anymore that she could be included ... she felt queer as a person drowning”(184).

When Frankie’s father finds her, the transformation is complete, and “ he looked at her with the eyes as china as a doll’s, and in them there was only the reflection of her own lost face”(184). Frankie sees a reflection of herself as something “grotesque”. Her tomboyishness is relinquished, and as Frankie turns thirteen, Frankie and F. Jasmine becomes Frances. Towards the end of the novel, Frances does not outgrow her tomboyism and successfully moves into a woman. Instead, she finds a new relationship with Mary Littlejohn, whose name has the combination of the feminine ‘Mary’ and the masculine ‘Littlejohn’. In her dream of a future with Mary, Frances still longs for freedom and mobility traditionally enjoyed by boys. Marriage and motherhood, the so-called appropriate female aspiration, are not her life options. At the beginning of *The Member of the Wedding*, Frankie plays with knives, cutting calluses off her feet in the kitchen. By the end of the novel, expecting Mary’s arrival at five o’clock, Frances “was making the sandwiches, cutting them into fancy shapes and taking great pains”(185).

The novel closes with the narrator’s announcement of Mary’s arrival: “Dark, when it came, would come on quickly, as it does in wintertime. ‘I am simply mad about-’ But the sentence was left unfinished for the hush was scattered when, with an instant shock of happiness, she heard the ringing of the bell”(190). The unfinished sentence serves to highlight a potentiality that is involved in continuous and ever-creating becomings, a queer futurity that opposes homogeneous identity and totalizing explanatory narratives. McCullers chooses to end the novel in a suspense state of expectation without leaving a definite image of any future or an assured success. Unlike the linear narrative of progress, this queer futurity would be willing to be disturbed by the negative effects, such as loss, disappointment, shame, and failure, and even make them central, as manifested by the novel’s preoccupation with freaks, crips, tomboys, racist victims, social outcasts, cross-dressers, and homosexuals.

Through the obsession of wedding, McCullers was able to express her view of life as a “tragicomedy in which the funniness and the grief coexists in the same line”(64). While Frankie’s obsession and her views about the world fascinate and amuse the reader, her fate which hangs in balance make the reader even to empathize with her. Not only Frankie but the reader also gets carried away into the aura of the wedding. It is the wedding which maintains the interest of the reader and it can be said that McCullers has been extremely successful in her choice of obsession as a stylistic choice. The reader very explicitly can feel that Frankie has been denied her right and the society has been too rude to her.

McCullers’s fiction through her use of the freak and the grotesque is an attempt to both reconcile and revolt against the prescribed gender norms. Initially literary critics approached McCullers use of freak and the grotesque as a mere representation of her own personal struggles with gender and sexuality. Frankie is representative of a revolt against becoming a “belle” yet the progression of tomboys into female adulthood is stunned. Frankie’s unresolved story represents the slow progression of women in the south during the 1930’s and 1940’s that McCullers was witnessing, both in her own life and from her perspective in the north. Her novel shows the “problems with growing up female in the south” and the struggle to confront white patriarchal society.

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**Mystic Blend of Eastern and Western Thought: A Study of Kahlil Gibran's
*The Prophet and Broken Wings***

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ABSTRACT:

Kahlil Gibran is an oriental sage like Tagore and a more familiar cosmopolitan prophet. He is the pioneer among oriental writers and he acted as a bridge between East and West. His mystic temperament is often similar to that of Blake and Yeats. Gibran considered himself as a bard and a prophet. He views portray him as a witness of absolute truth and spectator of all time and existence. His unique poetic expression characterized by beauty and spirituality was termed as 'Gibranism'. Gibran showed the Arabs how to break away from classical rhymed poetry and to feel free with the prose poems. This paper shows Gibran's unification of Eastern and Western thoughts as one and how the hidden aspects of life and death are expressed in two of his best prose poems.

Keywords: Mysticism, Existence, Death, Nature, Love, Life, Freedom and God

Mystic Blend of Eastern and Western Thought: A Study of Kahlil Gibran's the *Prophet and Broken Wings*

Kahlil Gibran is known to the world as the Prophet of Lebanon. He was recognized as one of the founders of Arab American Literature. He was born in the shadow of the holy cedars of Lebanon but spent the mature years of his life within the shadows of the skyscrapers of New York. Gibran is often described as the mystic, the philosopher, the religious, the heretic, the serene, the rebellious and the ageless. Some consider his works as dangerous, revolutionary and poisonous to youth, while others praise him for his Biblical majesty of phrase. He imitates the principles of Jesus and the values of *The Bible* in his works. He revolts against law, religion, and custom. He advocates a society peaceful and mystical.

Gibran was one of the leading members of the Syro-American school, an organizer, leader and active member of the Pen League, an organization formed by early Arab American writers. Lebanese by birth, Christian by creed, he was the inheritor and bearer of two cultures: Western and Arab. As a man of many gifts both refined and emotional, a painter and a musician, he was most famed as a major figure of literature. He penned short stories, parables, prose poems, essays, fables, poems, and criticism.

Kahlil Gibran was a bilingual writer. He wrote both in Arabic and in English. His best Arabic works were *Al-Ajniha al-Mutakassira*, *Ara'is al-Muruj*, and *Al-'Awasif*. These works were later translated into English namely *Broken Wings* (1912), *Spirit Brides* (1906) and *The Tempests* (1920). His English works consist of *The Madman* (1918), *The Prophet* (1923), *Jesus, the Son of Man* (1928) and *The Garden of the Prophet* (1933). By writing to both East and West Gibran essentially focused on what they lacked. He preached rationality to the East and Mysticism to the West. His works bear the flavour of ancient wisdom and mysticism of the East as well as the scientific inclination of the West. The West closed doors to the inwardness of human experience; the East rebuffed the objective matters. But Gibran through his works aligned them both.

The term ‘Mysticism’ is related to spirituality. They both have played an indomitable role in shaping human life and history. Gibran accepted the spiritual aspect of religion which emphasizes on man’s personal relationship with the Divine and rejected the formal authority of organized religion. After immigrating to the United States, Gibran rejected religious materialism and rather endorsed European Romanticism which played an important role in the growth of his spirituality. Later, Gibran readily exhibited Christian or Islamic influences in presenting his mystically inclined literary themes. The vision of Gibran penetrates through the veils of materialism and it connects the human consciousness to the soul of the universe.

Gibran’s style and philosophy are characteristic of the East and of the Arab in particular. His words went beyond the mere evocation of the mysterious East. However, it endeavoured to communicate the necessity of reconciliation between Christianity and Islam, spirituality and materialism, East and West. In the Arab world, he was considered to be the genius of his age, while in the West his work has been compared to Blake, Dante, Tagore, Nietzsche, Michelangelo, Rodin, Rumi, Emerson, and Shelley.

Also, Gibran tried to infuse Eastern mysticism into Western materialism, believing that humanity is best served by a man who is capable of bridging these two cultures acknowledging the virtues of each. Gibran’s writings establish a mystical union with nature, a relationship of love and harmony. In his famous works, *The Prophet* and *Broken Wings* he tries to define the concept of life and death in relation with love. *The Prophet* was written after his immigration to America which bears the flavour of Western philosophy and *Broken Wings* has some mystic essence of the east. However, in both of the prose poems, there is a zest of West and East style.

The Prophet by Gibran is a mystical philosophy of life in simple poetic verse which presents the farewell observations of the beloved prophet Almustafa who came to Orphalese as a foreigner and had lived among the inhabitants for twelve years, observing their daily life and speaking to them the words of God. The plot opens as a ship arrives to take him back to the island of his birth. There are twenty-six questions regarding various aspects of life. Addressing each question individually, Almustafa exhibits a general tendency to show, through allusions to nature and everyday activities, the interrelatedness of life. *Broken Wings* is considered to be Gibran’s best writing in Arabic. The prose poem is comprised of various chapters. Each has a different philosophy and theme connected with love and life. Gibran’s poetic novel portrays the autobiographical life of his first and last love. Selma and Gibran are compared to that of Eve and Adam and Gibran gives many biblical allusions and literary allusions of western writers like Shakespeare.

In both prose poems, the value of life and death is highlighted. He also shows how love is raised to a higher status by giving its constant presence in human relations. Love inspires people it stays with everyone it nurtures them and it expresses harmony among people. According to him the greatest quest of a man is to seek the love of God who is infinite. Mother acts as a prototype of all existence and a mother’s love for her child is boundless and equal to god. Love is also portrayed as a companion of Gibran and it is love which inspires him “Love provided me with tongue and tears.” (13) Gibran shows love’s constant presence in nature which mourns and rejoices one with humans.

Gibran also lays the bare concept of love being ingrained with pain and shows how the love itself is connected with life as well as death. He considered the love of God as

superior to others. Life and death are certain and it is love which lies between them. Gibran celebrates both life and death “If you would indeed behold the spirit of death, open your heart wide unto the body of life” (89). The concept of death has been dealt with by philosophers since time immemorial.

Despite the ardent denials of humanists and rationalists, many believe that there is some form of ongoing existence beyond death. But the understanding about such things varies. Some think of such an afterlife in terms of reincarnation or the transmigration of souls, a successive series of rebirths eventually leading to some form of liberation or enlightenment or transcendence. Death is the only certainty, yet also the ultimate unknown. As the saying goes, death is the great leveller and nowhere is it better expressed than in the world of literature. The inevitability or tragedy of death is a literary theme found in all manner of novels whether as the main focus or through the demise of a major character. This is approached from many different angles, exploring the mystery of death, a futile attempt to escape it, characters faced with their own mortality or dealing with grief and loss.

Arabic modernist poetry is imbued with the theme of death. These poets view death as a path for a better life. As for the western poets, death was still a complicated matter. The attitude of the modernist poets towards the matter of death differs from one poet to another. For some, death is a dreadful ghost and in the eyes of other poets, it is a saviour, a gift from God and the greatest blessing to human beings. Kahlil Gibran touches upon the concept of death in a philosophical way bearing values of West and Eastern culture. Gibran views regarding death parallel with all the doctrines and principles of the world. Gibran accepted the inevitability of death and his views regarding death shows his adherence to the Christian and Muslim doctrines. According to Gibran, death is a medium through which the spirit of human gets once again reunited with God.

In his prose poem *The Prophet* which consists of all greatest values in every human life, Almustafa explains the relationship between life and death. Some consider life a journey which eventually ends in death. Here the journey of Almustafa is about to embark on the vehicle ship denotes his journey towards death. Through this Gibran brings out the uncertainty of death. From the beginning of the narrative, Almustafa states that he is returning to the place of his birth. In a philosophical way, it can be understood that life ends where it began. The spirit or soul comes from God and it eventually returns to him. So Almustafa's departure denotes both his death and his reunion with God. Almustafa advises people not to fear death and to accept it “For life and death are one, even as the river and the sea are one” (89).

Gibran compares life with that of the river and death with the sea. The river and sea are one but not the same. Here through the river, Gibran denotes the short lifespan of the human. Like the river, the human soul flows freely but at the end, it mingles or unites with the sea, by which Gibran differentiates the understanding of life and death. Like river the depth of life can at least be explored to some extents but it is impossible to know about the mystic nature of death. Death is similar to the sea which is only visible until the horizon but it is unknown. Certainly are the origins of life and its ends are unknown to humans.

In Gibran's *Broken Wings* the concept of death and life is present. Selma represents both life and death. Gibran's empty life changes after the appearance of Selma whom Gibran calls as “spring of life”. Selma is the source of Gibran's life and her love revealed to Gibran

all about the bliss of love and life. It is from the love of Selma Gibran “awakened from the slumber of youth and solitude and set on the stage where life and death played their parts.”(35) The first part of the prose poem centres on the treatment of life in relation to life and the second part of the prose poem deals with death. Gibran connects life with nature and also touches upon God’s function in human life. He expresses the general philosophy that life begins not on the womb nor does it ends on the grave. “Man’s life does not commence in the womb and never ends in the grave.” (38) After enjoying the pleasures of life, Gibran was approached by death by means of Selma’s marriage to the bishop’s nephew Mansour Bey.

Gibran uses freedom by means of death as the only way through which Selma escapes from the chains of sufferings. However, the concept of referring to death as a freedom is also expressed in *The Prophet*. Death is seen as freedom, but life is also seen as freedom, though it is restricted. When one dies the fetter of life breaks and the bigger fetter of death takes over. So both life and death are like a prison which captures the soul of the human and God acts as a saviour. At one place in *Broken Wings*, Selma considers love superior to all other things as she says, “There is something higher than heaven and deeper than the ocean and stranger than life and death and time.”(37) But as expressed in the prose poem her love turned powerless before death and sorrow imprisoned her. As she remains as a prisoner of sorrow she eagerly awaits death as it is the only rescuer.

Gibran gives a strong imagery to differentiate the relation between life and death for which he gives two pictures one representing Ishtar, the goddess of love and other representing Christ which represents death and sorrow. The two pictures symbolically represent the state of Gibran and Selma. They both were driven between life and death. Selma accepts death over life and she longs to be united with God. Finally, she surrenders herself before God as his follower. Selma who first regarded life and love to be everything resolves herself and prefers death over life. Selma patiently waits for death to arrive. In *The Prophet* as well as in *Broken Wings* death stands as the ultimate end of existence and the souls reach heaven to God. Gibran gives both death and life as a cycle that turns around in every human’s lives.

Kahlil Gibran has introduced various mystical aspects throughout his works. The mystical element conceived by Gibran is a unifying thread that ties together his literary output in two totally different cultural environments. It grants his works as a distinctive flare amidst the apprehension of modernity. It roots them in the human psyche with reverberations of ancient mysticism and spirituality. The success of Gibran could be attributed to the fact that Gibran has gracefully given voice to the deep human need for spiritual answers to pressing questions on the meaning of existence.

The disparities between the linguistic consciousness of East and West should have created the problem of ‘root words’ but Gibran’s sensibility is influenced and tempered by the language of *The Bible* a book belonging to East and West. Gibran separated himself from the materialistic view of existence. He united spirituality with mysticism. His themes touch upon the insights and questions about the existence. Gibran concerned with the voice of every individual and their life. His works reveal some greatest truth about mankind. He answers spiritually to some tough questions regarding the purpose of existence.

Gibran’s works show his idealist view of a utopian society and how he blended Eastern Mysticism and Western wisdom in his works. He fused *The Bible* and *Quran*, Sufi

and Hindu, Romantic as well as spiritual unity in his works. His views regarding death and life are similar to the doctrines of both Eastern and Western novels. Gibran was one of those rare writers who actually transcend the barrier between East and West and could justifiably call himself a citizen of the world. His words went beyond the mere evocation of the mysterious East but endeavoured to communicate the necessity of reconciliation between Christianity and Islam, spirituality and materialism, East and West. His works truly possess a mystic blend of Eastern and Western thought. As Waterfield says, “The freedom to live with perfect virtue in the actual realization that life is one and infinite are the gifts of the mysterious to the person who has attained self-realization.”(xii) Gibran is gifted with such understanding which he reveals through his writings.

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Nature's Magic in Frances Hodgson Burnett's *The Secret Garden*

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ABSTRACT

The Secret Garden is a wonderful reminder of the healing power of nature, laughter, and love. It is an affirmation of the existence of magic as well as simply a beautiful story. This unusual story, has proved to be the most lasting element of Burnett's literary legacy. In *The Secret Garden*, the orphan Mary's rightful inheritance is ultimately herself and the natural world, the ability to speak truth to others and to have it spoken back to her – to live a full life of both the body and the imagination.

Keywords: Nature, love, life, God, magic, power.

Nature's Magic in Frances Hodgson Burnett's *The Secret Garden*

The Secret Garden by Frances Hodgson Burnett is a story of rebirth as a result of the power of love. It opens with Mary Lennox, a 10-year-old girl who lives in India with her English parents. She is terribly neglected by them, causing her to be sickly, unpleasant, and demanding. When her parents die in a cholera epidemic, Mary is sent to live with her uncle, Archibald Craven, in Yorkshire, England. Mr. Craven lives in a huge manor house with nearly hundred rooms, most of which are unused since the death of his wife ten years earlier, an event that has left him bereft. When she arrives at the Misselthwaite estate, the servants let her know that her uncle will pay no attention to her and that she is expected to get by on her own.

Soon after her arrival, Mary learns about a secret garden on the estate that has been locked away for ten years. She becomes enchanted with the idea of the garden and determined to find it, and eventually she locates it and goes inside. It appears to be abandoned, but she finds a few sprigs of new growth and begins tending to them even though she knows nothing about gardening. Mary befriends Ben Weatherstaff, a gardener on the estate, and questions him about the garden, but he makes it clear that it is not to be discussed. She learns that the garden belonged to the late Mrs. Craven and her husband ordered that it be locked away after her death because it caused him too much pain. Mary also befriends Dickon Sowerby, the brother of her housemaid Martha, who is a great lover of nature and is beloved by every living thing, including every animal he meets, and he begins to help Mary tend to the garden.

After hearing the soft sound of crying from time to time in the house, Mary eventually discovers Colin, the sickly, demanding son of Mr. Craven, who remains secluded in his room and is not expected to live long. Mary and Colin are kindred spirits and when she tells him about the secret garden, he becomes determined to see it for himself. She brings Dickon to meet him and they conspire to take Colin to the garden in his wheelchair, but to keep it a secret from the adults in the house. Just as Mary has grown physically and mentally healthier by spending time in the garden, Colin immediately begins to transform when he enters it and declares that he will now live forever.

As spring comes, the garden begins to thrive along with the health of Colin and Mary. Soon Colin is able to stand and walk, but the children keep this a secret because he wants to surprise his father when he returns from his travels, hoping that his improved health will enable his father to love him. Unbeknownst to the residents of the manor, Mr. Craven has begun a simultaneous transformation as a result of the garden's spiritual power. When he returns to Misselthwaite, he is surprised to find that the garden has been discovered and is now thriving again and thrilled that his son, whom he has come to regret neglecting all these years, has now been made strong and healthy through his connection with nature and the power of love that comes from the secret garden.

In the novel takes the shape of a small red breasted bird – a robin. The robin is one of the central characters in *The Secret Garden* and occurs frequently throughout the novel. Burnett herself had a very special bond with these birds and, in the short story *My Robin* (1912), she writes about her relationship to the original robin. Burnett continues, that she knew what Mary felt the first time she saw the robin (10). “An intimacy with a robin”, she states, “is a liberal education” (3). In *The Secret Garden* the robin is also known as “the robin who showed me the way” (213), as he is the one that helps Mary get into the secret garden, which has been locked up for ten years. This adds an element of magic realism to the story.

The encounter with the garden is characterised by activity, participation and responsibility. “The strongest and deepest actuality”, Buber (1923) writes, “is to be found where everything enters into activity – the whole human being” and “the boundless You” (137). Or as Colin puts it: “The Magic works best when you work yourself” (Buber 258). This notion is central in the novel as Mary goes from contemplating the garden to working in it. “It is not only the attitude of my soul”, Buber writes, “but how I let the attitude of my soul towards the world come to life, that affects the world, actual life” (142).

This awareness is present in Mary’s desire to get a spade and some seeds: “‘If I have a spade,’ she whispered, ‘I can make the earth nice and soft and dig up weeds. If I have seeds and can make flowers grow the garden won’t be dead at all – it will come alive’” (87). Moreover, this passage shows that this encounter does not only inspire contemplation or activity, but also a loving sense of responsibility.

Another lovely passage from *The Secret Garden* is when Dickon proves to Mary that the wintery garden is still alive, by cutting into the green centre of a tree branch: “In the course of half an hour Mary thought she could tell too, and when he cut through a lifeless-looking branch she would cry out joyfully under her breath when she caught sight of the least shade of moist green” (105). Finally, the encounter with the garden is characterised by mutual transformation. Throughout the encounter, Mary and the garden mutually aid each other in becoming, that is, to actualise their inborn potential and come alive.

Life with nature introduces Mary to the world of relation through a curious grace and Mary to life with men. It should be noted that the wordless interaction with nature enables Mary to open up to relation, in a way that the interaction with men or God is not yet able to. Mary goes out into the grounds of Misselthwaite Manor expecting to experience nature but instead she encounters the nature. In the meeting with the robin and the garden Mary is transformed, inside and out, which shows the immense power of the encounter.

The world of relation arises is life with spiritual beings. *The Secret Garden* is not religious in any conventional sense, it is a deeply spiritual work, which is an aspect of the

novel that is often overlooked by critics. In the novel, God becomes present to Mary through her relationship to the robin, the garden, Dickon and Colin. In this sense, “God is not outside the meeting, the meeting is inside God” (Buber 59). Moreover, one could argue that the relation the children experience in the spring garden triggers a religious impulse.

Burnett argues that by naming the magic power, the children are able to wield it. She writes “to recognize, to know, the sacred power is primary. Knowledge of the power is symbolized by the ability to name it. What one can name, one has power over, for naming indicates knowledge of the essence” (97). Yet, although this is a valid point, one could argue that the most magically powerful character, Dickon, does not name his power, nor does he presume to have knowledge of it or even a desire to use it.

The emphasis on this ‘Magic’ turns the natural environment into a symbolic environment because the positive influence is attested to these mythical healing powers of the garden. Symbolic environments are often connected to myths about health, or can be understood through the meanings attached to geographical settings. In other words, the garden has turned into more than a mere garden; it is a place of magical forces and restorative energies. Finally, this powerful force transfers even onto Colin’s father, who returns to Misselthwaite after another long absence of running away from sorrow about his wife’s death and Colin’s condition. In accordance with the rules of happy endings, seeing Mary and Colin healthy turns him into a happy man.

In *The Secret Garden*, the children refer to that which is unexplainable as Magic, which leaves room for various interpretations. This shows that Burnett, like Buber, is eager to keep the mystery alive by focusing on the encounter with God as it is experienced in the moment, rather than a clearly defined or pre-existing concept of God. Yet, it can be concluded that through the encounter with the nature, men and herself, Mary is able to encounter the eternal God. Despite this, however, the sense that the encounter with God is not the end but only another beginning. God is not a station but a way of travelling.

There are two elements of *The Secret Garden* that influence the play’s style. The first of these is the realistic element, or the fact that the basic story behind the play could have happened in real life. The second is the element of fantasy. Even though all the places in the play are realistic, the ghostly powers of the Dreamers, the many references in the play to magic, and the power of the children’s imaginations pull the realistic world into the realm of fantasy. There is nothing more powerful than the imagination of a child. The mansion and the garden maze is real, but the Dreamers have the supernatural power to haunt both places.

Dickon has the magic to call forth life from things that seem to be long dead. He also seems to be the one real character in the novel that understands and can consistently see and react to the actions of the Dreamers. It is the power of hope and the imagination of the children that bring the garden back to life and bring Colin and Uncle Archibald back to it.

According to Burnett’s autobiography, her imagination was stimulated by stories of adventure and romance, such as ballads, biblical tales, and Roman histories. She was also influenced by the works of William Shakespeare, the Romantic poets, and novelists. Nature in Burnett’s work like the English poet William Wordsworth, Burnett depicts nature as the great teacher of children, nurturing spiritual and emotional health. She described her own bliss in the gardens of her childhood and her feelings of entrapment in the crowded and

lifeless environment of a large manufacturing city. In contrast, she recounts the flowering of her emotions and the liberation of her spirit in the wilderness of rural Tennessee.

The Secret Garden has charmed readers for over a hundred years with the story of three children who discover the magic, wonder, and healing power of the great outdoors. In *The Secret Garden*, the three children Mary, Colin, and Dickon, encounter the miracle of life in the growing plants and animals, which helps the children see that all life is a gift from God – a gift for which they need to be thankful. Like many other early twentieth century children's books, *The Secret Garden* reveals in the gentle beauty of nature emphasizing the wonder and awe that children feel as they discover the beauty of God's world for the first time. Throughout the novel, the children refer to their sense of wonder as 'The Magic'. For them, the beauty of thriving life is so powerful that 'magical' is the only way they can describe it.

Through the magic of the garden, the children finally begin to see the value in their own lives and in the lives of the people around him. *The Secret Garden* reminds us that all children need love, protection, and exposure to the mysterious miracle of life to help them understand that every life is a gift from our Loving Creator.

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Postcolonial Elements in Ondaatje's *The English Patient*

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ABSTRACT:

An officer of the Order of Canada and the Booker Prize winner for The English Patient, Ondaatje is one among the most celebrated living authors. He is the most mainstream of the writers, having received widespread public acceptance and high sales, both in Canada and internationally. In his fictions, he both alters and supplements historical records to present other stories artistically, suitable to and representative of the voices of outsiders who do not figure in published history. This paper deals with the prominent postcolonial elements in the novel, The English Patient. The novel raises fundamental issues of wars, nations and boundaries. It envisages a world, in which different cultures become intermingled, interdependent and hybrid.

Keywords: postcolonial, identity, space, war, mystery, hybridity.

Postcolonial Elements in Ondaatje's *The English Patient*

An award-winning novelist, poet and critic, Michael Ondaatje has secured himself as one of Canada's brightest literary talents. He has also won several prestigious literary awards, including the Golden Man Booker Prize for *The English Patient*, which was also the basis for the Academy Award-winning movie of the same name, the Governor-General's Literary Award for Fiction for *The English Patient*, *Anil's Ghost* and *Divisadero*, the Giller Prize for *Anil's Ghost* and the Prix Medicis for *Anil's Ghost*. He has also received the Governor-General's Literary Award for Poetry for *The Collected Works of Billy the Kid* and *There's a Trick with a Knife I'm Learning to Do*.

Ondaatje consistently and consciously writes from different points of view about statelessness, lack of allegiance to homeland or nationality, the permeability and impermanence of human-imposed borders, and the isolation of human beings. Additionally, he provides alternative versions of history, telling different stories about the same subject or event, with a blurring of fact and fiction. He represents history as a form of sanctioned storytelling, a necessarily incomplete version of the past, no matter how thoroughly researched and documented. "Ondaatje's texts reveal an intensive preoccupation with the sound and texture of words, a preference for unexpected juxtapositions and conjunctions, and an often devious sense of humour" (New 846). The dialogue and intersections between self, persona, myth and a subterranean kind of history inform many of Ondaatje's works, and in interviews he repeatedly emphasizes the importance of discovery and process in the act of writing.

Hana and Caravaggio, two characters from *In the Skin of a Lion*, reappear in Ondaatje's next novel, *The English Patient*, which is a historiographic metafiction. The book won the Booker Prize and the Governor General's Award in 1992. On 8 July 2018, the novel has been crowned the Golden Man Booker, the best winner of the Booker prize of the last 50 years. Set around and during the Second World War and ranging in locations from North

Africa to Europe and from Canada to India, this work again unfolds past events as they are reconstructed in the interactions among several characters whose lives become part of a communal history, in a half-destroyed villa that becomes a setting for reading, hazardous deciphering, and imagination.

Hana, a 20-year-old nurse from Canada, seeks refuge from an explosion of wartime death. Kirpal Singh, a 25-year-old bomb dismantler, from India is a member of the British Army. David Caravaggio, a friend of Hana's father, worked as a spy during the war and severely disfigured while a captive of the Germans. Hana's patient is a severely burned man whose identity is the mystery at the heart of this novel. Each of these characters finds him or herself far away from home, displaced by the war, and each of them finds a quiet refuge in the abandoned Italian villa to reconstruct their lives. While Hana and Kip eventually develop a romantic relationship, Caravaggio becomes more and more obsessed with the patient's true identity. Caravaggio believes that the patient may not be English, as everyone assumed, but a Hungarian who worked as a spy for the Germans. Scattered into the story of the lives of these characters together in Italy are each character's clear reminiscences of the past, including the patient's hallucinatory memories of a sultry love affair, of desert exploration, and of friendship and betrayal. The novel becomes a patchwork of memories that explores themes of war, nationality, identity, loss and love.

The postcolonial theme of cultural hybridity can be construed as a mixture of different cultural fragments, including among others such features as nationality, race, and religion. According to Bhabha, "Hybridity is the sign of the productivity of colonial power, its shifting forces and fixities; it is the name for the strategic reversal of the process of domination through disavowal (that is, the production of discriminatory identities that secure the 'pure' and original identity of authority)" (159). *The English Patient* interrogates the notion of a pure cultural or national identity and conceives the postmodern identity as hybrid identity. The characters in *The English Patient* are mental ruins. In the novel, cultural and national borders vanish with characters that have diverse cultural identities due to their past. The patient has multiple national and cultural connections spanning from Hungary to the Levant, France, England and Libyan Desert. Hana and Caravaggio are Canadians with a mixed background of emigration including Italy for Caravaggio's family, while Hana is a French-Canadian of Finnish and Slovenian origin and Kip is a Sikh who emigrated from Punjab, India, to England to work in the British Royal Engineers. At present he is in Italy defusing German bombs and "fighting English wars" (129). Caravaggio opportunely sums it up by saying, "The trouble with all of us is we are where we shouldn't be" (129). The four of them slowly form a brittle community amidst the war.

The story of the presumably English patient, who will be revealed as Ladislaus de Almsy, a Hungarian Count, unknots through narrated flashbacks of his desert explorations in the Libyan Desert in Northern Africa. His mysterious identity is revealed little by little as his narration confesses his past secrets and actions in desert exploration missions. However, Almsy's narrative is not trustworthy because despite his initial injuries, he also conceals his national identity because of his German affiliations. He claims that he cannot remember his name or nationality. He is adding layers to his story to mask his identity.

Kip has a complex identity which is the result of his exposure to Indian as well as the English culture. He is allured by the English culture that has made him ignore his older

brother's anti-English remarks, siding with whoever was against the English. He is part of an elite bomb disposal squad which defuses bombs planted by the enemy. He is a colonized native who works for the colonizer, that is, the British army. Kirpal Singh's name change from Kirpal Singh to Kip is a part of this hybridisation process. His maiden name Kirpal Singh, indicative of the community and caste of Singhs he belong to, is no longer mentioned in the novel after he is nicknamed as 'Kip' by the members of his bomb disposal unit. Kirpal Singh, the colonized native, latently accepts the new name given to him by the colonial authority. Though he accepts the name change, it is done by people he does not know. He admits "And he remained the foreigner, the Sikh" (105). This indicates that he still identifies himself as an Indian even though he possesses many attributes which are the products of English cultural influence.

Kip has a dual belonging to India as well as to Britain. But this hybridity is denied by him when Hiroshima and Nagasaki are bombed, which forces him to reject English culture altogether. The bombing of Hiroshima and Nagasaki exasperates him. This incident makes him relinquish the West. The characters are culturally dislocated or become so in the novel. The four of them share the villa as their new homeland. They are leaving old cultural identities behind as they are, according to the phrasing used in the novel, "shedding skins" (124), or ridding themselves of their old identities from their old lives before the war. They have grown wary of life and endure from disillusionment: "They could imitate nothing but what they were. There was no defence but to look for the truth in others" (124). Ondaatje is bothered with the challenges of postcolonial struggles. He writes about an ideal world, without any geographical or cultural borders, where hybridity rules, and the theme of cultural hybridity is strongly portrayed in *The English Patient*.

Identity becomes the fulcrum upon which the postcolonial character revolves. Each character that is created suffers from a certain lack of direction in their lives. Identity becomes an overwhelming emotional force in the character's lives that begins to drive every action that the characters take. This search for a true identity forces their decisions and guides their lives in directions that seem almost irrelevant. The struggle for an identity apart from the colonial power becomes paramount.

"*The English Patient* is a story about trapped people – people who are trapped in their past casting its shadow on their present, and struggling to somehow possess a hold over life" (Ray 70). Almsy is trapped in his past, reliving it constantly to escape the pain of the present. Hana too does not have the freedom of mind and is yet to overcome the loss of her lover, child and father in the war. She retreated from everybody around her except the patient with whom she shares everything in her mind. Although their stay in the Villa San Girolamo could appear as a flight from the outside world, the fact that each character attempts to remember the past in order to get a grip on his or her identity stresses the importance of the larger context. As a result, the novel consists of flashbacks, which are often vague and provide only a fragmentary account of both history and each character's story. The mysteriousness that surrounds the title character raises the suspicion that he himself might have behaved in savage ways, inconsistent with justice or laws. Even though different characters attempt to fill the gaps in his story and darns the holes that history has torn in the tissue of the self, the English patient's identity remains fluid and therefore suspicious. He is the unsettling presence at the end of colonialism and the war because history writes the

problems of a “period of adjustment” (57) upon his body. After the plane crash, the English patient is different from who he was before. He has been propelled into the elusive space of the nomadic ‘Other’. In this sense the past is different from the present and stands beside it. The return of what was forgotten and repressed creates an ambivalent space for knowledge, not only for the ‘English’ patient who tries to recall his past, but also for those who want to fill the gaps in his identity in order to make sense of their own lives.

In the novel, the English patient establishes his slipperiness in identity when he mentions that, “after ten years in the desert, it was easy for [him] to slip across borders, not to belong to anyone, to any nation” (148). Hana, the only female in the group, is the pivotal point on which all of the action revolves. She becomes a conduit through which the men will ultimately see into themselves by recognizing what as individuals each has become as a result of his war experiences. Kip’s “trick of survival” (214) manifests itself as a profound emotional identification with English culture and customs. The forge of this identification suggests that this trick should be read as an expression of the cultural ambivalence felt by the colonial subject whose home space has been overwritten by the presiding imperial presence.

The characters in *The English Patient* do not have a well defined identity. The characteristics are overlapping and mixed and a plural notion of identity that belongs to different cultural spaces has been presented. To be lost, or to be unable to find oneself on the map, is to become caught in a problematic fantasy of identification with that which has been pushed off the map. Michael Ondaatje, in *The English Patient*, describes a moment of being lost in the United Kingdom.

Maps serve a purpose of delimiting various geographical territories. A way of controlling a particular area is to name the land. The English patient’s rejection to live without maps is his denial of the concept of borders. He lost interest in his own identity as well as a nation. He wanted to cast off his identity completely. By invoking desert as place, Ondaatje allows for a contrast between nation as easily mappable and with boundaries, and the desert as that which stands outside nation, where “it is easy to lose a sense of demarcation” (20). The desert becomes for Almsy a place of renewal and regeneration, away from the constructs and ideologies of nation. Ondaatje represents the desert as a space of escape, a kind of utopia that is empty of time and space, becoming for Almsy a substitute for religion. His disgust with the notion of nation comes to the fore when he says, “All I desired was to work upon such an earth that had no maps” (277). Maps play an important role in Kip’s life too. To him, they mean the difference between life and death. He makes use of them in deconstructing bombs and mines which he reduces to their skeletal shape. They represent an order without which anarchy and deluge would follow.

Michael Ondaatje’s *The English Patient* addresses the probing issues of postcoloniality. The novel suggests the possibility of the mixedness, interaction or interconnectedness of cultures, the possibility of a Third space, which is likely to reduce or to prevent the detrimental effects of borders. The four characters are metonymies of peaceful coexistence of divergent cultures.



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Perils of Postcolonial Hybridity: A Study of Jean Rhys's *Wide Sargasso Sea*

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ABSTRACT

Jean Rhys's novels and short stories have been read in multiple ways from multiple cultural perspectives. She marks the crossroads of powerful literary forces: modernism, women's writing, and emergent postcolonial literatures. Her work has gained accelerated attention and sparkling critical debates. Rhys's colonial Caribbean background gives perspective, tone, and aesthetics. It shares a great deal with modernist styles and themes of homelessness and alienation which attributes to modernism. This paper deals with the postcolonial hybridity in the novel, *Wide Sargasso Sea*. It was shaped by the dislocation of empire and colonial migration. Her work helped to see the complex dynamics linking modernism and imperialism.

Keywords: Identity crisis, Madness, Patriarchal, Creole, victim and Dejected child.

Perils of Postcolonial Hybridity: A study of Jean Rhys's *Wide Sargasso Sea*

Jean Rhys was born in Dominica, one of the former English colonies, to a Welsh father and a Creole mother. As a British in Dominica, she underwent certain discriminations because of her race, gender and economic condition. She went to London at the age of sixteen. She was influenced by Ford Maddox Ford, to start her career as a writer. Some of her works are *The Left Bank*, a collection of short stories, *Voyage in the Dark*, *Good Morning*, *Midnight*, and *Sleep It Off Lady* and her unfinished autobiography, *Smile Please* which was published posthumously. Her works bring to the centre of voices of those women who struggle for survival in the men's worlds. Her narratives have female protagonist who lives in the margin of the society. Her honest portrayal of abandoned and isolated women brought her fame throughout the world. According to A. G. Morrell, "All her stories are about the indignity, the personal damage, which flows from a woman's financial and economic dependence on men in an alien world" (80).

Toward the end of her writing career, Rhys produced the captivating story *Wide Sargasso Sea* in 1966, a story of a lonely woman who is driven to madness. Rhys explores the reason for madness of Bertha Mason in Charlotte Bronte's *Jane Eyre*. Antoinette is denied positive culture and gender identity. Her madness is the manifestation of denial. An important factor that leads to the fragmentation of Antoinette's identity and her identity crisis is concerned with race and ethnicity.

Antoinette is a White Creole. The meaning goes beyond the binary oppositions of Black and White, African and European categories of identification and establishes a new domain "third space". As a Creole, Antoinette suffers a confusion and of identity and individual existence. The Black people consider her as a "hybrid". Homi K. Bhabha recounts about hybrid culture as, "Strategies of hybridization reveal an estrangement movement in the authoritative" (212). The Emancipation Act of 1833 under which Britain barred slavery in all its colonies. The dominance of British in the West Indies is suppressed. The powerful class

suffered from economic crisis. The White Creole lost their status in comparison with new arrivals from Britain like Mason.

Like the unfortunate parrot in the novel, Rhys symbolized the parrot which seems to be anxious about its own identity. In narration of Antoinette, she describes it as “Our parrot was called Coco, a green parrot. He didn’t talk very well” (22). It speaks French and Creole language, but not English. When repeatedly asks in French ‘Who is there?’ and it replies in Creole, ‘Dear Coco’. Mason causes its death by clipping its wings; it cannot fly away from the fire. This incident foreshadows what will happen to Antoinette. She wonders who she is: “So, between you I often wonder who I am and where is my country and where do I belong and why was I ever belong” (64).

At her early stage, Antoinette suffers identity crisis. Her friendship with Tia shows the pain she underwent. Tia shows Antoinette the extent to which black people don’t like her and her Creole family. Intending to torment her friend, Tia calls Antoinette a “white nigger”, a hybrid who does not belong to any specific race. Tia’s insolent behaviour with her childhood friend shows how racism is controlling her behavior and her treatment of her Creole friend. Tia refers to Antoinette as poor and dirty and also tries to underestimate her by cheating on her and by taking her clothes. Antoinette is looking for a place which she loves and to which she belongs. She is also anxious to have a trustworthy friend who would make her feel more secure and might help in the construction of her identity. Antoinette becomes a double outsider: “white nigger” for the Europeans and “white cockroach” for the blacks.

