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Journal of Commerce, Arts and Science (JOCAS) is a bi-annual journal being published by Narasinha Dutt College, Howrah, West Bengal. It will be published twice every year. Research articles/papers relating to the disciplines of Humanities, Social Sciences, Commerce, Pure/Physical and Applied Sciences will be considered for publication. JOCAS seeks to encourage publication of both theoretical and empirical research articles of high quality offering new insights in the fields of commerce, arts, sciences and allied areas. Authors should follow the guidelines before submission. The publisher and the Editorial Board shall not assume any responsibility to share the views of the authors contained in their articles. All rights are reserved by the publisher. Reproduction of any matter from this journal or storing in a retrieval system or transmitted in any form or by any means is not permitted without the permission of the publisher of JOCAS.

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From the Desk of Editor-in-Chief

JOCAS (Journal of Commerce, Arts and Science) is successfully launching its third publication in this year. Dedicated and commendable effort of the Editorial Board has proved the fact that even pandemic cannot stop academic endeavour. **JOCAS** is one of the many means which endorse the vast proliferation of different academic spheres achieved by the institution down the years. **Swami Vivekananda** had said: *“Education is the manifestation of the perfection already present in man”*. To reach this perfection has been the target of our authors through their range of speculation that enlighten each article of this volume. Academic reflections in the area of Humanities cover topics as diverse as Baul Tourism, Female characters in Popular Comic and Fairy Tales, Shakesporean Heroines, Shavian Women, creation of Misir Ali by Humayun Ahmed, while scientific investigations ranging from “Phylogenetic Analysis of Some Mesophilic and Thermophilic Bacteria” to the theoretical findings of “n-composite naturals” to the thorough exploration of the “contribution to the Medicinal Weeds growing in and around the college campus” and lastly an experimentation regarding “Studies on *in vitro* callus induction and proliferation from leaf explants” make the volume all the more varied and interesting. The article “Historical evolution of Monetary Policy and India’s Standpoint” remains as an exclusive effort to determine the parameters of financial affairs.

I would finally like to express my sincere gratitude to all the authors and reviewers for their contribution in materializing this volume. I would also like to thank the editorial board for their praiseworthy patience and immense effort to make this issue a grand success.

Dr. Soma Bandyopadhyay
Principal & Editor-in-Chief

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Baul-Tourism: Vision of a Value-added Life

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According to the Cambridge Dictionary, 'Eco-tourism' is the business of organizing holidaying to places of natural beauty in a way that helps local people and does not damage the environment. It is about synchronizing the ideas of conservation, community-culture and sustainable travel. The Kenduli Mela in Birbhum is such a place for 'eco-tourism' rich with the potentials of socio-cultural promotion primarily because of the Bauls, a group of mystic mianstrels, the bearers of a unique musical tradition, identified by their saffron attire and distinctive musical instruments. Baul singers sing a philosophical way of life and living, a simple natural musical life deeply engaged with the lessons and motivations of eco-friendliness in senses more than merely physical. Living in village huts, singing with their ektara / dotara, discoursing in their akhras, Bauls are a traditional community of travelling minstrels, rooted in soil and located in 'nature' in the physical as well as spiritual sense of the term. Learning the life and living of Bauls might be construed as an effective module in 'eco-tourism', especially for the urban / metropolitan tourists. This paper aims to focus on the Bauls of Birbhum with special reference to the annual fair of Jayadev at Kenduli to consider how promotions of tourism through a Baul circuit in Birbhum can more seriously embrace the cultural heritage of the Baul tradition and thus inculcate the vision of an environment-friendly, planetary life.

Keywords: Eco-tourism, Baul-tourism, musical tradition, planetary life.

“Those who do not move do not notice their chains”: Rosa Luxemburg.

Urgency for emotional self-sufficiency and detoxification of routine-bound mundane life often ignites a passion for liberation from the bondage of a claustrophobic 'chain'. The word 'chain' carries a metaphorical sense of restriction, the breaking of which may lead to the joy of being liberated from mundane materiality. Our choking heart always craves for some resting place, some soulful solitude in the lap of Nature where a man can identify himself or herself with the fostering surroundings, where a sense of oneness with some larger planetary life upgrades the coherence of body and mind, of mind and spirit. Such a refreshing journey to one's own self is vital for a contemplative, holistic life-experience. This paper tries to focus on the possibilities of *Baul*-tourism, as a contemplative version of 'eco-tourism', the tourism that may also inculcate a more philosophical attitude to travelling through life by negotiating the limitations of time and place. This philosophical or rather spiritual

attitude to travelling lies deeply grounded in many of Tagore's songs, for example,

“পাছ তুমি, পাশ্চজনের সখা হে,
পথে চলাই সেই তো তোমায় পাওয়া।
যাত্রাপথের আনন্দ গান যে গাহে
তারি কণ্ঠে তোমারি গান গাওয়া।”

The Cambridge Dictionary defines ‘eco-tourism’ as the business of organizing holidaying to places of natural beauty in a way that helps local people and does not damage the environment. It is about uniting conservation, communities and sustainable travel (<http://dictionary.cambridge.org>). To quote Epler Wood, ‘eco-tourism’ is “purposeful travel to natural areas to understand the cultural and natural history_of the environment, taking care NOT to alter the integrity of the eco-system while producing economic opportunities that make the conservation of natural resources financially beneficial to local citizens” (Weaver: 2006, 192). From another point of view, Fennel said, eco-tourism is “a sustainable form of natural resource-based tourism that forces primarily on experiencing and low-impact, non-consumptive and locally oriented” (ibid: 192). For Ceballos Lascurain, cultural influences may be the secondary part of attraction for eco-tourism. Cultural importance of a place can provide an elemental and holistic approach sometimes with direct sometimes with indirect influences on human mind, philosophy, ethics and nature that surely affect the ‘dynamics of any contemporary eco-system’ for ‘interpretation and understanding’ (ibid:192). Keeping these reference points in consideration, the paper would like to stress on promoting Baul-philosophy and fitting it into the domain of eco-tourism. The basic argument is clear and the underlying question simple: can the philosophy of life and the songs of the *Baul* be cultivated and promoted among tourists as a value-adding qualitative component of ‘eco-tourism’ to make a better and healthy environment for all lives on the planet?

West Bengal, particularly Birbhum, is famous for the *Bauls*. Of course, *Bauls* are not only found in Birbhum; we find them also in Nadia, Murshidabad and other districts of West Bengal. Pabna and Kusthiya in Bangladesh are also famous for *Baul* songs and

Baul community habitation. These *Bauls* are mystic minstrels. According to some scholars, the word ‘*Baul*’, derived from Sanskrit ‘*batul*’ or Prakrit ‘*baul*’, means some sort of ‘madness’ (Sources: *Baul and Fakiri Traditions of Bengal*, sahapedia.org/বাউল_baul, মনসুর মুসা সম্পা. মুহম্মদ এনামুল হক রচনাবলী, প্রথম খণ্ড, “বঙ্গে সুফি প্রভাব”, ঢাকা: বাংলা একাডেমী, ১৯১১, <http://www.uniindia.com/baul-tradition-a-unique-heritage-of-bengali-folk-music/entertainment/news/965399.html>) The *Bauls* are mad in search of some kind of god close to their mind; in other words, they search madly for some sort of ‘inner-self’, a man living deep within (*moner manush*); they long for some sort of harmonization of a man living ‘without’ with a man living ‘within’. *Bauls*’ chief instrument, the ‘*Ektara*’ which symbolizes ‘unity’ and ‘peace’ bear a unique musical legacy. The term ‘*Baul*’ was mentioned in ‘*Chaitanya Bhagavat*’ by Brindavana Das as well as in ‘*Chaitanya Charitamrita*’ by Sri Krishnadas Kabiraj. The word came into use in the early part of the 17th C (www.sncwgs.ac.in). *Bauls* and *Fakirs* are commonly known to the people as wandering minstrels having *Ektara* in their hands and a bowl for alms. Their simple way of living a life portrays their philosophy which is greatly influenced by ‘*Sahajiya*’ Vaishnavism, Hindu Tantric thoughts, Buddhism, Sufism and also the Upanishads. The key-message of the Upanishads ignites its believers to look into one’s own-self. Such a philosophical and introspective search certainly moulds a man morally, ethically and psychologically, and does qualitatively enrich a person.

The image of an engaged performer of the *Baul* tradition—many such images being readily available in the public domains of many digital platforms—may give us a preliminary impression of their soulful vocation:



These photographs of Baul *akhras* surely provide primary impressions of their art and life:



Baul philosophy is a mystic philosophy of singing and living. The *Bauls* inculcate people to live 'naturally' as they believe in the 'Sahajiya' theory of learning 'naturally'. They search for the basic truth, knowledge and wisdom of life in a holistic understanding of the universe. The *Bauls* search for 'inner-self', free from the temptations of 'materialism'. They possess and promote all-encompassing love and sympathy for man and nature. They are eager to experience the taste of some metaphysical life going through the physical. This idealistic attitude helps them to negotiate all bitterness of troubles and miseries. A craving for the 'desired good' makes them look into a life of common man who in spite of his poor and wretched condition, never stoops to his circumstances. *Baul* singers, both men and women, rather address smilingly to the call of the '*moner manush*', with their songs sung to the accompaniment of *Ektara*. This dichotomy is believed to be the very essence of man's life. The man within lives like a bird in a cage, the soul confined in the body. Human body with the deep craving of the soul within is also the key-theme of their songs, the term, in Bengali, being 'Dehotatwo' (theory of the body).