Antoinette remembers her natural curiosity about the changes in their lives and how she questioned her mother about the past. She recalls Annette's reluctance to tell her anything. “Why do you pester and bother me about all these things that happened long ago?” (18). Antoinette sees that she was unable to understand or gain a sense of belonging to a past which Annette had shut away from her. She realizes that, being denied any knowledge of the past. She was deprived of an important part of her heritage and identity. Her rejection and alienation had their roots in the past that was closed to her.

Rhys affirms that Antoinette’s madness is acquired and not genetic. The reason for abnormality is childhood stress and neglect by her only parent, Annette. The unsuccessful relation of Antoinette with her mother, the improper identity formation and the absence of a father figure leads to the lack of confidence. She sought refuge in Christophine's company to compensate for her mother's rejection. She says that: “I spent most of the time in the kitchen which was an out-building some way off. Christophine slept in the little room next to it. When evening came she sang to me if she was in the mood.”(7). Antoinette recalls that Christophine became her surrogate mother. She nourished Antoinette's cultural development. Through her songs, stories and the food she prepared, Christophine provided her with a psychic rather than an economic development. Annette and Christophine was the catalyst for drastic changes in her life.

Landscape and its utilization symbolize different aspects of the narrative. Ashcroft, Griffiths and Tiffin note that place and displacement are important concepts in the study of postcolonial literature. The emphasis is placed on “an effective identifying relationship between self and place” (8). Place, consequently landscape, is an important element in the construction of one’s cultural identity. It helps to anchor one’s existence to a location, a home. Having a place to call home is an important building block in an individual’s practical

identity. Being part of a society presumes a location specific to said society. Cultural identity as well as the sense of belonging is intimately connected to the notion of place. Displacement is a concept related to removal from said place, or home. Ashcroft, Griffiths and Tiffin define displacement as a state where the “valid and active sense of self may have been eroded by dislocation” (9).

In *Wide Sargasso Sea*, landscape is used as a tool for the portrayal of many different aspects of cultural identity as well as emotion. One such use of landscape and nature imagery in the novels is to portray nostalgia, which is also closely linked with the concept of displacement. Nostalgic feelings towards a place occur when one is removed from it, voluntarily or involuntarily. The use for landscape imagery is the development of an individual’s cultural identity.

As a victim and dejected child Antoinette spends time with nature. Rhys sets her novel in a plantation area. Emancipation rejects the power exercised by English in Creole. For instance, Antoinette compares the garden to the “garden of Eden” before emancipation. The garden had changed and gone wild. The paths were overgrown and smell of dead flowers mixed with the fresh living smell reflects the life of Antoinette. As a subversive, she can’t pave the way of her own life. The impending danger in the future is mirrored in the initial pages of the novel. “I didn’t remember the place when it was prosperous” (6).

The reality is harsh to Antoinette and the acceptance of reality is difficult. She says, “I went to bed early and slept at once” (6). Even the physical plan is better for her. In certain instances, Antoinette says: “And if the razor grass cut my legs and arms I would think ‘It’s better than the people.’ ... All better than people. Better. Better, better than people” (12).

Wide Sargasso Sea stresses the opacity of the boundaries that separate a white English male from the Creole woman. When Edward Rochester sees Antoinette for the first time he associates her with natives who are mysterious and unmistakably ‘other’. Rochester says of Antoinette, “Long, sad dark alien eyes. Creole of pure English descent she may be, but they are not English or European either” (67). Edward, who is proud of being English resists falling in love with his Creole wife whom he sees with suspicion. Edward empathizes and finds a response in his heart both for the wilderness of the island and Antoinette. Finally he rejects Antoinette saying: “Vain silly creature. Made for loving? Yes, but she’ll have no lover, for I don’t want her and she’ll see no other” (165).

The double oppression that Antoinette undergoes relatively is much evident within the context of the novel via several relationships that she develops such as her morbid marriage to Edward Rochester, her pathetic pursuit of relief from Christophine, and her hateful relation to Amelia, who would not obey Antoinette’s imperatives. Even the social space in which Annette and her daughter are fated to live in search of rich white English husbands is enough to recognize their restricted in-between status in the society. The patriarchal subjugation that Antoinette experiences as a woman intensifies her repression, causing her to endure double ‘othering’ of the society both as a woman and as a postcolonial subject. The triple oppression under which Antoinette tries to acknowledge her self-identity leads her to the final place of resolution, which is nothing less than a desirable madness.

In postcolonial terms and particularly in light of Edward Said’s *Orientalism* (1978), the “othering” attitude of Rochester when he considers his wife to be the “other” for he is the “subject”, the superior Western colonizer, while his wife represents the inferior Creole

colonized “object”. The decisive negation of Antoinette’s identity or existence is further enhanced by the oppression exercised by Rochester on her. Under the colonial hegemony of her husband who is actually a symbol of colonization, Antoinette is colonized into a slave figure and thus loses her identity. Becoming more aware of her need for an identity of her own, Antoinette finally tells Rochester not to call her Bertha:

Bertha is not my name. You are trying to make me into someone else, calling me by another name... I loved this place and you have made it into a place I hate... I used to think that if everything else went out of my life I would still have this, and now you have spoilt it... I hate it now like I hate you and before I die I will show you how much I hate you. (94)

The above impassioned speech indicates that Antoinette is gradually moving, though slowly, towards achieving a kind of epiphany or realization of what is going on and of her need for an independent self and an identity of her own. Antoinette cannot come to terms with her identity, which is usually manifested as ambiguous. And her female status also blurs Antoinette in her acknowledgement of a precise individuality. Throughout the novel the character Antoinette, is referred to by the public as the daughter of Annette, or as the wife of Mr. Rochester, or as Bertha, a name and individuality which is totally imposed on her by the husband. Owing to the imposed identities on herself by other power holders, Antoinette cannot strike a balance with her individual self.

The novel’s evocation of colonial history consists of random and blunt references to place names, slavery and the Emancipation Act. The straightforward historical narrative is replaced by allusions. Antoinette comes to realize the pre-established views of her husband Edward Rochester. She says: “You are trying to make me into someone else, calling by another name” (65). Rhys creates space for woman and their experiences in her writing. Antoinette’s marriage with Rochester subverts her identity which is a result of the long imprisonment in the cold dingy attic room is sensitively shown in the following lines in which she is not able to recognize her mirror image and longs for Christophine to give her some proof of her identity:

I dropped the candle I was carrying and it caught the end of a table cloth and I saw flames shoot up ... I called help me Christophine help me Christophine help me and looking behind I saw that I had been helped. There was a wall of fire protecting me. (121)

Wide Sargasso Sea provides unique insight into the gradual deterioration of the human mind and spirit. On examining Antoinette and her mother Annette, the reader gains a new perspective of insanity. One realizes that these two women are mentally perturbed as a result of numerous external factors that are beyond their control. The cruelty of life and people drive Annette and her daughter to lunacy. Neither mother nor daughter has a genetic predisposition to madness, and their downfall is an inevitable result of the actions of those around them and the unbearable nature of their living situation. Thus, “Perils of postcolonial hybridity” is substantiated.



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Journey from Detachment to Involvement: A Study of Arun Joshi's *The Foreigner*

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ABSTRACT:

Arun Joshi is an outstanding Indian English novelist who has outlined human predicament caused by inner crisis of man living in the present world. He gave a new dimension to the Indian fiction written in English. His novels are based on the rootlessness of the characters who is always in search of his identity. Arun Joshi's first novel *The Foreigner* enacts the crisis of foreignness of its protagonist Sindi Oberoi. It also traces how his philosophy of detachment declines and he gradually gets involved with the world. Dealing with Sindi Oberoi's journey from detachment from the world to his involvement in it, Joshi depicts Sindi's anguish resulting from his loneliness and his so called rootlessness. It is his detachment from self leads to his attachment to the society. He realises that detachment does not mean renunciation but selfless action. Finally he comes to know the purpose of his existence on this earth.

KEYWORDS: Rootlessness, Detachment, Self-alienation, Existence, Estrangement

Indian English literature is a body of writing which is the creation of Indian race responding fruitfully to the western impact during the 19th and 20th centuries of colonial period. After 1960s the Indian English fiction shifted its focus from the public to the private sphere. The mass destruction in the two World Wars caused by nuclear weapons brought envy and unrest all over the world. This situation gave rise to psychosocial disorders and loss of moral values in humanity and it also disturbed man's mental peace and harmony and brought discomfort, depression and frustration. The Indian novelists could not remain aloof from these currents. This shift of focus in Indian English fiction becomes clearer particularly with Arun Joshi and Anita Desai. They explore the agonised existence of modern man in their writings.

Arun Joshi, like Anita Desai, has recorded modern man's traumas and agonies in his novels with rare competence and gravity. His main thrust is on the individual psyche of protagonist. His technique of self-introspection intensified by self-mockery opens a new dimension in the art of Indian English fiction.

Arun Joshi is a major Indian English novelist who has attempted to tussle with the predicament of modern man. While other Indian English novelists like Mulk Raj Anand, R.K. Narayan and Raja Rao concentrate on the social scenario in the native country and endeavour to underline its inadequacies. Arun Joshi's main thrust is on the individual psyche of the protagonist. Despite surrounded by material comforts and sophistication, the protagonist finds himself as an outsider and misfit in the environment. By virtue of some existential themes and skilful weaving of fictional techniques in his novels, Joshi has created a desirable space for himself among the group of Indian novelists.

As Shyamala A. Narayan puts it:

Arun Joshi presents an India riddled with corruption. Even God can be propitiated, by gifts in black money to his temples, where the priests themselves are corrupt as the narrator. Hypocrisy is so all pervasive that the narrator himself is not free from it (35).

Arun Joshi was born on 7 July 1939 at Banaras Hindu University, Varanasi where his father, late Prof. A.C. Joshi was on the science faculty of the University later he became the Vice-Chancellor as well. The youngest child of his illustrious parents he had his formal education at Varanasi, Lahore and Jalandhar. After completing his Intermediate courses he got a scholarship from the U.S.A. to pursue higher studies. He obtained a Degree in Engineering from the University of Kansas in 1959 and Master's degree in Industrial Management from Massachusetts Institute of Technology, U.S.A. in 1960. During his American sojourn, he had also worked at a mental hospital where his uncle was a psychiatrist dealing with chronic schizophrenics for a brief period. After returning to India in 1962, he joined the Delhi Cloth and General Mills Co., Delhi in a managerial capacity, as chief of its Recruitment and Training department.

As a creative artist, Joshi has brought out five novels, *The Foreigner*(1968), *The Strange Case of Billy Biswas* (1971), *The Apprentice* (1974), *The Last Labyrinth* (1981), *The City and the River* (1990) and a collection of short stories, *The Survivor* (1975) have won him high critical acclaim and a recognition as an author of rare sensitivity and exceptional talent. He won the prestigious Sahitya Akademi Award for his fourth novel *The Last Labyrinth* in 1982. It was very unfortunate that a man of such amazing abilities died of cardiac arrest in April, 1993 at the age of fifty four in New Delhi.

Arun Joshi has certainly exposed the grave issues like detachment, rootlessness, quest for identity, self-realisation in a most skilful manner. Also he has not failed to highlight the illuminating cultural heritage and moral values of India. The introduction of the theme of alienation in the modern Indo-English literature opens a new realm of understanding of human nature and behaviour. It helps us to observe an individual in terms of his responses and reaction to other human beings, the environment and with his own self. Alienation is one of the greatest problems confronting modern man. Its corrosive impact can be seen in the form of generation gap, the anti-war movement, the credibility gap, the compartmentalization of our life, the stunting of personal development, the conspicuous absence of a sense of meaningfulness of life, and so on. These have made the modern man lose his confidence.

This has resulted in his estrangement from the self, the family and the society. He is not able to grasp the meaning of his existence in a hostile world in which he is a stranger and an exile. There is something absurd about him. He feels lost and finds no solace in religion and philosophy which all thrust him towards becoming senseless, absurd and useless. The crisis of character, identity or consciousness or authenticity has grown out of man's looking before and after and pining for what he is not.

Crisis of identity may have its roots in both self-alienation and social alienation. Self-alienation is loss of contact of the individual self with any inclination or desires not in agreement with the prevailing social pattern. Alienation from the self is the basic form of rootlessness. This is not only a sociological but also a psychological problem of contemporary man and literature.

As S. Rangachari aptly remarks:

The themes of alienation, of rootlessness of individuals, of inanity and purposelessness of human existence, of moral vacuity, spiritual bankruptcy and apathy- the themes which are associated with T.S. Eliot's early poetry figure prominent in *The Foreigner*. (T.S Eliot's Shadow on *The Foreigner*)

The Foreigner deals with the journey of the protagonist, Sindi Oberoi, from his detachment from the world to his involvement in it. He learns that real detachment is the ability to allow people, places or things the freedom to be themselves. It is giving another person 'the space' to be himself or herself. Towards the end of the novel, he learns that 'indifference' implies detachment from self, and 'involvement' signifies 'attachment to the society at large'. A truly detached person involves himself in the lives of the people around him for their betterment and his own physical and mental well-being. Joshi brings out the narrator's point of view through the protagonist, Sindi Oberoi's words "You had a God; you had roots in the soil you lived upon. Look at me. I have no roots" (118).

Through the character of Sindi, Joshi presents the plight of the modern man, who is pulled off his roots because of his problems. A pervasive sense of his rootlessness, along with his loneliness, is a threat to him. He lives in no man's land and is incessantly haunted by his past. He has no belief in himself, or in the society around, or on the land he is born. As stated by R. S. Pathak in his article, "Human Predicament and Meaninglessness", "The work of Arun Joshi, reads like the spiritual *Odyssey* of the twentieth century man who has lost his spiritual moorings" (109). To find out the solution to the problem of his restlessness and forgiveness Sindi tries to be detached from the world. Sindi aimlessly roams in search of peace, identity and purpose of his life. Disappointingly, he tries to escape from the world as a solution to this problem

Sindi Oberoi is a perennial outsider, an uprooted young man living in the latter half of the twentieth century. Born of a Kenyan-Indian father and English mother, is orphaned at the age of four when his parents met their end in an air crash near Cairo. His deprivation of parental love perforates his heart. This realisation of 'loneliness' in the entire social set up causes his failure to find any purpose behind his existence. He belongs to no country, no people and finds himself an outsider in Kenya, Uganda, England, America and India. Sindi is trapped in his loneliness, which is "accelerated by his withdrawal from the society around him" (Dhawan, 47). He mulls over his foreignness which is almost Kierkegaardian:

I wondered in what way, if any, did I belong to the world that roared beneath my apartment window. Somebody had begotten me without a purpose and so far I lived without a purpose, unless you would call the search for peace a purpose. Perhaps I felt like that because I was a foreigner in America. But then, what difference would it have made if I had lived in Kenya or India or any other place for that matter. It seemed to me that I would still be a foreigner. My foreignness lay within me and I wouldn't leave myself behind wherever I went (55).

Sindi is also burdened with the sorrow of broken relationships with Anna and Kathy. When Sindi goes to Boston, America for academic perusal (engineering course) where he meets June Blyth. He develops an intense relationship with her and seems to be in love with her. But when she demands for a permanent manner of setting down in life in the form of marriage and creating a home of their own, Sindi hesitates. His feeling of self alienation does not allow him to get involved so easily.

Fate and destiny have a prominent role to play in the lives of man. It so happens that destiny drives Sindi to the office premises of Mr. Khemka where he seeks a job just for the reason of being Babu's friend. Being a broken person mentally, Sindi tries to start a new life

in India. But the feelings of uprootedness always lurks in him that he is not able to stand firmly anywhere. Also, the traumatic experiences of the past haunts his memories and do not allow him to experience a calm, composed life. Echoing the very words of him from the novel:

In many ways the past had been a waste but it had not been without its lessons. I had started adult life as a confused adolescent, awesomely engrossed with myself searching for wisdom and the peace that comes with it. The journey had been long and tedious and still was not over (221).

Here, the well educated Sindi is enlightened by Muthu, a worker in the industry who teaches him the value of being attached in a detached manner. Sindi is made aware that as a social animal, he is not to remain aloof and isolated from the society but has his own commitment as a civilian. Sindi takes charge of the factory and saves the lives of numerous workers. At length, the protagonist experiences a feeling of contentment; it looks as if he has stopped shedding tears after he has involved himself in wiping them from the eyes of others. He understands the true meaning of detachment. For all his initial alienation, he has at last earned the right to suffer for others and this care for others gains perspective, a self-validating context. The education of existential man can be learned only through encountering the absurdity of experience.

The protagonist emerges out of the clutches of misery and pain as a complete human being who is going to lead a fulfilled life. He has learnt the art of converting the agony of life into pure ecstasy. He has experienced pain and alienation in such a manner that he can understand the meaning of joy, happiness and fulfillment in the fullest measure. Sindi is distinctly different from the mindless multitude that surrounds him and he experiences the existential anguish which results in a relentless search for fulfillment and it ultimately ends in his realisation of the values of the noble virtues of compassion, understanding and benevolence towards his fellowman. Thus, his quest for identity is at length quenched and his understanding of being attached in a detached manner gives a new dimension to his life.

As Arun Joshi has his roots deep in the ancient Indian philosophy; he never accepts detachment as the final solution to the problems of life. He has faith in the notion that estrangement is something to be overcome, and not to be nourished. Through Sindi, Joshi presents the tremendous capacity for transcendence. The novel shows the protagonist's journey from inaction to action, from detachment to involvement and from illusion to reality.

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Resurrection of a Poetic Soul: A Study of Sylvia Plath's *Ariel*

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ABSTRACT

Plath was born to be a writer, and she improved her writing to be one of the greatest poets of her time. Sylvia Plath's inherent melancholia and rejection, stems for most part of her poems. She estranged her father after his death, and also she rejected the infidelity of her husband Ted Hughes. In *Ariel* she effectively expels and conquers these oppressing figures that once governed her life. Through the rituals carried out in her poems, she is resurrected and she even transcends death. Her poems convey a paradoxical sense of transcendence, death is not the end of all ends but instead an ulterior existence beyond the physical level. As such death is a transformation of the self and means to rebirth. The separation of the body and soul is a central theme in Plath's work .She conveys the distorted and detached sense of self and difficulty with self-realization. From that exact sense, stems her unique twofold nature of death, as a resurrection through the defiant conquest of death and her vision of actual or imminent death. This paper deals with the aspect of identity, persona and performance of Sylvia Plath.

Key Words: Persona, Death, Rebirth, Soul, Lady Lazarus.

Resurrection of a Poetic Soul: A Study of Sylvia Plath's *Ariel*

Death is an all encompassing theme in *Ariel*, filled with explicit and intense imagery, brilliant language and fierce tone that leave the reader with a haunting impression. In Sylvia Plath's "Lady Lazarus" she portrays death as an art and her expertise in it.

Dying

Is an art, like everything else.

I do it exceptionally well. (43-45)

The subject matter is intimately personal and autobiographical, completely exposing the author and her innermost emotions and private matters with a frightening focus on death. Selected poems from *Ariel* explore the duality and different representations of death, portrayed as both a ritual of rebirth and a ritual of actual death.

Among the American writers who attempted suicide, Sylvia Plath is worth exploring in feminist perspective. She is a well educated, disciplined writer who usually avoided the sentimentalities of some female writers. She is one of the poets who wrote about civilization poems of the post-Auschwitz, post-Hiroshima era. She showed instance of extremist art along with Robert Lowell, John Berryman, and Anne Sexton. Plath dedicated herself to poetry writing with determination. Her autobiographical novel, *The Bell Jar*, is a true delineation of her own life before she dies at the age of 31. Many of her poems that she wrote touch upon death itself, foreshadowing her upcoming suicide. As Plath is fascinated with death theme, so are the readers obsessed with the real cause of her death. Death is a prominent topic as can be seen in many talented writers.

This analysis focuses on Plath's late poems from *Ariel* with a few exceptions where reference is made to her earlier poems where it is necessary and relevant in the context of her work as a whole. To outline Plath's twofold portrayal of death following poems as representations of her poems on rebirth and her poems on actual death, have been chosen. The poems "Daddy," "Medusa" and "Lady Lazarus" are analyzed as rituals of rebirth or resurrection, while the poems "Death & Co." and "Edge" are analyzed as rituals of actual or bodily death.

Among the death poems that Sylvia Plath wrote, "Lady Lazarus" is the one that made her famous posthumously. The poem itself is highly confessional, dealing with her three successive suicidal attempts at different points of her life. "Lady Lazarus" may provide insight of conflicted mind of a talented woman attempting to make her mark during the period before woman's liberation. When Sylvia Plath wrote "Lady Lazarus" in 1962, she was only three months away from ending her life. She had already made one suicide attempt at the age of twenty.

"Lady Lazarus" epitomizes the mythical repetitive motif of dying and being reborn:

I have done it again.
One year in every ten
I manage it — (1-3)

Like the persona in "Daddy," Lady Lazarus must break away from "Herr Doktor," "Herr Enemy," (65-66) although both refer to her father, at the end, where she threatens men. She is also breaking away from her husband whose "Wedding ring" she leaves behind.

In "Lady Lazarus," the persona frees herself from the immobilizing authority, reaching her true character as victorious revived goddess, the entirely redeemed, fierce true self that is the person, embodied or veiled, in much of her late poems. Plath herself described Lady Lazarus as "a woman who has the great and terrible gift of being reborn. The only trouble is, she has to die first. She is the phoenix, the libertarian spirit, what you will. She is also just a good, plain, very resourceful woman". (Rosenthal 73)

As such, the phoenix, that is the figure of the true reborn self, is endowed with enchanting independence and is self-generative. Plath's engagement with endurance, in her life and in her art, is inevitably an engagement with rebirth. In challenging death "Lady Lazarus" expels the tragedy of her past. From this rebirth arises the form of heroine or goddess who ceremoniously slays her associates. Lady Lazarus's red hair associates her with a kind of expiring and reviving deity. Her red hair refers to the traditional mythic elements of the blazing phoenix. Although Lady Lazarus's claims that "dying is an art" (45) her true talent lies in her great and terrible gift of being reborn, acknowledging that "It's easy enough to do it and stay put" (52). Lady Lazarus is an artist of resurrection, the valuable possession of "Herr God, Herr Lucifer" and "Herr Enemy" (65-66):

I am your opus,
I am your valuable,
The pure gold baby. (69-71)

However, this opus rebels against her gods, she eradicates their formation and thereby her false self. The first two "deaths" she carried out were essentially an effort to heal her connection to her father, the "Herr God, Herr Lucifer," (65-66) while in the end, death

becomes her way to break away from these “gods” and ultimately redeeming her true self. As much as it is a burden, for Lady Lazarus, dying and being reborn is an innate art.

“Lady Lazarus” is, in a sense, Plath’s vision of the state of perfection. She is the embodiment of resurrection, a brilliant artist possessing the terrifying gift of being reborn, an almighty and fearless goddess that devours the figures of her male oppressors:

Herr God, Herr Lucifer
Beware
Beware.
Out of the ash
I rise with my red hair
And I eat men like air. (53-58)

“Death & Co.” is one of the greatest examples of the element of duality that characterizes the poems in *Ariel*. In the poem the two polarities, or faces of death, fear and overarching confidence, are united in the image of the dual nature of death.

Two, of course there are two.

It seems perfectly natural now — (1-2).

The poem “Death & Co” is a prime illustration of Plath’s ambivalence towards death, because the two contradictory forces, her fear of death and her fascination with it, are united in the poem. In the poem, Plath satirizes the two traditional portrayals of bodily death, the conceptual form of terminality and the real form of degeneration. The former becomes a raw, corpselike, businessman who delivers a persuasive promotion, insisting “. . . how sweet / The babies look in their hospital / Icebox, simple” (13-15) implying that death might do no less for her, making her as pristine and as tender. She satirizes the notion of death as a suitor or groom, who is low and revolting. He is a fake, artificial and sexually enigmatic character impertinently smiling and smoking “Death-gowns, /Then two little feet. /He does not smile or smoke.” (23-25). The last stanza of the poem resonates a menacing and fearful tone:

I do not stir.
The frost makes a flower,
The dew makes a star,
The dead bell,
The dead bell.
Somebody’s done for. (26-31)

This last chant invokes a conception of completeness attained by way of renewal essentially a rebirth. The conceptions present in the lines “The frost makes a flower, / The dew makes a star,” (27-28) mark the renewal of something from a temporary into a more perpetual condition, and the time’s wearing on, from night “frost,” to morning “dew.” When morning comes at last, “the dead bell” (28) is certainly tolling for her. Possibly, the speaker assumes a state of a more perpetual form, reaching the definiteness and completeness of a work of art. However, although these forms indicate transcendence in the mythical sense of death, eventually they do not comprise more than an infirm objection “I do not stir” (26) against an imminent actual or bodily fate.

In the summer of 1962, she discovered that her husband was attracted to, and possibly already having an affair with, the wife of another poet. Overwhelmed with grief and anger, she turned to writing as an outlet for her pain. The resulting poems, “Ariel”, churned out at a

furious pace, were the finest she had ever written. In one of the *Ariel* poems, “Stings” she wrote, “I have a self to recover, a queen.”(52) Although she mourned for the end of her marriage.

They thought death was worth it, but I
Have a self to recover, a queen
Is she dead, is she sleeping?
Where has she been,
With her lion-red body, her wings of glass? (52-56)

She was gaining a new sense of freedom and power through her writing. With her suicidal attempt, she releases herself from the cruelty of the reality and revenges on her unfaithful husband. As fatal and futile her death is, she has transformed and transgressed herself from the unequal treatment in her life.

In Plath’s poem “Ariel” she depicts a woman riding her horse in the countryside, at the very break of dawn. It details the ecstasy and personal transformation that occurs through the experience. The poem begins with complete immobility in the darkness, while the rider waits on the horse. There is then a change the intangible blue of hills and distances come into being. The rider is “God’s lioness;”(4) she experiences the sensation of becoming one with her horse in a powerful entangling of knees and heels.

Stasis in darkness.
Then the substanceless blue
Pour of tor and distance
God’s lioness,
How one we grow,
Pivot of heels and knees!- The furrow (1-6)

She compares herself to Lady Godiva, who rode naked upon her horse. In the midst of the ride, she can slough off things of no consequence –“dead hands, dead stringencies.” (21) She views herself as the foam on wheat, as a sparkling of light on the ocean. She discerns a child's cry through a wall, but ignores it. The rider is now a potent arrow, as well as dew that “flies suicidal.”(28) She has been subsumed into both the horse and the ride as she propels herself forward into the rising sun, which is depicted as a powerful red eye “Into the red / Eye, the cauldron or morning.” (29-30)

The poem “Edge” displays Plath’s ultimate act of drama as the last illustration in a ceremoniously orchestrated tragedy. In itself, it does not comprise a ritual so much as it displays the conclusion of a ritual:

The woman is perfected.
Her dead
Body wears the smile of accomplishment. (1-3)

Sylvia Plath and her past are exempt from further revolution, accomplished and completed. Although there is death, the conception is not that of bodily destruction. The form of destruction is peculiarly counteracted by the evolution of the poem from a dead woman to the moon elevating the significance of the event to a different position. To such an extent as “Edge” exemplifies the last act of drama, it insists transcendence through realization, rather than through an actual rebirth. Everything seems resolute and perpetual, examined from a

considerable distance, as if under the prospect of infinity. “Edge” is one of the last poems Sylvia Plath wrote before she committed suicide.

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Riot and Rebellion in Chinua Achebe's *Arrow of God*

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ABSTRACT

Riot and Rebellion in Chinua Achebe's *Arrow of God* exposes the issues of identity and culture and how the internal tribal conflicts and the intervention of the missionaries to dislocate the Igbo people from their religious concerns. The novel is set amongst the villages of the Igbo people in British Nigeria during the 1920s. Ezeulu is the chief priest of the god Ulu, worshipped by the six villages of Umuaro. The book begins with Ezeulu and Umuaro fighting against a nearby village, Okperi. The conflict is abruptly resolved when T.K. Winterbottom, the British colonial overseer, intervenes. After the conflict, a Christian missionary, John Goodcountry, arrives in Umuaro. Goodcountry begins to tell the villages tales of Nigerians in the Niger Delta who abandoned their traditional "bad customs" in favour of Christianity.

Ezeulu is called away from his village by Winterbottom and is invited to become a part of the colonial administration, a policy known as indirect rule. Ezeulu refuses to be a "white man's chief" and is thrown in prison. In Umuaro, the people cannot harvest the yams until Ezeulu has called the New Yam Feast to give thanks to Ulu. When Ezeulu returns from prison, he refuses to call the feast despite being implored by other important men in the village to compromise. Ezeulu reasons to the people and to himself that it is not his will but Ulu's; Ezeulu believes himself to be half spirit and half man. The yams begin to rot in the field, and a famine ensues for which the village blames Ezeulu. Seeing this as an opportunity, John Goodcountry proposes that the village offer thanks to the Christian God instead so that they may harvest what remains of their crops with "immunity". So many of the villagers lost their faith in Ezeulu. One of his sons, Obika, dies during a traditional ceremony, and the villagers interpret judgement against his priest. For this apparent judgement against Ezeulu and the promised immunity by the Christian God, at the Christian Harvest, taking place a few days after Obika's death, many men embrace Christianity by sending their son there with yams. The title "Arrow of God" refers to Ezeulu's image of himself as an arrow in the bow of his God.

Chinua Achebe (1930-2013), an Igbo writer in English, is one of Africa's most acclaimed authors and the pioneers in the portrayal of African life from the African perspectives. His writings introduced readers throughout the world to the creative use of language and form, as well as to factual inside accounts of modern African life and history. Not only through his literary contributions but also through his championing of bold objectives for Nigeria and Africa, Achebe has helped to reshape the perception of African history, culture, and place in the world affairs. The readers come across the theme of complexities of the Igbo society before and after the arrival of the Europeans from his literary work. To support this theme, he includes detailed descriptions of the justice codes and the

trial process, the social and family rituals, the marriage customs, food production and preparation processes, the process of shared leadership for the community, religious beliefs and practices, and the opportunities for virtually every man to climb the clan's ladder of success through his own efforts. Achebe's theme of Igbo cultural complexity is the theme of the clash of cultures which poses the identity issues.

The main theme of *Arrow of God* is the efforts of the priest of the God Ulu, Ezeulu, to cope simultaneously with the adherents of the rival God, Idemili, who hold political power, and the British District Officer, Captain Winterbottom, who is keen to make Ezeulu his warrant chief in Umuaro. Ezeulu refuses the chieftaincy, despite realizing that it would give him great power over his enemies. The District Officer imprisons him far from home for daring to refuse the position. During this time Ezeulu conceives of a plan to punish his enemies. He does not eat his two sacred yams during the two-moon period of captivity, and the yam harvest to be called in the name of his God, Ulu, cannot proceed. Umuaro is faced with famine. The Christians offer immediate absolution to those faced with famine for they incur the wrath of Ulu. They ask the people of Umuaro to bring 'thank offerings' to Christ during the harvest festival, abandoning the God Ulu and his priest.

Arrow of God has been described as the richest, most mysterious of Achebe's novels. In marked contrast to Achebe's earlier novel in the trilogy, *Things Fall Apart*, in *Arrow of God* the narrative voices are many and various. *Things Fall Apart* offers a unified perspective whereas *Arrow of God* offers multiple rivalries, interpretations, and points of view. Amongst the British administration, the readers encounter differing attitudes to modes of rule. Amongst the inhabitants of Umuaro, there are conflicts between the generation, and between Christians and traditional believers. There are differing perspectives and interpretations of the events of the novel: regarding the founding of Umuaro and the status of the Gods; the claims of the Okperi to farmland, the ownership of which is contested; and the motives of Ezeulu at various stages.

The central issue in *Arrow of God*, the problem of knowing, is intricately bound to its outlook on law. Achebe spins a detailed web of different interpretations which are offered by a multitude of narrative voices. Most importantly, he interrogates the sources and limitations of the authority exercised by Ezeulu. In so doing he sows the seeds of disorder by admitting into the novel the existence of an 'infinite range of normative possibilities, a diversity of disputing processes ... and intricate connections between everyday behaviour and the living law' (Innes, 72).

Early in this novel, Ezeulu contemplates the forces which limit, contest and circumscribe his power:

Whenever Ezeulu considered the immensity of his power over the year and the crops and, therefore, over the people he wondered if it was real. It was true he named the day for the feast of the Pumpkin Leaves and the New Yam feast; but he did not choose it. He was merely a watchman ... What kind of power was it if it would never be used? (3)

Ezeulu's consciousness of the uncertainty of his power is contrasted in the novel with the approach of the British administration towards him. Whereas Ezeulu perceives his power as one which 'would never be used', the colonial project requires him to exercise the authority of a warrant chief. The 'creative misunderstanding', which is necessary for the

British to make an administrative chief out of a man who is certain of the limitations of his own spiritual role, is examined in this novel. This may also be phrased as the narrative invocation of a discursive ethopoeia whereby generation by substitution is the representational law. Achebe demonstrates this both in terms of legal praxis in colonial Nigeria and also in the culturally essentialist terms of power reduced to spiritual terms, typically African, and thus derided as an inferior discourse, like the dilemma faced by Ezeulu.

Arrow of God as a novel that has a lot to say about law, may be a consequence of a legal-centralist outlook which views all law as deriving from the state. A legal-pluralist stance, on the other hand, challenges an authoritative conception of law in the form of legal pluralism, where two or more legal systems co-exist in the same social field. There are two key areas in *Arrow of God* around which Achebe explores law and colonialism. First, the claim of the rival Okperi's clan to a piece of farmland, and the different interpretations of the land dispute, and secondly, the issue of indirect rule. Achebe interrogates both the political and epistematic aspects of indirect rule in this novel. The particular event around which Achebe explores the links between law and customary authority is the forced labour which the British District Commissioner extracts from the inhabitants of Umuaro. This novel stresses on the idea of fluidity and of the existence of a multitude of different positions from which to contemplate the world.

Arrow of God mirrors the issues of Nigerian Igbo identity. The internal tribal conflicts make the fertile ground for the disintegration of the tribe. The political and religious powers mirror the discourse of their ethnicity. Ezeulu, the central character of the novel tries to hold the community unified by his thoughtful decisions, but the social aggression is seen to challenge the traditional religious ethos. It is evident from this novel that the change in the cultural patterns sows the seed in the minds of the people by the power relations. The missionaries succeed to fall them apart by the influence of the religion, trade, education and justice. Ezeulu simply becomes an 'arrow' or the 'tool' of the religious power of the Igbo people for nothingness at the end when the natives were divided into two groups. One of them, the followers of the missionaries and the second becomes passive due to the 'pride' of Ezeulu, who deliberately delays the *New Yam Festival* to prove himself as the most powerful man in the clan. The missionaries divide them on the ground of the conflicts between Ezeulu and Nwaka regarding the war of Umuaro with Okperi.

The African Igbo society is reflected by relations with the Missionaries and the presence of the imperial power of colonization. The issues of their individual and social identity subsist in various dimensions of conflict: religious, patriarchal and cultural, as well as traditional. In each of these dimensions revolve around issues of identity and culture. The Igbo people express themselves in spiritual communal ethos by which the individual and social identity are found deeply rooted in a spiritual sense of the kinship that do not keep them vibrant with the changing pace after arrival of the missionaries. This novel, *Arrow of God* points out the issues of Igbo identity as they consider the changes are meant for to fall them apart from their values. The transmission of the cultural patterns due to imperialism is pointed out as the disruption of their identity.

Arrow of God describes the concepts of identity and culture along with the implications of them in the literary works. It has also focused its academic relevance by

elucidating the pedagogical implications. The novel takes a cursory look on issues of identity and culture at present in Nigeria in relation to the issues depicted by Chinua Achebe in his novel. Identity is a dynamic and a continuing changing process; it is not static and it continues to be modified and finally becomes generally accepted with the times. The issues of identity are related with the framework of culture which has different facets on the part of the individual and social identity. The affirmation or rejection of the cultural values effects on the sense of self both at personal and social levels in relation with the identity. On this ground, the issues of identity and culture need to be supported with a great deal of harmonious co-existence in the rapid age of globalization to keep the social norms vibrant with the changing pace. Achebe gives this message through his novel to explore continuities with the past that can coexist with modern society.

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A Study About Consumer Satisfaction Of Android Mobile Phone In Keela Alangara Thattu Area Of Thoothukudi Town

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Abstract

Mobile communication today is the fastest and the most effective way of communication in the world. So the study attempts to observe the mobile network users preference towards the selected mobile service providers in Thoothukudi city. The present study made an attempt to consumer behavior towards mobile phone services offered in Alangarathattu, Thoothukudi District, India.

Objectives of the study

- To identify the customer's preference towards the mobile network service provider.
- To study the factors influencing the customers to select a mobile network service provider.
- To identify the brand preference offered by different companies for mobile handset among different companies for handset among different income level consumers.

Designing a suitable methodology and selection of analytical tools are important for a meaningful analysis of any research problem. It includes a sample design, the period of the study, the method for collection of data, and the method of analysis and tools of analysis used. The primary data for the study were collected through personal interviews. The present research focuses on the study of customer preferences with the special reference to the mobile network users in the Coimbatore city. The study has been carried out to find out most preferred mobile network service provider and the factors influencing to use the particular mobile network service. The results revealed that, BSNL, Airtel, and Reliance are the most preferred mobile network service providers.

Keywords: Mobile services, value added service, voice message, research & development, network service.

INTRODUCTION

Mobile services were introduced in India in the late 1990s and the population is the main advantage for any marked player operating in India. The mobile network service providers are ready to serve their subscribers anywhere at any time to retain the existing subscribers to earn a new subscribers. By knowing the preference and buying behavior of the consumer the mobile network service providers can develop the promotional method to survive in the competitive market.

The healthy competition between the different mobile network service providers create the mobile number portability, value added service, voice message, MMS, SMS, unbreakable signals, scheme changes, easy to recharge, other comfortable and satisfactory service to the mobile network subscribers. Usage of the mobile network by the lower and middle class people increased by reducing the mobile network subscribing tariff from Rs1...

The Indian government permits the spectrum operators clears signal clarity issue and develops the subscribers benefit. Everyone in the market is trying to satisfy his customers.

Today all the organizations satisfy the customers to attain a competitive advantage. So the business faces the toughest competition from their competition. It is the main problem faced by the organization. So it turns out to be very important for the organization to identify the customer preferences not just by the services but by reaching beyond the expectations of the customers. So the study attempts to observe the mobile network users preference towards the selected mobile service providers in Thoothukudi city.

Mobile communication today is the fastest and the most effective way of communication in the world. It has changed the working pattern of human being in each and every corner of the world. No wonder to say that it is inevitable part in life of everyone to fulfill needs.

At present sale volume of feature phone is greater than the smart phone but demand of smart phone is increasing very fast due to providing various features like face book, whatsApp, twitter, video call, voice chat, etc. And it is predicted that selling of smart phone will be around 16 crore/year from 2017 while sales of feature phone will fall short of 15 crore. There are many companies which are providing variety of products and there are around 431 Mobile Hand set brands available in market in this year but consumers will have more than that option from next year because of launching number of companies in India and make in India concept. Working people and younger's from urban area are purchasing smart phones mostly and high sale volume is getting because of them but it is increasing very fast in rural area too.

The study focuses on the perception of consumers towards Mobile Handset. As there are different Mobile Handsets available in the market by many different companies providing different features. This situation gives a great potentials to telecom sector, as the market is competitive where number of mobile handset are offered with effective features and there are growing number of consumers with great capacity.

SCOPE OF THE STUDY

The main aim of the study is to establish a platform to examine the customer references for the selected mobile networks. The study also extends to understand the factors influencing to use the particular mobile network service.

STATEMENT OF PROBLEM

In the modern world everything becomes close to everyone because of the improvement in the science & technology and also in the research & development. The new innovation changes the life style of common man for the dynamic environment to meet with social needs in every sphere of life. The faster modes of communication that can be provide solution rapid changes in the business scenario.

Before a telephone was considered to be an extra ordinary thing and status symbol; but now most of the people are using basic telephone services which also mobile phone has become a part of day today life. In India cellular phones were introduced and reaches the large section of the society with connected by cellular network including remote villages also. After the inception of liberalization policy, many private operators has played vital role improving the infrastructure facilities and highly focused on the

customer need and wants. From the customer point of view has focused on the customer need coverage, service quality, new tariff plans and value added services attached by the mobile service providers. The present study made an attempt to consumer behavior towards mobile phone services offered in Alangarathattu, Thoothukudi District, India.

OBJECTIVES OF THE STUDY

- To identify the Customer's Preference towards the mobile network service provider.
- To study the factors influencing the customers to select a mobile network service provider.
- To identify the brand preference offered by different companies for mobile handset among different companies for handset among different income level consumers.

HYPOTHESIS:

There is no significant relationship between age and brands of mobile connections used by respondents.

METHODOLOGY:

Designing a suitable methodology and selection of analytical tools are important for a meaningful analysis of any research problem. In this section, the methodology adopted for the present study has been describing bed for. It includes a sample design, the period of the study, the method for collection of data, and the method of analysis and tools of analysis used. The primary data for the study were collected through personal interviews.

Sampling Techniques:

A sample of 105 members of different micro enterprise has been selected using random sampling technique administered with pre-designed questionnaire. This study based on primary data regarding gender, working hours, income and expenditure have been obtain through administering a schedule. The period of the study is from the month of July 2018 to the month of September 2018.

Collection of Data:

The researcher has collected both primary and secondary data from the micro enterprise, which includes the representatives and other members with the help of a questionnaire. The secondary data were collected from various journals, dailies etc, and statistical data other basic information was received from the Thoothukudi project office.

REVIEW OF LITERATURE

VipanBansal and BinduBansal (2013) "have studied the Customer satisfaction of mobile phone service users operating in Malwa Punjab" This paper is used to trace the reason for purchasing mobile phones and usages of mobile phone applications. This study revealed that SMS is the most widely used Valued Added Service. The results revealed that most of the respondents were satisfied with their current service provider show maximum willingness for shifting to Airtel.

Dr. T. N. R. kavitha and Mr. R. MohanaSundaram (2014) their study entitled “A Study on Customer Satisfaction towards Samsung Mobile Phone in Erode City”. This paper carried out with an objective to determine the consumer preference and satisfaction. This paper concentrated on one particular mobile phone brand called Samsung and its price, quality, colour, and satisfaction level.

Uchin Lee, et al. has studied the negative aspects of smartphone overuse on young adults, such as sleep deprivation and attention deficits, are being increasingly recognized recently. This emerging issue motivated us to analyse the usage pattern related to smartphone overuse. The paper is also analysed the usage data of identify between group usage differences, which range from the overall usage patterns to app-specific usage pattern.

LIMITATIONS:

Like any other study, this project study has various limitations, Time was very limited. As the study is on behavior aspect, information may be biased. Since the study is conducted in a very small area and on a small sample size, the results of the study cannot be generalized for another geographical area. Since sampling method is used, chances of sampling errors are high.

FINDINGS

- ❖ The study reveals that 42.22% of the respondents are female.
- ❖ Majority of the respondents are 29.6% between the age group of 26-35 years.
- ❖ 13.8% of the respondents are lie between the age group of 36-40years.
- ❖ In the present study 53.4% are married.
- ❖ The survey reveals that 33.4% of the samples Higher Secondary level in their education.
- ❖ 8.45% of the respondents are Post graduated, 25.9% of the respondents are Graduate, and 33.4% of the respondent is Higher Secondary.
- ❖ 34.0% of the respondents are using the mobile phone for the purpose of having touch with their family and friends.
- ❖ 31.8% of the respondents are using their mobile phone to feel secure in a society.
- ❖ For the official purpose the respondents were using the mobile phone is 17.7%
- ❖ Among the respondents most of the students are using their mobile phone is 34.8%, employed people are 28.1% and the business man is 20.7%
- ❖ 19.6% of the respondent using mobile phone more than 5 hours.
- ❖ 35.5% of the respondents using mobile phone are from 1 hour to 3 hours.
- ❖ 21.5% respondents are less than 1 hour duration of mobile usage per day 34.8% of the students using mobile phone in this study.
- ❖ Only 16.2% of the house wife from our respondents are using.
- ❖ 48.14% of the respondents only switching their mobile phones for several reasons.
- ❖ Nearly 29.23% of the respondent’s coverage reason for switching over.
- ❖ 32.30% of the respondents for switching their mobile for value added services.
- ❖ Most of the respondents are 59.2% pre-paid scheme of mobile service.
- ❖ Nearly 66.6% of the respondent’s opinion roaming facility availed.
- ❖ Most of the respondents 51.8% is not opinion GPRS facility availed.

- ❖ The main criteria of selecting the service provider is the network and the friend circle if many uses in their friend circle people are going to that service provider.
- ❖ 34.1% of the respondents are using BSNL, 27.4% of the respondents are using Reliance Jio and 11.1% of the respondent is using the Idea phone in a least level according to this research.
- ❖ 20% of the respondents are from the age group of 51 and above using Airtel.
- ❖ 24% of the respondents are from the age group of up to 20 years using Idea.
- ❖ 56.25% of the respondents are from the age group of 21 – 30 years using BSNL.
- ❖ 32% of the respondents are from the age group of up to 20 years using Reliance Jio.
- ❖ 32.5% of the respondents are using Vodafone from the age group of 31-40 years.
- ❖ The table value of chi square is lesser than the calculated value so the hypothesis was rejected.

SUGGESTIONS

- It is found from the study that the majority of the respondents have given top preference to BSNL, Airtel, and Reliance. Hence it is suggested that the other service providers (Idea, Vodafone) have to focus on improving their service quality, responsiveness, attractive offers, customer care service and impactful advertisement in order to widen their subscriber's base and capture more customers and market share.
- It is found from the study that the majority of the respondents have given top preference to the service quality. Service quality of the network plays a vital role. Hence it is suggested that the operators have to maintain proper service quality in the call connectivity, Fulfilling their expectation, value added service offered by them including mobile data, caller tune, dry run, playback etc. Especially special attention must be given for providing on time customer care connectivity which may save customer time and able to process their request by the service providers on a need basis.
- The top activities that people perform on their mobile devices haven't changed its still email and texting, like you might expect. Remember that these activities are the foundation of all mobile efforts.
- When it comes to what they can do on their mobile devices, consumers are inundated with options: games, social media, flipping through photos, answering emails, and infinitely more choices. To break through the mobile noise, think about how your brand can better sell and demonstrate the value of different mobile channels and types of engagement to these people who are already inundated with alternatives.
- In many cases, company apps are an extension of other customer-facing efforts and are offered for free to attract as many users as possible. If your mobile application is intended to generate revenue, the app marketplaces make it easy to sell.

- Resources and data can be stored locally in a mobile app, and the user interface operates independently of web delivered interact elements, so some or all of your app may be used when internet or Wi-Fi is not available.
- While a good portion of mobile website visits are destination-driven, mobile search continues to grow rapidly and local search is even more important considering the nature of mobile searches. A mobile-optimized website can be found and visited from a standard search, and you can even expand your paid search campaigns to target mobile devices. If you do offer a mobile app, it's a good idea to provide a link to it from your mobile website.

CONCLUSION

The Indian mobile telephony market has grown at a rapid speed in the last decade. Declining the call tariffs and favorable regulatory policies has led to a tremendous increase in the subscribers' base. Proper identification of the customer preference will facilitate the favorableness toward the various mobile service providers. Continuous research on consumers will enhance the customer satisfaction. The present research focuses on the study of customer preferences with the special reference to the mobile network users in the Coimbatore city. The study has been carried out to find out most preferred mobile network service provider and the factors influencing to use the particular mobile network service. The results revealed that, BSNL, Airtel, and Reliance are the most preferred mobile network service providers. Service quality value added services customer care service is the most influencing factors in the selection of a particular mobile network service provider. If these suggestions are considered by the respective mobile network service providers and it would certainly help to improve the service quality of the mobile network service providers and also it improves the level of satisfaction of the mobile network users.

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A STUDY ON WORKING CONDITION OF BANANA CULTIVATORS IN THERIKUDIYERUPPU AT THOOTHUKUDI DISTRICT

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Abstract

Banana has a pride of place not only for its diverse uses but also for its special preference by consumers – rich and poor, while it is also subjected to the above stated production and marketing problems. Hence, the present study is an attempt to analyse the production and marketing of banana in Tirunelveli district.

The main aim of the study is to analyse costs, returns and marketing channels of banana in Therikudiyeruppu, Thoothukudi district. The specific objectives are:

1. To study the characteristics of the sample farmers in the study area namely Therikudiyeruppu, Thoothukudi District.
2. To estimate the cost and returns structure of banana cultivation for small and large farms.
3. To analyse the resource productivity and to examine the resource-use efficiency of different factor inputs used in banana cultivation.
4. To identify the determinants of marketable surplus in banana.
5. To discuss the existing marketing channels for banana and to evaluate the marketing cost, marketing margin, price spread and marketing efficiency of different channels; and
6. To study the problems faced by the banana cultivators in the production and marketing of banana.

The results of the study would guide in reallocation of scarce resources with a view to increase the economic efficiency of banana farming in the study region. An in depth analysis of marketing of banana would identify the ways and means of augmenting the producer's share in consumer's rupee. Hence, the results would be useful particularly to policy decisions on production and marketing for the benefit of the producers and the ultimate consumers.

Keywords: banana cultivators, employment, productivity, marketing, rural poverty, under employment.

INTRODUCTION

Food, employment and productivity have always been the basic priorities in the formulation of Five-Year Plans. The challenge of food front has to be met in an environment of increasing population, shrinking land resources for agriculture, swelling up of small sized holdings, high incidence of rural poverty, under employment and low levels of living. This calls for concerted efforts on the development of agriculture on a war-footing.

Banana is one of the oldest fruits cultivated by man from pre-historic times. A reference to the banana in India frequently occurs in the Vedic literature, where mention is made of its use in religious rituals. Today, it is the leading tropical fruit in the world market with a highly organized and developed industry. The English word 'banana' seems to have

come from the term used for it in the languages of Guinea coast of West Africa and was probably made well known by the Portuguese navigators and explorers.

About 691.2 lakh tones of banana are produced in the world annually and India is the largest producer of banana. It is cultivated in about 5, 53,000 hectares in India and the annual production is 16 million tones. Banana has replaced mango as the number one fruit of the country.'

India is one of the world's largest producers of farm commodities, and the second largest producer of fruits and vegetables. Agriculture accounts for about 14.7 percent of the country's total export earnings. It also has one of the world's largest agricultural research systems and relatively well-developed base for research and development and extension. In past four decades, India has become self-sufficient in food grains and now has a surplus. Food grain production increased from 89.4 million tons in 1964-65 to 2.3 million tons in 2001 - 2002 with dissemination and adoption of green revolution technology.

In India Banana ranks second next to Mango in area and production, occupying an area of about 83 lakh hectares with an annual production of 46.26 lakh tons. The important banana growing states are Maharashtra, Tamilnadu, Andhra Pradesh, Kerala, Kamataka, West Bengal, Bihar and Gujarat. However, the present production of banana in the country is highly inadequate. It is estimated that, the present annual per capita consumption of banana in India is 50 kg per head which is very low compared with other progressive banana growing countries such as Jamaica, Congo, Equator, Kenya and Uganda. Thus there is an immense scope of increasing banana production in the country.

Banana is a nutritious, palatable and easily digested fruit, rich in carbohydrates, minerals such as potassium, magnesium, sodium and phosphorus; and is even richer in calorific value than potato. Being relatively cheaper than other fruits, and owing to its availability almost throughout the year, banana should be regarded as a subsidiary food and forms a part of common man's diet. Apart from fresh fruit, banana can be consumed as processed in various forms such as chips, powder. Flakes, etc

The Government of India has recently launched a plethora of measures to boost the production in the horticultural sector. These measures include extension of technology mission for integrated development of horticulture, launching of National Horticulture Mission to double the horticultural production in 2010, creation of additional cold storage facilities by the National Horticulture Board and allocation of additional budgetary provision for the Hi-Tech Horticulture and precision farming.

WORLD EXPORT OF BANANA

The details of export of banana by the major exporting countries are furnished in Table.

GROSS BANANA EXPORTS BY MAJOR EXPORTERS - 2016-17 (in 000 m.t)

Sl. No.	Country	Quantity exported	Percentage
1.	Equador	3942	34.41
2.	Coastarica	1883	16.48
3.	Philippines	1599	13.98
4.	Colombia	1524	13.33
5.	Guatemala	801	7.01
6.	Panama	537	4.70
7.	West Indies Islands	403	3.51
8.	Ivory coast	217	1.89
9.	Cameroon	206	1.80
10.	Honduras	150	1.31
11.	Belize	68	-----
12.	China	50	1.5843
13.	Nicaragua	45	-----
	World export	11425	100

Sources: United Nation Conference on Trade and Development, Major Development and Recent Trades - International Banana Marketing Structure, 2017, p.62

From the table, it could be seen that the main banana exporters were dominated by Equador (34.41 per cent), Coastarica (16.48 per cent), Colombia (13.98 per cent), the Philippines 13.33 per cent), and they together accounted for 78.20 per cent of total world export. Some of the main banana producing countries such as India and Brazil are hardly involved in international trade. Infact, only about one fifth of the total production is internationally traded.

AREAS AND PRODUCTION OF BANANA IN THOOTHUKUDI DISTRICT

Sl.No.	Year	Thoothukudi district		Tamil Nadu state	
		Area (in hectares)	Production (in tonnes)	Area (in hectares)	Production (in tonnes)
1.	2011-2012	4478	67132	87132	4203560
2.	2012-2013	4086	320560	89856	3599040
3.	2013-2014	4175	153630	85122	3132240
4.	2014-2015	4152	153983	82767	3069540
5.	2015-2016	3815	267513	84542	3543796
6.	2016-2017	3702	136800	76771	2836916

Source: Season and Crop Report of Tamil Nadu, Department of Economics and Statistics, Chennai-600 006 (Various issues).

Inadequate market infrastructures and too many intermediaries between the producers and consumers lead to high marketing costs resulting in lower share of producer in the

consumer's rupee. Therefore any strategy to exploit the production potential should also satisfy its market structure, conduct and performance and hence this study.

STATEMENT OF THE PROBLEM

Banana is a significant food crop and it has greater economic importance among the food crops, since it is one of the leading commodities in agricultural exports. Hence, the production performance of the crop is of critical importance in improving the efficient use of resources. The cost of production and net returns obtained per unit would determine the profitability of the crop. The profitability of an enterprise depends upon the efficient use of the resource in production.

Further, the study of cost and returns structure of banana would help the farmers in ensuring proper resource combinations to augment the banana yield, thereby increasing the profits. Though production is the initiation of the developmental process, it could provide less gain to the producers unless there efficient marketing system. Agricultural marketing is therefore, of greater importance.

Commercialization of agriculture has further increased the importance of marketing. Farmers raise the crops with a hope of receiving fair returns for their hard labour. For this, they depend upon the market conditions, which are not very conducive to fulfill their hopes and expectations. Forced sales, multiplicity of market charges, malpractices in unregulated markets and superfluous middlemen are the problems faced by the farmers.

These problems of marketing get further added up by the special features of agricultural commodities namely, their inelastic demand, seasonality in supply, spatially scattered production, bulkiness and perishability. The market imperfection and the consequent loss in marketing efficiency are more pronounced in markets for perishable commodities which require quick transportation and better storage facilities, involving large number of intermediaries who take away high margins from the price paid by consumers.

Banana has a pride of place not only for its diverse uses but also for its special preference by consumers – rich and poor, while it is also subjected to the above stated production and marketing problems. Hence, the present study is an attempt to analyse the production and marketing of banana in Tirunelveli district.

OBJECTIVES OF THE STUDY

The main aim of the study is to analyse costs, returns and marketing channels of banana in Therikudiyeruppu, Thoothukudi district. The specific objectives are:

1. To study the characteristics of the sample farmers in the study area namely Therikudiyeruppu, Thoothukudi District.
2. To estimate the cost and returns structure of banana cultivation for small and large farms.
3. To analyse the resource productivity and to examine the resource-use efficiency of different factor inputs used in banana cultivation.
4. To identify the determinants of marketable surplus in banana.
5. To discuss the existing marketing channels for banana and to evaluate the marketing cost, marketing margin, price spread and marketing efficiency of different channels; and
6. To study the problems faced by the banana cultivators in the production and marketing of banana.

SCOPE OF THE STUDY

This study is an attempt to analyse the resource use efficiency and various issues associated with it. The results of the study would guide in reallocation of scarce resources with a view to increase the economic efficiency of banana farming in the study region. The problems encountered in production would pave way for furthering research efforts in the desired direction. An in depth analysis of marketing of banana would identify the ways and means of augmenting the producer's share in consumer's rupee. Hence, the results would be useful particularly to policy decisions on production and marketing for the benefit of the producers and the ultimate consumers.

LIMITATIONS

This study had however some important limitations.

First, it is a micro level study covering the major banana producing taluks and villages.

Second problem relates to the data. Quantitative information needed in this study was admittedly difficult to obtain and it was often impossible to determine the reliability of the secondary and even primary data.

Too often agencies that collected and distributed agricultural data did not use consistent definitions and methods and sometimes presented aggregated data without listing the characteristics and limitations of data. Primary data could also be incorrect or biased as producers were frequently found not very communicative about costs, income and prices. They did not maintain records of transactions and data based on their memory would be subject to recall bias. Middlemen were even less communicative and were not much cooperative.

Finally, the sample was small to help policy decisions but it was large enough to indicate general trends and characteristics of the banana market. At best the study would reveal the travails of an academic effort in unraveling the vicissitudes of market problems and individual efforts to assemble and analyse information for deriving meaningful conclusions. With all the limitations for generalization, the results could be used as indicative to generalize with caution.

FINDINGS:

- The age wise distribution of the respondents showed that 20% of the respondents belong to the age of 20-30 years, 21.6% of the respondents are 30-40 years, 29.2% of the respondents are 40-50 years, 17.6% of the respondents are 50-60 years and 60 and above age of the respondents are 11.6%.
- Sexes –Wise Classification reveals that 80% of the respondents are Male and 20% of the respondents are Female.
- 47.5% are Hindu respondents, 34.2% are Christian respondents and 18.3% are Muslims.
- 10.8% and 24.2% of the respondents were completed their Primary and high school level of the education. 38.3% and 18.3% of the respondents were completed their Higher Secondary School and College level respectively and there were 8.4% of the respondents are illiterate too.

- 19.2% of the respondent having below 2 acre land, 20.8% of the respondents having 2-4 acre of land, 30% of the respondents are having 4-6 acre of land, 20% and 10% of the respondents are having 6-8 acres and above 8 acres respectively.
- 27.1% of the male respondents acquire income between Rs.5000 – 10000, 35.4% of the male respondent's income between Rs. 10000-15000, 37.5% of the male respondent's income between Rs.15000-20000. In the case of female respondents 33.3% obtain income between Rs.5000-10000, 50% of the female respondents acquire income between Rs.10000-15000, 16.7% of the female respondents get income between Rs.15000-20000.
- 28.3% of the respondent was spending Rs.6000- 9000, 38.3% of the respondent was spending Rs.9000-12000 and 33.4% of the respondent was having their expenditure pattern as Rs.12000-15000 per month.
- 39% of the respondents is able get their production level for Rs.10000-15000, 47% of the respondents is able get their production level for Rs.15000-20000 and 14% of the respondents is able get their production level for Rs.20000-25000.
- 57.5% of the respondents save their money around Rs.2000-5000, 20.8% of the respondents save their money around Rs.5000-8000, 21.7% of the respondents save their money around Rs.8000-12000.
- Debt details of the respondents that the 96 respondents alone having their debt from many source but other 24 respondents are not having their debt at all by many reasons. 55.2% of the respondents having their debt from the Bank , 27.1% of the respondents having their debt from their relatives, 17.7% of the respondents having their debt from Chit Funds.

CONCLUSION:

Studies point out that choice by farmers has not been correct and they grow crops, which are less well suited to the condition for cultivation. As though banana is water intensive crops are cultivated in water scarce areas. As a consequence, crop risks increases. Long term solution lies in the policies that will induce farmer to cultivate crops which offer best return and have low risk? This will be accompanied by better irrigation and marketing support.

Government should introduce such cropping patterns which would ensure that there is market for product in global markets. For example the Green Revolution belt can produce fruits, vegetables and flowers for export to the market of developed world.

The farmers are largely dependent on the market for the supply of inputs and for the demand for agricultural credit have also increased as the new technology. The vast majority of rural households with little or no land, with poor finances and poor credit worthiness have not gone in for the new technology.

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A COMPREHENSIVE ANALYSIS OF SOCIO-ECONOMIC CONDITIONS OF FISHERMEN IN THOOTHUKUDI TOWN

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Abstract

The current study leads to the proper recognition of the labour conditions of marine fishing workers and to the formulation of new policies for the remuneration of their work. This may go a long way to eradicate discrimination and gender inequality in general and empowerment of rural fishing workers in particular.

OBJECTIVES

- To study the socio-economic conditions of the fishermen households in the sample villages.
- To study the fishermen-expenditure in fishing net and the number of days of fishing activities of fishermen.
- To find out the types of fishes captured in New Street area.
- To analyse the operational cost at fishermen per production trip.
- To highlight the nutritional and medicinal values of fishes.
- To study the process of fish catching.

The study has made use of primary and secondary data. The collected information have compiled, tabulated, and tested with the statistical tools. Secondary data collected from Magazines, Journals, Library Books, and websites. The ultimate aim of uplifting the socio economic status of households In the coastal villages of Thoothukudi District is achieved through the development of mechanized fishery sector with its backward and forward linkages which contribute further diversification and strengthening of The marine fishery economy of Thoothukudi District.

Keywords:marine fishery, discrimination, gender inequality, grass-roots participation, diversification.

INTRODUCTION:

In the early 1960s there was a great deal of debate within the Catholic Church worldwide which eventually led to the Second Vatican Council calling for Christians to become more socially and Politically aware and active. Inspired by this debate and moved by the plight of the fisher people in his diocese, the then Bishop of the Latin Catholic Church in Trivandrum, Bernard Pereira, entered into a bold initiative. In 1961, he founded a model fishing village on an uninhabited stretch of land 25 km north of Trivandrum. Low cost housing was constructed and little by little the poorest families of the area started to arrive. The village was called Mariana.

The Bishop invited a group of foreign volunteers – professional Christian women - to work in this project. The criteria they used for building up the village community were: assess the real needs of the people, give out nothing free and make sure that everyone has the

opportunity to participate in decision-making. Strong and lively grass-roots participation fostered from the start in Mariana. However, the bishop was well ahead of his time in his approach (as were his Indian co-workers, who replaced the original volunteers) and the increasing confidence of the fisher people was not always appreciated by the more conservative clergy of the diocese.

The Fisheries sector has been recognized as an important factor to generate income and Employment as it stimulates the growth of a number of subsidiary industries. Besides serving as a source of animal protein to meet the food security for future Generation. Tamil nadu is one of the important Coastal States in the East Coast, having a coastline of 1076 kms. There are 13 Coastal Districts and 591 fishing villages with a total Marine Fishers population of about 8.38 lakhs, of which 2.81 lakh fishermen are actively engaged in fishing.

The marine fishery resources comprise of 1.9 lakh sq. km of Exclusive Economic Zone (EEZ) (9.4% of India's EEZ) and a continental shelf of about 41,412 sq. km. Tamil Nadu is one of the leading producers of both marine and inland fish and fishery products. At present, about 6200 mechanized fishing crafts and 50,360 Traditional crafts (18,727 villas and 31,633 catamarans) are engaged in marine Fishing. The annual marine fish catch in Tamilnadu is estimated at 3.93 lakh tones. The State has the potential to emerge as a major exporter of marine products. During 2007-08, about 72,644 M.T. of marine products valued at Rs.1,81,314 lakhs was Exported from Tamil nadu.

The inland fisheries sector has about 3.71 lakh ha. of water spread area Comprising of reservoirs, major irrigation and long seasonal tanks, short seasonal tanks and ponds, estuaries, backwaters, etc., which are amenable for both capture and culture fisheries. The Inland fisher's population is about 2.16 lakhs. The inland fish catch is estimated at 1.65 lakhs tones. About 5,000 ha are being utilized for fresh water. Aquaculture under the programmer of the Fish Farmers' Development Agency. There are 8 fish seed production centers and 29 fish seed rearing centers located in various places with a capacity to produce 2750 lakhs of early fry annually. The total brackish water area available for aquaculture production is 56,000 ha. Apart from that, shrimp culture is being undertaken in 6,066 ha.

There are 1,366 primary fishermen cooperative societies which include 399 inland fishery /fisher women co-operatives. Tamil nadu ranks sixth in fishing, have not yet been fully exploited. The fishery resources in the inshore areas have been over exploited, whereas the offshore resources and deep sea resources are yet to be tapped to the Optimum level. The prime responsibility of the Department is to judiciously balance, Enhance fish production with sustained conservation of resources as well as to improve the socio-economic standards of the fishermen production in the country.

PURPOSE OF THE STUDY:

The current study leads to the proper recognition of the labour conditions of marine fishing workers and to the formulation of new policies for the remuneration of their work. This may go a long way to eradicate discrimination and gender inequality in general and empowerment of rural fishing workers in particular.

This study will also consider the boat owners in the study area-Thoothukudi town and to take Necessary steps to rectify the defects and also to adopt precautionary measures to have a cordial relation with the fishing workers in future. The findings of this work would be of immense help to planners, policymakers and institutions who are concerned with fisheries

development, particularly with ways and means of improving the socio-economic life of fishing workers.

STATEMENT OF THE PROBLEM

Fisheries sector occupies a very important place in the socio-economic development of the country. This sector is thus an important source of livelihood for a large section of economically backward population of the country, particularly in coastal areas. Fishing is the traditional occupation of a community of fisherman living along the seacoast. Fishing and allied activities constitute an industry and have created employment opportunities for more and more fisherman having different skills in different fields of fisheries. It offers a wide scope to fulfill the objective of production-cum-employment envisaged in the developments plans in India. It provides direct employment to millions of sample fisherman and indirect employment through associate networks like net-making, boat-making, boat-repairing, fish-processing, fish transportation etc. In this context the fisheries sector given high priority since it has the potential of employment generation. The marine fish and its products very good export potential for earning considerable amount of foreign exchange for the nation. Fishing worker's particularly in the communities for the most advantaged group. They have a very low status in the society.

There are about 6.79lakhs fisherman in Tamilnadu, of which 2.70 lakhs are productively employed in fishing and its related activities. Fishing workers are actively involved in the economic activities such as making and mending of nets, fish processing, dry fish preparation, marketing of fresh fish, dry fish and fish handling such as sorting weighing gutting icing, etc. Their contribution to the development of small-scale fisheries is not recognized and compensated properly due to the social and cultural discrimination against them. They have acquired a secondary status in social life, economic activities, and decision-making. A number of socio-economic constrains limit their work productivity and role in employment and income generating activities. They have the potential to play an active and sometimes dominant role in fishing related activities.

The state of Tamil has a coastal length of 1076 k.m which constitutes about 15 per cent of Indian coastal line. There are 695 fishing villages in 16 coastal districts in Tamil starting from Guallatiri District to humanitarian District. The fisherman living the coastal fishing villages are 8.79 lakh, which include 4.58lakh fisherman and 5.31lakh fishermen. The literacy rate is 77percent. About 4.70lakh metric tonnes of fish are caught in commandant coast Balkbay, and Gulf of Mannar coast throughout the year.

There are about four lakhs of fishermen in Tamilnadu low, which only about 44,000 are productively employed in fishing related activities in Thoothukudi district, one of the important maritime districts of Tamilnadu the fishing workers are busily engaged in all the shore-based activities often go unnoticed. There is no extensive and scientific study on the economic activities of fishing workers.

Hence a research is required inevitably to out the exploitation of the weaker section with total literacy living along coastal line. It will throw light on their real contribution for economic development. This will also pave the way for proper compensation for their activities through suitable policy measures. The present research aims at studying the economic appraisal of marine fishing workers in New Street, Thoothukudi district.

OBJECTIVES

- To study the socio-economic conditions of the fishermen households in the sample villages.
- To study the fishermen-expenditure in fishing net and the number of days of fishing activities of fishermen.
- To find out the types of fishes captured in New Street area.
- To analyse the operational cost at fishermen per production trip.
- To highlight the nutritional and medicinal values of fishes.
- To study the process of fish catching.

METHODOLOGY

Collection of data

The study has made use of primary and secondary data. The required data has collected from the 'Thoothukudi-New street' people by making use of the random sampling method. This study follows questionnaire to have the actual information regarding their socio-economic status. The collected information have compiled, tabulated, and tested with the statistical tools. Secondary data collected from Magazines, Journals, Library Books, and websites.

The population figure and other data regarding the study area collected from the records available with Village Administrative Officer and district websites.

Sampling Design

The people from Thoothukudi Town has selected for the present study. The sample household for the study selected through unrestricted random sampling method.

Sample size

Statistical data are gathered from 105 sample households through a structured a questionnaire. Among 105 respondents, 55 were male and 50 were female.

Period of the study

This study takes active period from July 2018 to September 2018.

Tools of Analysis

The tools selected for data collection should be appropriate and accurate for ensuring reliability of information. This study has used simple statistical tools like average, percentage, Mean, Standard deviation, Measure coefficient of variation for income and expenditure of the sample respondents and related chart & graph diagrams also used perfectly.

REVIEW OF LITERATURE

Rena and Chou in a paper titled "Women in Fisheries in the European Union" have examined the women in fisheries in the European Union. The subordinate status of women in the western world originated from the Greek and Roman civilizations when women were relegated to roles in the home and were responsible for child-bearing, while men took over public responsibilities. Women in Europe were known to have participated actively in the fishing sector as far back as the 19th century. They worked in the fish processing factories.

T. Rathakrishnan, and others in their research work "Traditional Fishing Practices Followed by Fisher Folks of Tamil Nadu" have pointed out that India is the world's fourth largest fishing nation, accounting for over 4.39% of the global output. It is also a major

contributor of foreign exchange earnings for several countries including India through export. The potential forward and backward linkages through boat building, construction of fishing Harbors, fish processing etc., contribute further to diversification and strengthening of the regional and national economy. Modern fishing devices like motor boats are increasing the pollution and destroy the natural environment. But the ancient tradition of fishing by using the traditional devices like Pari, Katcha, Oath, Strati, Catamaran and Karaivalai have become sustainable way of harvesting inland and marine life without damaging the environment of coral mangrove, wetland and sea-grass bed habitats. It has been practiced by the coastal fishing communities.

B. Ahlen, and P. Solara, in an article titled “Levels and Patterns of Earnings of Fisher Women in Chidambarannar District of Tamil Nadu” have made a comparative analysis of fishing related and non-fishing related activities in the Chidambaram District of Tamil Nadu. The overall mean income from self-employment in fishing related activities worked out Rs.2568.28+Rs.373.33 with a C.V. of 14.56%. The mean for wage employment was Rs.3176.04+2752.71 (86.67%) and for self employment it was Rs.2416+348.18 (14.41%). The fisher women respondents could earn 48.98% of their income from non-fishing wage employment. The magnitude of variation from household to household was the highest in case of wage employment in non-fishing activities.

Arundhati R. Choudhury in a research study titled “Common Property Resource Management: Gender, Equity and Participation – A Case Study of the Fish Workers of Kerala” has analyzed the problems encountered by the fisher women community in the small scale fisheries sector. She expressed that the survival of artisan’s fisheries stands threatened due to increasing pressure on resources. This is mainly a result of the ongoing nature of development and lack of adequate management and regulatory measures. Considering that these communities, specially the women, are one among the most deprived in the country, and the fact that they enjoy very little occupational mobility, the need to preserve their space and right to livelihood is becoming mandatory. In this context, today as opposed to state control over natural resources, there is a growing trend emphasizing community based natural resource control/management.

Bisoyi, Tanuj Kumar, in a work titled “Marketing of Marine Fisheries” has pointed out that Food and Agriculture Organization, ever since its inception in 1945 and the joining of it by several newly independent countries after 1950s, has been instrumental in promoting fisheries development in the less developed countries of the world. It has spear headed several studies relating to the fishing industries, first in Europe and then in the developing countries. One of the early studies of the Food and Agriculture Organization relates to the fishing industry of Great Britain.

Daniel Viswasam Samuel in his work titled “Economics of Marine Fishing and Role of Fisherwomen in Tirunelveli” has studied the socio-economic conditions and role of marine fisher women in Tirunelveli District of Tamil Nadu. The study revealed that though women play a major role in decision making in economic activity (nearly 40%) but are neglected and their role stand unrecognized. About 70% of women are not involved in decision making but they have a major role regarding expenditure on food (92.81%), purchase of cloth (78.21%), purchase of jewel/vessels (77.81%) and hut repair and maintenance (76.29%). The decision

on expenditure on food was made by women in 90% of cases. Women dominated in taking decision on almost all other household activities.

FINDINGS:

- ✚ About 28.5%(30) of the sample fisher men have completed primary education , 19.0%(20) of the sample fisher men completed secondary education, 33.3% (35) of the sample fisher men completed higher secondary education and 19.0% of the sample fisher men finished college.
- ✚ About 19.0%(20) of the sample fisher men are BC, 33.3%(35) of the sample fisher men are MBC, 14.2%(15)of the sample fisher men are SC 33.3%(35) of the sample fisher men are OC.
- ✚ About 38.0%(40) of the sample respondents fisher men are belonging to Christian, 42.8%(45) of the sample respondents fisher men are belonging to Hindu. 19.0% (20)of the sample respondents fisher men are belonging to Muslim.
- ✚ About 47.6%(50) of the sample fishermen are married, 33.3% (35)of the sample fisher men are unmarried, and 19.0% (20) of the sample fishermen are widow. About 85.7%(90) of them have toilet facility in their houses and 14.2%(15) of them do not have this facility, 61.9%(65) of them have water connection in houses and 38.0%(40) of them do not have this facility and 95.5%(100) of them having electricity facility .
- ✚ About 85.7%(90) of the fishermen are having self help group(SHG) and 14.2%(15) of the fishermen are not having self help group.
- ✚ About 47.6%(50) of the sample fishermen are using of their basket to carry the fish for sale, 38.0%(40) of the sample fishermen are having their own cycle to carry the fish for sale and 14.2% (15)of the sample fishermen are having link with export agencies.
- ✚ About 47.6%(50) of the sample fishermen are using of their basket to carry the fish for sale, 38.0%(40) of the sample fishermen are having their own cycle to carry the fish for sale and 14.2% (15)of the sample fishermen are having link with export agencies.
- ✚ About 14.2%(15) of the sample fishermen are using cast net,19.0%(20) of the sample fishermen are using gill net and 66.6%(70) of the sample fishermen are using ghost net.
- ✚ we can find that most of the sample respondents use iceboxes to store the fresh fish. Using of iceboxes just, above the average i.e. 57%.
- ✚ The percentage values of income, most of the respondents fall on the minimum income group of less than 5000 rupees.
- ✚ The average monthly expenditure of the sample household is Rs. 14,000. Although the standard deviation is the absolute measure of dispersion we found it as S.D = 7,280.

CONCLUSION:

The ultimate aim of uplifting the Socio economic status of households in the coastal villages of Thoothukudi District is achieved through the development of mechanized fishery sector with its backward and forward linkages which contribute further diversification and strengthening of The marine fishery economy of Thoothukudi District. The observed facts on

the socio-economic features indicated that the boat owner households enjoy with a better standard of living compared to the other sections in the fishermen community.

A technologically efficient fishing method may not always bring economic efficiency. In other words, an increase in productivity in quantity terms may not be reflected in terms of money value. Difficulty of operating trawlers without a harbour and absence of large scale fish exporting companies in the district took most of the mechanised boats of Thoothukudi district to the other parts of the country. Therefore, the benefits of the technological efficiency cannot be enjoyed. If the infrastructure and marketing facilities have not improved in par with improvement in technology.

SUGGESTIONS:

The present study carefully handles the socio-economic status of the fisher men living in Thoothukudi New street area. With regard to the prospects of mechanised fishing, the boat operators held the view that the mechanisation has brought out several benefits to the marine fishery industry as well as the economy as a whole. The fisheries department should take initiatives in the establishment of resource centers and provide information to vessel operators regarding fish shoal locations. Government has to plan the implementation of quota system on the rare species targeted by the mechanised vessels. This may impose some kind of control over the exploitation of scarce marine resources.

The development of marine fishery and marketing infrastructure is the need of the hour for enhancing the production and export of fish. Suitable fishery management policy should be implemented to address the conflicting issues such as exploitation and exhaustion of marine fishery resources. Special Protection Force to be set up to protect the domestic marine resources from the encroachment of foreign fishing vessels and to safeguard the seamen from the dangers of turbulent deep sea.