The *Bauls* never negate the existence of our corporal life; rather, body and its usages repeatedly come back as a focal theme of their songs. But they do not like to be confined into the cages made of flesh and blood. Through their songs and philosophy they aspire to transcend from the mundane and materialistic life and reality to the world of the Infinity. It refers to the three-tier structure of body-mind-spirit: the basement or the ground floor is our body which can never be denied but through surpassing the barrier of corporeal limitations, the search may touch the ground of the mind which gradually drags to the realm of spirit. Somehow, this 'metaphysical' approach is needed to be incorporated into the very capitalistic approach of our life. This particular orientation may be understood with reference to a very common and popular song of Lalon Fakir:

"Khanchar bhitor achin pakhi kemne ase-jae, / Dhorte parle monoberi ditam pakhir paye". (How come an unknown bird moves in the cage? / If I could, I would have tied its feet with the strings of my heart). The *Baul* philosophy is deeply indebted to the songs of Lalon. Lalon's songs mock at identity politics which divides communities and generates violence; Lalon's songs build up a strong philosophical and cultural resistance to any communal conflict, conflicts based on castes, creeds, races and classes. Lalon's songs strongly reject the jingoistic nationalism. We may remember songs like:

"Jaat gelo, jaat gelo bole", (with the hue and cry of losing one's caste) or,

"Sab loke koy Lalon ki jaat sangsare" (everyone asks about which caste Lalon belongs to in the society). Both the songs are strongly vocal against the evils of casteism and racism. Even today, the *Bauls* keep singing songs that deal with the tenets of Lalon's philosophy. Many more songs of the *Bauls* centre on themes like devotion, mystic realisation and self-realisation. We may mention samples like the following:

- *"Moner manush ei manushe achhe layo chine / Tare dekh re mon, gyan nayone"* which means that the man dear to one's own self lives within and can be recognised only through the eyes of knowledge.

- “*Teerthe giye ki fal pabi mon / Jodi teerthe jabi, age tobe karo ayojon / Ja tor ghumaye mone, ore chinli na tare*” which regrets for lack of introspection and unnecessary importance given to formal pilgrimage.
- “*Pakhi kakhon jani ure jaye, / Ekta bad hawa lege khanchaye*” uses the same bird in the cage image to suggest that the bird may flee if the cage is hit by a foul wind.
- “*Khanchar bhitor achin pakhi, / Jwolchhe ekta ruper bati / E bado ajob kudrati*” indicates the philosophy of body and also focuses on the virtues and good habits of a man which help him to go through the dark phases of life. The song may carry a similar import like that of the famous Tagore song “*Nibir ghano andhare, jwolichhe dhrubotara, / Mon re mor pathare, hos ne dishehara*” (The polestar shines in deep darkness, / O my mind, don't get lost in the waves).
- “*Mon majhi tor boitha ne re / Ami aar baite parlam na / Aami janam bhoriya bailam boitha re...*” sings about the struggle of life against all adversities and about the need that the boat-like life must come to the shore.
- “*He mon tare daikho aankhi khuliye / Jini achhen sada antare / Sobare chhari prabhu karo tare / Deho mon-dhan-jouboun / Rakho taari odhine*” provokes us to make the ultimate surrender at the feet of the ultimate Lord to attain eternal love and peace.

There is no thread of any religio-cultural exclusionism like racism, casteism, communalism or aggressive nationalism in the songs of the *Bauls*. The philosophy is echoed in the words of Albert Einstein: “A man's ethical behaviour should be based effectually on sympathy, education and social ties; no religious basis is necessary.” (Roberts, 2011: p: 103) In Tagore's songs, these life-enhancing features of *Baul* philosophy have been clearly imprinted.

The *Bauls* of Birbhum get highlighted compared to their compatriots at other places primarily because of the aura of Santiniketan and the overwhelming presence of Tagore as well as because of the Kenduli Fair of Joydeb being held at Illambazar in Birbhum, every year in the month of January on the bank of

River Ajay. The fair has been declared by the UNESCO as one of “Masterpieces of the Oral and Intangible Heritage of Humanity” in 2005. This happens to be the largest fair for the *Bauls*. *Bauls* come from different parts of the world to perform. Tagore's Santiniketan is not very far from Kenduli, and much of Tagore's performing arts like his songs and dances are very close to the *Baul* culture and tradition. Some of his songs directly come under the *Baul*-category, for example, “*Aamar ei path chaoatei anando / Khele jae raudro chhaya, barsha ase, basanta*” (I am pleased with this looking at the road / Here play the sun and the shadow, the monsoon comes, and the spring) It is, as if, the singing voice here is that of a *Baul* minstrel observing the walkway of life, searching through the seasons the ultimate truth. We may also remember “*Aamar praner manus achhe prane, / Tai heri tae sokol khane*” (My man of life lives in me / So I see him everywhere). It is, as it were, the singing voice refers to the inner self of every human-being. When the poet notes “*Majhir laagi achhi jagi sakol ratri bela / Dheu gulo je amay niye kore kebol khela*” (As I remain sleepless all through the nights / The waves only keep playing with me), it directly harps on an ardent soul which is craving for a meeting with his most desired one, so that he can calmly tide over the turbulent waves of sorrows, anxieties, troubles and miseries of life. Here are some more songs of Tagore that reflect the *Baul* philosophy in a soulful way:

“*He mor debota / Bhoriya e deho-praan, / Ki amrito tumi, chaho koribare paan*” (O my lord / Filling this body and soul, / What elixir of life you want to drink), or “*Prabhu amar, priyo amar, parom dhan hey*” (O my lord, my love, my essence of life), or “*Pathe chole jete-jete / Kothay konkhane / Tomar parosh ase, kakhon ke jane*” (While travelling through the roads / Who knows where and how / Your touch comes to me)—each of them suggesting how the poet eagerly awaits the unification with the Man living within him.

Tagore-family patronized the *Baul* and Lalon songs. We may cite the comment of a learned observer in this regard: “This goes without saying that if Jorasanko Thakur Bari and especially Rabindranath Tagore did not search through their constructive patronage,

however strong be the campaign by the middle-class intellectuals, Hindu resurrections never could see Lalon. That was a strong promotion backed by the Tagores who gave *Baul* songs and Lalon immortality". (Chakraborty, S. 2001, pg. 103). Even Tagore himself once wrote: "In so many songs of mine, I have used *Baul* tune and in some others, knowingly or unknowingly, my songs are influenced by *Baul* tunes tinged with other Ragas. Through this fusion, it is quite evident that *Baul* songs for both lyric and tune quite easily mingle into my senses so much so that they become inseparable from my creation" (ibid: 103).

We initiated this paper with the argument that such philosophy can be tagged on to the project of tourism to make a different sense of tourism in the promotion of environment in a more philosophical way. In this regard, we would like to mention a comment made by Charles Darwin: "In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively, have prevailed" (Roberts, 2011: 81). *Bauls*, undoubtedly, have the quality of being 'together' with mankind, 'improvising' their thought, feeling and philosophy through their songs as well as their life and living, their attitude to life with a positive and long-term effect. If the *Baul* philosophy is promoted through tourism, a holistic world-view can be built against the backdrop of today's capitalistic world. Once G. B. Shaw commented: "Capitalism has destroyed our belief in any effective power but that of self interest backed by force" (ibid: 87). This menace of 'self-interest' can be positively challenged if we nurture the philosophy of brotherhood and ethics, of 'being together' with nature and environment, and obviously having a 'co-ordination' in mentality and attitude.

Before we conclude, we would like to defend our argument with some proposals because Baul-tourism may be a new and innovative concept to extend the frontiers of eco-tourism. We do believe that eco-tourism should not primarily aim at making business or profit. Its primary target is to cultivate and promote tourism in such a way that it can substantially protect our environment—not only the physical but also cultural, precisely human environment. By opening a

permanent cultural centre somewhere in Santiniketan ('The Gateway of Birbhum') to make tourists fully aware of *Baul* music, *Baul* philosophy of life, *Baul* way of living, a new kind of cultural tourism may be initiated keeping close eyes on the *Baul* fair at Kenduli, *Baul* Akhras at different places in the district of Birbhum, such as Suripara, Parul Danga, Kangkalitala, Adityapur, Bhuvan Danga, Sonajhuri and other locations, taking into account the features differently associated with the *Baul* tradition. After a thorough introductory exposure to the Baul tradition and heritage at the said cultural centre, Indian and foreign tourists may be escorted to a *Baul* circuit including chosen spots vibrant with *Baul* life, *Baul* music and *Baul* philosophy of life and environment. It should be noted that foreign tourists have especial curiosity and inclination for our culture and heritage. Tourists from outside Bengal may also find this tourism attractive. The proposed *Baul* tourism shall hopefully inculcate a natural, musical, environment-friendly attitude among the tourists. Such tourism shall serve to promote and explore a long-cherished cultural heritage of Bengal in India and abroad. Promotion of *Baul* tourism among the foreign tourists may also open up some source of earning and a better livelihood for the *Baul* singers.