Absence of fishing harbor in most part of this region makes the mechanised boat operators to depend more upon the traditional craft operators to carry out the routine fishing operations. Moreover, there will be delay in bringing the catch to the auction centre. Since the catches brought to the shore passes through many hands, the freshness of the catch cannot be reasonably maintained to the expectation of the buyers and then fetches a low price. Recently, Government of Tamilnadu took initiatives in the building up of three small size fishing harbours along the Thoothukudi west coast.

Only a few fishing villages around Muttom are benefitted from the boat repairing unit of Thoothukudi district. Additional boat repairing unit should be established to serve the needs of the mechanised boats in the Thoothur region. The influence of money lenders or commission agents is insignificant in the marketing of fish. But the problem arises when there is excess supply in the market or a situation of extremely less number of bidders for fish lot. Government should announce minimum support price for certain varieties of fish to avoid price fluctuations and ensure a stable level of income to the boat operators.

A few private sector cold storages have been established to cater the only a few fishing villages around Muttom are benefitted from the boat repairing unit of Thoothukudi district. Additional boat repairing unit should be established to serve the needs of the mechanised boats in the Thoothukudi region. The influence of money lenders or commission agents is insignificant in the marketing of fish. But the problem arises when

there is excess supply in the market or a situation of extremely less number of bidders for fish lot. Government should announce minimum support price for certain varieties of fish to avoid price fluctuations and ensure a stable level of income to the boat operators.

A few private sector cold storages have been established to cater the current needs of the entire mechanised fishing industry in Thoothukudi district. Building up of more cold storages with sufficient capacity naturally attracts more people to invest on mechanized fishing units. Co-operative sector can be encouraged in the setting up and maintenance of cold storages. Since there is shortage in the supply of ice, procuring ice is too costly in Thoothukudi district. It is suggested that new ice factories should be established under public sector to ensure the regular supply of ice at a subsidized price.

A special fund can be created to provide lean season grant to cover up the minimum operating costs of mechanized crafts. The complicated legal formalities and procedures involved in investment credit should be replaced with easy credit policy. Moreover, adequate amount of credit on time is the most essential requirement of the progress of the mechanized fishery sector. Subsidy linked credit might relieve the boat operators from credit default. Current needs of the entire mechanised fishing industry in Thoothukudi district. Building up of more cold storages with sufficient capacity naturally attract more people to invest on mechanised fishing units.

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The restrictions imposed by the local authorities on the operation of mechanised boats have to be relaxed .The mechanised boat operators of Chinnamuttom and thoothukudi fishing villages are demanding the 182 implementation of multiday fishing operations. This would help the boat operators to reduce the fuel cost. At present, the various provisions of the Marine Fisheries Regulation Act throughout the Indian sub-continent. The new deep sea

fishing policy of Government of India should be reviewed. No foreign fishing vessels should be permitted to encroach upon the marine resources within the Exclusive Economic Zone of the Indian Sub-continent.

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A SOCIO-ECONOMIC STUDY OF AGRICULTURAL WORKERS IN KACHANAVILAI VILLAGE OF THOOTHUKUDI DISTRICT

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Abstract

Agricultural labourers contribute enormously towards the rural economy and also to the national economy. In the study area also, the socio-economic conditions of agricultural labourers is poor. They face various problems related to their earnings and indebtedness etc., thus a need arises to study the conditions of the agricultural labourers in Kachanavilai Village in Thoothukudi District.

The following are the objectives of the study:

1. To study and analyse the socio-economic conditions of the agricultural workers in Kachanavilai Village.
2. To find out the type of crops cultivated
3. To analyse monthly income and savings of the sample respondents

The study has made use of primary and secondary data. The primary data have been collected by adopting an interview method from 112 agricultural workers through random sampling technique using structured interview schedule. The secondary data has been collected from various journals, magazines, books and websites etc.,

The data reveals that 47.5% of the male respondents acquire income between Rs.5000-10000, 34.2% of the respondents obtain income between Rs.10001-15000 and 18.3% of the respondents receive income Rs.15001-20000. In the case of female respondents 33.4% obtain income between Rs.5000-10000, 38.3% of the respondents acquire income between Rs.10001-15000 and 28.3% of the respondents get income Rs.15001-20000 respectively.

Keywords: agriculture sector, high yielding variety program, national economy, farm employment, mechanization.

INTRODUCTION

Indian agriculture started dating back to ten thousand years and the agriculture was and is a way of living. In India about two third of its population is dependent on agriculture sector. This sector in India, as also in several other developing countries, is still in the evolving shape, and the sector poses a variety of challenges.

In most of the developing countries through the emphasis is on industrialization, the agriculture continues to be the main source of livelihood by offering work to most of the people in these countries. The participation of women in agriculture and allied activities is in no way insignificant in these countries.

The politics of the planners have aimed at improving more of agriculture practice under high yielding variety program and green revolution and little attention has been paid to the problems of women in this sector.

STATEMENT OF THE PROBLEM

India is essentially an agricultural country, as about seventy percent of the population live in villages. Majority of the Indian rural workers are agriculture dependent, in which the share of agricultural labourers is quite high. Agricultural labourers contribute enormously towards the rural economy and also to the national economy. Historically, they were the working class and the chief reason for the development of the society and economy. But, mostly the socio-economic conditions of these agricultural labourers are not remarkable.

In the study area also, the socio-economic conditions of agricultural labourers is poor. They face various problems related to their earnings and indebtedness etc., thus a need arises to study the conditions of the agricultural labourers in Kachanavilai Village in Thoothukudi District.

OBJECTIVES OF THE STUDY

The following are the objectives of the study:

1. To study and analyse the socio-economic conditions of the agricultural workers in Kachanavilai Village.
2. To find out the type of crops cultivated
3. To analyse monthly income and savings of the sample respondents

METHODOLOGY

For the purpose of study, the investigator has personally visited the agricultural workers of Kachanavilai Village and collected data. This helped her to judge the size of samples. It helped her to understand the existing problem among the workers. Most of the respondents were females.

Collection of Data

The study has made use of primary and secondary data. Detail schedule forms were issued and information had been collected. Random sampling method has been used for the study. The collected information have been compiled, processed, tabulated, and tested with the help of some statistical tools. The primary data have been collected by adopting an interview method from 112 agricultural workers through random sampling technique using structured interview schedule. The secondary data has been collected from various journals, magazines, books and websites etc.,

Tools of analysis

This study has used simple statistical tools like averages, percentages and mean. The hypothesis framed in this study has been tested with the help of Chi Square test.

Sampling size and Design

Kachanavilai village of Thoothukudi District has been selected for the present study. The data has been collected from 112 sample agricultural workers through random sampling method. Out of the total respondents, 70 were females and 42 workers were males.

Period of the Study

This dissertation study period is from July 2018 to September 2018.

Hypothesis

- (i) There is no significant difference between the incomes of the sample respondents between sexes.
- (ii) There is no significant difference between the savings of the sample respondents between sexes.

REVIEW OF LITERATURE

Singh, G. (1980) found that even though the green revolution was ushered in Punjab in the mid-sixties, the condition of agricultural labourers in Ludhiana district had not improved because a large section of them was still living below the poverty line.

Impact of green revolution on landless labour has been examined by **Aggarwal, A.N. (1981)** the author found that with the advent of green revolution, large farmers were becoming prosperous. They were investing in capital-intensive equipment in order to enhance their direct control over agriculture. The labourers, on the other hand, had been losing out in several ways because demand for their traditional services decreased, availability of land on crop sharing basis reduced and alternative employment opportunities remained behind requirements. Consequently, the two classes were becoming polarized and increasingly antagonistic to each other.

Kahlon, A.S. and N.J. Kurien (1983) examined the impact of technological progress on labour absorption, productivity and returns to labour in Indian agriculture in the wake of green revolution in midsixties. They analysed the data on wheat cultivation from 1970-71 to 1979-80 for major wheat-producing states, namely, Punjab, Haryana and Madhya Pradesh. The study observed a declining trend in the intensity of labour use almost in all the states. This decline came to be the highest in the Punjab.

Parthasarthy, G. (1988) has estimated the daily money wages in 1984-85 to be broadly between Rs. 6 and Rs.11 (except in Punjab, Haryana and Kerala where they were higher), as against this, the minimum wage required to maintain a basic minimum standard of living was Rs. 22 per day. With the advent of green revolution, money wage rates started increasing. However, as prices also increased considerably the real wage rates did not increase much. It has been generally said that increases in output did lead to increase in real wages in some states but such spurt in real wages has been of a short duration and there is hardly any state which managed to maintain sustained increase in wage over a period of three decades from the mid - 1960s onwards.

Sidhu, R.S. and S.S. Grewal (1990) analysed the demand for labour in tractor-operated farms and bullock operated farms in Punjab. They brought out that contrary to the belief that tract 14 non-agricultural activities. The phenomenon of major shift from agricultural to non-agricultural activities need to be given special attention for drawing implication regarding the improvement and worsening of employment situation accompanying the overall process of 'casualisation' in rural areas. He further noted that one is not compelled to move away from self-employment in agriculture, unless the income situation is likely to improve. He indicated that 'casualisation' that is taking place in rural India is a positive process induced by higher earnings outside agriculture. Still employment pattern continue to be dominated by agriculture sector, on the other side the growth in non-agricultural sectors particularly, industrial sector has not been employment intensive. Overall organised sector remained slow in creating new job opportunities.

Jha, P. (1997) concludes that the rural workforce structure had more or less remained unchanged for the first two and a half decades since independence, and subsequently, it started shifting to the non-agricultural occupations; it reached the highest level ever in 1989-90. During the 1990s, this trend has suffered a reversal contraction in the rural non-farm activity means shrinkage in whatever employment opportunities had opened up in this sector

for members belonging to agricultural labour households, thus having a depressive effect on their income.

Regarding determinants of occupational change, a study conducted by **Pal, S. and J. Kynch (2000)** reveals that the major causes remained behind occupational change in rural India were being male, from larger farming families or having higher schooling experience.

The study conducted by **Sidhu, H.S. and J.S. Toor (2002)** states that there were altogether 147 non-farm activities in which the agricultural labour households were engaged. Rural Non-Farm Activities (RNFAs) were emerging as an alternative in the state of Punjab. In his paper ‘Employment Oriented Development’,

Bharat, T. (2002) described that the sharp rise in unemployment in the country originates from large-scale structural adjustment in some previously over employed sectors. The RNFS has significant potential for absorbing rural labour.

Gosh, J. (2003) in his paper ‘Whatever happened to farm employment’, indicates that the growth of agricultural employment by usual status fell from an annual rate of 2.08 per cent in the period 16 1987-88 to 1993-94 and shrank to 0.8 per cent in the period of 1993- 94 to 1999-2000. The paper also throws light on the reasons of decline in the farm employment. The labour saving technologies and pattern like mechanization and shifting of cropping pattern (Especially towards horticulture at the margin in some areas) might have decreased the demand for labour. On the other side, the increase in non-agricultural work has been much less than the decline in agricultural employment. Employment opportunities in agriculture sector are seasonal in nature. To meet the increasing requirements of the family, one has to seek better options of employment, specially, when rural poor is not well equipped financially.

LIMITATIONS OF THE STUDY

This study suffers from the following limitations:

1. This study is confined to the agricultural workers of Kachanavilai Village only.
2. The field study has been made in the selected areas only.
3. Some data are not 100% accurate.
4. Lack of sufficient time is one of the drawbacks of the study.
5. Labour efficiency varies from work to work, person to person. Hence, it is not easy to measure the efficiency of labour in relation to their socioeconomic status.

ANALYSIS OF DATA

AGE OF RESPONDENTS

S. No	Age group	No. of Respondents	Percentage
1.	25-35	42	38
2.	35-45	28	25
3.	45-55	25	22
4.	Above 55	17	15
	Total	112	100

Source: Primary data

The table shows that 38% of the respondents belong to the age group of 25-35 years, 25% of the respondents are in the age group of 35-45 years, 22% of the respondents are in the age group of 45-55 years and only 15 % are above 55 years.

SEX-WISE CLASSIFICATION OF RESPONDENTS

S. No	Sex	No of Respondents	Percentage
1.	Male	42	38
2.	Female	70	62
	Total	112	100

Source: Primary Data

This table reveals that 38 % of the respondents are males and 62% of the respondents are females.

MARITAL STATUS OF THE RESPONDENTS

S. No	Marital Status	No. of Respondents	Percentage
1.	Married	89	80
2.	Unmarried	18	16
3.	Widow	5	4
	Total	112	100

Source: Primary Data

The above table reveals that 80 % of the respondents are married, 16 % are unmarried and only 4 % are widows.

EDUCATION LEVEL OF THE RESPONDENTS

S. No	Education	No of respondents	Percentage
1.	Primary	40	36
2.	Middle	14	13
3.	High school	26	23
4.	H.S.S	2	1
5.	Illiterate	30	27
	Total	112	100

Source: Primary data

The above table shows that 36% of the respondents completed Primary school education, 13% of the respondents completed Middle school education, 23% of the respondents completed High school education, 1% of the respondents completed Higher Secondary School education and only 27 % of the respondents are illiterate.

FAMILY SIZE OF THE RESPONDENTS

S. No	Number of members	No. of respondents	Percentage
1.	2-4	56	50
2.	5-6	40	36
3.	Above 6	16	14
	Total	112	100

Source: Primary data

The above table shows that out of 112 samples, 50% respondents have their family size ranging between 2-4 members, 36% respondents have family members in the range of 5-6 members and 14% respondents have family size above 6 members.

TYPE OF CROPS CULTIVATED

S. No	Crops Cultivated	No. of respondents	Percentage
1.	Paddy	26	23
2.	Black gram	18	16
3.	Green gram	20	18
4.	Tomato	12	11
5.	Lady's finger	10	9
6.	Brinjal	15	13
7.	Others	11	10
	Total	112	100

Source: Primary data

The above table reveals that 23% of the respondents are cultivating paddy, 16% of the respondents are cultivating black gram, 18% of the respondents are cultivating green gram, 11% of the respondents are cultivating tomato, 9% of the respondents are cultivating Lady's finger and 13% of the respondents are cultivating brinjal and 10% are cultivating other vegetables or fruits.

MONTHLY INCOME DETAILS OF THE RESPONDENTS AND ITS RELATIONSHIP WITH SEX OF THE RESPONDENTS

Null hypothesis: There is no significant difference between the incomes of the sample respondents between sexes.

MONTHLY INCOME OF THE RESPONDENTS (Sex Wise in Percentage)

Income (Rs.)	Male	Female
5000-10000	47.5	33.4
10001-15000	34.2	38.3
15001-20000	18.3	28.3
Total	100	100

Source: Primary Data.

The above table reveals that 47.5% of the male respondents acquire income between Rs.5000-10000, 34.2% of the respondents obtain income between Rs.10001-15000 and 18.3% of the respondents receive income Rs.15001-20000. In the case of female respondents 33.4% obtain income between Rs.5000-10000, 38.3% of the respondents acquire income between Rs.10001-15000 and 28.3% of the respondents get income Rs.15001-20000 respectively.

In order to find out whether there is any correlation between the sex and income of respondents, chi-square test has been applied. The results of the Chi-square test are furnished below.

Calculated value of Chi-square	= 41.63
Table value at 5 per cent level	= 5.991
Degrees of freedom	= 2

As the calculated value of Chi-square is greater than the table value at 5 per cent level of significance, there is a relationship between income of the respondents and sex of the study area. Hence, the null hypothesis has been rejected.

MONTHLY SAVINGS DETAILS OF THE RESPONDENTS AND ITS RELATIONSHIP WITH THEIR SEX

Null hypothesis: There is no significant difference between the savings of the sample respondents between sexes.

MONTHLY SAVINGS OF THE RESPONDENTS (Sex-Wise in Percentage)

Savings (Rs.)	Male	Female
Post office	40.0	20.8
Bank	46.7	21.7
Chit fund/ SHG's	13.3	57.5
Total	100	100

Source: Primary Data.

The above table reveals that 40% of the male respondents have savings in post office, 46.7% of the respondents prefer banks and 13.3% of the respondents are having their savings with chit fund /SHG's respectively. In the case of female respondents only 20.8% have savings in post office, 21.5% of the respondents prefer banks and 57.5% of the respondents are having their savings with chit fund /SHG's respectively.

In order to find out whether there is any correlation between the sex and savings of respondents, chi-square test has been applied. The results of the Chi-square test are furnished below.

Calculated value of Chi-square	= 29.03
Table value at 5 per cent level	= 5.991
Degrees of freedom	= 2

As the calculated value of Chi-square is greater than the table value at 5 per cent level of significance, there is a relationship between savings of the respondents and sex of the study area. Thus, the null hypothesis has been rejected.

CONCLUSION

India is a land where agriculture sector is a backbone of the country. Nearly 70% of the population is dependent on agriculture for their livelihood. If we need to improve the country's GDP it is necessary that we improve the agricultural sector and simultaneously improve the socio-economic conditions of these workers.

Government should introduce such cropping patterns which would ensure that there are global demands for their supply. For example the Green Revolution belt can produce fruits, vegetables and flowers for export to the market of developed world. The farmers are largely dependent on markets for demand of agricultural inputs and also for supply of their output.

Hence government should provide essential subsidies and financial assistance to them. The government should also help to export their output to a large extent. Government should make arrangements for proper irrigation facilities during non-rainy seasons and help farmers to reduce their debt conditions. The condition of Indian agricultural labourers is at risk in today's IT and business world. So the government should seriously take

essential measures to improve the socio-economic and living conditions of the agricultural labourers.

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A STUDY ON HOUSEHOLD FOOD WASTE AND THE CHOICE OF CONSUMER BEHAVIER TO DISPOSAL IN THOOTHUKUDI TOWN

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Abstract

The present study is undertaking to describe the socio economic characteristics of the Thoothukudi town people. This study also explores the consumer perception towards the food waste. The present study is modest attempt to analyses the household food waste system followed by Thoothukudi town people. This study also interested to give suggestions to use the waste into profitable way and then support to do vermin-compose practice.

The following objectives had taken as primary motive.

1. To determine the socio economic and environmental benefits associated with the food waste management by household
2. To develop an efficient sustainable model for the management and waste from the food industry as alternative to disposal in land till.
3. To analyze governmental supporting schemes for to collect the household wastage.
- 4 .To study the general behavior of the people regarding management of their household food wastes.

It is studied the purpose expiry date on the packed food item, which purchased from the shop or market, almost fifty percentages of people having positive knowledge about food quality regards we needs to create awareness about the quality food product which are ready to consume. Then analyzed the alternative use of household food waste in this sense with to feed animals instead of throw it out. Most of them supported for convert the food waste into vermin compose manner. Finally, with referent to satirical analytical method we consulted that the people of Thoothukudi Town's responsibility on house hold food waste.

Keywords: food chain, food storage, human consumption, waste management, imperfect appearance.

INTRODUCTION:

According to the Food and Agricultural Organization (FAO),” one third of the world's food produced is wasted or lost along the food supply chain”. In relation to this, several factors and trends could essentially lead to the high level of waste and losses in the food chain. According to, Stem mark ET.AI, 2016 there is a substantial amount of food wasted from farm to fork and that 53% of households contribute to this high level of food wasted in the value chain. This alarming rate calls for increased attention towards finding new ways of intervening into food waste practice among households (Hebron 2017). As people are becoming more aware of the levels of food waste that is occurring, more interest has spawned in local groups to educate consumers. These groups educate consumers how to reduce food waste and to become more mindful, conscious on their food purchases, and waste.

What is food waste?

In 2011, the FAO conducted a survey assessing the global food losses and waste. The study found that each year, around one-third of all food produced for human consumption in the world is either lost or wasted. Grown but uneaten food puts huge pressure on the environment and economical costs. All this significant waste has proven that there has been a missed opportunity in solving the global issues of food security. Food waste often defined into two categories avoidable and unavoidable. In industry, avoidable food waste often comprises of damaged stock and products that were not used for the matter intended (Bagherzadeh et al, 2014). There are several reasons why avoidable food waste occurs which can result in the over purchase of a good, poor preparation, inadequate food storage and excessive portion sizes. While avoidable food waste can be reduced with better planning, whereas unavoidable food wastes is a separate issue, which describes food, being inedible or unsellable. Although, these terms could be deemed useful in waste management, the terms are subject to interpretation by individuals and governments so are, therefore not universally accepted.

Why Reduce Food Waste?

In recent times, food waste has been holding the potential to combating the global problem of food scarcity for millions of people who remain undernourished around the world. Although, reducing the levels of food waste in developed countries may not fully tackle the problem of food insecurity in developing countries, it would see the reduction for the competition of water, land and biodiversity uses, making these resources available for other uses (Bagherzadeh et al, 2014). There is a great opportunity for edible food that is usually wasted to be redistributed to the food insecure populations.

Tackling food waste needs to be top priority going forward for governments in the next number of years. The FAO 2013 estimated also that the value of food waste was costing \$750 billion at producer cost level. This is due to the value of food increasing throughout the supply chain, but the actual economic value of food waste is deemed to be much higher. With these high volumes of food waste being produced annually, the local governments are finding themselves under increased pressure financially to collect and treat the waste.

The EPA (2014) estimate that the UK gate fees and landfill taxes are amounting to around \$450 million a year just to dispose of household food waste. As already mentioned if the issue is not soon taken into consideration and tackled it is likely that food waste could significantly rise because of the rising population, the rapidly growing middle class and changes in the diets of consumers.

As evidence is suggesting, the middle-class population in developing countries are adopting the diets and habits of those in the developed world, therefore it is estimated that there could be an additional 280 million tons of food waste generated per annum which would see the figures gathered in 2011 doubling (United Nation, 2013.). The OECD Food Chain Analysis Network in June 2013 repeatedly raised the issues of the importance of reducing food waste to increase the efficiency of the food supply chain from the social, environmental, and economical view.

STATEMENT OF THE PROBLEM

Food waste is getting a lot of attention today and for good reason. While we continue to make progress through technology to increase efficiencies in our food system, we're moving in an unsustainable direction, with more and more food being produced while nearly a billion people still don't have enough to eat. The most effective way to describe our food waste problem was presented by poor handling, lack of sufficient storage, etc. Three slices are fed to animals to produce meat, eggs and cheese.

Unfortunately, animals are horribly inefficient when it comes to producing protein, so they replace only one slice of bread, and the other two slices wind up as waste (manure). That leaves only six slices of the original nine. Then, we lose two slices to food that ends up in the garbage for various reasons: spoilage, sell-by-date confusion, imperfect appearance, etc. So in the end, we're left with four slices to consume. The present study is undertaking to describe the socio economic characteristics of the Thoothukudi town people. This study also explores the consumer perception towards the food waste. The present study is modest attempt to analyses the household food waste system followed by Thoothukudi town people. This study also interested to give suggestions to use the waste into profitable way and then support to do vermin-compose practice.

OBJECTIVES:

The following objectives had taken as primary motive.

1. To determine the socio economic and environmental benefits associated with the food waste management by household
2. To develop an efficient sustainable model for the management and waste from the food industry as alternative to disposal in land till.
3. To analyze governmental supporting schemes for to collect the household wastage.
4. To study the general behavior of the people regarding management of their household food wastes.

METHODOLOGY

Collection of data

The study has made use of primary and secondary data. The required data has collected from the Thoothukudi town people by making use of the random sampling method. This study follows questionnaire to have the actual information regarding consumer behavior on waste management and their socio-economic status. The collected information have compiled, tabulated, and tested with the statistical tools. Secondary data collected from Magazines, Journals, Library Books, and websites.

The population figure and other data regarding the study area collected from the records available with Village Administrative Officer and district websites.

Sampling Design

The people from Thoothukudi Town has selected for the present study. The sample household for the study selected through unrestricted random sampling method.

Sample

Statistical data are gathered from 120 sample households through a structured a questionnaire. Among 120 respondents, 58 were male and 62 were female.

Period of the study

This study takes active period from July 2018 to September 2018.

Hypothesis Hypothesis framed based on Chi-Square test. There is the observed frequencies are compared with the expected frequencies. Let us take the hypothesis that People's responsibility on household sanitation is not effective.

Tools of Analysis

The tools selected for data collection should be appropriate and accurate for ensuring reliability of information. This study has used simple statistical tools like average, percentage, mean, Standard deviation, related chart & graph diagrams and Chi-Square test.

LIMITATION OF THE STUDY

This study not free from limitation also. This study tries to find the consumer preference towards household food waste. Biased answers may mislead the concept. Since it is difficult to examine the whole population, we study only samples from the whole population. This study has focused only on the basic issues because of the time constraints. Questionnaire consist only fewer items to avoid confusions on consumer preferences.

REVIEW OF LITERATURE

Yedla and Kansal (2003) found out that of the 6256 tons of waste generated in Bombay every day, 17-20 percent is recyclable, but only a fraction of thesis retrieved by rag-pickers. With the increasing demand for improved waste management, the authors suggested that private sector participation is essential and a Pigouvian tax is a necessary tool to make the private sector participation in solid waste management a success. The Times of India (2006) reported that Delhi generated 8,000 metric tons of waste daily and 7,435 metric tons was put in to three landfill sites. By 2021, the waste will be three times more in quantity and require one hundred more landfill sites, unless the waste is disposed effectively.

Horne and Tata (2012) made a global review of solid waste management, and reported that three billion residents generate 1.2 kg per person per day (1.3 billion tons per year). By 2025 this will likely increase to 4.3 billion urban residents generating about 1.42 kg/capita/day of municipal solid waste (2.2 billion tons per year).

Bichi and Amatobi (2013) found that 57.5 percent of the solid waste generated in Sabin-gray area of Kano in Northern Nigeria with 17.6 percent plastics and 3.0 percent metals. Per capita waste generated was 0.31kg/capita/day and the average bulk density of waste generated was 259kg/m³. The study recommended that a formal composting and recycling facilities be established within the community, and private firms can be involved for efficient and effective solid waste management in the area.

Hardier (2013) examined household solid waste generation in urban Pakistan. The total waste generated by household increased with household size. The state of solid waste collection was found to be poor across all income strata. The two low incomes and one mid-income neighborhood did not have any municipal waste collection service. Fewer than 50 percent of the households in the high-income neighborhood reported access to municipal solid waste collection service. The rest self-disposed solid waste mostly in empty plots in the neighborhood. More than 65 percent of the households sold recyclables to waste collecting street hawkers, while another 25percent handed recyclables to domestic workers, who in turn sold recyclables in them.

Siobhan et.al (2014) made an assessment of public attitudes and behavior towards the improvement of urban solid waste management offered by a municipality in Malaysia by looking at the people's willingness to pay (WTP) for the improved services. Contingent

Valuation Method (CVM) was used for the quantitative data analysis. The study results indicated that the households are willing to pay for the improved service.

Mucus (2013) conducted a study on factors influencing household solid waste management in urban Nero Municipality, Kenya. The study finds that, households were not using correct methods of waste management. The percentage of households where separation of solid waste was practiced was 24.6 percent; the 75.4 percent incorrect practice was associated with carelessness, socialization style and long distances to then earnest garbage chamber. The common correct methods of solid waste management were use of a self-provided bin for storage, use of garbage chamber, compost pit and curbside services for household disposal.

FINDINGS:

- 64% of the Sample is male and 36% of the respondent is female.
- Majority of the respondent are coming and the age group of 40-50 years. I.e.36% of the respondent.
- In the study, therefore 34% of the respondent unmarried and 66% of the respondent are married.
- The minimum level of respondent are combined the post-graduation that is 30%.
- There are maximum of homemaker were respondent in the study that is 41% and 28% of the sample respondent are government private employees.
- 21% of the sample are professional and 11% of the sample respondent are doing own business
- 35% of the respondent are belong to BC categories and 28% of them are OC categories.
- In the study 73% of the sample are group trended Nuclear livid in joint family.
- There are 70% of the respondent are Hindu. 30% of the respondent are christens and their no one respondent belong to Muslim.
- 49% of the respondent is purchasing perishable commodities form the super market.
- 53% of the respondent is confirming their food safety.
- 39% of the respondent is using household foods waste to feed cattle.
- 17% of the respondent is considered price, which was received corporation, are fair and 8% of the respondent are accepted.
- 33% of the respondent is asserting the separation of perishable and non-perishable.
- Majority of 37% the respondent coming under they income group 10,000-20,000.
- There are 33% of the respondents are spending below 10,000 per month.

SUGGESTION:

An important part of food loss is “food waste “which refers to the discarding or alternative (nonfood) Use of food that was fit for human consumption– by choice or after the food has been left to spoil or expire as a result of negligence. Under the purview of above stated problems, this study gives some suggestion. Now a day people are thinking as health conscious we need to be aware about our daily food habits i.e. expiry-dated products, perishable food items-fruits and vegetables, dairy milk products, eggs. In economics point of view, we consider the management of household wastes into correct root, from the socio-economic pattern study we found that consumer always having full-fledged motive to

consume fresh product rather out dated product. Then the actual problem is how to use the wasted food items in a profitable way. The respondents always trends to feed their cattle or pet animals and excessive are wasted by throwing out. Instead of throwing out the people can make it as profitable by doing vermin-compose practice.

CONCLUSION:

In view of “A Study on household food waste and the choice of consumer behaviour to disposal in Thoothukudi Town. “We derived the following conclusion. As such we concluded that all the people living in Thoothukudi Town having good education, family income, lifestyle, to persuade the awareness of food quality. We studied the purpose expiry date on the packed food item, which purchased from the shop or market, almost fifty percentages of people having positive knowledge about food quality regards we needs to create awareness about the quality food product which are ready to consume. Then we analyzed the alternative use of household food waste in this sense with to feed animals instead of throw it out. Most of them supported for convert the food waste into vermin compose manner. We examined the family’s standard of living by analyzing the income and expenditure pattern of sample respondents by which we concluded its all better. Finally, with referent to satirical analytical method we consulted that the people of Thoothukudi Town’s responsibility on house hold food waste.

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A STUDY ON KIEFER SEAFOOD INDUSTRY WORKERS ECONOMIC CONDITIONS IN VAGAIKULAM AT THOOTHUKUDI DISTRICT

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Abstract

Fishing is one of the oldest and largest industries in the world. Almost 90% of the people consume fish as a regular item in their daily food. So the researcher firmly believes that the seafood industry could be the panacea to cure the economic evils like unemployment, low income and industrial underdevelopment of the district.

The basic objectives of the study are to analyse and understand seafood industry production and the labourers who were working there. For the purpose of the study focuses on the following specified objectives.

- To find out the educational level of the workers.
- To study about the income and expenditure of the workers.
- To analyze their saving pattern.
- To identified the problem faced by the workers at their working place.
- To give suggestions to improve the conditions of the workers.

Marine fishing workers are a section of people in the lowest rung of the social ladder inhabiting the rural coastal areas. The fisherman work hard and take much effort with the available instrument to harvest the maximum fish form the sea so as to raise their family income. The level of income of fishing workers is not sufficient to nourish their family with nutritious food and to meet other requirement, so they spend whatever they earn and borrow from various sources. The various fishermen welfare schemes of the government and the measures taken by other non-governmental organisations to uplift the fish men communities do not reach them properly due to difficult formalities. The marine fishing worker is not better off in all aspects of the economic and social life.

Keywords: seafood industry, unemployment, low income, industrial underdevelopment, economic and social life.

INTRODUCTION

Fishing is one of the oldest and natural occupations of mankind. Since three fourths of the earth's surface is covered by oceans, people living in the coastal areas went to sea in search of food. As population increased, fishing developed significantly to provide food for the growing population. As the demand for food increased, fishing activity expanded from shallow waters to deep sea. Fishing was considered as a way of life as fishermen had to work with the unpredictable natural conditions of the oceans in earlier times. The construction of fishing crafts for deep sea fishing and the fishermen's knowledge of the oceans was considered as the second line of Naval defense in England by the Mercantalist.

As fishing increased the food production in a country, there will be less import of food, making a country's balance of payments favourable. This naturally increased the riches of the country and the strength of the State. Hence the fisher folk were considered important both from the military and economic point of view. Exploring ways of food production from natural resources has been the pursuit of man ever since the dawn of civilization. But with the advent of science and technology a rational approach has been adopted to locate new and better food sources.

Fishing, one of the oldest occupations of man, started as mere collection of animal food from the shallow waters by hand picking, later developed into an important industry. The rapid strides made in the development of advanced type of fishing gear, craft and advent of modern electronic fish finding devices have all contributed to the significance of fishing in world trade'. Fisheries have also a pivotal role in the socio-economic development of the poor in the coastal areas. Fishing development is a part of economic development, as it provides employment, contributes to gross national product and the foreign exchange earnings of a country. In a developing country like India, it assumes an added importance because of the potential social benefits it offers to fish people. Fisher folk are considered as one of the most backward sections of our society. Information on socio-economic framework of the fishing community forms an effective base for planning and development of this economically backward sector.

SALIENT FEATURES OF FISHERY RESOURCES

A clear understanding of the fishery resource base is an essential prerequisite for social science research in fisheries. Oceans have been a good source of food and until recently the supply of fish seemed inexhaustible. Fishery resources are living beings which breed and multiply. Even if certain quantities of fish from the stock in the seas are exploited it is still self-renewing. The important feature of this resource is that it is a common property that nature permits to be simultaneously used by more than one individual or economic unit. As it is open to all and owned by none; the fishermen have no obligation to conserve the resource. The picture one gets of the life in the sea is one of the constant predation of one species on another.

Marine resources are the raw materials for the production of fish meal, oil and other by-products. The waste coming out during processing is also used in the production of by-products like manure and animal fodder. Marine fish are free resources requiring no inputs for cultivation except investment on modern gear and man - power utilisation. However the physical nature of the resource has given the industry certain peculiar characteristics. Fish is a wet and highly perishable commodity and consists of discrete units of different size and shapes. It is rarely processed at source, and requires specific technical process of preservation.

The varying fish supply is due to the uncertainty imposed by ocean currents, weather and the occurrence and behaviour of fish. But there are currents in the oceans which are said to increase the productivity and therefore provide more food for fish.

STATEMENT OF THE PROBLEM:

Fishing is one of the oldest and largest industries in the world. This is true in the case of India also. Fishing industry gives employment and income to crores of people. Fish play a significant role in solving the food problem of the world. As food, fish is very nutritious and harmless. The demand for fish is increasing year by year along with the increasing population. Fishing and Seafood industry are interlinked. When there is an increase in the demand for fish, automatically there is an increasing seafood product also.

As India is blessed with a long coastal line and cheap labour, India can start numerous new seafood industries along the coastal villages and can produce its products for export at a competitive price. But so far neither the government nor the native entrepreneurs have taken the initiative to start new seafood industries with modern technology. If it is done, seafood industries can generate considerable employment. By exporting seafood products to other countries, the country can earn a lot of foreign exchange. Thoothukudi district has a long coastal line and this District has largest fisherman population.

Almost 90% of the people consume fish as a regular item in their daily food. The geographical situation, suitable climate, availability of skilled manpower resource and availability of medium scale entrepreneurs, are really encouraging factors to start seafood industry in large number throughout the district. By doing so, the seafood industry will definitely generate new employment opportunities in the district. So the researcher firmly believes that the seafood industry could be the panacea to cure the economic evils like unemployment, low income and industrial underdevelopment of the district.

OBJECTIVES OF THE STUDY:

The basic objectives of the study are to analyse and understand seafood industry production and the labourers who were working there. For the purpose of the study focuses on the following specified objectives.

- To find out the educational level of the workers.
- To study about the income and expenditure of the workers.
- To analyze their saving pattern.
- To identified the problem faced by the workers at their working place.
- To give suggestions to improve the conditions of the workers.

HYPOTHESIS:

- ❖ There is no relationship between income and expenditure pattern of the workers.

PERIOD OF THE STUDY:

This dissertation study period is 2018 June – 2018 August.

LIMITATIONS:

The primary data is collected from the seafood industry labourers during the working time itself and their co-operation in responding to the questionnaire was not encouraging. Some time they were able to give information's only out of their memory which may not be accurate, but conscious efforts have been taken by the researcher to make it precise to minimize the errors. Even though the researcher has taken large samples (>30), it does not

depict the nature, causes, working conditions and problems of all the workers. Therefore the conclusions drawn from this study cannot be generalized. The study has focused only on few items due to lack of time.

LITERATURE REVIEW OF THE STUDY

Amutha (1998) observed that the Socio-economic Conditions of Fisheremen in Tuticorin. The study pointed out that the gross annual income of fishermen in mechanised sector was three times greater than in non-mechanised sector.

Anwar Hashim (2011) analysed the tsunami that wreaked havoc in Japan last week is set to rock the \$2-billion Indian seafood export industry. The North-Eastern city of Sendai in Japan, the epicenter of the quake and tsunami, was a bustling city full of seafood factories and processing units with which Indian exporters had direct links. The studied that while admitting that seafood exports to Sendai would be immediately affected, he pointed out that the impact on other export destinations such as Tokyo and Osaka has been on a far lower scale and trade with these destinations could revive faster.

Nikita Gopal et al., (2007), reported that the export of finfish from India had been rising over the years, having touched 1.86 lakh tones in 2005, which accounted for 37% of the total seafood export. In value terms, however, its contribution was only 16%. The unit value realisation for finfish exports, excluding ribbonfish, was \$ 1.92 per kg in 2005, which was not significantly different from what was realized in 1991 at \$ 1.56 per kg, an increase of 23% in 15 years. This unit value realisation of finfish is low comparison with the domestic prices.

Murugan (2000) revealed that the irregular and unstable income from fishing and uncertain economic base had prevented the fishermen families from maintaining health and educating the children. The study also pointed out that the fisherwomen used to undergo high tension due to poverty, non- availability of food on time and hence they were more vulnerable to physical and mental ailments.

Ezhil, (2000) revealed that the annual income of 19 per cent of total earning population of marine fisherfolk in manyakumari district ranged upto Rs.3000 and the income of 23 per cent of earing population was between Rs.3991 and Rs.6000. The income of 37.5 per cent of fisherfolk was between Rs.6001 and Rs.12000. Just 11 per cent of the total earning fisherfolk came under the highest income range, 15001 and above.

Karna (2011) observed that the Visakhapatnam was one of the major marine product export centres in the country but of late it was registering negative growth and therefore the IIP had decided to hold the workshop to educate the exporters and others in the field on the need for proper packaging of marine products. The study is highlighted on handling marine products, storage and logistical problems associated with marine products and also on the latest trends and technologies.

FINDINGS:

The present study has been undertaken from Kiefer Sea Food Industry to analyse the working condition and their life style of the workers at vagailkulam area of Thoothukudi

district. The survey is based on the primary data and secondary data for the reference year 2018.