In order to protect and promote our environment, we need a natural and spontaneous motivation, better understanding of and sympathy with Nature. *Baul* tourism may thus harvest a more than material profit if it is envisioned and implemented on a long-term basis. Our vision and proposals for launching this experimental tourism are:

- a) Promotion of tourism through a *Baul* circuit in Birbhum to more seriously embrace the cultural heritage of the *Baul* tradition and thus inculcate the vision of an environment-friendly, planetary life.
- b) Establishment of a *Baul* tourism-cum-cultural centre at Santiniketan.
- c) Making proper study to map out the tourist locations and mobilising all feasible resources to build up the basic minimum infrastructure for the tour programmes.

This is because we believe that only tree-plantation is not enough to make an eco-friendly environment; rather a man philosophically upgraded in spirit and thought can make a better and sustainable eco-friendly environment. The life and living of *Bauls* can surely be a model to make a beginning in this direction. The question of its feasibility may arise; there may be some doubt as to how far the scheme is practicable. But every thesis begins with a hypothesis before it arrives at a confirmation. When Bernard Shaw wrote his famous play, 'Man and Superman', he gave it a sub-title, 'A Comedy and A Philosophy'. We may follow suit by calling our idea of *Baul* tourism 'A Tourism and A Philosophy', inculcating the vision of a value-added life.

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মনসুর মুসা সম্পা. মুহম্মদ এনামুল হক রচনাবলী, প্রথম খণ্ড, "বঙ্গে সুফি প্রভাব", ঢাকা: বাংলা একাডেমী, ১৯১১

Discourse of representation and characterization of women in narratives of popular comics and fairy tales for children and their adaptations in audio visual media

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The scope of graphic narratives has remained immense since its inception as it successfully adopts the facade of being narratives of children. The oxymoronic playfulness provides a potent space for critiquing and commenting on socio-political scenarios and as well as building a dreamland. Fairy tales and comics are part of every child's childhood, they are a part of the growing up process of each and every child, often having deep impact on the young minds and effects on the mindset of the children. Children tends to relate themselves and follow the footsteps of the characters they read or watches on audio visual media. The women characters of popular comics and fairy tales are mostly portrayed as demure, helpless, pretty young girls often incompetent to fight for their own rights and justice. Problems starts from here as these characters have deep impact on the young minds and after reading and watching these tales and comics, an imagine often gets drawn in the mind of the children about women that is quiet improper and negative. The delightful humour of the comic panels or fairy tales lies in representing women in their extreme stereotypes. In comics we often find women in a distasteful role. Women are not only misrepresented, their identities being reduced to play the cultural stereotypes or commodified, but they are also not represented at all. With changing time and development in the field of audio visual media, the projection of female characters have also came a long way. With growing popularity of adaptations of fairy tales and comic characters for audio visual medium, new trends are developing in representation of female characters who are powerful and portrayed in proper and dignified manner. In this 21st century, it is extremely important to discuss what message we are actually catering to our future young generation, embedded in form of comics and fairytales.

This paper is an attempt to study the discourse of representation and characterization of women in comics and fairy tales for children and their recent trends of adaptations in audio visual media.

Keywords: Fairy tales, comic, women, humour, stereotype, commodification, audio-visual media.

Introduction:

‘The graphic novel is a man’s world, by and large...’
(McGrath)

Cartoons and fairy tales are part of every child’s growing up years. The scope of graphic narratives has remained immense since its inception as it successfully adopts the facade of being narratives of children. Comics and fairytales provides a potent space for critiquing and commenting on socio-political scenarios and as well as building a dreamland for kids. They have deep impact on the young minds and effects on the mindset of the children. Children tends to relate themselves and follow the footsteps of the characters they read or watches on audio visual media. With changing time and development in field of audio visual media, recent trends have emerged where the age old fairy tales and comic characters are audio visually presented to children through television shows and films. There is a general view that the media acts as important agents of socialization, and therefore contributing to the shaping of gender roles. Children are particularly susceptible to the way in which genders types are portrayed on television and films, especially cartoons which make up the majority portion of children’s television viewing practice between the ages group of two to ten years of age. Therefore, it can be assumed that children might learn a lot from the portrayals of males and females in cartoons. The messages conveyed through representation of males and females in fairy tale books or comic strips contribute to children’s ideas of what it means to be a boy, girl, man, or woman. The disparities that they find point to the symbolic annihilation of women and girls often suggests to children that these characters are less important than their male counterparts and are weak. The women characters of fairy tales are mostly portrayed as demure, helpless, pretty young girls often incompetent to fight for their own rights and justice. Problems starts from here as these characters have deep impact on the young minds and after reading and watching these tales and comics, an imagine often gets drawn in the mind of the children about women that is quiet improper and negative. The delightful humour of the comic panels

or fairy tales lies in representing women in their extreme stereotypes, as if they try to implement the fact that girls are weak and incompetent to protect themselves and a male figure is always stronger than them, and hence should always be there to protect them. In comics we often find women in a distasteful role. They are often hyper sexualized. Women are not only misrepresented, their identities being reduced to play the cultural stereotypes or commodified, but they are also not represented at all. Critics have often noted that the roles of women as both supporting characters and lead characters are substantially more subjected to gender stereotypes, with femininity and or sexual characteristics having a larger presence in their overall character.

Aims:

This paper is an attempt to study the discourse of representation and characterization of women in comics and fairy tales for children and their recent trends and also their representation in audio visual medium.

Research questions:

The main questions that are to be considered in this paper are:

- Are female characters misrepresented in comics and fairy tales?
- If yes, then what is the reason behind this stereotypical misrepresentation?
- How and what changes can be brought in the field of representation of female characters in comics and fairy tales in today’s age of audio visual media?

Research Methodology: To conduct the research and reach a conclusion, empirical approach will be done. Qualitative method of research will be followed and qualitative understanding will come through in-depth analysis of the contents of the popular fairy tales and comics for children and their recent audio visual adaptations.

Theoretical Framework: While doing this research work, reference can be drawn to George Gerbner’s Cultivation theory. According to this theory a long ,

persistent exposure to media (audio visual specially, like television) is capable of cultivating common beliefs about the world. Gerbner highlighted through this theory that the powerful effect of mass media act as moulders of the society. To complete this research paper we will also refer to Freudian model of psychoanalysis consisting of the concept of Conscious, Pre Conscious and Sub conscious mind.

Analysis of Representation of female characters in comics and fairy tales for children:

“In conclusion, modern children’s picture books continue to provide nightly reinforcement of the idea that boys and men are more interesting and important than are girls and women.” (Hamilton, Broaddus, Niehaus, 2006). There have been controversies surrounding representation of women in the comic book worldwide since the very beginning of the industry, their gender roles, stereotypes, and unrealistic body type depictions. The women that have starred as leaders, supporting characters, have both succeeded and failed throughout each comic book age in justly portraying women representation. Patriarchal representations of women in comic books have not been positive from a woman’s point of view. The creators and presenters of these characters often neglects the dignity and sentiments of the female readers and audiences. They are presented as beautiful but weak and incompetent characters. They have gone from damsels in distress, to sexualized objects, being drawn by men and created for the male audience, what is considered “attractive” to the male gaze. This portrayal often is a reflection of misogynist attitudes towards women in the patriarchal culture. “The images of women with large bust sizes, slim figure, bare legs, and half-naked appearance became enormously popular after the success of Wonder Woman. Believe it or not, comic books were filled with so many sexual images of women that they were known as “headlight comic books” — a crude and stereotypical reference to the female anatomy”. (Jehanzeb, 2019).

The adults who reads out fairy tales and bed time stories to the children often transporting them in a fairy land tends to often forget about the long lasting effects of these characters on young minds.

Let us consider few popular fairy tale characters to analysis the portrayal and characterization of female characters in these tales:

Snow White is a 19th-century German fairy tale which is today very popular throughout the world thanks to Disney. The fairy tale features a young princess and such elements as the magic mirror, the poisoned apple, the glass coffin, and the characters of the Evil Queen and the Seven Dwarfs. The princess is typically portrayed as a damsel in distress, powerless who has to save by the Prince charming. Whereas the step mother of the princess is typically portrayed as the evil, self-obsessed queen determined to destroy everyone to gain power.

Cinderella – Tale of a poor teenage girl, living at the mercy of her cruel aunt and cousin sisters, who treats her like a slave, until one fine night when an angel comes and gifts her a pair of shoe so that she can go to a ball and meet her handsome prince charming, who can save her from her current misery, marry her and gift her a dignified wealthy happy life. The title character is a young woman living in unfortunate circumstances that are suddenly changed to remarkable fortune. Here again the lead female character is incapable of changing her destiny and is depended upon her prince charming to help her come out of her misery.

The Princess and the Frog - A fairy tale telling the story of a hardworking poor girl who dreams of living a life of dignity and wealth. After kissing a prince who has been turned into a frog by an evil voodoo sorcerer, she becomes a frog herself and but finds a way to turn back into a human before it is too late and also turns the prince back into human. Then they marry and live happily forever.

Thumbelina - is a literary fairy tale written by Danish author Hans Christian Andersen . Thumbelina is about a tiny girl and her adventures with marriage-minded toads, moles, and cockchafers. She successfully avoids their intentions before falling in love with a flower-fairy prince just her size, marrying him and living a happy life.

Sleeping Beauty - is a classic fairy tale about a princess, Aurora, who is cursed to sleep for a hundred

years by an evil fairy, where she would be awakened by a handsome prince with a kiss.

Rapunzel - Rapunzel is a classic fairy tale where a beautiful princess with exceptionally beautiful long hair is held captive in a tower by an evil witch, who is ultimately saved by a handsome young knight.

In all the above mentioned tales we can notice that all the female lead characters are represented as beauty, demure, powerless, fragile figures, and incompetent to fight for their justice and totally depended on destiny to bring them a prince charming who can save them from their nemesis and misery. The beautiful, innocent, abused maiden dutifully cleans the house or minds her cruel elders and does nothing to better her situation. The only way her situation in life changes is when a man, a handsome prince, who comes along and rectifies the situation, saving her, thus also satisfying the deep rooted patriarchal thinking of the society. The girls, they don't have any voice of their own, Marriage being the ultimate goal and destiny of every girl. On the other hand the negative female characters are always stereotypically portrayed as ugly, self-obsessed often stupid power hungry women. Either ways all of them are presented in a very distasteful manner.

The implications could be that when Children reads these fairy tales or observes television shows showing these characters, they might perceive from such tales and cartoons that it is not natural in society for women to have the main more domineering jobs in society and that the jobs which require a lot of strength are carried out by mostly males. Males are represented as more dominant and the females are very stereotypical in their colour. The females are also presented as being more passive and reliant on the male characters. From the debut of the first female superhero, Wonder Woman, Created by William Moulton Marston, the representation of women was always within the frame of gender bias. Marston created Wonder Woman to counter to what he perceived as an overly masculine-dominated world but unfortunately after his demise Wonder Woman went through a subtle standardization process that more closely mimicked typical female roles, appropriate for male gaze. The fate of most of

the female super heroes have suffered miserably in the hands of the patriarchal representation of typical female characters.

With development in the field of technology, television is a part of every household today and several channels are dedicated only for children viewers running different programs meant for children, the most popular among them being cartoon shows. Earlier children used to read cartoon strips from books or papers but now television is the most popular medium for them. There is a general view that the media act as an important agents of socialization, and therefore contributing to the shaping of gender roles. Young children watching television from a very young age, finds difficulty telling fantasy from reality. Children are particularly susceptible to the way in which genders types are portrayed on television, especially comics and cartoons which make up the majority of children's television. Therefore, it can be assumed that children might use the portrayals of males and females in cartoons as real. But the problem is that the roles which women are given in cartoons are still stereotypical with women being portrayed as emotional, passive, frail, and feminine and they are less active and less domineering. The lead male characters tended to be more independent, assertive, athletic, technical, and responsible than the female characters.

Representation of female characters in comics and fairy tales for children- Indian Perspective:

In India, the comic books were first produced with the intention of educating the children of the nation about the mythological and historical figures, which were predominantly male. India being a land of patriarchy, since the birth of the comics in India, the male characters have been given the central positions as it is a male dominated society where women are considered as subordinate and inferior to men. Women characters in comics were given mere importance, mostly they were assigned the profession of being housewives and they were sketched with stereotypical body types, loud and indecent attire like Bini chachi (wife of Chacha Chaudhary). Never did these characters motivate the readers to encourage the women in real life. All wit

and power were showcased through the male characters like Bahadur, Doga, Nagraj, Super Commando Dhruv, Chacha Chaudhary etc. It was in the hands of these characters to resolve the conflicts and bring end to the evil in the story. The few women characters present in these comics were supporting characters and were used for the development of the plot. They were portrayed as beneficiaries, they either played the supporting role or a powerless one. Even when they played protagonist, it was their dumb and confused quotient that raised the conflict in the plot. Their 'problem-solving' quotient was negligibly reflected in the early Indian comics.

In Indian fairy tales the female characters were primarily divided into two categories – the obedient, demure “good” girl, who were predominately beautiful and dutiful towards their in laws and followed every order of their husband without uttering any questions. On the other hand there were the “bad” girl characters who were portrayed as naughty, selfish because they denied to follow the social order and were predominately ugly. These stories were narrated to the young children by the elders so that right from the young age with a tender mind the girls can be taught to be demure, meek and ever sacrificing self. Another important area is that the fairy tales had female characters being portrayed as evil supernatural characters like “Chudrail”, “Petni”, “Sakchunni”, “Dayan” and many other such characters. It is interesting to note that the number of male evil supernatural characters were much less than female evil supernatural characters.

More than often the female characters are projected in a disrespectful manner also. “On a darker side, the women are now portrayed as flaunting objects. Even though they have gained their identity in the Indian comic industry yet their depiction is not of a kind that earns respect. Firstly, the outfits imposed on these characters are completely out of the social context. Be it rebellious Shakti, intelligent Chandika or powerful Devi, the outfit is highly skimpy and revealing. The attire associated with Shakti is quite indecent with the flesh being flaunted from here and there. The same is the case with vamp Nagina. Newly established Virgin Comics are a step ahead as far as the salacious outfits of women characters are concerned. While Devi is always

shown in skin tight lycra dress, the Snake Woman is seen exposing her skin in a femme fatale manner.” (Siddiqui, Naz, 2015).

Recent development in the field of portrayal of women in comics and fairy tales for children in audio visual media:

With changing time there has been developments taking place in the depiction and representation of female characters in cartoons and fairytales for children. With development in the field of audio visual media new trends are developing where women are portrayed in much dignified matter unlike earlier. Now they are beautiful but not powerless and incompetent to fight for their justice like earlier. They are bold and have voice of their own and are not depended upon their prince charming solely. Though their advancements towards a positive progression have been slow, but there has been a positive change recently and that is pleasing to the industries' rapid growing female fans. The last few years showed a drastic change in the portrayal of women in Indian comics as well. More women characters are now created and recognized in the comic industry. The characters are moving away from their stereotypical portrayal. For example Raj Comic's “Shakti” is a symbol of sheer women power. She is an incarnation of Goddess Kali and has emerged out to fight unruly practices of men over women. Almost in every issue of Shakti, a satirical but motivational dialogue appeal is made to invoke the readers. Whether viewed as a superhero, a villain or simply the love-interest of Batman, “Catwoman” has endured many character transformations and is still holding strong today. She was never depended on any male counterpart and always bold and had a mind of her own. “Sue Storm”, only female member of Marvel's, the Fantastic Four, was once a weak character always in need of rescuing, has grown into what is considered to be the strongest and most powerful character of the group, rather just being a dutiful wife and mother.

With development in the children film industry now a days, stories of fairy tales and comics are now adapted and made into films. Here changes are made in the storylines and the female characters are given new

twists and are presented in powerful manner like the animated film “Tangled” (2011) , based on the story of Rapunzel, where Rapunzel is smart , intelligent and competent enough to fight for herself , rather than waiting for her prince to help her out. A whole new series in being made on the character “Wonder Women” the warrior princess of amazon produced by the media giant DC. This series has a huge fan following, showing the swift in the mentality of the audiences, as they now prefer female sheroes, equally as male heroes. In films like “Snow white and the Huntsman”, (2012), “Red Riding Hood” (2011) we could clearly identify the fighting spirit of the female protagonists , as they fight for their own rights and justice , sometimes even protecting others like a trained fighter and protector. If we consider the animated child film “Moana” (2016), we don’t get to see any “prince charming” actually. The whole journey is that of our young female protagonist, her fight against the evil and her triumph over it. On a positive note, few female characters who were earlier portrayed as predominantly evil without any proper reason, have now successfully emerged as characters with dignified shades. For example the character of Maleficent from “Sleeping beauty” was originally crafted as a pure evil fairy causing destructions but in the recent film adaptations of the character – “Maleficent” in 2014 and “Maleficent: Mistress of Evil” in 2019, here Angelina Jolie played the role of Maleficent, she is given a proper dignified background story, where she is actually a tragic character than an evil one. She is strong, powerful, yet vulnerable and often being betrayed by the persons she truly loved and cared for, causing her to seek for revenge with vengeance, yet she is a loving motherly figure to Aurora and the protector of the fairies and kingdom of Moors.

These changes are happening for betterment because stereotyped portrayals of the sexes and underrepresentation of female characters contribute negatively to children’s mental development, can limit their career aspirations, frame their attitudes about their future roles and even influence their personality characteristics. These powerful representation of female characters are successful in motivating the children and helps in building a stable and unbiased mental state for both the sexes.

Conclusion:

“How important it is for us to recognize and celebrate our heroes and she-roses!” Maya Angelou, African American Poet.