In this chapter, an attempt has been made to recapitulate the findings of the present study of also the site few suggestions for further improvement of workers of Kiefer Sea Food Industry.

- There are 53.9% of the respondents males and 46.1% of them were females.
- 28.7% of the respondents belong to the age group of 40-50 years of age.
- 13.1% of the respondents are above 60-70 years old.
- 19.1% of the respondents are lie between the age group of 20-30 years and 20.8% of the respondents are lie between the age group of 30-40 years.
- Majority of the sample respondents 48.0% of Hindu religion
- 34.7% of the respondents are Christians in this area.
- Minimum of the sample respondents are 17.3% of Muslim religion
- Majority of the respondents 62.6% are BC caste.
- Minimum of the sample respondents 17.4% of MBC caste and 20% of the sample respondents are SC/ST.
- Majority of the sample respondents 40% of Higher Secondary School.
- 8.6% of the respondents are Illiterate.
- 19.2% of the sample respondents are completed their College level of education.
- 11.4% and 20.8% of the sample respondents are completed their Primary and Higher Secondary level of education respectively.
- 25.2% of the sample respondents are earning their monthly income is 5000 – 10000.
- Maximum of the sample respondents (38.3%) their monthly income is 10000-15000.
- 32.5% of the sample respondents are earns their monthly income as 15000 -20000.
- 27.9% (93) of Males and 36.4% (22) of Females they were earns 5000 -10000 as their monthly income.
- 36.5% (93) of Males and 45.5% (22) of Females they were earns 10000 -15000 as their monthly income.
- 35.6% (93) of Males and 18.1% (22) of Females they were earns 15000 -20000 as their monthly income.
- 29.5% of the sample respondents their Expenditure is 6000-9000.
- 35.7% of the sample respondents their Expenditure is 9000-12000.
- 34.8% of the sample respondents their Expenditure is 12000-15000.
- “There is correlation between the income and expenditure of the workers”. Since the value of “r” is lesser than one(0.641)
- 60% of the sample respondents their Monthly savings is 2000-5000.
- 21.7% of the sample respondents their Monthly savings is 5000-8000.
- 18.3% of the sample respondents their Monthly savings is 5000-8000.
- 55.2% of the respondents got their debt from banking institutions.
- 27.1% of the respondents got their debt from their relatives
- 17.7% of the respondents got their debt from the private chit fund limited.

SUGGESTIONS:

- ❖ Scientific and technical knowledge and training for the adoption of workers in rural area should be by government agencies which ultimately increase fish production by the government agencies ultimately increase fish area and production of the district.
- ❖ Workers those who are working in this industry need a union to protect their own interest.
- ❖ Export of fishery products from India face problems of lack of market information, processing infrastructure, advanced technology in value addition, quality control, and Research and Development.
- ❖ Only 40 percent of the production quantities satisfy the criterion for exports hence the rest 60 percent of fish are sold away in the domestic markets.
- ❖ The requirement of traceability as an integral part of HACCP and food safety system of the buyers has put tremendous strain on the export of cultured products.
- ❖ The value of addition in India is taking place in case of certain species of marine fish only. There is shortage of Ice making units near the vicinity of aquaculture farms.
- ❖ Lack of modern and sophisticated packaging technologies make the Indian marine products in lesser demand in the international market.
- ❖ More emphasis is required in hygienic and sanitary practices in pre-processing and processing plants.
- ❖ There is lack of efficient logistics to enable delivery of fishery products in its freshest form to the consumers.
- ❖ The domestic markets are largely underdeveloped with poor and unhygienic market resulting in poor prices for Fishes. Diversification of more species to meet the export demand and adoption of new technologies need focus, there is lack of knowledge and training to utilize the available man power in these sectors.
- ❖ Integration among the domestic fish markets of our country is weak so creating market infrastructure and institutions would benefit the fishermen, farmer, and the consumer.
- ❖ There are problems in getting adequate market information, knowledge dissemination in this sector these should be removed for the growth and development of marine export sector.
- ❖ Welfare facilities are not available for manpower employed in pre-processing, processing, and export units.

CONCLUSION:

Marine fishing workers are a section of people in the lowest rung of the social ladder inhabiting the rural coastal areas. The fisherman work hard and take much effort with the available instrument to harvest the maximum fish from the sea so as to raise their family income. They are unable to relish the fruits of their strenuous work, while they are exploited during the realisation of their catch by middlemen and money lenders. The level of income of fishing workers is not sufficient to nourish their family with nutritious food and to meet other requirement, so they spend whatever they earn and borrow from various sources. The various fishermen welfare schemes of the government and the measures taken by other non-governmental organisations to uplift the fish men communities do not reach them properly

due to difficult formalities. The marine fishing worker is not better off in all aspects of the economic and social life.

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A STUDY ON LPG GAS CYLINDER (INDANE) CONSUMPTION AND ITS SUPPLIERS IN MUTHIAH PURAM VILLAGE, THOOTHUKUDI DISTRICT

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Abstract

The present study induced by the consumers and suppliers of LPG in Muthiyapuram village especially for Indane gas cylinder. Moreover in this scenario government put some efforts to regulate the price of Gas cylinder which should be affordable for the poor section. This analysis suspects the standard of living of the people so the present study considers Muthiyapuram village as part of study area.

OBJECTIVES OF THE STUDY

- 1) To study the socio-economic conditions of the Muthiyapuram village.
- 2) To study the household consumption towards LPG gas cylinder.
- 3) To study the about the distribution of LPG gas cylinder by the supplier.
- 4)To analyse the awareness about LPG subsidy among the household.
- 5)To study the process of Indane gas cylinder supply among Muthiyapuram village and
- 6) To analyse the governmental schemes related to gas cylinder price, tax, subsidy etc.

The findings of the study depict that the customers has faced the irregularity of price increase and delayed supply of LPG gas cylinders. It is suggested that the HP gas company should take some necessary action to improve their service quality by the way they can introduce some more dealers and provide constant service to the customers. This study emphasizes that the company needs to improve in customer care area, proper communication while booking and delivery through short message service (SMS). HP Gas Company should understand the importance and needs of the customers. It is essential for a healthy business in creating new customers, keeping loyal customers, and developing referrals for future customers.

Keywords:Gas cylinder, Indian Oil Corporation,sources of energy, LPG subsidy, customers

INTRODUCTION

There are various traditional as well as modern sources of energy used for cooking purpose. Yet, it is very obvious that many go for LPG. The preference for LPG by the people of both urban and rural areas may be due to its salient features like economy and speedy. Till the end of 20th century it has been moved towards buyers' market. This is mainly due to the incoming of private agencies supplying LPG cylinders.

Among the three government agencies supplying LPG such as Indian Oil Corporation, Bharat Petroleum and Hindustan Petroleum, it is the Indian Oil Corporation which introduced LPG in the name "Indane" for the first time in India. Customers' opinion on dealer's trade practices will eventually affect their attitude towards the product on which the dealer

provides various services. Therefore, it is necessary to study and analyse customer's opinion on dealer's trade practices. Generally when customers have favourable opinion on dealers' trade practices in relation to the product they will have positive attitudes towards the product. That is why, this study has been undertaken by the researcher to get know the reasons why customers prefer Indane gas cylinder and to know about their opinion towards the services rendered by dealer.

LPG's domestic uses can never be ignored. It has played a revolutionary role when it comes to changing the face of domestic fuels used for heating and cooking. LPG for household consumption is nearly 89% of total LPG off-take in India. Total LPG consumption in the country for the year 2011-12 is projected to be more than 16.5 MMT (Million Metric Tons) and is expected to grow at 8-9% as envisaged in Vision 2015 document of Ministry of Petroleum and Natural Gas. There are still many rural areas where they have no awareness on use of LPG for domestic purpose.

In developing countries the main benefits of LPG is in helping people to switch from unsustainable biomass use to a clean and safe cooking fuel. This provides enormous health benefits helping to avoid the 1.6 million deaths per year from respiratory problems caused by smoke and other pollutants released by inefficient biomass burning in enclosed spaces. It also releases women and children from the drudgery of collecting firewood and health problems associated with carrying heavy bundles long distances. The main domestic uses of LPG are with respect to lighting, refrigeration, cooking and most of all heating. It is as good for powering standalone stoves and huge cooking stoves. It has been found to be cost effective and hence is used in large scale cooking also. The main reason behind this is easy accessibility, low cost per unit and the environment friendly properties of LPG.

The Indane gas company reforms have deregulated the market to a great extent. It has become necessary to design and execute the best customer oriented practices and to internalize them for providing enhanced satisfaction to the customer through the employees. Customers' service is not merely the compliance with the government's policies or the mechanical adherence to the time frame of services. It is a philosophy and an attitude of professional commitment, which believes in the ultimate satisfaction or each customer 'wants'.

Service marketers have really understood that competition can be well managed by differentiating through quality. Significance of service lies in customer service management. In this the competitive environment, service quality has become the success mantra in all service sector. Keeping this in mind, this study has been conducted at Muthiyaputam village to identify the service quality of Indane gas. The result indicates that customers are not highly satisfied with the service provided by the Indanegas suppliers. So the company took some serious action to improve the service quality.

In 2007, the Indonesian Government embarked on the largest household fuel conversion program for cooking that had been attempted at that time, to phase out the domestic use of kerosene completely in five years and replace it with liquefied petroleum gas (LPG). LPG is an abundant by-product of oil refining and natural gas extraction, and is a clean burning and portable fuel used as the primary or secondary cooking fuel by almost 3 billion people across developing and developed countries (Bruce, Aunan, &Rehfuss, 2017; WLPGA & Argus, 2018).

In terms of the Government's stated objectives, the program was successful in reducing domestic kerosene use by 92% in less than 10 years. While subsidy reductions were achieved; the cost effectiveness of these reductions needs to be considered in light of a high initial subsidy and the sustainability of the changes in terms of rising energy prices and growing energy needs. The impact on household cooking behavior, sustained usage of LPG for daily cooking and associated health gains has also been less clear.

STATEMENT OF THE PROBLEM

Humanity faces a unique and far-reaching challenge. Our energy needs are growing as a result of continued population increases, economic growth, and individual fuel/energy consumption. At the same time, emissions from fuel wood and fossil fuels, the main energy source for heating in homes and powering our economies, are contributing to climate change and affecting the local air quality (WEC, 2005). In this situation, there are many opportunities for LPG to contribute to improved living standards. LPG is known to be the most useful and effective energy alternative for domestic, as well as business, use. The fact that it offers versatile usage at lower costs than other energy sources, accompanied with its environmentally-friendly nature, greatly increases the demand among people. This can sometimes make some suppliers charge more than they should. LPG is subsidized by the government in India. Increase in LPG prices has been a politically sensitive matter in India as it potentially affects the urban middle class voting pattern.

Customer oriented market should make sure that there is healthy competition in the market between different companies. This is necessary because in a competitive business environment, not only the companies but also the customers obtain benefits in the form of competitive prices; along with quality services and facilities provided by the LPG gas company. Consumer satisfaction is the basic for modern concept of marketing. It is the basic philosophy of management, which forces the organization to align its actions with the market mandates. The present study induced by the consumers and suppliers of LPG in Muthiyapuram village especially for Indane gas cylinder. Moreover in this scenario government put some efforts to regulate the price of Gas cylinder which should be affordable for the poor section. This analysis suspects the standard of living of the people so the present study considers Muthiyapuram village as part of study area.

OBJECTIVES OF THE STUDY

The present study induced by the following main objectives

- 1) To study the socio-economic conditions of the Muthiyapuram village.
- 2) To study the household consumption towards LPG gas cylinder.
- 3) To study the about the distribution of LPG gas cylinder by the supplier.
- 4) To analyse the awareness about LPG subsidy among the household.
- 5) To study the process of Indane gas cylinder supply among Muthiyapuram village and
- 6) To analyse the governmental schemes related to gas cylinder price, tax, subsidy etc.

METHODOLOGY:

Collection of data

The study has made use of primary and secondary data. The required data has collected from the Thoothukudi town people by making use of the random sampling method. This

study follows questionnaire to have the actual information regarding consumer behaviour on LPG gas cylinder and their socio-economic status. Then the present study analyses supply side also. The collected information have compiled, tabulated, and tested with the statistical tools. Secondary data collected from Magazines, Journals, Library Books, and websites.

The population figure and other data regarding the study area collected from the records available with Village Administrative Officer and district websites.

Sampling Design

The people from Muthiyapuram, Thoothukudi district has selected for the present study. The sample household for the study selected through unrestricted random sampling method.

Sample size

Statistical data are gathered from 112 sample households through a structured a questionnaire. Among 112 respondents, 50 were male and 62 were female.

Period of the study

This study takes active period from July 2018 to September 2018.

Tools of Analysis

The tools selected for data collection should be appropriate and accurate for ensuring reliability of information. This study has used simple statistical tools like average, percentage, assumed mean, standard deviation, coefficient of variation, correlation between income and expenditure and related charts & graph diagrams.

REVIEW OF LITERATURE

Vinayagamoorthy et al., (2007) in their study entitled, “Study on Service Quality Perception of Domestic LPG”, stated that the service marketers have really understood that competition can be well managed by differentiating through quality. Significance of service lies in customer service management. In this the competitive environment, service quality has become the success mantra in all service sector. Keeping this in mind, this study has been conducted at Salem city to identify the service quality of Indane gas. The result indicates that customers are not highly satisfied with the service provided by the Indane gas. So the company took some serious action to improve the service quality.

VimalPriyan&Karthihaiselvi (2010) in their study, “Customers' opinion towards Indane gas dealers”, found that, most of the customers are of the opinion that there is a delay in providing cylinder. It is suggested that there should be one more dealer in Sivakasi so as to distribute gas cylinder quickly. Majority of the customers prefer indane gas for the reasons like economy, convenience, time saving and cleanliness. As LPG has been moved towards buyers' market, the dealer should provide better customers service that his competitors in order to have repeated sales, increased clientele and eventually sustainable development.

Gronroos (2007) in the current marketing literature, much attention on the issue of service quality as related to customers' attitudes towards services has focused on the relationship between customer expectations of a service and their perceptions of the quality of provision. This relationship known as perceived service quality.

Sultan Singh (2008) in her study has found out that the level of customer service and satisfaction is influenced by the factors such as location of the branch and lay out, differentiated services, system and procedures, delegation and decentralization,

mechanization and computerization, complaint redressal; and skills, attitudes and responses of the employees.

William Young et al., (2009) in their study entitled, “Sustainable consumption: green consumer behaviour when purchasing products”, concluded that, the green consumers’ decision-making processes when buying a technology-based product. The most common green criteria that our interviewees mentioned when they were deciding which consumer electronics products to purchase were mainly what could be classified as: Product environmental performance (energy efficiency, durability, water consumption, LPG conversion, fuel type, fuel consumption and energy ratings).

LIMITATIONS

- It is a micro level study and therefore the findings of the study are applicable only to the market segments possessing the characteristics of Coimbatore central zone.
- Only we take the single connection of INDANE LPG users for the study.
- Due to the time constraint the sample size were restricted to 112 respondents only.
- The response received from consumer may not represent the views of the universe
- Since the study is based on the primary data collected through questionnaire, the results of the study is subject to all the limitations of the primary data.
- The analysis based on some statistical tools which has its own limitation.
- The findings and suggestions are based on the information given by the respondents.

FINDINGS

- ❖ The age wise distribution of the respondents showed that the maximum percentage of 36% is in the age group of 26-35 years.
- ❖ The Educational status showed that 10% of the illiterate also using LPG.
- ❖ The monthly income of the respondents showed that 38% are having monthly income of 15000-20000, 10% are receiving above 25000 as their monthly income.
- ❖ The monthly Expenditure of the respondents showed that 38% are spending 15000-20000, 10% are spending above 25000 as their monthly Expenditure.
- ❖ 49% of the respondents reported that a cylinder last for 15-20 day only 5% said that it comes more than 30 days.
- ❖ 79% of the respondents know about subsidy to LPG.
- ❖ The monthly expenditure fuel per month showed that 55% spend less than Rs.1000 per month.
- ❖ In case of registration, 78% feel that it is easy; the remaining person is of the opinion that it is not at satisfactory level.
- ❖ 54% of the respondents do not know to fit the regulator properly.
- ❖ The awareness about LPG showed that 73% respondents use it economically, 13% of respondent received information from Brochure.
- ❖ When there is gas leakage problem 73% of the respondents will disconnect the regulator, 8% of them will inform the agency.
- ❖ When there is a shortage of gas cylinder 55% of the respondents begin to use the kerosene.
- ❖ 47% of the respondents choose the Indane gas cylinder for their satisfaction.
- ❖ 58% of the supplier are facing the shoulder pain problem, 17% of the respondents are facing the Leg Pain.

- ❖ The mode of service in supplying the gas cylinder is 67% of the respondents are using ACE.
- ❖ 67% of the sample respondents are using the size of the gas cylinder between 5Kg-14Kg and the remaining 33% of them are between 5Kg-19Kg.

SUGGESTIONS

- There should be one more dealer in Muthiahpuram so as to distribute gas cylinder quickly
- Gas cylinder storage installed in few more places as the study area is vast.
- There should be a periodical checking up of the cylinder. If any defect is found in any place, the dealer should send immediately a mechanic to rectify the defect in the gas cylinder.
- Gas cylinder for commercial purpose may be in different colour so as to avoid irregularities in cylinder distribution.
- The government subsidy should continue for LPG
- Restriction in number of cylinders per year should be removed.
- Free gas connection should continue.
- The gas companies should conduct companies on energy.
- Regular check up on gas tube, regulator should be conducted by conducted by the gas authorities.
- Additional cylinders may be permitted depending on the size of the family.
- Additional litter of Kerosene should be distributed to the card holders to minimize the use of LPG.
- Strict vigilance should be a usage of LPG in automobiles.
- The gas companies should avoid delaying the supply of LPG.
- Most of the customers are facing the irregularity of increasing the price of the gas. So Indane Agencies and Government should take the necessary action to rectify it or make the customer awareness on increasing price of the gas.

CONCLUSION

As the India is over population country, the demand for energy/fuel consumption is increases rapidly. It leads to increasing the need for LPG. Thus Indane gas should make proper marketing strategy to sustain in the competitive market and also to satisfy the customers.

This study has been undertaken for identifying the customers' opinion towards indane gas dealers' trade practices. Most of the customers are of the opinion that there is a delay in providing cylinder. It is suggested that there should be one more dealer in Muthiahpuram so as to distribute gas cylinder quickly. Majority of the customers prefer indane gas for the reasons like economy, convenience, time saving and cleanliness. As LPG has been moved towards buyers' market, the dealer should provide better customers service that his competitors in order to have repeated sales, increased clientele and eventually sustainable development

“The customer is always right” is a famous business slogan. The underlying truth behind this statement is realizing that, customers are the life blood for any business. In this competitive environment, quality service has become the secret of success in all service sectors. Quality service means, it is absolutely to satisfy the customer needs. Keeping this in mind, this study has been conducted at Coimbatore city to identify the customers’ attitude and satisfaction towards the domestic HP LPG services. The findings of the study depict that the customers has faced the irregularity of price increase and delayed supply of LPG gas cylinders. It is suggested that the HP gas company should take some necessary action to improve their service quality by the way they can introduce some more dealers and provide constant service to the customers. By seeing the overall customer service and the performance of the company, the results indicate that the consumers have positive attitude towards referring others to buy the HP LPG. This study emphasizes that the company needs to improve in customer care area, proper communication while booking and delivery through short message service (SMS). HP Gas Company should understand the importance and needs of the customers. It is essential for a healthy business in creating new customers, keeping loyal customers, and developing referrals for future customers.

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THE USE OF MOLLUSCAN-DERIVED BIOACTIVE COMPOUNDS AS POTENTIAL HEPATOPROTECTIVE AGENTS

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Abstract

Marine molluscs are the rich source of structurally novel and biologically active metabolites. These metabolites may be potential bioactive compounds of interest in the pharmaceutical industry. In the present study the hepatoprotective activity of methanol extract of marine cephalopod *Octopus dollfusi* was evaluated and the bioactive compounds which could be responsible for hepatoprotective activity have been isolated and characterized through GC-MS study.

Key words: Hepatoprotective, GC-MS study, *Octopus dollfusi*

Introduction:

Hepatic disorders, cardiovascular diseases, cancer and other chronic diseases are nowadays the most frequent causes of death. They all share a multifactorial origin and are caused by complex interaction between genetic predisposition and personal life style (Hu *et al.*, 2011). Liver diseases are mainly caused by toxic chemicals, excessive consumption of alcohol, infections and autoimmune disorders also drug-induced liver toxicity is a common cause of liver injury. The rate of hepatotoxicity has been reported to be much higher in developing countries like India (8% - 30%) compared to that in developed countries (2% - 3%) with a similar dose schedule (Sharma, 2004).

Natural products may be the best source of remedies for the treatment of liver diseases. Thus identification of a potential therapeutic agent for the protection of liver from hepatotoxins will provide a useful way for the prevention of these liver related illness. Modern allopathic medicine has very little to offer for the treatment of liver disorders inspite of consistent effort for new drug discovery (Ravindra *et al.*, 2015). In the present study the hepatoprotective activity of methanol extract of marine cephalopod *Octopus dollfusi* was evaluated and the bioactive compounds which could be responsible for hepatoprotective activity have been isolated and characterized through GC-MS study.

Materials and Methods:

Sample preparation:

Specimens of *Octopus dollfusi* used in the present study were collected from Gulf of Mannar Coastal region of Thoothukudi.

Preparation of methanolic extract of *Octopus dollfusi*:

Epibionts adhering to the outer skin of *Octopus dollfusi* were carefully removed, washed several times with sterile sea water, dried in hot air oven at 56°C for about 10 days and powdered. 100g of powder was exhaustively extracted with methanol in a Soxhlet apparatus, concentrated in a rotary vacuum evaporator when 15 g brown sticky mass was obtained.

Experimental animal:

Albino (Wistar) rats of 150-200 g (weight) were used for the study. Animals were housed in a well ventilated room temperature ($23 \pm 2^{\circ}\text{C}$), humidity (65 -70%) and 12 hours light / dark cycle at Central Animal House, Department of Experimental Medicine, Rajah Muthiah Medical college and Hospital, Annamalai University. Animals were fed with standard pellet diet and water *ad libitum*. Prior approval of Institutional Animal Ethics Committee (IAEC) was obtained.

Drugs and Chemicals

Silymarin, paracetamol were purchased from Micro labs Ltd., Bangalore, India. Carboxy Methyl Cellulose (CMC), was purchased from S.D. Fine Chemicals Ltd., Mumbai, India and other solvents / reagents were of analytical grade.

Paracetamol - induced liver damage in Rats

Five groups (I-V) each comprising of six Albino (Wistar) rats of 150-200g were selected. Group I served as control and received orally 0.5% sodium CMC (1 ml each) for seven days. Group II rats were treated with paracetamol to induce hepatotoxicity by giving paracetamol (2 g/kg p.o). Group III & IV received oral dose of 100 and 200 mg/kg methanolic extract of *Octopus dollfusi* respectively for seven days. Group V received oral dose of silymarin (25 mg/kg body weight) for seven days. Paracetamol at a dose of 2 gm/kg body wt. was administered on the 8th day to all animals in group II, III, IV & V. After 48 hours of administration of paracetamol dosing, the rats were sacrificed by cervical decapitation under Xylazine + Ketamine (16 + 100 mg/kg i.m.), blood samples were collected via abdominal aorta puncture, the separated serum was used for the determination of diagnostic marker enzymes such as AST, ALT, ALP, GGT, bilirubin, and albumin values estimated by standard procedures. Histopathological studies of liver were also carried out by following the methodology of Yahya *et al.*, 2013.

GC-MS analysis

GC-MS analysis was carried out on a GC Clarus 500 Perkin Elmer System comprising a AOC 20i auto sampler and gas chromatography interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions such as Column Elite - 1 fused silica capillary column (30 x 0.25 mm ID x 1 EM df, composed of 100% poly siloxane), operating in electron impact mode at 70eV: Helium (99.999%) was used as a carrier gas at a constant flow of 1ml/min and an injection volume of 0.5 EI (split ratio of 10:1) injector temperature 250°C; and ion- source temperature 280° C. The oven temperature was programmed from 110°C (isothermal for 2 min), with an increase of 10°C/min, to 200°C, then 5°C/min to 280°C. Mass spectra were taken at 70eV; a scan interval of 0.5 s and fragments from 40 to 550 Da.

Identification of bioactive compounds

Interpretation of mass spectrum was conducted using the database of National Institute of Standard Technology (NIST Ver.21), WILEY and FAME having more than 62,000 patterns. The unknown components found in the body tissues of *Octopus dollfusi* were matched with the spectrum of the known components stored in NIST, WILEY and FAME, the MS library and predicted from Duke's Ethno Botanical Database.

Statistical analysis

All the data were treated statistically by the method of one way ANOVA followed by Dunnett's t-test. $P < 0.01$, $P < 0.05$ and $P < 0.001$ were considered as statistically significant.

Results

The present study evaluated the hepatoprotective effects of methanol extract of *Octopus dollfusi* in paracetamol induced liver toxicity. Acute administration of paracetamol produced significant elevation of serum AST (107.0 ± 12.16), ALT (82.66 ± 11.24), ALP (256.0 ± 16.62), GGT (3.10 ± 0.44), total bilirubin levels (0.02 ± 0.01) and significant decrease in serum albumin level (3.68 ± 0.04) (Table 1) When compared with the control group. Treatment with methanol extract of *Octopus dollfusi* decreased at 200 mg/kg the elevated serum levels of AST (78.86 ± 2.64), ALT (62.87 ± 4.22), ALP (101.11 ± 2.86), GGT (4.68 ± 0.87) and total bilirubin levels (0.86 ± 0.08) towards the respective normal value and that indicates the stabilization of plasma membrane as well as repairing of hepatic tissue damage caused by paracetamol. The albumin values were almost to that of the normal values comparable with the results observed in standard group (Table 1). The methanol extract of *Octopus dollfusi* treated rats 100 and 200 mg/kg have gained normalcy against the hepatocellular injury caused by paracetamol during the 10 days treatment period and both dose levels were found to be almost equipotent.

Histopathological examination of the liver:

Histopathological examination of the liver sections under the light microscope revealed that liver sections from control rats (Group I) showed normal hepatic cells with well-preserved cytoplasm, prominent nucleus, nucleolus, central vein and compact arrangement of hepatocytes (Plate 1 a). Paracetamol treated rats (Group II) showed wide spread of inflammation, vascular congestion, dilated sinusoid spaces and focal necrosis (Plate 1 b). In the liver sections of the rats treated with methanol extract of *Octopus dollfusi* 100mg/kg (Plate 1 c) improvement in the liver tissues was observed. Only minor distortion in architecture and vasculature was observed and the liver tissues in rats treated with methanol extract of *Octopus dollfusi* 200mg/kg (Plate 1 d) very minor changes in cytoplasm of hepatocytes, sinusoids begin to appear, normal architecture of liver begins to regenerate.

The results obtained from the GC-MS study revealed the presence of 23 pharmacological compounds which were structurally elucidated. Of the 23 compounds, 4 compounds isolated from the methanolic extract of *Octopus dollfusi* showed the presence of Tetradecanoic acid, 8,11,14-Eicosatrienoic acid (z,z,z), trans-z-a-bisabolene epoxide and spiro (androst-5-ene-17, 1'-cyclobutan) -2'-one, 3-hydroxyl-(3a,17a) compounds which could be responsible for hepatoprotective activity in the present study.

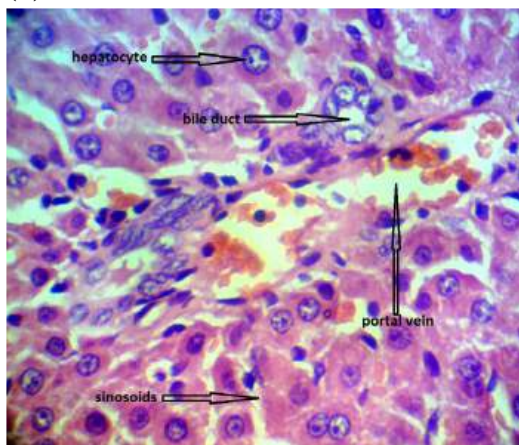
Table 1 : Effect of methanol extract of *Octopus dollfusio* Biochemical Parameters

Groups	AST (U/L)	ALT (U/L)	ALP (U/L)	GGT (U/L)	Total Bilirubin (mg/100ml)	Albumin
Group I (Normal control)	107.0 ± 12.16	82.66 ± 11.24	256.0 ± 16.62	3.10 ± 0.44	0.02 ± 0.01	3.68 ± 0.04
Group II (Paracetamol)	236.64 ± 0.85	146.22 ± 10.28	342.12 ± 12.20	10.08 ± 1.88	2.22 ± 0.12	1.87 ± 0.11
Group III (low dose of octopus extract 100mg/kg)	102.22 ± 1.84	82.12 ± 9.26	212.0 ± 3.53	5.84 ± 0.80	0.96 ± 0.02	2.62 ± 0.02
Group IV (High dose of octopus extract 200mg/kg)	78.86 ± 2.64	62.87 ± 4.22	101.11 ± 2.86	4.68 ± 0.87	0.86 ± 0.08	3.22 ± 0.01
Group V (Standard drug Silymarin)	62.42 ± 1.87	55.63 ± 3.17	95.52 ± 1.78	3.16 ± 0.11	0.82 ± 0.32	3.12 ± 0.02

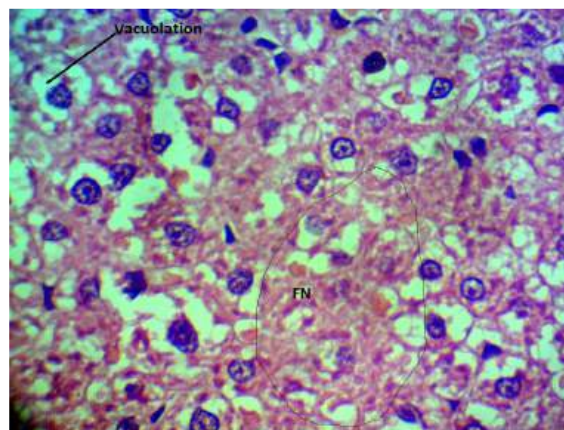
One way ANOVA	F	2.66	2.67	1.45	1.38	2.37
	DF	5.12	5.12	5.12	5.12	5.12
	P	0.05	0.05	0.05	0.05	0.05

Plate-1: Histological section showing hepatoprotective activity

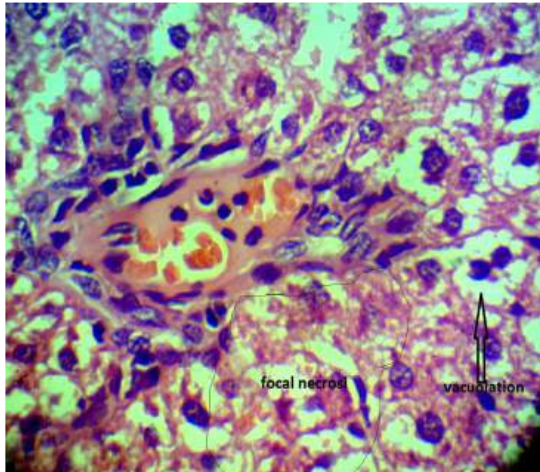
(a) Control



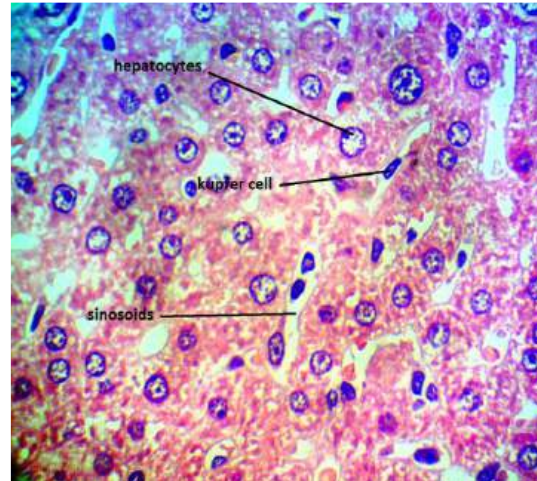
(b) Paracetamol



(c) 100mg/kg



(d) 200mg/kg



Discussion

Liver diseases have become one of the major causes of morbidity and mortality all over the world. Drug induced liver injury is one of the most common causative factor that possess a major clinical and regulatory challenges (Parmaret *al.*, 2010).

Paracetamol is a known antipyretic, analgesic drug which produces hepatic necrosis at high doses and normally eliminated as a sulphate and glucouronide conjugate. Higher doses of paracetamol and N-acetyl-p-benzoquinemine can alkylate, oxidise intracellular GSH, results in the depletion of liver GSH pool subsequently leads to increased lipid peroxidation and there by causes liver damage(Arnaizet *al.*,1995). In the assessment of liver damage by paracetamol the determination of enzyme levels such as AST, ALT, ALP, GGT, bilirubin and albumin were largely used. A high level of AST indicates liver damage, as well as cardiac infraction and muscle injury. ALT is more specific to the liver, and hence this is a better parameter for detecting liver injury. Elevated levels of serum enzymes were indicative of cellular leakage and loss of functional integrity of cell membrane in liver. Serum ALP and bilirubin level on the other hand are related to the function of hepatic cell. Increase in the serum level of ALP is due to increased synthesis, in presence of increasing biliary pressure.

Gamma GlutamylTransferase (GGT) is also widely used to assess liver function. Some drugs and alcohol, induce the liver to produce more amount of this enzyme (Suleet *al.*, 2012).Total bilirubin results are comprised of the conjugated and unconjugated forms of bilirubin. In the present study also rise in bilirubin level revealed liver damage by paracetamol.

Albumin is a small protein which accounts for nearly 50% of total plasma protein. It helps in the maintenance of colloidal osmotic pressure in the vascular and extra vascular areas of the body and preventing edema. Additionally, albumin is a carrier transport protein. Low albumin levels indicate poor liver function and contribute to peripheral edema and

ascites sometimes seen very late stage liver diseases. Albumin in levels are usually normal in chronic liver disease until significant liver damage is present (Rosalki and McIntyre, 1999). Similar to the above findings in the present study albumin level was decreased in Group II (paracetamol treated) whereas it was elevated in Group III, IV & V (the methanol extract of *Octopus dollfusi*). This could be due to the hepatoprotective substances present in the methanol extract of *Octopus dollfusi*.

Because of its functional roles in the body, liver is the major target organ of toxicity. ALP, ALT, AST and GGT are commonly used as markers of hepatic injuries (Gaskillet *et al.*, 2005; Panda *et al.*, 2009 and Kissimudie, 2014). In the present study, treatment with methanol extract of *octopus dollfusi* significantly lowered the values of liver enzymes elevated by Paracetamol and restored the damaged hepatocellular architecture. The decreased level of liver biomarkers and restoration of hepatocytes in methanol extract of *Octopus dollfusi* treated group leads to the inference that methanol extract of *Octopus dollfusi* counteracts the abnormal increase in serum enzymes and repair the hepatic tissue damage induced by paracetamol.

The results of histopathological studies provided supportive evidence for biochemical analysis. Histology of liver section of control animal exhibited normal hepatic cells each with well defined cytoplasm, prominent nucleus, nucleolus and well brought out central vein, whereas examinations of liver sections of rats treated with paracetamol dose revealed disruption of hepatic architecture with centrilobular hepatic necrosis, fatty changes, vasculization, congestion of sinusoids, kupffer cell hyperplasia, crowding of central vein and apoptosis. The architecture of liver elicited severe hepatic injury. These pathological changes correlated well with the altered enzyme activities.

Many bioactive compounds of plant animal origin were tested for their potential hepatoprotective liver damages (Ahsan *et al.*, 2009, Parmaret *et al.*, 2010, Shanmugapriya *et al.*, 2015, Ajithkumaret *al*, 2012, BavaniSaraswathy *et al.*, 2016, Chandran Stella Packiamet *al.*, 2017).

Histopathological investigations (plates) provided that hepatoprotective activity of methanol extract of *Octopus dollfusi* was enhanced with concentration and best activity was achieved at the dose of 200 mg/kg.

The GC-MS chromatogram of the methanolic extract of *Octopus dollfusi* confirmed the presence of 23 active compounds that could be identified as n-Decanoic acid, Tetradecanoic acid, Z-10-Tetradecen-1-01 acetate, Octadecanoic acid, ethyl ester, n-Hexadecanoic acid, 9,9-Dimethoxybicyclo [3.3.1] nona-2, 4-dione, Pentadecanoic acid, 2,6,10,14-tetramethyl-, methyl ester, Cyclopentaneundecanoic acid, 9-Octadecenal, Oleic acid, Docosanoic acid, ethyl ester, 3-Trifluoroacetoxy pentadecane, 8,11,14-Eicosatrienoic acid, (z,z,z)-,cis-9,10-Expoxyoctadecan-1-01, Hexanoic acid, octadecyl ester, valeric acid, dodecyl ester, 2,2-Dimethylpropionic acid, tetradecyl ester, z,z-2, 5-Pentadecadian -1-01, 3-Hexadecyloxy carbonyl-5-(2-hydroxyethyl)-4- methylimidazolium ion, E,E-1,9,17-Docasatriene, 7-Oxabicyclo [4.1.0] heptane, 1-methyl-4-(2-methyloxiranyl)-,trans-z-a-Bisabolene epoxide, Spiro [androst-5-ene-17,1'- cyclobutan]-2'-one, 3-hydroxy-(3a, 17a)- with the prominent peak of stearic acid ester (26.38%). Of the 5 compounds the Tetradecanoic acid, 8,11,14- Eicosatrienoic acid (z,z,z), trans-z-a-bisabolene epoxide, spiro

(androst-5-ene-17, 1`- cyclobutan) -2` -one, 3- hydroxyl-(3a,17a) compounds which could be responsible for the hepatoprotective activities in the present study.

CONCLUSION:

Hepatitis is one of the major health problems which may sometimes even lead to death. Natural products may be the best source of remedies for the treatment of liver diseases. In the present study the hepatoprotective activity of methanol extract of marine cephalopod *Octopus dollfusi* has significant action on paracetamol induced hepato-toxicity. This investigation is necessary to determine the pharmacologically active molecules in the methanolic extract of *Octopus dollfusi* that are responsible for the hepatoprotective activity.