Gender stereotyping and under-representation of women characters have been documented in children’s fairy tales and comics in the past, in the hope that one day improvements would follow. Though the truth is that depiction of female characters in the fairy tales and comics industry always had a complicated relationship with female characters, mostly presenting them in stereotyped undignified manner, the trend is fast changing. With growing popularity of adaptations of comic and fairy tale characters for audio visual medium, new trends are developing in representation of female characters who are powerful and portrayed in proper, decent and dignified manner. Improper gender portrayals in the comics and fairytales are cause for concern because of the importance of them in the socialization process for children and their impact on mental growth of children. Children tend to imitate same-gender characters more than opposite-gender characters therefore, the comics and fairytales plays an important role in modeling gender-specific behavior among young children. Realistic and varied portrayals of men and women can enhance healthy development while unrealistic stereotypical representations can negatively influence young minds. New style is also emerging in the field of writing fairytales and comics for children where there is no biasness towards a particular gender and female are given the same place of power and position like their male counterpart like in Rupkotha Samagra by Nabaneeta Debse, who herself is an acclaimed Indian writer. This is a ray of hope not only for the better representation of women in comics and fairy tale, earning them their due respect and dignity but also will help in creating a proper mind set among the children when they will watch or read such unbiased, mature and proper female characters in books or on screen. To build a healthy society it is essential to develop proper sound mind set of young children from their growing up years as what they learn at this age have a lifetime effect on their mind and personality. Children should be able to draw inspiration from such female characters.

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Phylogenetic Analysis of Some Mesophilic and Thermophilic Bacteria Based On 23S rRNA Sequence

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The relationship among different groups of bacteria is increasingly supported by the molecular phylogeny and forms the basic platform for understanding of their natural affiliation and subsequent classification. Comparative rRNA sequence analysis is the most widely used approach for constructing the microbial phylogeny. The more or less conserved primary structure and higher-ordered structural elements of rRNA express the evolutionary history of microbes. The prerequisite for a reliable phylogenetic conclusion is the optimal primary structural alignment and a careful data selection. In this study few mesophilic and thermophilic bacteria are selected and their evolutionary relatedness is calculated based on 23S rRNA sequence conservation. Interestingly it is found that some mesophilic bacteria are more closely related to thermophiles on the basis of 23S rRNA sequence homology. This signifies the need of reconstruction of classical microbial classification system from evolutionary point of view using conserved rRNA sequences.

Keywords: 23S rRNA, Extremophiles, Multiple sequence alignment, Phylogenetic tree.

1. Introduction

Molecular phylogeny supports the proper understanding of relationships between different organisms and provides the platform for classification of all microorganisms. Bacterial identification and its phylogenetic position are elucidated by rRNA sequence analysis. Microbial evolution is supported by conserved primary and advanced order structural elements of 16S rRNA. ATP synthase β subunits, elongation factors etc. are also used as phylogenetic markers (Cowan, 1968). Now-a-days comparison of 23S rRNA sequence is also used as an efficient tool to reveal the evolutionary history and to establish phylogenetic relationship among different genera (Cliffs and Woese, 1993; Ludwig and Schleifer, 2017).

Contemporary organisms are the products of historical events during the course of evolution and their structures at all levels reflect their evolutionary history. In microorganisms, prehistoric documents of earlier evolutionary events are hard to be found at the phenotypic level. It has almost taken 100 years to finally unleash the phylogenetic relationship of prokaryotes (Cowan, 1968). The conclusive construction of the bacterial phylogenies is allowed by comparatively studying the phylogenetic marker molecules and by comparing the phenotypic level of evolution, a higher number of definable characters at the molecular and genotypic level can be obtained. The underlying genetic information for every definable phenotypic function comprises tens to thousands of evolutionary independent sequence residues. Size is an important factor regarding the usefulness of the molecules for the reconstruction of major phylogenies. Since every individual sequence position can only carry the information on a rather narrow range of evolutionary time, an increasing number of independently evolving positions or regions augments the number of phylogenetic levels which probably can be detected. Another most important advantage of large sized molecules like 16S and 23S rRNA over smaller molecules like 5S rRNA is that the localized non-random rearrangement does not tend to disturb the complete picture that is derived from comparative analysis (Trifiper and Achleifer, 1991; Zuckerandl and Pailing, 2005).

Selected genera for this study belong to Mesophiles (according to their optimum temperature of growth)

and extremophiles (according to their tolerance of extreme environmental conditions such as - extreme temperature, acidity, alkalinity or chemical concentration). RNA molecules conferring thermal adaptations are also known. The G+C content of rRNA and tRNA of thermophilic bacteria is higher than mesophiles, the base pairs of G+C forms more hydrogen bonds than that of A+T base pairs and higher the G+C contents in double-stranded stem region more is the thermostability of the RNA molecules. In this study the phylogenetic relationship between some selected mesophiles and thermophiles are established by comparing their 23S rRNA sequence.

2. Materials and Method

2.1. Target Organisms:

Five mesophilic and five thermophilic bacteria were selected. Among the selected mesophiles most of the bacteria belong to Class III γ proteobacteria and most of the thermophiles belong to high G+C content in Bergey's Manual of Systematic Bacteriology; selected mesophiles and thermophiles are mentioned in Table 1 and 2.

2.2. Search of 23S rRNA sequences of the selected mesophiles and thermophiles:

23S rRNA sequence data of the selected mesophiles and thermophiles or extremophiles were collected from NCBI (National Centre for Biotechnology Information) and their accession numbers were mentioned in Table 1 and 2.

Table 1: Target mesophilic bacteria and respective 23s rRNA accession number

Sl. No.	Name of the bacteria	23S rRNA accession no.
1	<i>Escherichia coli</i>	>NR_076322.1
2	<i>Staphylococcus aureus</i> subsp. aureus strain N315	>NR_076325.1
3	<i>Salmonella enterica</i> subsp. Entericasero var Typhi strain Ty2	>NR_076191.1
4	<i>Vibrio cholerae</i> O1 biovar El Tor strain N16961	>NR_076165.1
5	<i>Pseudomonas aeruginosa</i> strain PAO1	>NR_076166.1

Table 2: Target thermophilic bacteria and respective 23S rRNA accession number

Sl. No.	Name of the bacteria	23S rRNA accession no.
1	<i>Deinococcus radiodurans</i> strain R1	>NR_076078.2
2	<i>Thermus thermophilus</i> strain HB27	>NR_076211.1
3	<i>Thermus scotoductus</i> strain SA-01	>NR_076136.1
4	<i>Chloroflexus aurantiacus</i> strain J-10-fl	>NR_076553.1
5	<i>Spirochaeta africana</i> strain Z-7692	>NR_103194.1

2.3 Prediction of secondary structure of 23S rRNA:

Secondary structures of selected 23S rRNA sequences were predicted using RNAfold webserver (<http://rna.tbi.univie.ac.at/>). Energy minimization was done. The centroid structure was built (Lorenz et al., 2011).

2.4 Multiple Sequence Alignment (MSA):

To understand the sequence similarities between different strains or different species multiple sequence alignment is used. In this study the 23S rRNA sequences of the selected mesophiles and thermophiles were aligned in Clustal Omega (<https://www.ebi.ac.uk/Tools/msa/clustalo>).

2.5 Phylogenetic tree construction:

Alignments were also used to establish evolutionary relationship and construction of the phylogenetic tree. The sequences were used for constructing the tree by using MUSCLE alignment software. Phylogenetic tree was constructed by maximum parsimony method using 1000 bootstrap values. *Acorus calamus* plastid genome (>NC_007407.1) was taken as outlayer.

3. Results and Discussion

3.1 Variation in the secondary structure of 23S rRNA:

The secondary structures of 23S rRNA of the selected mesophiles and thermophiles were predicted. There was ample difference between the folding patterns so as to overall structure of the rRNA molecules of selected micro-organisms when viewed from the same angle. The predicted secondary structures of the rRNA molecules were depicted in figure 1A & B.

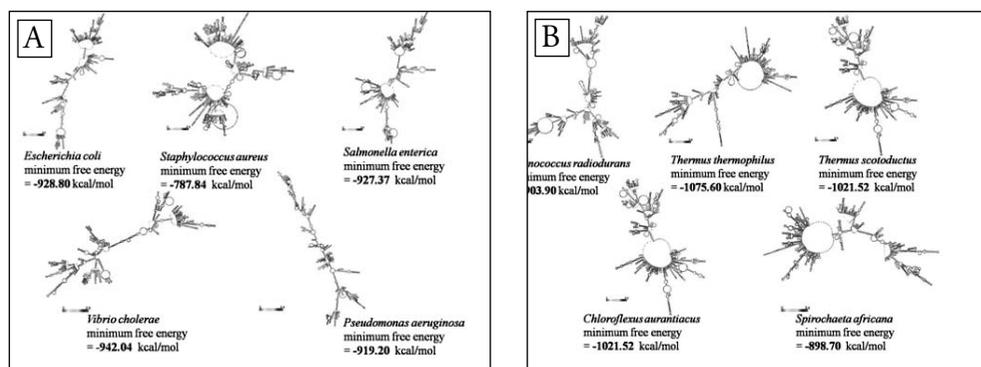


Figure 1: Predicted centroid secondary structures of selected mesophilic (A) and thermophilic bacteria (B). The scale represents the base pair probabilities.

3.2 Sequence conservation between different bacterial groups:

Among the selected microorganisms 66%-98% sequence conservation was observed. Identity matrix was represented in table 3. Maximum sequence similarity was observed between *E. coli* and *Salmonella enterica*, whereas minimum sequence homology was found in between *Chloroflexus aurantiacus* and *Spirochaeta africana* although both of them were thermophiles. Interestingly 95.75% sequence homology was present within two different species of *Thermus*, whether 97.93% sequence homology was present between *E. coli* and *Salmonella enterica*. About 80%-90% sequence conservation was observed in the multiple sequence alignment between 2500-2700 nucleotide of the selected sequences. Sequence alignment was represented as fig. 2.

Table 3: Sequence identity matrix (in terms of % of sequence similarity) of selected mesophilic and thermophilic bacteria

	<i>E. coli</i>	<i>S. aureus</i>	<i>S. enterica</i>	<i>V. cholerae</i>	<i>P. aeruginosa</i>	<i>D. radiodurans</i>	<i>T. thermophilus</i>	<i>T. scotoductus</i>	<i>C. aurantiacus</i>	<i>S. africana</i>
<i>Escherichia coli</i>	100									
<i>Staphylococcus aureus</i>	72.83	100								
<i>Salmonella enterica</i>	97.93	72.55	100							
<i>Vibrio cholerae</i>	88.17	73.13	87.77	100						
<i>Pseudomonas aeruginosa</i>	84.91	74.32	84.79	84.98	100					
<i>Deinococcus radiodurans</i>	70.19	73.18	70.27	70.27	71.65	100				
<i>Thermus thermophilus</i>	70.43	73.03	70.50	70.50	72.33	77.94	100			
<i>Thermus scotoductus</i>	70.57	73.39	70.79	70.79	72.40	77.81	95.75	100		
<i>Chloroflexus aurantiacus</i>	67.92	68.78	67.93	67.57	68.22	71.07	71.23	70.60	100	
<i>Spirochaeta africana</i>	73.76	74.81	73.55	73.73	74.91	70.47	71.72	71.54	66.54	100

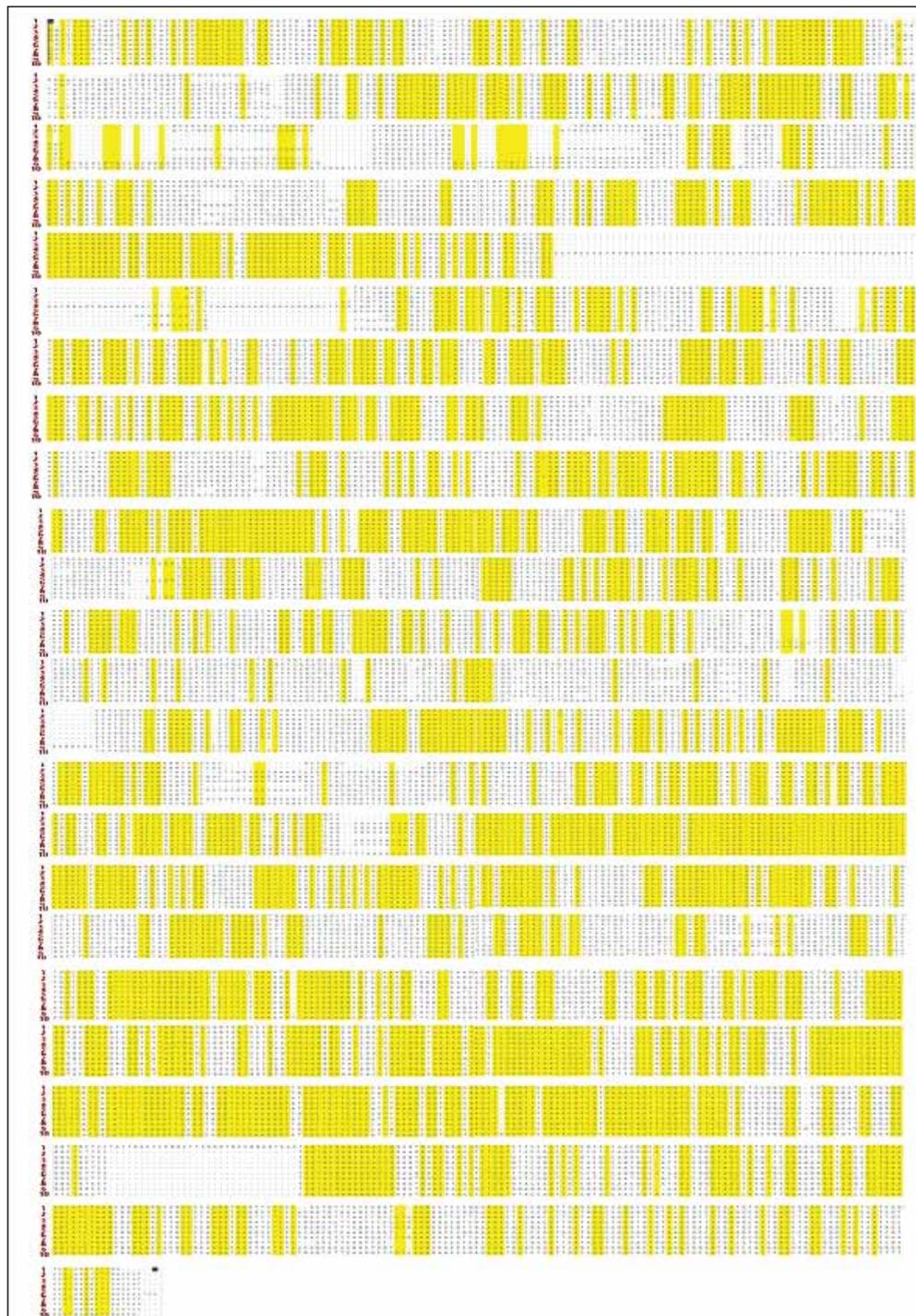


Figure 2: Multiple sequence alignment of the 23S rRNA sequence of selected bacteria. Conserved regions are highlighted in yellow colour. In this alignment the microorganisms were represented by numbers that are listed below -1: *Deinococcus radiodurans*, 2: *Thermus scotundus*, 3: *Vibrio cholerae*, 4: *Pseudomonas aeruginosa*, 5: *Salmonella enterica*, 6: *Thermus thermophilus*, 7: *E. coli*, 8: *Staphylococcus aureus*, 9: *Chloroflexus aurantiacus*, 10: *Spirochaeta africana*

3.3 Evolutionary relationship between selected taxa:

The phylogenetic tree was constructed based on 23S rRNA sequence of selected taxa. The 23S rRNA tree has two clusters or the tip species, mesophiles were present in cluster 1 and the thermophiles were present in cluster 2. The phylogenetic tree represents the evolutionary relationship of the extremophiles with a common or shared ancestry with the mesophiles. The closely related strains were placed closer to each other compared to the distantly related ones. The branches were also spaced proportional to the accounted changes or the evolutionary time; this helps us to draw the inference regarding the species those had changed over time. Grouping of species were also accomplished based on the similarities in their genetic set up. In the above mentioned phylogenetic tree, Cluster 1 and 2 or more specifically the two separate Clades represent their ancestor and the descendants from the ancestor. From the tree thus can be concluded that the mesophiles and the thermophiles originated and then diverged from a common ancestor which is known as LUCA, Last Universal Common Ancestor.

From the tree it was evident that *Spirochaeta africana* had diverged from the same ancestor with that of mesophiles rather than thermophiles. Again, *Chloroflexus aurantiacus* formed a completely separate clade from the others and was much more closely related with the plastid sequence of a green plant *Acorus calamus*. It can be concluded that rapid speciation has taken place in the evolutionary history of the selected taxa.

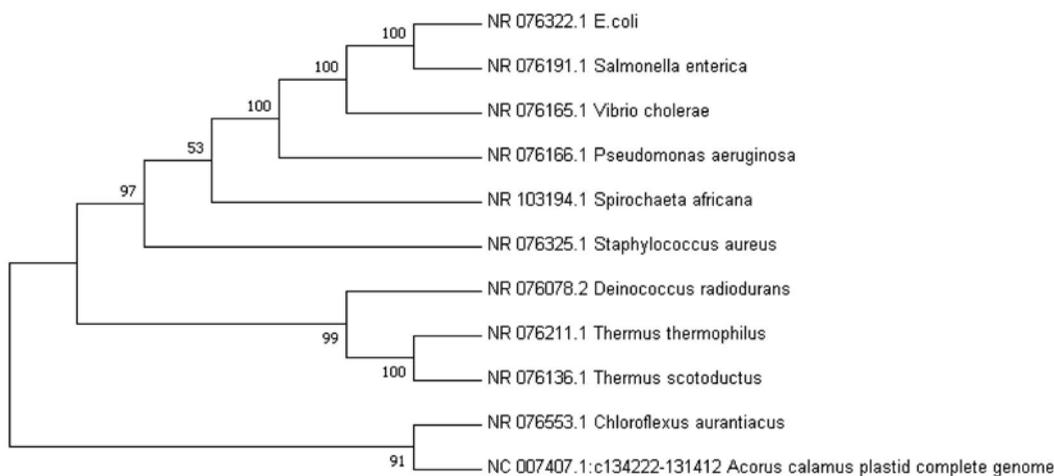


Figure 3: Phylogenetic tree constructed based on 23S rRNA showing the relationships of the mesophilic and thermophilic bacteria.