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Diversity and Seasonal variation of fishes of Tuticorin mangrove ecosystem

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Abstract:

A study on the effect of seasonal variation in the fishery diversity and richness was carried out in the Karapad bay and Korampallam creek mangrove ecosystems of Tuticorin, from March 2015 to February 2016. Totally, 1210 fishes belonging to 23 species and 20 families were collected during the study. The most abundant species in Korampallam Creek included *Mugil cephalus*, *Lates calcarifer*, *Arius subrostratus* and *Terapon jarbua*. At Karapad Bay, *Leiognathus equulus* was the most dominant, followed by *Siganus canaliculatus*, *Epinephelus tauvina* and *Hemiramphus far*. The species richness did not differ between Karapad Bay and Korampallam creek, but significantly more species were found in October 2015 than in January 2016. The 20 most abundant species that occurred at both Karapad bay and Korampallam creek accounted for >94% of the total catch. At Korampallam Creek region *Sillago sihama*, and *Etroplus suratensis* were most abundant in summer. The same species were abundant at the Karapad Bay during summer, pre-monsoon and monsoon seasons. *Hemiramphus far* reached the peak abundance in May at Korampallam Creek region.

Key words: mangroves, monsoon, biomass, seine net

Introduction

Ecologically, mangroves are defined as an assemblage of tropical trees and shrubs that inhabit the coastal intertidal zone. They form one of the highly productive and biologically rich ecosystems which provide a home and feeding ground for a wide range of floral and faunal species, many of which are endangered. These remarkable forests are of great importance to coastal communities, providing not only a source of food and resources but also protecting coastlines, preventing erosion and regulating our climate. The present total worldwide area of mangroves has been estimated at < 150,000 km² (FAO, 2003), but this represents only about 40% of the original cover. The need to understand the interrelationships between mangroves and fishes is now greater than ever, not only for sustainable fisheries management reasons, but for overall management of the exploitation or conservation of mangrove forests.

Being most commonly located in estuarine zones, mangroves act as a nursery for numerous species of fishes. Estuaries are very productive zones because

they concentrate nutrients from rivers, and have a nutrient trap effect due to mixing with sea water (flocculation) and local retention due to tidal alternance (Knox, 1986). The productivity of mangrove ecosystem is higher as a result of leaf litter, supplemented by that of cyanobacteria, diatoms and microalgae (Alongi, 1989) and also the algae fixed on mangrove prop roots (Rodriguez and Stoner, 1990). The high abundance and diversity of these resources along with zooplankton, mysids and shrimps provide a whole range of food items for fish post-larvae and juveniles. The pneumatophores constitute shelter for juvenile fishes that is inaccessible to the adult predators (Thayer *et al.*, 1987). In more open waters the shadow of the canopy reduces contrasts and thus the hunting efficiency of predators (Helfman, 1981).

Ecosystem level alterations of a mangrove wetland, including habitat loss and alteration, directly and indirectly affect biodiversity, including that of fish (Twilley *et al.*, 1996). Characteristics of the fish communities within an estuarine ecosystem, such as a mangrove wetland, including measures of diversity and richness, relative abundance, and trophic integrity can be useful in evaluating the relative health of an estuarine system (Whitfield and Elliott, 2002; Harrison and Whitfield, 2004). Consequently, the present study has been focused on evaluating the fish communities of mangrove wetlands in Tuticorin, to get a better understanding of the ecological significance of mangrove habitat.

Materials and Methods

A study on the diversity of mangrove associated fishes in the Karapad bay and Korampallam creek areas of Tuticorin was carried out during March 2015 to February 2016. At each site, samples were collected with a beach seine (10 m long and 1m deep, with a 1 mm mesh). The seine net was deployed in shallow water (0.2-1.3 m) in an upright position in the form of a semicircle with an area of 50 m² and was slowly pulled towards the shore. Captured fish were immediately preserved in a 10% formalin-seawater solution and returned to the laboratory for analysis. All fish were collected at low tide during the daytime. In the laboratory, all fishes were sorted, counted and identified to the lowest taxon possible according to Shen *et al.* (1993), Leis and Carson- Ewart (2000) and Nakabo (2000). The mean of fish numbers, biomass and species were graphed with its different seasonal variations.

Results and Discussion

Mangroves of backwaters of Karapad Bay and Korampallam creek regions of Tuticorin district play a vital role in enhancing fish productivity. The sampling was carried out at two stations in Korampallam creek and three stations at Karapad bay. In total, 1210 fishes belonging to 23 species and 20 families were collected during this study (Table 1). The most abundant species in Korampallam Creek included *Mugil cephalus*, *Lates calcarifer*, *Arius subrostratus* and *Terapon jarbua*. At Karapad Bay, *Leiognathus equulus* was the most abundant species, followed by *Siganus canaliculatus*, *Epinephelus tauvina* and *Hemiramphus far*. On average, fish captured at Karapad Bay were much greater in terms of weight than those captured at the other site.

Seasonal distribution:

At Korampallam Creek region, 20 species were recorded; of which 11 species were found both at KC 1 and KC 2, whereas 6 species were found only at KC 1, and 3 species only at KC 2. At Karapad Bay 16 species were evidenced; of which 7 were exclusive to KB 1, 4 species at KB 3 and 2 were exclusive to KB 2. Only 3 species were common to both the study areas. Most of the dominant species exhibited distinct seasonal variations in terms of abundances *Gerres abbreviatus* and *Siganus javus* were dominant during the monsoon season. *Mugil cephalus*, *Etroplus suratensis*, *Caranx ignobilis*, *Arothron immaculatus* were the most abundant in Post monsoon season. *Leiognathus equulus*, *Terapon jarbua*, *Siganus canaliculatus* were most abundant in early summer. *Hemiramphus far* reached peak abundance in May in Korampallam Creek. Juveniles of *T. jarbua* and *Chanos chanos* were dominant during summer. *Sillago sihama*, *Etroplus suratensis*, *Arius subrostratus* and *Lutjanus argentimaculatus*, were most abundant during summer and monsoon in Korampallam Creek and Karapad bay respectively. Figure 1 shows mean of species, number and biomass collected from both study areas with seasonal variation.

The 20 most abundant species that occurred at both Karapad Bay and Korampallam Creek accounted for > 94% of the total catch. Most of the fishes collected in this study were juveniles, and fish densities were higher in mangrove than in less mangrove habitats in both Korampallam Creek and Karapad Bay areas. Results presented in this study suggest that the dependence of species on mangrove habitats is mainly based on the seasonal variations. Some investigators reported higher fish abundances and species richness (Laegdsgaard and Johnson, 1995; Laroche *et al.*, 1997; Suda *et al.*, 2002) in shallow soft-shore habitats during the wet and warm seasons. Only in some species it is site-specific. For example, *Lutjanus argentimaculatus* was more abundant at mangrove sites of Karapad Bay and at the less mangrove site in Korampallam Creek.

Conclusion

Lack of knowledge on mangrove ecosystems, their extent, status and linkages to other ecosystems hampers efforts to conserve and manage mangroves, leading to the unsustainable exploitation of these productive coastal resources. Mangroves serve as a critical nursery for young marine life and therefore play an important role in the health of fisheries and the economic well-being of fishermen. This study is carrying a constructive knowledge on the fish productivity of Tuticorin mangrove ecosystem. This can form a milestone for further sustainable management strategies towards the conservation of this sensitive habitat and its resources.

Figure 1. Seasonal changes in the mean number of fish per net (a & f), mean fish biomass per net (b & g), mean number of fish species per net (c & h), total number of fish species (d & i)

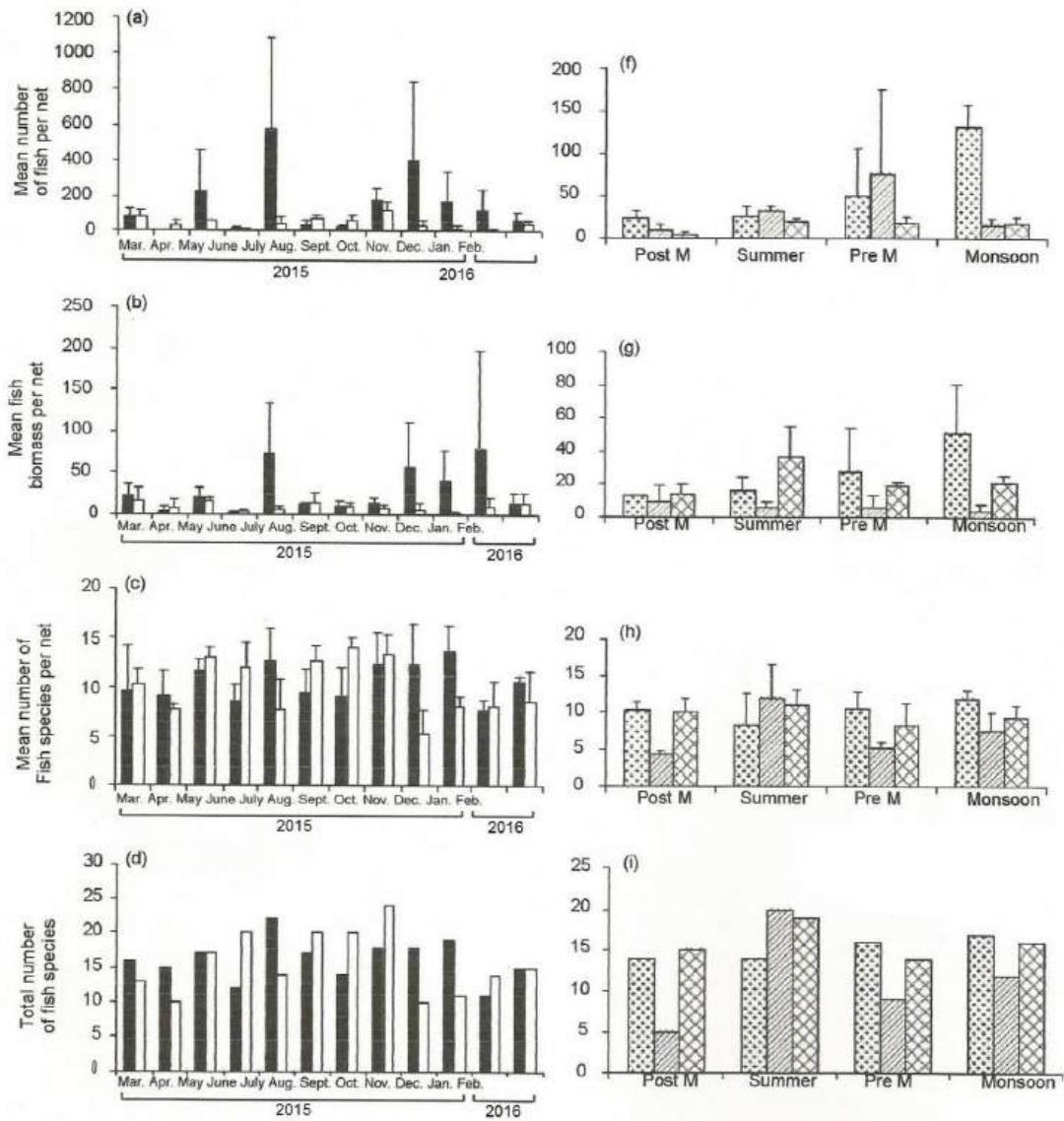


Table 1: List of fish species collected from the study area

S.No	Name of the Fishes	S.No	Name of the Fishes
	Mugilidae		Carangidae
1	<i>Mugil cephalus</i>	13	<i>Caranx ignobilis</i>
2	<i>Liza parsia</i>		Tetraodontidae
	Gerreidae	14	<i>Arothron immaculatus</i>
3	<i>Gerres abbreviatus</i>		Clupeidae
	Ambassidae	15	<i>Nematalosa nasus</i>
4	<i>Ambassis gymnocephalus</i>		Leiognathidae
	Latidae	16	<i>Leiognathus equulus</i>
5	<i>Lates calcarifer</i>		Teraponidae
	Ariidae	17	<i>Terapon jarbua</i>
6	<i>Arius subrostratus</i>		Siganidae
	Lutjanidae	18	<i>Siganus canaliculatus</i>
7	<i>Lutjanus argentimaculatus</i>	19	<i>Siganus javus</i>
8	<i>Lutjanus fulviflamma</i>		Synbranchidae
	Haemulidae	20	<i>Monopterus albus</i>
9	<i>Pomadasys kaakan</i>		Hemiramphidae
	Chanidae	21	<i>Hemiramphus far</i>
10	<i>Chanos chanos</i>		Epinephlidae
	Sillaginidae	22	<i>Epinephleus malabaricus</i>
11	<i>Sillago sihama</i>		Syngnathidae
	Cichilidae	23	<i>Hippichthys specifer</i>
12	<i>Etroplus suratensis</i>		

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“IMPACT OF COW MILK ON THE BIOLOGICAL AND COCOON CHARACTERS OF SILKWORM *BOMBYX MORI L.*”

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Abstract- Silkworm is a monophagous insect which has special significance in sericulture industry. *Bombyx mori L.* is a well studied lepidopteran model system because of its morphology, life cycle, and economic importance. Many person have placed importance on enhancing the economic traits of *B. mori* because it’s larvae, silkworms, are vital in the production of silk. In this study the effect of cow milk on *B.mori* growth was tested. Cow milk contain several components that aid in healthy growth. The treatment was given to V instar *B.mori* larvae because the fifth period is when *B.mori* eats and maximum growth of larval stage. The larvae were treated with fresh mulberry leaves , and mulberry leaves dipped in milk from the first day of the V instar. Treatments were given on alternate days and the silkworms were weighed every day to enhancing the weight of the larvae. Cocoon weights were measured as the weight indicates the approximate amount of silk that can be reeled. The result showed that larval gained 100% more weight by end of the fifth instar larval, when fed with mulberry leaves dipped in cow milk. these result suggested that *B.mori* larvae can be fed mulberry leaves treated with cow milk for better growth rate and increased silk production.

Key words: Growth rate , Silkworm *B.mori L.*, Cow milk, Mulberry leaves, economy traits.

INTRODUCTION

Silkworm *Bombyx mori L.*, is a very important economic insect that contributed to the national economy of India. Sericulture has indeed become business oriented and helps in uplifting millions of small and poor sericulturists and others involved in silk industry.

The most important factor influencing the growth of silk worm or for that matter in any organisms is nutrition (kanafi *et al.*, 2007). Mulberry (morus species) leaf is the solo food and source of nutrition for the silkworm, *Bombyx mori L.*, due to the presence of morin (Tribhuwan *et al.*, 1989). The growth and development of larva and subsequent cocoon production are greatly influenced by nutritional quality of mulberry leaves. Supplementations in silk worm nutrition like protein substitute fortified with food stuff are needed for nutritional requirement among several insects(House, 1996). Fortification of mulberry leaves by using supplementary nutrient

and feeding the silkworm is an useful modern technique to increase economic value of cocoon (Kamaraj *et al.*, 1972).

Nutritive values of different proteins, amino acids, fatty acids for the silkworm varied largely and it goes without saying that nutrition of the silkworm closely related to the synthesis of silk protein as well as the growth of silk glands. Phospholipids extracted from the soya bean were also proved to be effective for growth improvement (Russo 2009). Similarly the B vitamin such as biotin, choline, inositol, nicotinic acid, pantothenic acid, pyridoxine, riboflavin and thiamine were also found to be essential for the silkworm.

Konala *et al.*, (2013), suggested that *B.mori* larvae can be fed with bovine milk treated mulberry leaves for increased growth rate and silk production. Cow milk is a source of proteins, carbohydrates, fatty acids, minerals, and other nutrients that facilitate healthy growth and development. Peptides, polyamines, and enzymes also comes from it. Considering the beneficial properties of milk, the importance of protein, carbohydrates, and lipids in the insect diet, and the economic importance of *B.mori*, the present study was undertaken to find out the effect of cow milk on the biological and economic characters of the silk worm in *B.mori*.

MATERIALS AND METHODS:

The eggs of silkworm race L x NB4D² were obtained from the sericulture Demonstration cum Training Centre, Konam, Nagercoil. It is a hybrid variety between the mysore local variety and a Japanese bivoltine variety, introduced by Centrl Sericultural Research and Training Institute (CSRTI), Mysore.

EXPERIMENTAL DESIGN

About 175 freshly moulted IV instar larvae obtained from the same moth were selected and used for the experiment. They were reared in the experimental trays in 5 sets, 4 for experimental purpose and one as control each containing 35 larvae in them. The larvae selected for the experiment were first weighed and reared separately in each tray. The mulberry leaves dipped in different concentration of the raw milk extract were chopped and provided to the each of the respective sets of larvae in required quantities. The leaves provided to the each time of feeding were weighed accurately (20 mgs) and the quantities of leaves given to each set were noted down. The larvae were fed in uniform quantities at each time. The initial weight of the larvae was measured. All weights were made in digital balance. The producer was followed till the larvae reached the spinning stage. The matured larvae were isolated and mounted on separate chandrike. Few cocoons from each treatment were allowed to hatch out. When the moths emerged out they were allowed to mates and then introduced in to the black box and allowed to the eggs.

RESULT AND DISCUSSION

Cow milk which is rich in protein, carbohydrates, fatty acid, minerals, peptides, polyamines and enzyme has profound impact on the growth and development of silkworm *Bombyx mori*. Growth and growth index were enhanced by cow milk in higher concentration. The present result implies the positive and

enhancing effect of cow milk on the silk protein of *Bombyx mori*. The present investigation results indicated an enhancing effect on the cocoon parameters. Nutrition plays an important role in improving the growth and development of *Bombyx mori* Kanafi et al., (2007). The supplementation in fortification of mulberry leaves is a recent technique in sericulture research. Murugan et al.,(1998). Supplementation of cow milk was observed to have an enhanced effect on result silk protein, fibroin, sericin, and total silk protein in the silk gland. The amount of silk proteins in the glands of supplemented larvae increased with the increasing concentration of cow milk. It might be due to the growth promoting and nutritive effect of proteins, carbohydrates fatty acids and minerals present in cow milk. Similar result were obtained by Saravanan et al., (2011) *Vigna unguiculata* aqueous extract supplementation which enhance quality of silk in *Bombyx mori*

TABLE 1

Effect of cow milk on the silk protein of B. mori L

Concentration	Fibroin	Sericin	Total silk protein
Control	0.235	0.23	0.465
30%	0.107	0.016	0.123
70%	0.306	0.127	0.433
100%	0.359	0.46	0.819

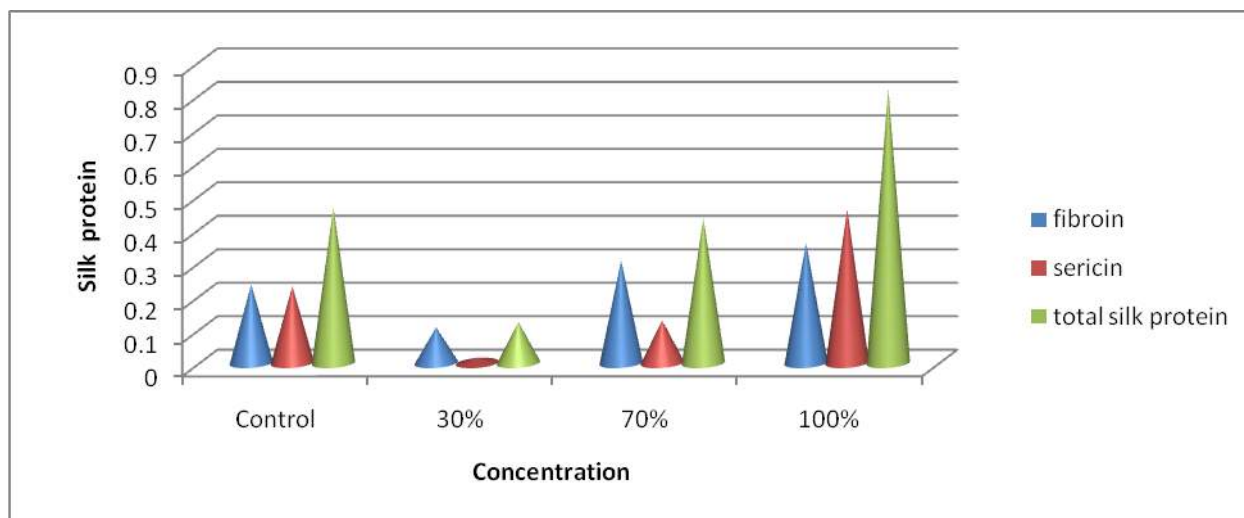
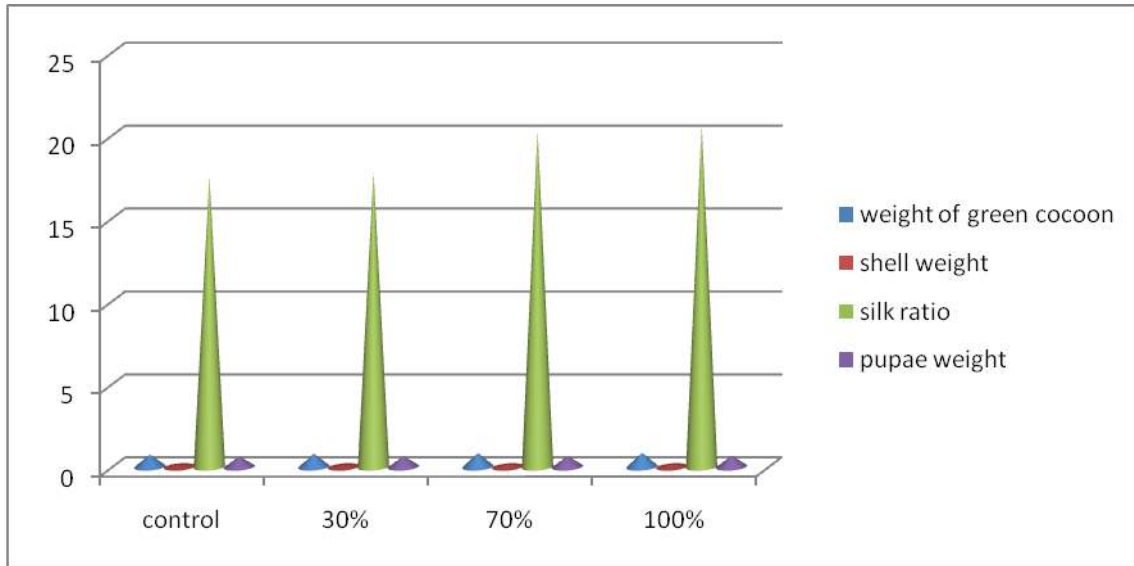


TABLE 2

Cocoon characters of Bombyx mori fed on raw milk supplemented mulberry leaves.

Concentration	Weight of green cocoon (gm)	Shell weight (gm)	Silk Ratio	Pupae weight (gm)
Control	0.759	0.133	17.52	0.626
30%	0.797	0.142	17.81	0.655

70%	0.839	0.170	20.26	0.669
100%	0.859	0.177	20.60	0.682



CONCLUSION

The present study unveiled the nutritive effect of cow milk supplementation on the growth and commercial qualities of *Bombyx mori*. Cow milk which is rich in protein, carbohydrates, folic acid, minerals, peptides, polyamines and enzyme has profound impact on the growth and development of silkworm *Bombyx mori*. The present works has revealed that the enrichment of mulberry leaves by cow milk has drastically promoted food consumption economic parameters and silk quality of *Bombyx mori*. The higher concentration had maximum output. Nutritional supplementation would be one of the waste to improve silk production.

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SCREENING OF ANTIOXIDANT BIOACTIVE COMPOUND FROM THE MARINE MOLLUSC *Phalium glaucum* (Linnaeus, 1758)

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ABSTRACT

The natural products offer great hope in the identification of bioactive compounds and their development into drugs for the treatment of various diseases. Molluscs are considered as one of the important sources to derive bioactive compounds that exhibit antitumor, antimicrobial, anti-inflammatory and antioxidant activities. Molluscs also contain rich nutrients that are beneficial to people of all ages. In our body, oxidation process leads to cell damage, cancer and degenerative diseases, antioxidant molecules present in different molluscs prevent cell damage from oxidation reaction. Current research in free radicals has confirmed that foods rich in antioxidants play an essential role in the prevention of cardiovascular diseases, cancers and neurodegenerative diseases including Parkinson's and Alzheimer's diseases, as well as inflammation and problems caused by cell and cutaneous aging. In the present study the methanolic extract of gastropod *Phalium glaucum* was found to exhibit good scavenger of DPPH radical with percentage inhibition of 8.87% at 50µg/ml concentration, 19.47% at 100µg/ml and 33.64% at 150µg/ml concentration. Of the eleven compounds isolated through GC-MS analysis cholesterol was found to be responsible for antioxidant activity. The result of the present study reveals that the methanolic extract of *Phalium glaucum* has moderately good antioxidant activity and this extract can be served as an iconic agent of antioxidants.

Key words : *Phalium glaucum*, Antioxidant activity, Methanol, DPPH radical, GC-MS

INTRODUCTION

New trends in drug discovery from natural sources emphasize on investigation of the marine ecosystem to explore numerous complex and novel chemical entities. Many of the marine natural products have been isolated from sponges, coelenterates, tunicates, molluscs, echinoderms and bryozoans and a wide variety of marine microorganisms. Marine molluscs are very promising source for wide range of bioactive compounds. Antioxidants from natural sources play a paramount role in helping endogenous antioxidants to neutralize oxidative stress (Sasikumar et al.,2009). The generation of reactive oxygen species (ROS) is an unavoidable consequence of life in an aerobic environment. In which, the production of ROS is essential to many organisms for the production of energy to fuel biological processes (Yong-Xu et al.,2010).

Damage to cells caused by free radicals is believed to play a central role in the aging process and in disease progression. Antioxidants are our first line of defense against free radical damage and are critical for maintaining optimum health and well-being. The need for

antioxidants becomes even more critical with increased exposure to free radicals. Thus the free radicals and ROS are considered important because the human body constantly quenches excessive oxidants through various scavenging mechanisms such as use of antioxidant enzymes and molecules. These antioxidants refer to any substance that hinders the reaction of a substance with deoxygen or any substance that inhibits free radical reaction (Abdel Satter et al.,2007). Hence antioxidants are called as free radical scavengers.

The molluscs received attention not only for their delicacy as food next to fishes and crustaceans but also for the possession of bioactive compounds of pharmaceutical interest. Gastropods have not been utilized in identifying and extending the natural antioxidants present in them and screened for their antioxidant potential. Hence attempt has been made to study the natural antioxidant present in the gastropods. In the present study, the whole body tissue of gastropod *Phalium glaucum* was extracted with methanol and antioxidant potential of methanolic extract was evaluated.

MATERIAL AND METHODS

Sample Collection

The gastropod *Phalium glaucum* was collected from Tuticorin coast (8⁰45'N ; 78⁰46'E) along Gulf of Mannar region. The Gulf of Mannar is an established Marine National Park located between India and Srilanka on the South east Coast of India. The Specimens of *Phalium glaucum* were collected during low tides from the sea in their natural habitat that is intertidal zone and from reefs by divers, brought to the laboratory and maintained under laboratory conditions for further observations.

Antioxidant Activity

The whole body tissue of *Phalium glaucum* was cut into small pieces and air dried, it was then extracted with methanol by cold steeping and filtered. The filtrate was evaporated and the methanolic extract of whole body tissue of *Phalium glaucum* was used for determining the antioxidant activity. The analysis was done at Biozone Laboratories Pvt.Ltd., Chennai by DPPH (1,1 – Diphenyl 2-Picryl hydrazyl) free radical scavenging method. The stock solution of the extract was prepared to the concentration of 1mg/ml. And this was further diluted with 80% methanol to obtain different test concentrations (50,100 and 150 µg/ml). The test was carried out by adding 0.5ml of 0.022% DPPH free radical solution to the extract. The resultant solution was incubated at room temperature for 30min and absorbances were measured at 570nm. The control reading was also taken using DPPH solution. Ascorbic acid was used as standard.

$$\% \text{ of antioxidant activity} = \frac{\text{Control (ac)} - \text{Test (at)}}{\text{Control (ac)}} \times 100$$

Where

Ac - absorbance of control

At - absorbance of test

GC-MS Analysis

GC-MS analysis was carried out on a GC clarus 500 Perkin Elmer system comprising a AOC 20i auto sampler and gas chromatography interfaced to a mass spectrophotometer

(GC-MS) instrument employing the following conditions such as column elite - 5MS fused silica capillary column (30 × 0.25mm 1D × 0.25µm df, composed of 5% Diphenyl 95% Diphenyl poly siloxane), operating in electron impact mode at 70Ev; Helium (99.999%) was used as a carrier gas at constant flow of 1ml/min and an injection volume 3µl (split ratio of 10:1) injector temperature 250° C. The oven temperature was programmed from 110°C (isothermal for 2min), with an increase of 10°C/min to 200°C, then 5°C/min to 280°C. Mass spectra were taken at 70Ev; a scan interval of 0.5s and fragments from 45 to 450Da.

Identification of Compounds

Interpretation of mass spectrum was conducted using the database of National Institute of Standard Technology (NIST ver 2.1), WILEY 8 and FAME having more than 62,000 patterns. The unknown components found in the body tissues of *Phalium glaucum* were matched with the spectrum of the known components stored in NIST, WILEY and FAME, the MS library and predicted from Duke's Ethno Botanical Database.

RESULT

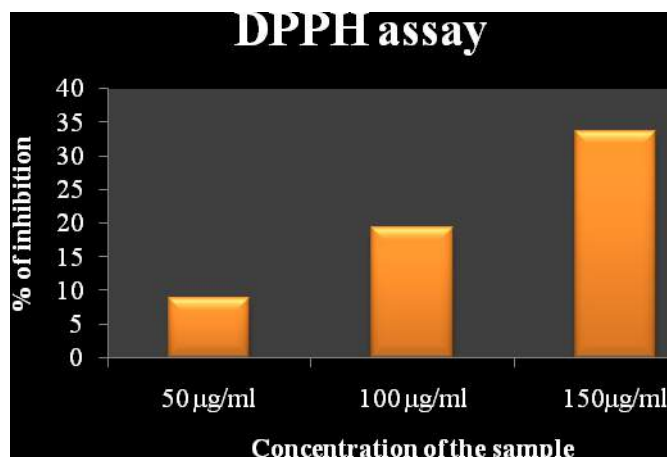
Antioxidant Activity of *Phalium glaucum*

Oxidation is an essential process for all living organisms for the production of energy necessary for biological processes. Antioxidants act at different stages in an oxidative sequence. They act as a) scavengers, imitating free radicals such as hydroxyl, alloxyl and peroxy species, b) breaking the chain of initiated sequence, c) quenching or scavenging singlet oxygen. In the present study the body tissue extract of gastropod *Phalium glaucum* is having natural and deoxidant potential as its methanolic extract was found to exhibit good scavenger of DPPH radical with percentage inhibition of 8.87% at 50µg/ml concentration, 19.47% at 100µg/ml and 33.64% at 150µg/ml concentration (Table 1) (Fig 1).

Table.1 Scavenging potential of methanolic extract of *Phalium glaucum*

Sample	Concentration µg/ml	Absorbance of control	Absorbance of sample	% of inhibition
Methanol	50 µg/ml	0.8273	0.754	8.87
	100 µg/ml	0.8273	0.666	19.47
	150µg/ml	0.8273	0.549	33.64

Fig.1 Antioxidant activity of methanol extract of *Phalium glaucum*

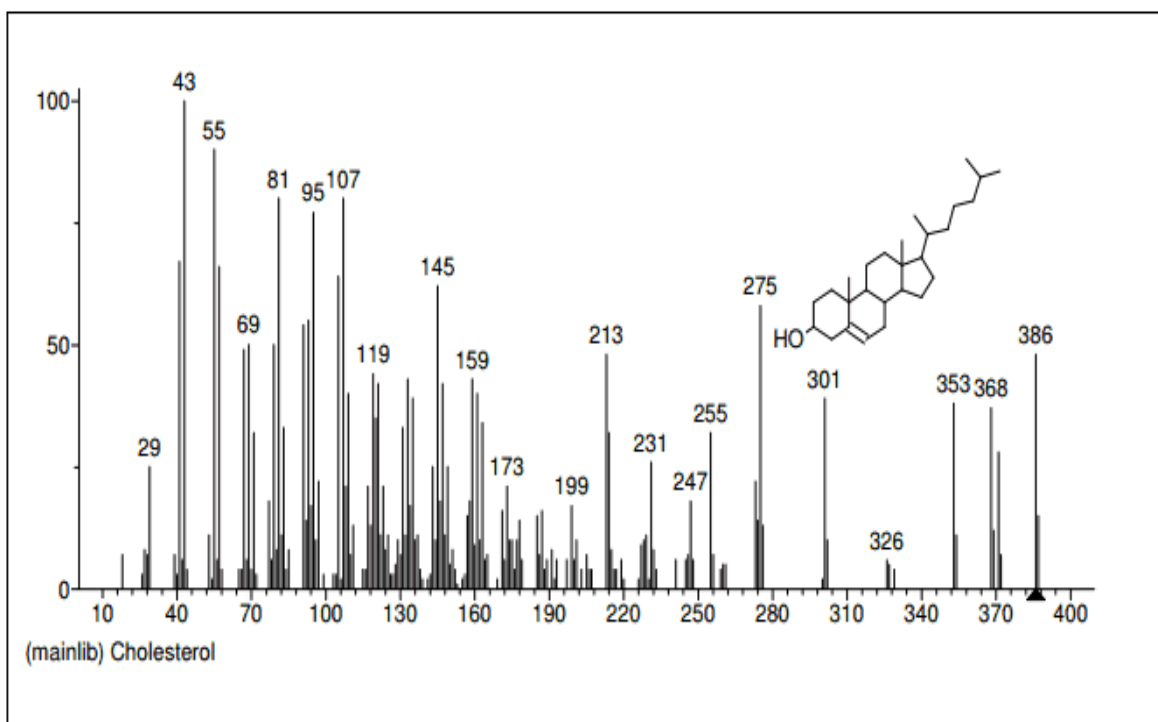


GC-MS Study

To know the specific compounds which are responsible for the pharmacological activities of the methanolic extract of *Phalium glaucum*, the GC-MS analysis was carried out and the chemical compound cholesterol which could be responsible for antioxidant activity was isolated and characterized (Fig.2).

Fig.2 **Chromatogram**

Name: Cholesterol
Formula: C₂₇H₄₆O



DISCUSSION

The marine environment is an exceptional reservoir of bioactive natural products having potential biomedical applications, many of which differ from those of terrestrial organisms in both chemical structures and peculiarities of biological actions. Several marine natural products have become the source of potentially novel chemical leads for the ongoing global search of therapeutic agents for the treatment of multiple disease categories. Majority of marine natural products and their derivatives are produced by invertebrates including molluscs and are currently in preclinical evaluation. It is quite clear that marine compounds have the potential to treat a wide assay of diseases in addition to cancer. In recent years, significant numbers of novel metabolites with potent pharmacological properties have been discovered from marine organisms (Chellaram and Edward, 2009).

In recent years, significant numbers of novel metabolites with potent pharmacological activities have been discovered from the marine organisms. Antioxidants have gained more importance on account of their positive effects, as health promoters in the treatment of cardiovascular problems, atherosclerosis, many forms of cancer, ageing process etc. Hence the quest for natural antioxidant compounds has initiated the search towards marine organisms which serves as a reservoir of unique molecules. The body possess defense mechanisms against free radical-induced oxidative stress, which involve preventive mechanisms, repair mechanisms, physical defenses and antioxidant defenses.

All these act by one or more of the mechanisms like reducing activity, free radical – scavenging, potential complexing of pro-oxidant metals and quenching of singlet oxygen. It is possible to reduce the risks of chronic diseases and prevent disease progression by either enhancing the body's natural antioxidant defenses or by supplementing with proven dietary antioxidants (Stanner et al., 2004). The methanol extract of *Phalium glaucum* showed a higher activity of 33% in 150µg/ml concentration and least activity 8% in 50µg/ml concentration.

Antioxidants are known to be beneficial to human health as they may protect the body against molecules known as reactive oxygen species, which can attack membrane lipids, proteins and DNA. This can be a causative factor in many diseases such as cancer. Witjaksono (2005) stated that *Discoidoris sp* contained saturated and unsaturated fatty acids and sterols and some other chemical substances played a role as antioxidants.

Fujimoto and Kaneda (1980) reported the chloroform soluble phospholipids fraction of *Eisenia bicyclis* which showed high antioxidant activity. Prem anand et al., (2010) showed the gastropod *Pleuroploca trapezium* meat is having natural antioxidant potential as its methanolic extract was found to exhibit a good scavenger of DPPH radical. Nurjanah et al., (2012) reported the highest antioxidant value was obtained from ethanol – extracted meat.

The harmful action of free radicals is blocked by antioxidant substances which scavenge free radicals and detoxify the organisms. Current research in free radicals has confirmed that foods rich in antioxidants play an essential role in the prevention of cardiovascular diseases, cancers and neurodegenerative diseases including Parkinson's and Alzheimer's diseases, as well as inflammation and problems caused by cell and cutaneous aging.

In addition oxygen –centered free radicals are involved in development of a variety of diseases including cellular aging, mutagenesis, carcinogenesis, coronary heart disease, diabetes, and neurodegeneration (Halliwell and Gutteridge, 1999). Recently much attention

was paid to screening natural biomaterials in the case of several clinical situations since use of synthetic antioxidants is restricted due to carcinogenicity (Kim et al., 2002).

Antioxidant activity of crude methanolic extract from body tissue of *Bursa spinosa* was evaluated through various antioxidant assays (Subhpradha et al., 2013). The free radical-scavenging activity of methanolic extract of *Bursa spinosa* was assayed through DPPH method. The result showed that the activity of methanolic extract of *Bursa spinosa* was found as 39.43% at 10mg/ml. In the present study, the scavenging or preventive capacity of methanolic extract of *Phalium glaucum* extract against the superoxide anion free radicals was investigated. Scavenging effects of methanolic extract increased with increasing concentration in range of 8.87 (50µg/ml), 19.49 (10µg/ml) and 33.64 (150µg/ml), similar to that of *Bursa spinosa* (Subhpradha et al., 2013).

It is worthy to note that the product from natural source is good for health and devoid of side effects. In the present investigation GC-MS analysis reveals that the methanolic extract of *Phalium glaucum* possessed cholesterol the antioxidant compound.

CONCLUSION

The free radical scavenging activity of the methanolic extract was evaluated based on the ability to scavenge the synthetic DPPH. The findings of the present study suggest that gastropod extract could be a potential source of natural antioxidant that could have great importance as therapeutic agents in preventing or slowing the progress of aging and age associated oxidative stress related degenerative diseases such as cancer and various other human ailments.