4. Conclusion

Rapid evolution of methods of classification of organisms based on their molecular phylogeny has formed the basis of this study. 16S rRNA is now well accepted as a tool to establish phylogenetic relationship among different taxa. Now-a-days along with this, researchers are interested about some other molecular markers for strengthening the phylogenetic relationship. Different methods of sequence alignment, phylogeny reconstruction, error check and signature analysis are currently being developed. From this study it can be concluded that mesophiles and thermophiles share common ancestor and they have diverged during the course of evolution. Some of the thermophiles are even more closely related to mesophiles than other thermophiles. So there is a need to revise the classical system of microbial classification in light of their evolutionary relationship using modern day tools.

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Theory of n -composite naturals and determination of the generating set for primes of the form $24m+1$

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In this paper, concept of ‘ n -composite natural’ has been introduced for naturals of the form $6k+1$. A theory has been developed which helps in identifying naturals of the form $6k+1$ for different nature of the values of k . It reveals that a natural of the form $24m+1$ can be $4n$ -composite only which finally helps to specify the set of naturals m for which $24m+1$ is prime.

Keywords: *Natural numbers, Composite, Prime.*

1. Introduction

To establish an effective algorithm for determining primes is of great interest in the study of number theory. There are many characterizations [1], [3], [4] and algorithms [2], [5],[6] already appeared in literature for determining primes, but the theory developed in this article will supply information on the composites of the form $6k+1$, and thereafter answer the following question :

‘Can we determine the particular subset of N consisting of naturals m for which $24m+1$ is prime?’

Since primes (>3) are of the form $6k-1$ or $6k+1$, in this article we shall consider naturals of the form $6k+1$ only and develop a theory on composite naturals of this form. This theory observes special features of composite naturals of the form $6k+1$ depending upon nature of k .

Since every composite of the form $6k+1$ has proper factors of the form $6t+1$ or $6t-1$ only, it clearly follows that for a composite $6k+1$, $6k+1 = AB$ where A and B are proper factors of $6k+1$ where $B-A = 6n$ for some natural n (ignoring the case that $6k+1$ is a perfect square).

Thus we define

Definition 1.1 Let the composite $6k + 1$ be not a perfect square. Then $6k + 1$ is said to be n -composite for some natural n if $6k + 1 = AB$ for some proper factors A, B of $6k + 1$ where $B - A = 6n$.

For example, $55 = 6 \cdot 9 + 1$ and $55 = 5 \cdot 11$, where $11 - 5 = 6 = 6 \cdot 1$. Hence 55 is 1-composite.

Also an n -composite $6k + 1$ may be m -composite for some $m (\neq n)$. For example, $385 = 5 \cdot 7 \cdot 11$. Hence it is 4-composite, 8-composite and 12-composite.

2 Properties of n -composite naturals and determination of the generating set for primes of the form $24m + 1$

Theorem 2.1. If $6k + 1$ is n -composite then $n \leq \frac{k - 4}{5}$.

Proof. Clearly $A \geq 5, B \geq 5$. Hence $6k + 1 \geq 5(6n + 5)$. This completes the proof.

Theorem 2.2. If $6k + 1$ is $2n$ -composite then $n \leq \frac{k - 4}{10}$.

Proof is easy.

Theorem 2.3. If $6k + 1$ is $4n$ -composite then $n \leq \frac{k - 4}{20}$.

Proof is easy.

Theorem 2.4. If $6k + 1$ is n -composite then $9n^2 + 6k + 1$ is a perfect square.

Proof. Let $6k + 1 = AB, B - A = 6n$. Then $A(A + 6n) - (6k + 1) = 0$ and hence $A = -3n + \sqrt{9n^2 + 6k + 1}$. If A exists then the result follows.

The following lemma will help in proving Theorem 2.6 and Theorem 2.7.

Lemma 2.5. If t is an odd natural then the equation $x^2 - y^2 = 6t$ has no positive integer solutions for x and y .

Proof. If possible, let $x^2 - y^2 = 6t$ for some naturals x and y where t is an odd natural.

Then $(x + y)(x - y) = 6t$ implies that x and y cannot be even or odd simultaneously, because in that case 4 is a factor of $(x + y)(x - y)$ but 4 is not a factor of $6t$. Hence if x is even then y is odd or if x is odd then y is even. But, in any case $(x + y)(x - y)$ is odd whereas $6t$ is always even. Hence a contradiction arises. This proves the lemma.

Theorem 2.6. If $6k + 1$ is n -composite then $(6k + 1) + 6t$ is not n -composite for every odd natural t .

Proof. Let $6k + 1$ be n -composite and if possible, let $(6k + 1) + 6t$ be n -composite for some odd t . Let $6k + 1 + 6t = AB$ where $B - A = 6n$. Then $A = -3n + \sqrt{9n^2 + 6k + 1 + 6t}$ and since A exists, $9n^2 + 6k + 1 + 6t = y^2$ for some $y \in N$.

$$\text{Then } 9n^2 + 6k + 1 = y^2 - 6t \quad (1)$$

Also by theorem 4, for some $x \in N$ we have

$$9n^2 + 6k + 1 = x^2 \quad (2)$$

Then by (1) and (2), $y^2 - x^2 = 6t$. But, by Lemma 1, this is not possible. Hence the theorem is proved.

Theorem 2.7.

(i) If k is even then $6k + 1$ is not n -composite for every odd n .

(ii) If k is odd then $6k + 1$ is not n -composite for every even n .

Proof. (i): Let k be even. Note that for any n , $(6k + 1)(6k + 1 + 6n)$ is n -composite. Now

$(6k + 1)(6k + 1 + 6n) = (6k + 1) + 6(6k + 1)(k + n) = (6k + 1) + 6t$ say, where $t = (6k + 1)(k + n)$. Hence if n is odd then t is odd, where $(6k + 1) + 6t$ is n -composite. So by theorem 5 it follows that $6k + 1$ is not n -composite. Thus if k is even then $6k + 1$ is not n -composite for every odd n .

(ii) : Let k be odd. Following lines of proof given in (i) we can conclude the result.

Theorem 2.9 and Theorem 2.10 are consequences of the following lemma.

Lemma 2.8. If t is any odd natural then the equation $x^2 - y^2 = 12t$ does not possess any positive odd integer solutions for x and y .

Proof. If possible, let $x^2 - y^2 = 12t$ for some odd naturals x and y where t is an odd natural.

Let $x = 2t_1 - 1$ and $y = 2t_2 - 1$. Then $(x + y)(x - y) = 12t$ implies $(t_1 + t_2 - 1)(t_1 - t_2) = 3t$.

Since t is odd, both $t_1 + t_2 - 1$ and $t_1 - t_2$ are odd. Let $t_1 + t_2 - 1 = 2A - 1$ and $t_1 - t_2 = 2B - 1$. Adding we get

$2t_1 = 2(A + B) - 1$, which is absurd, since L.H.S. is even whereas R.H.S. is odd. This proves the lemma.

Theorem 2.9. *If $6k + 1$ is $2n$ -composite then $(6k + 1) + 12t$ is not $2n$ -composite for every odd natural t .*

Proof. Let $6k + 1$ be $2n$ -composite and if possible, let $(6k + 1) + 12t$ be $2n$ -composite for some odd t . Let $6k + 1 + 12t = AB$ where $B - A = 6.2n = 12n$. Then $A = -6n + \sqrt{36n^2 + 6k + 1 + 12t}$ and since A exists, $36n^2 + 6k + 1 + 12t = y^2$ for some $y \in N$.

$$\text{Then } 36n^2 + 6k + 1 = y^2 - 12t \quad (3)$$

Also by theorem 4, for some $x \in N$ we have

$$9.(2n)^2 + 6k + 1 = x^2 \quad (4)$$

Then by (3) and (4), $y^2 - x^2 = 12t$. Note that x and y are both odd. But, by lemma 2, this is not possible. Hence the theorem is proved.

Theorem 2.10. *If $k = 4m$ for any natural m then $6k + 1$ is not composite for every odd n .*

Proof. Note that for any n , $(6k + 1)(6k + 1 + 12n)$ is $2n$ -composite. Now

$(6k + 1)(6k + 1 + 12n) = (6k + 1) + 6(6k + 1)(k + 2n) = (6k + 1) + 12t$ say, where $t = (6k + 1)\frac{k + 2n}{2}$. Now $k = 4m$. So $t = (6k + 1)(2m + n)$. Hence if n is odd then t is odd, where $(6k + 1) + 12t$ is $2n$ -composite. So by theorem 7 it follows that $6k + 1$ is not $2n$ -composite. Thus if $k = 4m$ then $6k + 1$ is not $2n$ -composite for every odd n .

Now we have the following result.

Corollary 2.11. *If $k = 4m$ then*

(i) $6k + 1$ is not n -composite for every odd n and

(ii) $6k + 1$ is not $2n$ -composite for every odd n .

Proof follows from theorem 2.7 and theorem 2.11.

As a consequence we get

Theorem 2.12. *Let $k = 4m$ and $6k + 1$ be not a perfect square. Then the following statements are equivalent :*

(i) $24m + 1$ is prime.