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kw;Wk; mtNd tafia ty;yhkNd (jpUke;jpuk;: 417)

mirapy; cyfk; mJ ,J MNk. jpUke;jpuk; 441

,g;ghlypy; Fatd; jphpifapy; kz;izg; Rw;wp mtd; kdjpDs; Njhd;Wk; tbtq;fisnay;yhk;
kl;ghz;lq;fshf tidthd;. ,iwtDk; mJNghyNt ,g;G+kpiag; gilj;jhd;. Nfhs;fisAk;
tpz;kPd;fisAk; mt;thNw gilj;jhd;. ghidAk; cUz;il. mtdJ gilg;GfSk; cUz;il vd cyfpd;
tbtj;ijAk; mjDs; mlq;fpapUf;Fk; mwptpaiy \$Wfpwhh.; jpU%yh; kz; topf; \$Wk;
mwptpay;

kz; xd;W fz;Bh; ,Utpidg;
jpz; vd;W ,Ue;jJ ghj;jpuk; jPapidr; Nrh;e;jJ
tpz;zpd;W ePh;tPopd; kpz;Lk; kz;zhtJ Nghy;
vz;zpd;w khe;jh; ,wf;fpd;w thNw.

gr;ir kz;ghz;lk; kWgb ePhpy; fiue;J kz;zhfp kWgb kz;ghz;lk; MtJ NghyNt kdpjdpd;
gpwg;Gk;> ,wg;Gk; vd;fpwhh; jpU%yh;. Rl;lghid> Rlhj ghid vd;w ,uz;L tifg; ghidfis
kdpjDf;F cjhuzkhff; \$Wfpd;whh;. jpU%yh; Rl;lghid jpz; vd;W ,Ue;jJ (jPapidr;
Nrh;e;jjhy;) vd;fpwhh;. Rl;lg;ghid kio ePhpy; fiuahJ. fhuzk; kz;zpy; ,Uf;Fk; fspkz;
vd;Dk; mYkpdpak; Mf;i]L ,izg;G fUtpahf ,q;F nray;gLfpwJ. ghidiar; RLk;NghJ kz;
Jfs;fs; xd;Nwhnlhd;W xl;b ,WFfpwJ. ,J kio ePhpy; fiuahj tz;zk;
cWjpahdjhfptLfpwJ. ,JNghyNt ,iwtidawpe;jth;fs; mtdpy; fye;J cyf khiafsy;
fythh; vd;w jj;Jtj;ij vspikahd mwptpayhfj; jUfpwhh; jpU%yh;.

khDlg; gpwg;gpy; - mwptpay;

kdpjdpd; gpwg;G Fwpj;J ,d;iwa kUj;Jt mwptpay; gy fz;Lgpbg;Gfisf; \$WfpwJ.
jhapd; fUtpy; cUthdJ Kjy; fUtiw jhz;b cyfpd; Kjy;];ghprk; fhZk; tiu mf;fUtpdJ
tsh;r;rpapidg; gy gbepiyfshf ekf;F ,d;iwa];Nfd; vdg;gLk; CLUtpf;; fhZk; fUtp %yk;
glk;gpbj;Jf; fhl;LfpwJ. ,d;iwa mwptpaiy; jhz;b mf;fU cUthFk; tpjk; kw;Wk;
mwptpay; \$whj gy mhpa;f; fUj;Jf;fisAk; ek; Kd; itf;fpwhh; jpU%yh; fU Kjypy;
je;ijapd; clypy; cUthfpd;wJ.

“GUld; clypw; nghUe;Jkw;Nwhuhh;”

jpUke;jpuk; ghly;:454

vd;w ghly; ,f;fUj;ij czh;j;Jfpd;wJ.

tpe;Jk; Rf;fpyKk; xd;W NrUk;NghJ Md;khtpw;Fhpa ,Ugj;J ehd;F jj;Jtq;fSk;
nghUe;Jfpd;wd.

vd;Dk; ghly; ,jidf; \$Wfpd;wJ. ,jpy; ,lk; ngWk; ‘xope;j Ejj;’ vd;Dk; njhlh; ehd;F
jj;Jtq;fs; xUq;fpapUf;Fk; ,lk; vd;Dk; nghUisj; jUfpd;wJ. ,Ugj;J ehd;F jj;Jtq;fs;
vd;gJ> Ritxsp CW Xir ehw;wk; vd;W le;jpd; tif njhpe;J fz;Nz cyF (jpUf;Fws;) vd;gJ>
jd;khj;jpiufs; -5 (Rit> xsp> CW> Xir> ehw;wk;)

QhNde;jphpaq;fs; -5 (ehf;F> Njhy;> fz;> nrtp> %f;F)

fz;Nke;jphpaq;fs; -5 (thf;F> fhy;> if> vUtha;)

gQ;rG+jq;fs; -5 (epyk;> ePh;> jP> fhw;W> Mfhak;)

me;j fuzq;fs; -4 (kdk;> Gj;jp>rpj;jk;> mfq;fhuk;)

,e;j ,Ugj;J ehd;F jj;Jtq;fSk; xLq;fpapUf;Fk; ,lk; ‘cr;rp’ vd;W ,d;W
miof;fg;gLfpd;wJ. ,t;Tr;rp ‘is’ vd;W miof;fg;gLfpd;wJ. ,jpy; ‘rpwg;G mwptT’” Kd;
%isapy; ,lk;ngWk; ,it ,uz;Lk; ,ize;Js;s gFjp cr;rpg; gFjp

fUtpDs;Kjypy; gha;tJ jrthAf;fsy; xd;whd jdQ;rad; vd;gjhFk;. ,jid ePs;thA
vd;fpwhh;. jpU%yh;. jpUke;jpuk; gh:456

G+tpd; kzj;ijg; nghUe;jpa thATk;

jhtp cyfpy; jhpg;gpj;j thDNghy;
Nktpa rPtdpy; nky;y ePs; thATk;
\$tp mtpOk; Fwfp;nfhz;lNghNj
cliy tpl;L caph; tpyfpr; nrd;w gpd; ,Wjpahf cliytpl;L ePq;FtJ ,t;thAthFk; fU tsUk;
NghJ xd;gJ Jthuq;fSk; tsUf;pd;wd. ,tw;iw xd;gJ 'tha;jy;' vd;W jpUke;jpuk;
Fwpg;gpLfpd;wJ. thapy; vd;Dk; nghUspy; ,J mlq;Fk;. mit.

fz;	-2
tha;	-2
ehrpj;Jthuhk;	-2
tha;	-1
fUtha;	-1
vUtha;	-1

Mf xd;gJ ,t;nthd;gJk; rhpahd tifapy; mikahtpby; kdpjg; gpwg;G gd;wpiag; Nghy
,ope;jjhhk; tpLk;. ,g;ghlypy; Fwpg;gplg; gLk; 'Gutp' gpuhzzpd; ,af;fj;ijf;
Fwpg;gpLfpd;wJ. ,J cyfpaypy; xd;wp tho;gth; fz;lj;jpw;Ff; fPo; vl;L tpuw;fil msT
nry;Yk; Nahfpahf;Ff fz;lj;jpw;Ff; fPo; ehd;F tpuw;fil msT nry;Yk;. vdNt jpU%yh;
'vl;Lld; ehY GutpAk;' vd;fpwhh;.

ghuk;ghpak; Fwpj;j jpU%yhp; fUj;Jf;fs; :

ngHjthf kdpjdpd; Fzeyd;fs; ghuk;ghpak;NjhL ngHpJk; njhLh;G nfhz;litaHf
,Uf;Fk; vd;W fUjg;glfpd;wJ. ,jid ,d;iwa kUj;Jt cyfk; xj;Jf; nfhs;fpd;wJ.
,g;ghuk;ghpa Fzq;fisj; jhq;fpapUg;ig FNuhNkhNrhk;fs; vd;W \$Wth;. jpUke;jpuk; ,jid
NtW tifapy; \$WfpwJ.

MZk;> ngz;Zk; xd;W NrUk; NghJ tpe;Jk;> fUTk; xd;W Nrh;fpd;wd.
mj;jUzj;jpy; tpe;J fUtpid vjph;j;Jr; nrd;why; gpwf;Fk;. Foe;ij jhkj Fzk; ngWk;. Nrhk;Ngwpahf> myl;rpakhf> RWRWg;gpy;yhky; ke;jkhf ,Ug;gJ. khwhf RNuhzpj; k;
vjph;j;J tUk; NghJ gpwf;Fk; Foe;ij rj;Jt Fzk; ngWk; gugug;gpy;yhky; rhe;jkhf> mlf;fkhf> nghWikahf ,Ug;gJ. tpe;JTk; fUTk; rkkhff; fye;jpUf;Fk; NghJ gpwf;Fk;
Foe;ij ,uhrj Fzk; ngWk;. fh;tkhf> mjPjkh d;dk;gf;ifNahL ,Ug;gJ.

,k;%d;W Fzq;fSk; xj;jpUf;Fk; xUtd; Nguuir MSk; jFjp cilatdhf tpsq;Fthd;
vd;fpwJ jpUke;jpuk;.

fUg;igapy; cUtk; ngw;wgpd; mf;fU kaf;f epiyapy; tsUk;. gpd; cwf;fk;
ePq;fpf; fU epidT ngWfpd;wJ. (460 jpUkzk;) Mz;-ngz; ,Uthpd; capuZf;fspd; fyg;ghy;
Foe;ij cUthfpd;wJ. ,f;Foe;ijf;F mjd; ifastpy; vz; rhz; clk;G tUthfpd;wJ.

jpUke;jpuk; gh : 464

Rf;fpy ehbapy; Njhd;wpa nts;spAk;
mf;fpu kj;Nj Njhd;Wk; mt;tpNahdpAk;
Gf;fpUk; vz;tpuy; Gwg;gl;L ehy;tpuy;
mf;fuk; vl;Lk;vz; rhz;mJ MNk

vd;Dk; ghly; top ,jid mwpayhk;.

,iwt; cliy mikj;j tpjk;:

vd;ghy; kpile;J euk;G thpf;fl;br;
nrk;ghy; ,iwr;rp jpUe;j kidnra;J
,d;ghy; caph;epiy nra;j ,iw Xq;Fk;

ez;ghy; xUtid ehLfpd;NwNd (jpUke;jpuk; 461)
,iwtid; vYk;Gfshy; gpd;dp euk;ghfpa fapw;why; fl;b ,uj;jj;Jld; \$ba ,iwr;rpahy; tPl;il
mikj;J ,d;gk; ngw caph; jq;Fk; clk;igr; nra;jhd;.

fU gf;Ftg;gLjy;:

‘xd;gJ ePh;r;rhy; fyrk; gjpndl;L

nre;jJ #is tpise;jJ. jhNd’

xd;gJ thapyhfpa (Jisfshyhfa) ePh;r;rhYk;> #f;Fk; clyhd vl;Lk;> QhNde;jphpak;>
fd;Nke;jphpak; Mfpa gj;Jk; Mfg; gjpndl;Lf; Flq;fSk;> fUg;ig vDk; #isapNy gf;Ftkha;
nte;jd vd;g;ngHUs; jUfpwJ. jpUke;jpuk; jhapd; fh;g;gg;igapd; #l;by; gjg;gLj;jg;gLtij
mofhf vLj;Jiuf;fpd;whh;. jpU%yh;.

gpwg;gpy; FiwghL Vw;gl fhuzk;:

gha;fpd;w thA Fiwapd; Fws; MFk;.

gha;fpd;w thA ,isf;fpd; Klk; MFk;

gha;fpd;w thA eLg;gby; \$d; MFk;.

gha;fpd;w thA khjh;f;F ,y;iy gh;f;fpNy (jpUke;jpuk; :480)

Rf;fpyj;ijr; nrYj;Jk; thA Fiwe;jpbd; Foe;ijahdJ Fl;ilaha;g; gpwf;Fk;. ghAk; thA
nkype;jpbd; KlkhFk;. mt;thA jilg;gl;lhy; Foe;ij \$dha;g; gpwf;Fk;. Mdhy;> Muha;e;J
ghh;j;jhy;> ngz;fSf;F thA ,y;iy vdpy; Foe;ijf; Fiwghl;Lld; gpwj;jYk; Mzpd;
epiyg;ghl;ilg; nghWj;Nj vDk; cz;ikapid cyfpw;F czh;j;Jfpwhh;. jpU%yh;

Mz; - ngz; jpUeq;if

Mz;kfpy; Mz; MFk; ngz; kpfpy; ngz; MFk;.

G+z; ,uz;L xj;Jg; nghUe;jpy; mypahFk;

jhz;kpFk; Mapd; juzp KOJ MSk;

ghztk; kpf;fpby; gha;e;jJk; ,y;iyNa (jpUke;jpuk; 48)

Mz; ngz; \$Lk; NghJ Mz; gz;G kpFe;jhy; mt;Taph; Mz; MFk;. ngz; gz;G kpFe;jhy;
mt;Taph; ngz;zhFk;. Mz;> ngz; gz;G rkkhdhy; mt;Taph; mypahFk;. Ms;tpid
Kaw;rpapy; fUj;J kpFjpaha; ,Ue;jhy; gpwf;Fk; caph; rpwg;gha;g; gpwf;Fk; mJ cyif
MSk;.

MAspd; ,ufrpak;

mQ;R Xby; MAsk; E}W MFk;

ehy; Xbd; ghhp; vz;gjhy;

thA gFj;J mwpe;J ,t;tif

Nahf;Fg; gha;r;Yk; MNk

le;J tpuw;fil Rf;fpyk; Nru MAs; E}W ehd;F tpuw;fil Rf;fpyk; Nru MAs; vz;gJ Nahf;F
,jid mwpe;J Nru Mw;wy; cz;L vd;fpwhh;. jpU%yk;. ngw;Nwhh; epidj;jhy;
MNuhf;fpakhd Foe;ijfisg; ngw ,aYk; vd;gJ ,sk; jiyKiw mwpa Ntz;ba xd;W

khjh cjuk; kyk;kfpd; ge;jd; Mk;

khjh cjuk; ryk; kpfpy; %q;if Mk;

khjh cjuk; ,uz;L xf;fpd; fz; ,y;iy

khjh cjuj;jpy; te;j Fotpf;Nf (jpU.ke;:48)

md;idapd; tapw;wpy; fUthf mike;j Fotpf;F me;j md;idapd; tapw;wpy; kyk;
kpFkhdhy; mf;Foe;ij ke;j Gj;jpAilajhf tpsq;Fk;. jha; tapw;wpy; ePh; kpFkhdhy;
me;jf; Foe;ij Cikaha; tpLk;. kyKk;> ePuk; kpFe;J ,Uf;Fkhdhy; mf;Foe;ij FULhfptLk;

vdNt jahdts; fUTw;w ehspypUe;J jd;Dliy rkepiyapy; itj;jpUf;f Ntz;Lk;. vDk;
nra;jpapid jUfpwhh; jpU%yh;.

,ul;ilf; Foe;ij;

‘FotpAk; ,uz;lhk; mghdd; vjph;f;fpy; gpuhz thATld; mghdd; vd;gLk;
kyf;fhw;W vjph;j;jhy; Rf;fpyk; rpije;J ,ul;ilf; Foe;ijahFk;.

FNshdpq;

,d;W Cloning Kiwahy; Njhy; nry;fspy; ,Ue;J me;j ,dj;ijNa MNlh> khNlh ve;j
capuhf ,Ue;jhYk; mjid mt;thNw cUthf;fpj; jUfpd;wdh;. ,jid

‘jhNd gilf;Fk; jiytDk; MFk;’ vd;Dk; thpfspy; ml;lkh rpj;jpg w;wpf; \$Wifapy;
jpU%yh; \$Wfpd;wdh;.

,ja milg;G: (`hh;l; - ml;lhf;)

mlg;gz;zp itj;jhh; mbrpiy cz;lhh;

klf;nfhb ahNuhL ke;jdk; nfhz;lhh;.

,lg;gf;fNk ,iw Neh;e;jNj vd;whh;

fplf;fg; gLj;jhh; fple;njhope; jhNu

,lJ gf;fk; typ te;jJ vd;whh; %r;rpiuj;Jg;gLj;jhh;. caph; ghphe;jJ vd ,ja Neha; (heart
attack) Fwpj;J jpU%yh; \$Wgit ,d;iwa tpQ;Qhd kUj;Jtj;jpd; RtL njhlhj gy;yhapuk;
Mz;LfSf;F Kd; \$wg;gl;litnadpy; mth; jk; gy;Jiw mwpT tpag;igj; jUfpwJ.

jpU%yhpd; gpwJiwfs;:

kuk; tsh;g;Gk; - jpU%yUk;

“fufj;jhy; ePh; ml;bf; fhit tsh;f;fhh;

eufj;jpy; epw;wpNuh ey; neQ;rpNu”

ePUw;wp nrb tsh;f;fhjth;fs; eufj;jpw;Fj; jhd; Nghthh;fs; vd;Dk; fUj;ijf; \$wp
jpU%yh; Xh; #oypay; ghJfhg;ghsuhfTk; jd;id epiy epWj;jpAs;shh;.

jpU%yUk; - ,aw;gpaYk;

#hpa xspf;fpuzq;fs; xU nyd;]; %yk; CLUtpg; gha;e;jhy; mit Focus vd;gLk;.

Gs;spapy; Ftpj;J xd;W NrUk;. ,jd; fhuzkhf me;j ,lj;jpy; ntg;gk; kpFjpahf cz;lhfK;.

,J gQ;ir vhpj;JtpLk;.

,jid jpU%yh;

#hpa fhe;jKk; #o; gQ;rk; NghyNt

#hpa fhe;jk; #o; gQ;irr; Rl;blh

#hpad; re;epjpapy; RLkhW Nghy;

#hpad; Njhw;wKd; mw;w kyq;fNs (jpUke;jpuk;:117)

#hpa fhe;jk; xUtiff; fy;. ,J #hpa xspia cl;fpufpj;J ntg;gj;ij ntsptpLk; Mw;wy; cilaJ.

,f;fy;ypd; kd; gQ;ir ePl;bdhy; mJ gw;wpf; nfhs;shJ. Mdhy; #hpa xspapd; Kd; ,f;fy;iy

itj;J fy;ypd; ,ilapy; gQ;ir itj;jhy; #hpa xsp fy;ypy; gl;L ntspg;gLk; ntg;gj;jpd; Kd;Nd

gw;wp vhpAk;. mJNghyNt Qhd Mrphpad; gh;it gl;l cld; khztdpd; kd khRfs; mfd;W

tpLk;. kyq;fs; vd;git ,q;F mfq;fhuk;> kaf;fk;> ngha;j;Njhw;wk; vd;gitahFk;.

ePhpd; -jpl -jput – thA epiy

jz;zPh; jz;zPuhf ,Uf;Fk; NghJ jputepiy ePuhtpahFk; NghJ thA epiy
gdpf;fl;bahFk; NghJ jpl epiy vd %d;W epiyfs; cz;L. ,ijj; jpU%yh;

fye;jJ ePuJ clk;gpy; fWf;Fk;

fye;jJ ePuJ clk;gpy; rptf;Fk;

fye;jJ ePuJ clk;gpy; ntSf;Fk;

fye;jJ ePh;epyk; fhW;W mJthNk

ehk; Fbf;F; jz;zPh; gpj;j ePuhf khWfpwJ. rpf;ghf uj;jkhf khWfpwJ. nts;is epwk;
cs;s Rf;fpykhfTk; khWfpwJ. mJNt rpWePuhfTk;> tpah;itahfTk; ntspNaWfpwJ.

cg;gpd; Njhw;wk;:

fly; ePhpy; fiue;Js;s cg;G> fly;ePiu #hpa xspA; ntg;gKk; Mtpahf;fpdhy;>
cg;ghf ntspg;gLfpwJ. Nrhhak; FNshiuL Nacl jz;zpypUe;J ntspNawpa cg;ghdJ kPz;L
jz;zPhpy; fiuAk; jd;ikAilaJ. jz;zzPUk; cg;Gk; NtWNtwy;y ,uz;Lk; xd;Nw.
xd;wpypUe;J kw;nwhd;W Njhd;WfpwJ. #hpa ntg;gk; ,y;yhtpl;lhy; fly;ePh; Mtpahf
cg;G gpwf;fhJ. jz;zPiuAk;> cg;igAk; gphpj;J ,uz;lhf;f #hpadpd; ntg;gk;
Njitg;gLfpd;wJ. Mdhy; cg;G ,utpYk; jz;zPhpy; fiuAk;. Mdhy; #hpadpd; ntg;gkpd;wp
gpwf;f KbahJ ,jd; thapyhf ,iwtdplkpUe;J gpwe;j ehk; ,iwtdplk; Nrh;fpNwhk; vDk;
jj;Jtj;ijj; jUfpwhh; jpU%yh; ,jDs; mwptpaiyAk; mlf;fptpLfpwhh;.

jpU%yUk; - gpugQ;r ,af;fKk;:

Ecological balance – vd;gLk; tpQ;Qhdpspd; fUj;ij jpU%yh; ,iwij; jj;Jtj;NjhL
,ize;Jf; \$Wfpd;whh;. gpugQ;r ,af;fkhdJ Automatic Control nfhz;LJ vd;gJ tpQ;Qhd
thjk; ,jid

mq;fp kpfhik itj;jhd; cly; itj;jhd;

vq;F kpfhik itj;jhd; cyNf ioAk;

jq;fp kpfhik itj;jhd; jkpo;r; rhj;jpuk;

nghq;fp kpfhik itj;jhd; nghUs; jhDNk

vd;fpwhh;. ,g;G+kp 24 kzpNeuj;jpw;nfhU Kiw RoYfpd;wJ. mjdh; ,uTk; gfYk;
cz;lhf;pd;wJ. ,jpy; gfypd; Neuk; rpwpJ mjpfkhdYk; ntg;gk; mjpfkhfptpLk;. caph;fs;
mopAk; tha;g;Gz;L ,jid mopahky; fhg;gtd; ,iwtd; vd;fpd;whh;.

KbTiu

mwptpy; tuyhw;wpy; irt rpe;jhe;jpfsdpd; rpe;jhe;jq;fSf;F jdpj;Jtkhd ,lkz;L.
(irt rpj;jhe;jKk; tpQ;Qhd cyfKk; g:234)

,jid ahUk; kWg;ghpy;iy. gyE}W Mz;Lfl;F Kd;G thoe;j xU irt rpj;jhe;jpapd;
ghly;fpy; tUk; ,j;jid mwptpay; fUj;Jf;fSk; gf;jp vDk; xU Nghh;it nfhz;L kiwf;fg;gLjy;
tUj;jj;jpw;FhpaJ gyhg; goj;jpid NjhiyAhpj;J cz;gJ Nghd;W gf;jp vDk; Kl;Njhy;
ePf;fp jpU%yhp; ghly;fis mZfpdhy; nka;QhdKk;> tpQ;QhdKk; NtW Ntwy;y vdj;
njspayhk;.

SYNTHESIS AND STRUCTURAL PROPERTIES OF ZnO NANOPARTICLES

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ABSTRACT: ZnO nanoparticles were synthesized by co-precipitation method. The synthesized Particles were characterized by X-ray diffraction (XRD), UV-visible Spectroscopy and FTIR. The X-ray diffraction study reveals that the synthesized ZnO particle size varies from 35 to 40 nm. Investigation reveals that the nanoparticles and surface morphology of ZnO nanoparticle is spherical in co-precipitation. The UV-Visible spectrum of the nanoparticles shows a red shift compared to that of the bulk sample.

Keywords: Co-precipitation, FTIR, OH-stretching and Zn-stretching

INTRODUCTION

Nano science is the study of structures and materials on the scale of nano meters. Nano crystalline materials have attracted a wide attention due to their unique properties and immense potential application in nano device fabrication. Zinc oxides of particle size in nanometer range have been paid more attention for their unique properties. They are widely used for solar energy conversion, non-linear optics, catalysis, pigments, gas sensors, cosmetics etc. Zinc oxide is an inexpensive, n-type semiconductor with a wide band gap having optical transparency in the visible range. Surface defects play an important role in the photo catalytic activities of metal oxides as they increase the number of the active sites. It can be easily etched in all acids and alkalis. Due to this reason it can be used in the fabrication of small size devices e.g. transparent electrodes, window materials for display and solar cells. In this present work, sol-gel method is used to produce the pure ZnO nanoparticles and their structural and optical properties are studied.

Co-precipitation process:

In this process, the required metal cations from a common medium are co-precipitated usually as hydroxide, carbonates, oxalates, formates or citrates. These precipitates are sub sequentially calcined at appropriate temperature to yield the final powder. For achieving high homogeneity, the solubility products of the precipitate of metal cation must be closer. Co-precipitation results in atomic scale mixing and hence, the calcining temperature required for the formation of final product is low, which lead to lower particles size. However each synthesis requires its own special conditions, precursor reaction, etc. Also, co-precipitation process is required to control the concentration of the solution, PH, temperature and stirring speed of the mixture in order to obtain the final product with the required properties.

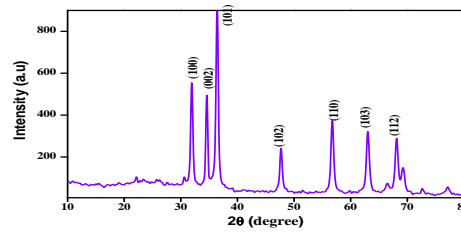
Characterization Technique:

The nanostructures can be characterized using various techniques such as XRD, FITR, UV, etc. The ZnO nanoparticles are subjected to XRD in the present work.

Result Analysis:

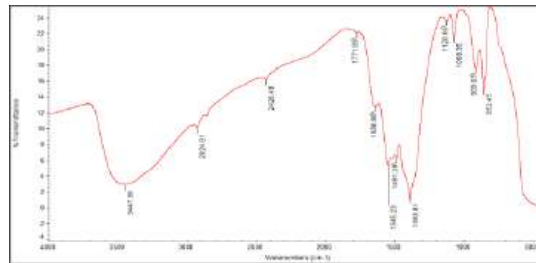
X-ray diffraction analysis: X-ray diffraction pattern of the nanoparticles the peaks are indexed as $31.83^\circ(100)$, $34.54^\circ(002)$, $35.53^\circ(101)$, $47.54^\circ(102)$, $56.34^\circ(110)$, $62.47^\circ(103)$ and $68.42^\circ(112)$ respectively. All diffraction peaks of sample correspond to the characteristic

wurtzite structure of zinc oxide nanoparticles. Average particle size of 26 nm of ZnO nanoparticles is found using De-bye Scherrer diffraction formula.

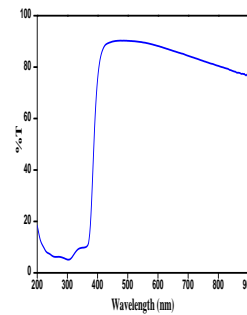
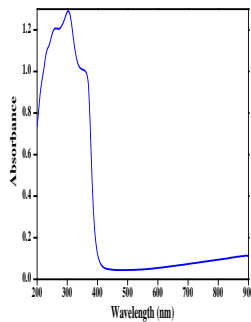


FTIR Spectroscopy:

O-H stretching	3347.80 cm^{-1}	1383.81 cm^{-1}
Zn-O stretching	1636.88 cm^{-1}	852.45 cm^{-1}



UV-Visible Spectroscopy of ZnO Nanoparticles: The **absorption** and **emission** peaks in UV-Visible range of ZnO nanoparticles are **400-900 nm** and **200-380 nm** respectively.



Conclusion:

The most important and utilizable ZnO nanoparticles is prepared using a simple chemical method called co-precipitation method. It's structural and optical properties have been studied using XRD, UV-Visible spectroscopy and FTIR. The synthesized particles were characterized by XRD. The grain size of ZnO can be calculated by De-bye Scherrer's formula, which proves ZnO is in nanometer size. The average grain size of the particle is about 26 nm. The sharp and broad peaks indicating that the particles show high crystalline quality. The observed d-spacing values are well agreed with the JCPDS file. In UV-Visible spectroscopic analysis the absorbance are maximum at the ultra violet spectral region in addition to this the excitonic absorption are also observed. This makes the ZnO nanoparticles as the efficient UV absorber. The FTIR spectral analysis reveals the characteristics Zn-O

band stretching. FTIR spectra reveal the absorption of water molecules on the ZnO nanoparticles. The unique of present work is no addition of surfactants by utilizing a simple co-precipitation method.

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STUDY OF OH AIRGLOW LAYER OVER RANCHI (23.3°N, 85.3°E), INDIA DURING 2011 USING SABER/TIMED MEASUREMENTS

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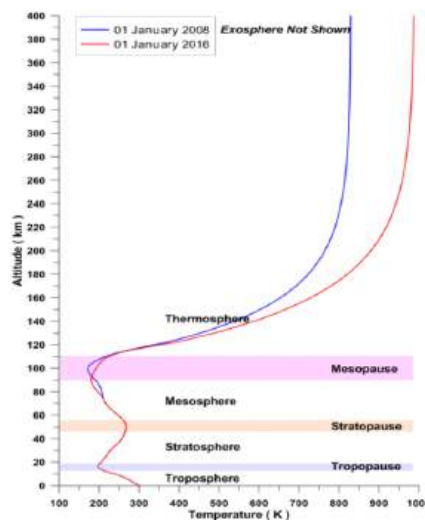
ABSTRACT

Hydroxyl (OH) airglow emissions are the most dominant nightglow emissions from the mesosphere-lower thermosphere region of the earth's atmosphere. SABER Version 2.0 Level 2A data have been used in the present study. Few SABER overpasses were available in 22.5 – 24.5° N x 84.0 – 86.0° E latitude-longitude grid centred over Ranchi (23.3° N, 85.3° E), India during 2011 is obtained.

Keywords: SABER, TIMED, hydroxyl, MLTI

INTRODUCTION

The gaseous envelope that surrounds earth and is retained by its gravity is called atmosphere. The earth's atmosphere shelters the life on our planet by warming the surface through heat retention (the greenhouse effect), lessening the temperature extremes between day and night, and absorbing the harmful ultraviolet radiation from the sun. Due to action of gravity, the earth's atmosphere is thickest near the surface and thins out with increasing altitude and finally fades out into space. According to National Oceanic and Atmospheric Administration (USA), the earth's atmosphere is stratified into five layers based on the temperature changes at different altitudes namely – troposphere, stratosphere, mesosphere, thermosphere and exosphere, with the two layers being bordered by "pauses". Using NRLMSISE07 model, the profiling of vertical temperature structure of the earth's atmosphere over our study area, Ranchi (23.3° N, 85.3° E), India was done for 01 January 2008 and 2016 is presented below:



The mesopause layer

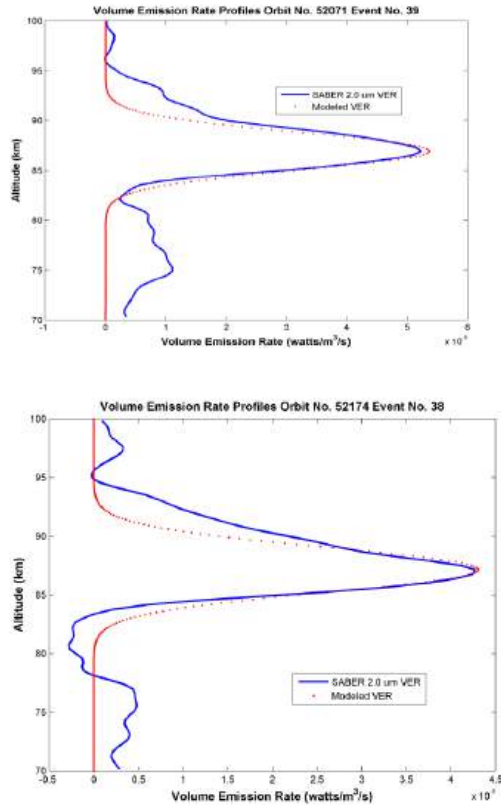
Mesopause is the coldest place of the terrestrial atmosphere with temperature as low as -100°C located between the upper mesosphere and the lower thermosphere. According to American Meteorological Society Glossary of Meteorology, mesopause is the top of the mesosphere and base of the thermosphere. There are two distinct mesopause altitudes at ~ 86 and 100 km during summer and winter. Nightglow refers to the airglow process occurring during the night. Nightglow emissions in the mesopause layer are mainly due to chemical reactions, and solar energy is linked in some way. The weak nightglow features arise due to the metallic species present in the MLT region, and the prime one being due to excited Na atoms.

OH AIRGLOW AND SABER

Hydroxyl (OH) airglow emissions are the most dominant nightglow emissions from the mesosphere-lower thermosphere region of the earth's atmosphere with the integrated intensity amounting to more than 1 mega Rayleigh. SABER (Sounding of Atmosphere using Broadband Emission Radiometry) is a 10-channel broadband infrared radiometer on board NASA's Thermosphere-Ionosphere-Mesosphere Energetics and Dynamics (TIMED) mission satellite that measures earth limb emission (between 1.27 and $16.9\ \mu\text{m}$) from the lower stratosphere to the lower thermosphere using the limb scanning technique. TIMED mission satellite is in action since its launch in 2000 to study the temporal and spatial variations of the basic atmospheric structure and energy balance of mesosphere-lower thermosphere-ionosphere (MLTI) region ($60 - 180\text{ km}$) in near-global timescale. The sounding of atmosphere by SABER gives vertical scans of limb radiances and their analysis provides information of temperature, pressure, O_3 , H_2O and CO_2 mixing ratio, the volume emission rates of $\text{O}_2(^1\Delta)$ airglow, OH airglow with the vertical resolution of approximately 2 km on the tangent point. SABER radiance data provides the energy loss by CO_2 emission between 100 km and 135 km as well as accurate cooling rate due to CO_2 emission.

RESULT ANALYSIS

SABER OH $2.0\ \mu\text{m}$ volume emission rate (VER) profile measurements data were obtained from <http://saber.gats-inc.com>. Owing to this limitation, few SABER overpasses were available in $22.5 - 24.5^{\circ}\text{ N}$ x $84.0 - 86.0^{\circ}\text{ E}$ latitude-longitude grid centred over Ranchi (23.3° N , 85.3° E), India during 2011. Around 50 SABER overpasses spread over January – December 2011 were available in the above-mentioned geographic grid 2° x 2° centred over Ranchi. About 18 SABER passes were noted during the day i. e. $0000 - 1200\text{ UT}$ ($0530 - 1730\text{ h IST}$) and majority of passes were observed during the night. Top and bottom panel of the following figure presents typical examples of OH $2.0\ \mu\text{m}$ volume emission rate (VER) profile measured by SABER instrument over Ranchi on 20 and 27 July 2011, respectively. The x-axis represents OH $2.0\ \mu\text{m}$ volume emission rates in $\text{watts/m}^3/\text{s}$; while, tangent point altitude of SABER observation is shown in the y axis.



Typical examples of SABER OH 2.0 μm VER profile over Ranchi on 20 and 27 July 2011 (shown in top and bottom panel, respectively).

SABER OH 2.0 μm VER measurements are shown in blue curves. A Gaussian model of the form $y = A * \exp[-(x - b)^2 / c]$ was forced on SABER OH 2.0 μm VER profiles in order to understand the behaviour of OH layer over Ranchi. In both the events, the peak of OH layer was located at ~ 87 km and its thickness was about 4.3 km.

SUMMARY

Discovered by Meinel in 1950, Hydroxyl (OH) airglow emissions are the characteristics feature of near mesopause region. The most dominant emissions among all airglow features from the mesopause layer, OH airglow measurements have been widely used to investigate the chemistry and dynamics of near the mesopause region. Of late, SABER instrument on board NASA's TIMED mission satellite has contributed immensely to our understanding of the mesopause region. Two of the 10 radiometers on the SABER instrument measure the limb profiles of the OH ($v' = 7, 8, 9; \Delta v = 2$) and ($v'' = 4, 5, 6; \Delta v = 2$) Meinel bands at 2.0 μm and 1.6 μm, respectively.

CONCLUSION

SABER measurements of OH 2.0 μm volume emission rate profiles have been used to study the behaviour of OH airglow layer in a 2° x 2° geographic grid over Ranchi (23.3° N, 85.3° E), India during 2011. Some of the salient features of the present study are as under: i) OH emission layer over Ranchi does not follow the usual Gaussian model. ii) The mean OH emission layer peak was located at ~ 86.6 ± 2.7 km. iii) Mean thickness of OH layer ~ 8.6 ± 3.3 km.

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PAINLEVE ANALYSIS

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Abstract

Nonlinear partial differential equations play a fundamental role in the description of many physical models. In order to arrive at a complete understanding of the phenomena, it is important to obtain closed form solutions. Several methods have been investigated to classify them and to construct solutions. The Painleve singularity structure analysis is one of the systematic and powerful method in nonlinear science to identify the integrability cases and the complete integrability properties of nonlinear systems. Painleve Analysis was introduced by a group of American mathematicians in 1983, for the classification of algebraic nonlinear differential equations without movable critical points. Since then, many integrable equations have been studied using this analysis.

Keywords: Painleve property, Laurent's expansion, Singularity structure, resonances.

INTRODUCTION

In recent years, much attention has been focussed on higher order nonlinear equations, known as evolution equations. Such nonlinear equations often occur in the description of chemical and biological phenomena. Their analytical study has been drawing immense interest. A fundamental question when dealing with nonlinear differential equations is "How can one tell beforehand whether or not they are integrable?". A system is said to be integrable if it is said to possess the Painleve property. For a given partial differential equation or discrete system, there are a variety of partially understood methods to determine the integrability of the system. The Painleve property is a sufficient condition for the integrability or solvability of equations.

Painleve property

A partial differential equation has the Painleve property if its solutions are single valued about a movable singular manifold,

$$\Phi(x,t) = 0$$

where Φ is an arbitrary function. In other words, a solution $u(x,t)$ of a partial differential equation should have a Laurent like expansion about the movable singular manifold, $\Phi=0$;

$$u(x,t) = [\Phi(x,t)]^p \sum_{j=0}^{\infty} u_j(x,t) [\Phi(x,t)]^j$$

where p is a negative integer.

The first two steps of this analysis are

- i) Determination of leading order behaviour of the Laurent series in the neighbourhood of the movable singular point.
- ii) Determination of resonances.

METHODOLOGY

Leading order analysis

The behaviour of solutions of the desired partial differential equation at a movable singular manifold $\Phi(x,t) = 0$ is determined by a leading order analysis where one makes the substitution,

$$u(x,t) = u_0(x,t) [\Phi(x,t)]^p$$

From the leading order behaviour, the following facts are observed:

- i) If 'p' is an irrational or complex number, then the solution is severely multivalued and so is non-Painleve type leading to non-integrability.
- ii) If 'p' is a negative integer, this can be an indication of the strong Painleve property and further analysis is necessary to confirm this.
- iii) If the value of 'p' is not an integer but a rational number, this indicates the association with weak Painleve property.

Resonance analysis

The number of arbitrary functions in Laurent expansion should be equal to the order of the partial differential equation. Inserting Laurent expansion into the targeted equation yields a recurrence formula that determines $u_j(x,t)$ for all $j > 0$, except for a finite number of $r_1, r_2, r_3, \dots, r_j > 0$ called resonances. The reduced equation will be of the form,

$$Q(r) = 0$$

where $Q(r)=0$ is a square matrix of order n with r appearing only in its diagonal elements. The roots of the equation $Q(r)=0$ are the resonances. One root is always -1 , representing the arbitrariness of $\Phi(x,t)$. Apart from Φ , there are $(n-1)$ other arbitrary constants.

RESULT ANALYSIS

Painleve analysis of Burger's equation

Burger's equation describes a lot of phenomena in physics field. It has attracted much attention since it was first proposed by Bateman.

$$u_t + uu_x = u_{xx} \tag{1}$$

The above equation has singularities of the form,

$$u(x,t) = [\Phi(x,t)]^p \sum_{j=0}^{\infty} u_j(x,t) [\Phi(x,t)]^j \tag{2}$$

where Φ is an arbitrary function

p is a negative integer

$u_j(x,t)$ are the coefficient functions.

Leading order analysis

Substitution of $u = u_0 \Phi^p$ into the Burger's equation (1) determines the possible value of p .

$$u_t = 0 \tag{3}$$

$$u_x = u_0 p \Phi^{p-1} \Phi_x \tag{4}$$

$$u_{xx} = u_0 p(p-1) \Phi^{p-2} \Phi_x^2 \tag{5}$$

$$\text{Thus, } u_0^2 p \Phi^{2p-1} \Phi_x = u_0 p(p-1) \Phi^{p-2} \Phi_x^2 \tag{6}$$

From the condition of coincidence of Φ 's power, $p = -1$. Substituting $p = -1$ in equation (6) yields, $u_0 = -2\Phi_x$

Identification of resonances

The recursion relations for u_j can be determined by inserting

$$u(x,t) = \sum_{j=0}^{\infty} u_j(x,t) \Phi^{j+p} \quad (7)$$

$$u_t = \sum_{j=0}^{\infty} [u_j(j+p) \Phi^{j+p-1} \Phi_t + \Phi^{j+p} u_{j,t}] \quad (8)$$

$$u_x = \sum_{j=0}^{\infty} [u_j(j+p) \Phi^{j+p-1} \Phi_x + \Phi^{j+p} u_{j,x}] \quad (9)$$

$$u_{xx} = \sum_{j=0}^{\infty} [u_{j,xx} \Phi^{j+p} + 2u_{j,x}(j+p) \Phi^{j+p-1} \Phi_x$$

$$+ u_j(j+p)(j+p-1) \Phi^{j+p-2} \Phi_x^2 + u_j(j+p) \Phi^{j+p-1} \Phi_{xx}] \quad (10)$$

Substituting these values in equation (1) we get,

$$\sum_{j=0}^{\infty} [u_j(j+p) \Phi^{j+p-1} \Phi_t + \Phi^{j+p} u_{j,t} + \sum_{j=0}^{\infty} u_j(x,t) \Phi^{j+p} [u_j(j+p) \Phi^{j+p-1} \Phi_x + \Phi^{j+p} u_{j,x}]$$

$$= \sum_{j=0}^{\infty} [u_{j,xx} \Phi^{j+p} + 2u_{j,x}(j+p) \Phi^{j+p-1} \Phi_x + u_j(j+p)(j+p-1) \Phi^{j+p-2} \Phi_x^2 + u_j(j+p) \Phi^{j+p-1} \Phi_{xx}]$$

Substituting $p = -1$ in the above equation and modifying the j terms and take Φ^{j-3} as common term, the above expression becomes,

$$\sum_{j=0}^{\infty} [u_{j-1}(j-2) \Phi_t + u_{j-2,t} + \sum_{j=0}^j u_{j-1} [u_1(1-1) \Phi_x + u_{1,x}]] =$$

$$\sum_{j=0}^{\infty} [u_{j-2,xx} + 2u_{j-1,x}(j-2) \Phi_x + u_j(j-1)(j-2) \Phi_x^2 + u_{j-1}(j-2) \Phi_{xx}] \Phi^{j-3} \quad (11)$$

Equating the coefficients of Φ^{-3}

Put $j=0$ in equation (11)

$$u_0 = -2\Phi_x \quad (12)$$

Equating the coefficients of Φ^{-2}

Put $j=1$ in equation (11)

$$\Phi_t + u_1 \Phi_x - \Phi_{xx} = 0 \quad (13)$$

Equating the coefficients of Φ^{-1}

Put $j=2$ in equation (11)

$$\Phi_{xt} + u_{1,x} \Phi_x + u_1 \Phi_{xx} - \Phi_{xxx} = 0 \quad (14)$$

The above equation can be expressed as

$$\frac{\partial}{\partial x} [\text{L.H.S of equation (13)}] = 0$$

$$\frac{\partial}{\partial x} [\Phi_t + u_1 \Phi_x - \Phi_{xx}] = 0$$

$$\Phi_{xt} + u_{1,x} \Phi_x + u_1 \Phi_{xx} - \Phi_{xxx} = 0 \quad (15)$$

Equations (14) and (15) are similar implying the arbitrariness of the coefficient u_2 and $j = -1$ shows the arbitrariness of $\Phi(x,t)$. The compatibility condition at $j = 2$ is satisfied identically and the Laurent's expansion (2) is valid with arbitrary functions Φ and u_2 .

The Burgers equation $u_t + uu_x = u_{xx}$, which is a non-linear partial differential equation of second order has been proved to be integrable as it passes the Painleve test. It is useful in fluid dynamics teaching and in engineering as simplified model for turbulence, boundary layer behaviour, shock wave formation and mass transport.

Painleve analysis of GKdV and KdV equation

In a similar way, GKdV and KdV equations are tested for integrability using the Painleve property.

d-dimensional generalization of GKdV equation is,

$$u_t - 6uu_x + u_{xxx} + \frac{(d-1)}{2t}u = 0$$

where $d = 1, 2, 3$ correspond to KdV, Cylindrical KdV, Spherical KdV equations respectively.

The Korteweg-de-Vries (KdV) equation is a non-linear partial differential equation of third order given by,

$$u_t - 6uu_x + u_{xxx} = 0$$

With Painleve property it was found that, only GKdV equations with $d=1$ and $d=2$ pass the Painleve test. The important fact is that $d \geq 3$ dimensional extension does not pass the Painleve test. The solution of the KdV equation is single-valued about the singularity manifold and so it satisfies the Painleve property. Thus it can be expected to be integrable.

CONCLUSION

Thus Painleve analysis is proved to be a simple and reliable tool for testing the integrability of nonlinear ordinary differential equations (ODEs) and Partial differential equations (PDEs). Several new and exciting results on the chaotic properties of dynamical systems have been obtained by studying the Painleve property.

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Isolation, Purification, Identification and Characterization of Bifenthrin Degrading Bacteria From Garden Soil of Thoothukudi

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ABSTRACT

Application of chemical pesticides such as bifenthrin by the farmers for protecting their crops against insects and pest became the common agricultural practices. The repercussions that impose on the environment and on human health were also unprecedented. So, reclamation of soil contaminated with various chemical pesticides became impending issues of the environment.

Hence, the minor research project aims in analyzing an eco- friendly method of remediating the contaminated soil. Microorganisms, with their novel metabolic activities can degrade potent toxic pesticides for their carbon / nitrogen sources. Based on this line the present study has carried out in isolating pesticide degrading bacteria from contaminated soil. Four different bacterial strains (*Arthrobacter atrocyaneus*, *Pseudomonas aeruginosa*, *Pseudomonas putida* and *Bacillus pumilus*) were found be resistant to bifenthrin up to the concentration of 250mg/l through enrichment technique. HPLC technique revealed that *Pseudomonas aeruginosa* degraded bifenthrin more efficiently (84.9%) than the other bacterial strains.

KEY WORD:

Bacteria, Bifenthrin pesticide, characterization, Degrading bacteria.

INTRODUCTION

Pesticides are chemical compounds which pollute our environment largely. During the Second World War, there was an increasing demand in food and rise in human population. So the farmers are in need of using pesticides to increase the quantity of agricultural products by protecting them from pests and supply to the increasing population. As the use of pesticides from long days the persistent of them has been strengthened and they are easily not degradable in the soil and water. India is primarily an agriculture based country with more than 60- 70% of its population dependent on agriculture and covers maximum portion of its economy (Sabdono and Radjasa, 2008). Pesticides importance in crop yield improvement is understood and well accepted. But still they pose a threat to the environment due their toxic nature and persistence in the food chain. Currently there are a number of possible mechanisms for the clean-up of pesticides in soil, such as chemical treatment, volatilization and incineration. Chemical treatment and volatilization, although feasible are problematic as large volumes of acids and alkalis are produced and subsequently must be disposed of. Incineration,

which is a very reliable physical- chemical method for destruction of these compounds, has met serious public opposition, because of its potentially toxic emissions, and its elevated economic costs (Kearney, 1998; Zhang and Quiao, 2002). Overall most of these physical-chemical cleaning technologies are expensive and rather inefficient (Kearney, 1998; Nerud *et al.*, 2003) because the contaminated soil has to be excavated at a site and moved to a storage area where it can be processed. Due to environmental concerns associated with the accumulation of pesticides in food products and water supplies there is a great need to develop safe, convenient and economically feasible methods for pesticide remediation (Zhang and Quiao, 2002). For this reason several biological techniques involving biodegradation of organic compounds by microorganisms have been developed (Schoefs *et al.*, 2004).

The use of microorganisms (fungi or bacteria), either naturally occurring or introduced, to degrade pollutants is called bioremediation (Pointing, 2001). Microbial metabolism is probably the most important pesticide degradative process in soils (Kearney, 1998) and is the basis for bioremediation, as the degrading microorganisms obtain C, N or energy from the pesticide molecules (Gan and Koskinen, 1998).

The goal of bioremediation is to at least reduce pollutant levels to undetectable, nontoxic or acceptable levels, i.e. within limits set by regulatory agencies (Pointing, 2001) or ideally completely mineralize organo-pollutants to carbon dioxide. From an environmental point of view this total mineralization is desirable as it represents complete detoxification (Gan and Koskinen, 1998).

The use of bioremediation to remove pollutants is typically less expensive than the equivalent physical-chemical methods. This technology offers the potential to treat contaminated soil and groundwater on site without the need for excavation (Balba *et al.*, 1998; Kearney, 1998); it requires little energy input and preserves the soil structure (Hohener *et al.*, 1998). Perhaps the most attractive feature of bioremediation is the reduced impact on the natural ecosystems, which should be more acceptable to the public (Zhang and Quiao, 2002).

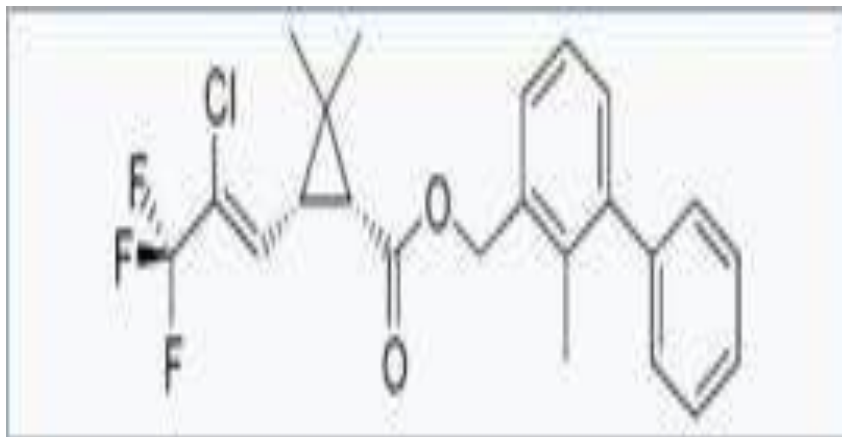
The complexity of microbial mechanisms for degradation of organo pollutants as well as the time period before microbial degradation starts, requiring weeks to months, has made the technology slow to emerge as a viable method of remediation (Nerud *et al.*, 2003). It becomes apparent that more detailed studies of the principles of biodegradation and the development of efficient methods of decontamination are needed to solve the hazardous waste problem (Nerud *et al.*, 2003).

MATERIALS AND METHODS:

Material:

The pesticides selected for the present study are Bifenthrin. They are collected from local market. Care was taken in handling the pesticide.

Bifenthrin



IUPAC name

(1S,3S)-3-[(Z)-2-chloro-3,3,3-trifluoroprop-1-enyl]-2,2-dimethylcyclopropane-1-carboxylate (2-Methyl-3-phenylphenyl)methyl

Chemical formula

$C_{23}H_{22}ClF_3O_2$

Bifenthrin

Bifenthrin (Biphenthrin, (2-Methyl-3-phenylphenyl) methyl-(1S,3S)-3-[(Z)-2-chloro- 3,3,3- trifluoroprop-1-enyl]-2,2-dimethylcyclopropane-1-carboxylate, CAS#82657-04-3) is a pyrethroid insecticide used primarily against the red imported fire ant by influencing its nerve system. It has a high toxicity to aquatic organisms. Although it is listed as a restricted use chemical in the United States, it is allowed to be sold for daily use, provided that the product sold has a low concentration of bifenthrin. Currently there is no known treatment.

Collection of soil

Garden soil was collected from the college campus for the purpose of isolation of pesticides resistant bacteria using enrichment technique, with varying concentration of pesticide (Bifenthrin) in the medium.

The collected samples were brought to the laboratory for analysis. Before analysis, the collected samples were air dried ground and passed through a 2mm pore size sieve and stored in sealed plastic bags at room temperature. These stored samples were used for further experimentation.

METHOD

Isolation of Bifenthrin resistant bacteria:

10g of garden soil was suspended in 50ml nutrient medium supplemented with 250 mg/L Bifenthrin and incubated at 30°C on plate form shaker at 200 rpm. After 5 days of incubation, 5ml culture was used to inoculate into the nutrient medium containing 100mg/L of Bifenthrin. Subsequently five rounds of enrichment process were carried out in nutrient medium supplemented with higher concentration of Bifenthrin (150 mg/L, 200 mg/L & 250 mg/L). The enrichment culture technique was used for the isolation of bacterial strains capable of utilizing Bifenthrin as a sole source of carbon and energy. Enriched medium was serially diluted and 0.1ml of aliquots was placed on nutrient agar plates supplemented with 250 mg/L Bifenthrin for the isolation of resistant bacteria cultures. The petri-dishes were observed on the next day to till third day for the appearance of resistant colonies. Morphologically different types of colonies were streaked for their purification on nutrient agar plate's containing 250mg/L Bifenthrin.

Purification of bacterial isolates:

A single isolated colony of the pesticides (Bifenthrin) A resistant bacteria were picked up with the help of sterilized wire loop and was streaked on agar medium containing 250 mg/L of pesticide (Bifenthrin). Each isolated strain was streaked at least 3 to 4 times on agar plates containing 250 mg/L pesticides (Bifenthrin) for purification. The isolated and purified bacterial strains were stored under refrigeration after preparing slant.

Identification of bacterial isolates:

The identification of bacterium exhibiting the activity of pesticides (Bifenthrin) degradation was carried out based on its colony characters.

Growth of bacterial isolates at different temperatures:

To study the stability of the pesticides (Bifenthrin) resistant bacterial isolates, an experiment conducted in an Erlenmeyer flask containing pesticides (Bifenthrin) in 100 ml nutrient broth. After sterilization by autoclaving the flasks were cooled and inoculated with the respective bacterial cultures and maintained at different temperatures (15°C, 35°C, 45°C and 55°C). After 48 hours, 5ml of culture was drawn and centrifuged at 3000rpm for 10 minutes and the pellet was discarded and the supernatant was collected to evaluate the growth of pesticide degrading bacteria. The optical density was taken at 600nm using UV – spectrophotometer. Un inoculated control was taken as a blank.

EXTRACTION OF PESTICIDE FOR HPLC ANALYSIS

In order to study the degradation potential of Bifenthrin the nutrient medium before inoculation of bacteria and nutrient medium after 3 days of inoculation were centrifuged at 3000 rpm for 5 minutes. The supernatant was extracted with 10 ml of methanol. Then the supernatant containing pesticide was taken in an eppendorf tube. The sample was stored at 4°C till analyzed by HPLC.

STATISTICAL ANALYSIS

Statistical analysis was worked out by using data analysis tool package of MS office Excel and excel package program XLSTAT 2015. The experiments were conducted in three replicates using the same treatments. The data of all values were statistically analyzed and expressed as mean standard deviation.

□ RESULT AND DISCUSSION:

Physicochemical characterization of garden soil:

In the present study garden soil that was contaminated with pesticides and its physico chemical properties such as soil pH, Moisture content, Bulk density, Specific gravity, Soil porosity, Organic matter, were estimated and their results obtained in **Table 1**. The selected garden soil was used for the purpose of isolation of pesticides resistant bacteria using enrichment technique, with varying concentration of pesticide (Bifenthrin) in the medium.

Table 1. Soil properties of garden soil

S. No	PARAMETERS	SOIL
1.	Soil pH	8.38 ± 0.32
2.	MOISTURE CONTENT (%)	19.8 ± 0.3
3.	BULK DENSITY (g/Cm ³)	1.3 ± 0.4
4.	SPECIFIC GRAVITY (g)	6.7 ± 0.2
5.	POROSITY (%)	79.8 ± 0.3
6.	ORGANIC MATTER (%)	2.39 ± 0.2

Identification of the bacterial isolates:

The garden soil was subjected to enrichment technique with pesticide such as Bifenthrin. At each round of enrichment process, the bacterial species were observed from pesticide (Bifenthrin) contaminated soil by serial dilution method. Different bacterial colonies were observed in nutrient agar medium. (**Plate I**). At the end of 5th round of enrichment technique a single isolated colony of the pesticide (Bifenthrin) degrading bacteria were picked up with the help of sterilized wire loop and was streaked on agar medium. Each isolated strain was streaked at least 3 to 4 times on agar plates for purification. The isolated and purified bacterial

strains were identified by Dr. Aravind Prasad, Department of Microbiology, Perriyar University, Selam. In Total 4 bacterial isolates were obtained from the pesticide (Bifenthrin) contaminated soil samples. These 4 isolates were identified as Bifenthrin resistant bacteria which are *Arthrobacter atrocyaneus*, *Pseudomonas aeruginosa*, *Pseudomonas putida*, and *Bacillus pumilus*. (Plate II.).

Plate I. Bacterial colonies were observed from Bifenthrin contaminated soil by using five rounds of enriched technique



1st round of enriched colonies



2nd round of enriched colonies



3rd round of enriched colonies



4th round of enriched colonies

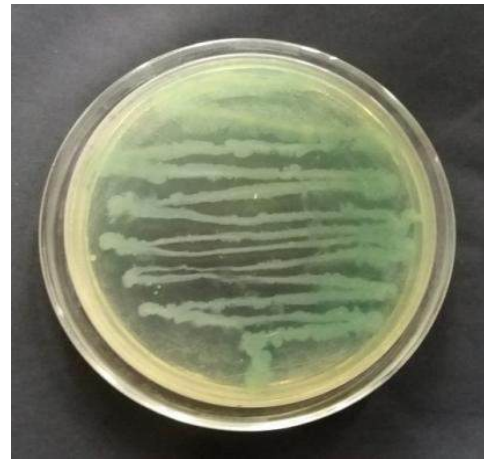


5th round of enriched colonies

**Plate II. Streak culture of Bifenthrin resistant
bacteria isolated from contaminated soil**



BI



BII



BIII



BIV

BI - *Arthrobacter atrocyaneus*

BII - *Pseudomonas aeruginosa*

BIII - *Pseudomonas putida*

BIV - *Bacillus pumilus*

Effect of temperature on the growth of bacterial isolates in pesticide added nutrient medium:

Growth response of each bacterial isolate in pesticide added medium was studied at varying incubation temperatures. Five different incubation temperatures such as 15°C, 35°C, 45°C and 55°C were selected, and the O.D. of the culture broth was measured at 600 nm, after 48 hours of incubation at respective temperatures.

Growth of Bifenthrin degrading bacterial isolates at different

temperatures were presented in **Table 2 & Plate III**. At 15°C temperature the maximum growth was recorded in BII (0.390) and minimum in BIII (0.192). In 35°C, the highest growth was noted in BII (0.555) and least in BI (0.338). At 45°C, the growth was more in BII (0.494) and less in BIV (0.326). At 55°C, the growth was high in BII (0.320) and lower in BIV (0.152). Among the four incubation temperatures, all the four bacterial species achieved maximum growth that was recorded at 35°C. Of the various temperature treatments, temperature of 35°C showed maximum growth of Bifenthrin resistant bacteria. The results were also agreement with Moreles gracia *et al.*, (2009) who have reported that all the three bacterial species i.e., *B. frigritolerans*, *B. aerophilus* and *P. fulva* achieved the maximum growth at 37°C providing maximum OD of 0.60, 0.73 and 0.84, respectively. The least growth was reported at 15°C could be due to the inability of bacterial metabolism at the low temperature. The low temperature caused viscosity of cytosol of bacterium that reduced growth Moreles gracia *et al.*, (2009).

Table 2. Effect of temperature on the growth of bacterial isolates in Bifenthrin added nutrient medium

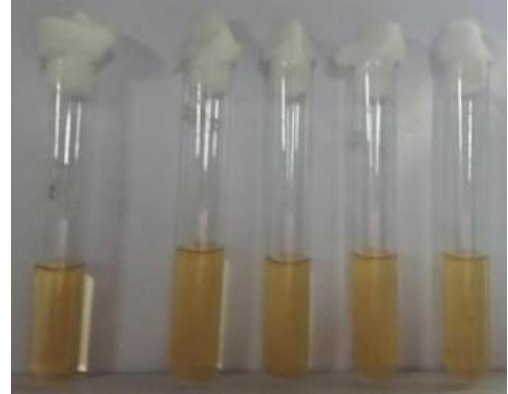
SAMPLE CODE	DIFFERENT TEMPERATURE			
	15°C	35°C	45°C	55°C
BI	0.219±0.3	0.338±0.4	0.441±0.3	0.201±0.3
BII	0.390±0.2	0.555±0.5	0.494±0.4	0.320±0.5
BIII	0.192±0.3	0.550±0.3	0.450±0.6	0.291±0.5
BIV	0.312±0.4	0.543±0.5	0.326±0.6	0.152±0.3

Mean of three replicates ± SD

Plate III. Effect of temperature on the growth of bacterial isolates in Bifenthrin added nutrient medium



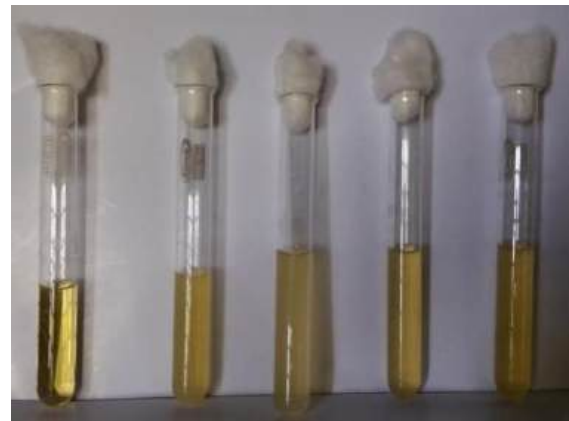
15°C



35°C



45°C



55°C

a- Control

b- BI.

*Arthrobacter
atrocyaneus*

c-BII.

*Pseudomonas
aeruginosa*

c- d-BIII.

*Pseudomonas
putida*

e-BIV.*Bacillus pumilus*

Growth Response of Isolated Bacterial Isolates at optimal temperature (35°C)

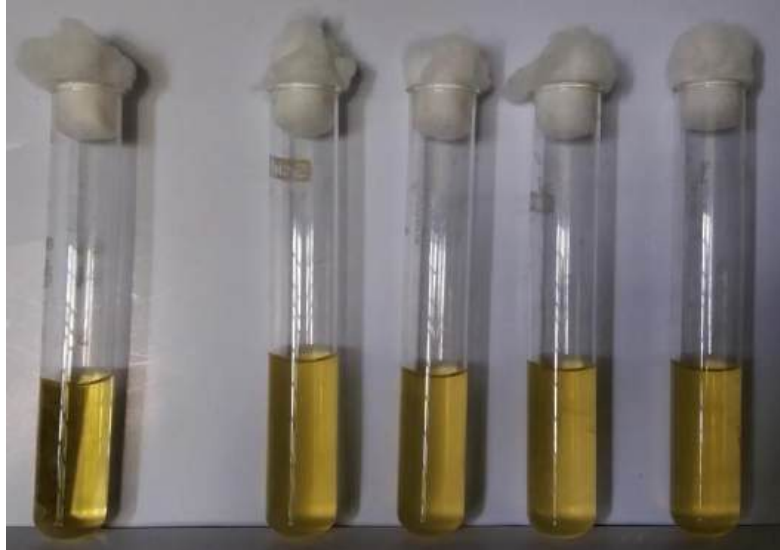
The growth response of bacterial cultures in nutrient broth amended with Bifenthrin at room temperature and under shaking condition was found to be varying significantly. The results are as given in **Table 3 & Plate IV**. The growth response was monitored by measuring the absorbance of cultures at 600 nm for a period of eight days. For majority of the growth was found to be maximal in 5th days of incubation. For BI, the highest growth was recorded in 5th day of incubation (0.790). The OD values ranges from 0.590 to 0.790 and finally decreased in 8th days of incubation (0.389). Similarly BII, BIII and BIV had OD values from 0.401 to 0.590, 0.501 to 0.611, and 0.520 to 0.611 these are decreased in 8th days of incubation 0.302, 0.481 and 0.329 respectively. The results are in agreement with Morles gracia *et al.*, (2009) who have reported that all the three bacterial species i.e., *B. frigoritolerans*, *B. aerophilus* and *P. fulva* had maximum growth was recorded at 96 hrs of incubation OD of 0.74, 0.68 and 0.91 respectively.

Table 3. Growth Response of Bifenthrin resistant bacterial isolates at optimal temperature (35°C)

SAMPLE CODE	NO.OF DAYS								
	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 9
BI	0.590 ± 0.4	0.624 ±0.4	0.559 ±0.5	0.694 ±0.3	0.763 ±0.5	0.790 ±0.4	0.621 ±0.4	0.490 ± 0.4	0.389 ± 0.3
BII	0.401 ±0.4	0.456 ±0.4	0.340 ±0.4	0.500 ± 0.6	0.580 ± 0.4	0.590 ± 0.4	0.502 ± 0.5	0.420 ± 0.3	0.302 ±0.2
BIII	0.501 ±0.5	0.599 ±0.5	0.550 ±0.5	0.761 ±0.7	0.760 ± 0.3	0.611 ±0.4	0.502 ±0.5	0.528 ± 0.4	0.481 ±0.1
BIV	0.520 ±0.4	0.564 ±0.5	0.543 ±0.4	0.606 ±0.1	0.590 ± 0.3	0.611 ±0.4	0.591 ±0.4	0.541 ±0.3	0.329 ± 0.3

Mean of three replicates ± SD

Plate IV. The growth response of bacterial cultures in nutrient broth amended with Bifenthrin



a - Control

b-BI.*Arthrobacter atrocyaneus*

c-BII.*Pseudomonas aeruginosa*

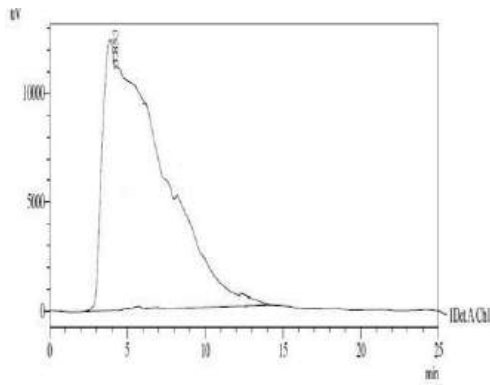
d-BIII.*Pseudomonas putida*

e-BIV.*Bacillus pumilus*

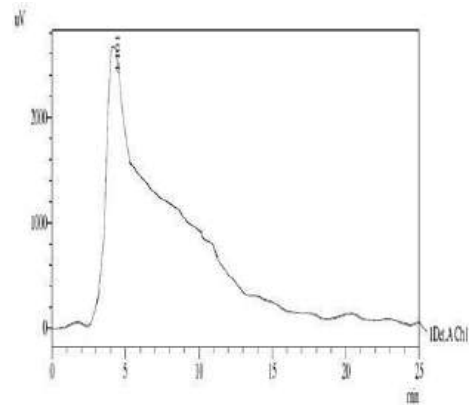
Study of pesticide degradation by HPLC analysis :

The bacterial isolates capable of metabolizing pesticide (Bifenthrin) were isolated from respective pesticides polluted soil by enrichment technique. *Arthrobacter atrocyaneus*, *Pseudomonas aeruginosa*, *Pseudomonas putida* and *Bacillus pumilus* were identified as Bifenthrin resistant bacteria. The degradation of Bifenthrin was determined by High Performance Liquid Chromatography (HPLC). The incubation mixture consists of nutrient broth, pesticides and isolated bacterial inoculation. The extraction solution was subjected to HPLC analysis. The HPLC test was analyzed by Dr. Simi, St. Joseph's College (Autonomous), Thiruchirapalli-2. The HPLC chromatograms of the pesticide (Bifenthrin) with uninoculated pesticide with inoculated nutrient medium were shown in **Fig 1**.

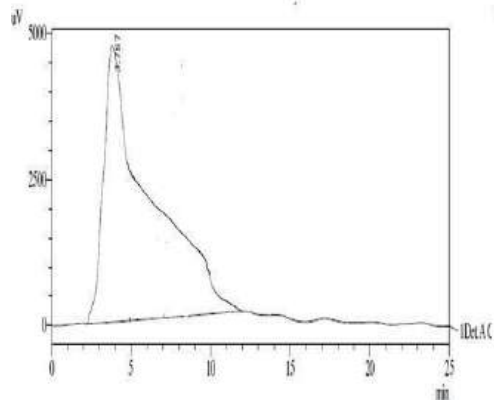
**Fig 1. The HPLC chromatogram of the pesiticide
(Bifenthrin) garden soil**



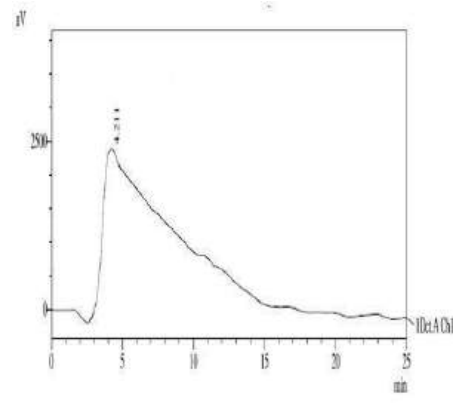
TBI



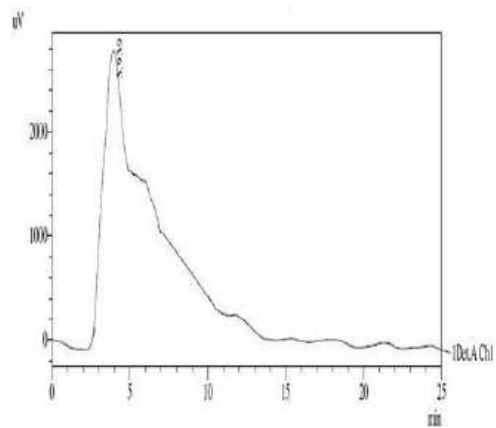
TBII



TBII



TBIII



TBIV

TB – Nutrient broth + Bifenthrin

TBI – Nutrient broth + Bifenthrin +
Arthrobacter trocyaneus TBII – Nutrient
broth + Bifenthrin + *Pseudomonas*
aeruginosa TBIII – Nutrient broth +
Bifenthrin + *Pseudomonas putida* TBIV –
Nutrient broth + Bifenthrin + *Bacillus*
pumilus

Degradation of Bifenthrin using HPLC

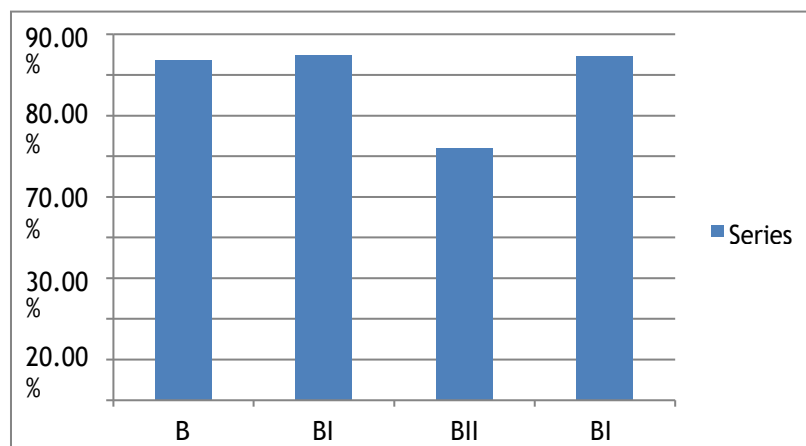
The results of Bifenthrin degradation were presented in **Fig 2**. The Bifenthrin peak was identified by their retention time. The retention time of Bifenthrin is around 3 to 4 minutes. The Bifenthrin degradation percentage by the respective inoculated bacteria was found by comparing the height of the Bifenthrin to the height of the Bifenthrin contaminated soil inoculated with resistant bacteria in the chromatogram. *Arthrobacter atrocyaneus* (BI) degraded 83.64% of the applied Bifenthrin pesticide. 84.94% of Bifenthrin degraded by *Pseudomonas aeruginosa* (BII). *Pseudomonas putida* (BIII) utilized 61.98% of applied pesticide. *Bacillus pumilus* (BIV) degraded 84.67% of pesticides.

Pseudomonas aeruginosa showed maximum degradation percentage than other isolates. The results were in agreement with Ifediegwu *et al.*, 2015 who stated that among the three bacteria isolates, *Pseudomonas aeruginosa* showed the highest Chlorpyrifos degrading capacity (60% reduction). This further affirms the claim made by Fulekar (2008); that *Pseudomonas aeruginosa* is the most Gram negative bacteria in the soil with Chlorpyrifos degrading potential.

Advantages

Phytoremediation techniques can optimize the yield of the crop plants with reduced chance of environmental hazards by Bifenthrin application. Environmental implications associated with persistent pesticides can be minimized. It is a less expensive, efficient and eco-friendly technology to clean up the environment than the equivalent physico – chemical methods.

Fig 2. Percentage degradation of Bifenthrin by the bacterial isolates



BI-*Arthrobacter atrocyaneus*
BIII- *Pseudomonas putida*

BII-*Pseudomonas eruginosa*
BIV- *Bacillus pumilus*

CONCLUSION:

Persistent organic pollutants are becoming an increasing global concern. Developed nations have the capacity to find alternatives and high cost cleaning up treatments for these harmful pollutants. Government of developed nation already banned several of these persistent pesticides as a cleanup mechanism. But developing nations like India still rely mainly on clean hazardous chemicals for the pest control. There is no proper regulatory mechanism to use these pesticides leading to potential harm to the environment and human health as well. Hence, there must be some assistance to implement alternatives to clean up the contamination that these chemicals caused.

Bifenthrin is the pyrethroid insecticides identified by the UN treaty as the potential hazardous pesticides of greater concern, as these are capable of persisting in the environment quite a long time and can cause so many metabolic disorders to human being. However these two chemicals are under constant use by farmers of developing countries, particularly in India. Remediation projects have been conducted at numerous pesticides contaminated soil. Incineration and low temperature thermal desorption are proven and frequently used methods for the remediation of these sites that gaining no positive results. So, the bioremediation and phytoremediation are the innovative alternatives that are gaining support as many bioremediation strategies have been successfully reported. Many of these successful phytoremediation technologies have been employed at different sites contaminated with different pesticides such as atrazine, glyphosate, cypermythrin. However, no substantial works have been carried out to remediate the paddy fields and banana fields contaminated with Bifenthrin. The study involves the collection of literature survey related to pesticides usage of local farmers and the extent of contamination of these fields with persistent pesticide such as Bifenthrin. Before the bioremediation projects was begun, all of the soil specific phytochemical parameters were survey and that revealed the continuous application of these pesticides and other chemical fertilizers rendered the soil unproductive for further cultivation. The array of literature also indicated that agricultural land of Thoothukudi district was contaminated with pesticide like Bifenthrin at the range between 50mg/L to 250 mg/L.

Hence, the bioremediation potential studies under lab conditions were done by using these pesticides at the concentration between 50mg/L and 250 mg/L. Further investigation was started with isolation of resistant bacterial strains from garden soil supplemented with pesticide such as Bifenthrin at

different concentrations that coincides to the level of contamination in the natural field. This trial involves enrichment technique. After 5 rounds of enrichment totally 4 different bacterial strains resistant to selected pesticide were reported. They have been identified as *Pseudomonas aeruginosa*, *Arthrobacter atrocyaneus*, *Pseudomonas putida* and *Bacillus pumilus*, In order to understand the physical condition; that is the temperature effect on growth of these bacteria at different incubation temperatures such as 15°C, 35°C, 45°C and 55°C were selected, and the O.D. of the culture broth was measured at 600 nm, after 48 hours of incubation at respective temperatures.

All the bacterial species including Bifenthrin resistant isolates achieved the maximum growth at 35°C providing maximum OD than other temperature. Among the different bacterial species isolated from Bifenthrin, *Pseudomonas aeruginosa* had maximum OD (0.559) at 35°C. Since these bacteria revealed their tolerance to Bifenthrin at the concentration upto 250mg/L. further study was extended to understand the pesticide degradation potential of these resistant bacteria using HPLC technique. The soil incubated with *Pseudomonas aeruginosa* was collected on 20th day of was subjected to HPLC analysis. The analysis revealed the highest degradation (84.9%) of Bifenthrin by *Pseudomonas aeruginosa*. In nutshell, the study shed the light of the different resistant bacteria strain studied, *Pseudomonas aeruginosa* and *Bacillus pumilus* are potential to be used in bioremediation of pesticide contaminated environment.

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