(ii) $24m + 1 \neq t(24n + t)$ for all $n \leq \frac{m-1}{5}$ and any t of the form $6v - 1$ or $6v + 1$.

Proof. (ii) \rightarrow (i). Let $24m + 1$ be composite. Then by corollary 2.11, it can only be $4n$ -composite. Hence by theorem 2.3, $n \leq \frac{m-1}{5}$. Now by theorem 2.4, we have $9(4n)^2 + 24m + 1 = y^2$ for some natural y . Then

$$9(4n)^2 + 24m + 1 = y^2 = (12n + t)^2 \quad (5)$$

for some natural t . So $24m + 1 = t(24n + t)$. Now L.H.S. of (5) is of the form $6w + 1$. Hence t must be of the form $6v - 1$ or $6v + 1$. This completes the proof.

(i) \rightarrow (ii). This is obvious.

Corollary 2.13. *Let $k = 4m$ and $6k + 1$ be not a perfect square. Then the following statements are equivalent :*

(i) $24m + 1$ is prime.

(ii) $m \neq nt + \frac{t^2 - 1}{24}$ for all $n \leq \frac{m-1}{5}$ and any t of the

form $6v - 1$ or $6v + 1$.

(iii) $24m + 1$ is not congruent to $t^2 \pmod{24t}$, for any $t (< \sqrt{24m + 1})$ of the form $6v - 1$ or $6v + 1$.

Proof is evident.

Now we consider the following important question:

Can we completely determine the particular subset $P(24)$ (say) of N such that for each $m \in P(24)$, $24m + 1$ is prime and conversely if $24m + 1$ is prime then $m \in P(24)$?

The answer to this question is as follows :

Consider the following subsets of N .

$$TF(1) = \left\{ nt + \frac{t^2 - 1}{24} : n \in N, t \in N, t = 6v - 1 \text{ or } t = 6v + 1, v \in N \right\}.$$

$$TF(2) = \{ m : m \in N, 24m + 1 = y^2, \text{ for some } y \in N \}.$$

Members of $TF(1)$ are of the forms, $5n + 1, 7n + 2, 11n + 5, 13n + 7, 17n + 12, \dots$ and so on.

$$\text{Let } S = TF(1) \cup TF(2).$$

Then it follows by corollary 2.13 that the subset $P(24) = N - S$ of N will be the Prime determining subset for the naturals of the form $24m + 1$. This means, for every $m \in P(24)$, $24m + 1$ is prime and conversely, if $24m + 1$ is prime then $m \in P(24)$.

Writing members of S in ascending order we can enumerate members of $P(24)$ in ascending order.

One can verify the main result obtained in this article for any finite subset of N by using the following algorithm.

Algorithm :

1. Set limit.
2. Generate set $TF(2)$:
 - 2.1. Set $TF(2) \leftarrow \{\}$.
 - 2.2. Set $m \leftarrow 1$.
 - 2.3. While $m \leq \text{limit}$
 - 2.3.1. Set $y^2 + 24m + 1$
 - 2.3.2. If y^2 is a perfect square, add m to $TF(2)$.
 - 2.3.3. Set $m \leftarrow m + 1$ and iterate loop.
3. Generate set $TF(1)$:
 - 3.1. Set $S_1 \leftarrow \{\}$, $S_2 \leftarrow \{\}$, $\text{flag} \leftarrow 0$.
 - 3.2. Set $V \leftarrow 1$.
 - 3.3. While $V \leq \text{limit}$
 - 3.3.1. If $\text{flag} = 1$, break loop.
 - 3.3.2. Set $n \leftarrow 1$.
 - 3.3.3. While $n \leq \text{limit}$
 - 3.3.3.1. Set $t \leftarrow 6V - 1$, $t_2 \leftarrow 6V + 1$.
 - 3.3.3.2. Set $a \leftarrow n.t_1 + \frac{1}{24}(t_1^2 - 1)$.
 - 3.3.3.3. If $a \leq \text{limit}$, add a to S_1 ,
else if $n = 1$, set $\text{flag} \leftarrow 1$ and break current loop, else break current loop.
 - 3.3.3.4. Set $b \leftarrow n.t_2 + \frac{1}{24}(t_2^2 - 1)$.
 - 3.3.3.5. If $b \leq \text{limit}$, add b to S_2 .
 - 3.3.3.6. Set $n \leftarrow n + 1$ and iterate loop.
 - 3.3.4. Set $V \leftarrow V + 1$ and iterate loop.
 - 3.4. Set $TF(1) = S_1 \cup S_2$.
4. Set $S \leftarrow TF(1) \cup TF(2)$.
5. Set $N \leftarrow \{1, 2, 3, \dots, (\text{largest element of } S)\}$.
6. Set $P(24) \leftarrow N - S$.
7. Set $P \leftarrow \{24p + 1 : p \in P(24)\}$.
8. If all elements of P are prime, declare success, else declare failure.

Conclusion :

It is worthwhile to mention that primes are important in Computer Science and Cryptography because the security of many encryption algorithms is based on the fact that the multiplication of two large prime numbers is very fast, but takes a lot of processing to do the reverse.

This article develops a method which gives us the particular values of m for which $24m + 1$ are prime numbers. An algorithm has been constructed which helps in finding larger values of m and the corresponding values of the primes $24m + 1$. In this way, this algorithm will certainly be helpful in obtaining larger prime numbers which will be useful in developing certain encryption techniques.

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Of Daughters and Lovers: A Study of Shakespeare's Daughters in *The Merchant of Venice* and *Hamlet*

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Shakespeare's female leads, especially in his comedies, were invariably smart and attractive, sometimes more than their male counterparts. It appears that most of them were modelled on the reigning queen Elizabeth I who was undoubtedly a very intelligent and powerful monarch, and an independent woman, not requiring a partner. However, if we look deeper into the lives and roles of these female characters, we find that Shakespeare ultimately makes them subservient to the male partner/guardian and fit into conventionally accepted social roles dictated by patriarchy.

Keywords: *heroines, fathers, controlled, instructs, counterparts, patriarchy*

Elizabeth I came to the throne of England as a daughter, independent of a male partner or guardian. Henry VIII's will named her as successor to the throne only if his son Edward and elder daughter Mary died without a legitimate heir. Though Elizabeth did not forsake her desire to be monarch, yet she waited for her father's will to be carried out and finally ascended the throne in 1558, twelve years after her father's death. It is true that she did not have many supporters in the Tudor court for a bloody war of succession; but even when Mary's reign, marked by violence and bloodshed, made people think of her as a better alternative, Elizabeth waited for Mary's natural death, enduring distrust and imprisonment at her sister's hand.

Was then the Queen a model for Shakespeare when he created his greatest heroines? It does appear so; his women, especially in comedies, are educated, witty, intelligent, powerful, and more in control of their situations, as compared to their male counterparts. But many-a-times, they are ruled or controlled by their father's will and fate, a situation which they meekly accept too. In fact, almost all heroines in Shakespeare are presented in the context of their relationship with their fathers. Cordelia suffers because she displeases her father; Rosalind shares her father's fate; Jessica defies her father's dictates while Miranda follows her father's dictates; even Lady Macbeth is unable to murder Duncan as he resembles her father in his sleep. In this paper, I have attempted a discussion of two such heroines – Portia and Ophelia, torn by loyalties to their fathers and lovers.

Bassanio introduces Portia to the audience/readers in his conversation with Antonio, in Act I Sc i, of *The Merchant of Venice* –

In Belmont is a lady richly left,
And she is fair, and (fairer than that word),
O wondrous virtues, - sometimes from her eyes
I did receive speechless messages:
Her name is Portia, nothing undervalu'd
To Cato's daughter, Brutus' Portia,
(lines 161-166, Shakespeare 7)

Portia is fair and virtuous, no doubt, but firstly she is a lady 'richly left' for whom many Jasons have ventured into Belmont. Bassanio, in spite of receiving 'speechless messages' from her eyes, appears to be one too. Later Portia expresses her feelings for Bassanio in Act III Sc ii, and confesses "One half of me is yours, the other half yours" (line 16, 48) but laments the inappropriateness of time—"O these naughty times/ Put bars between the owners and their rights!" (line 18, 48). As we know from Act I Sc ii, Portia's "time" is controlled by her dead father.

O me the word "choose"! I may neither choose who I would, nor refuse who I dislike, so is the will of a living daughter curbed by the will of a dead father: is it not hard Nerissa, that I cannot choose one, or refuse none?" (9)

Nerissa justifies Portia's father's decision thus:

Your father was ever virtuous, and holy men at their death have good inspirations,-therefore the lottery he hath devised in these three chests..... will no doubt never be chosen by any rightly. But one who shall rightly love." (lines 26-32, 9)

But Portia does not appear convinced by this logic. She is in constant fear of being chosen by the wrong suitor, and none of them are acceptable to her- the Neapolitan prince, County Palatine, Monsieur Le Bon, Falconbridge, the Scottish lord and the German Duke of Saxony's nephew. She even thinks of unlawful methods that can prevent them from choosing the right casket. Nerissa warns-"...you should refuse to perform your father's will, if you should refuse to

accept him..." (line 89, 11) and Portia laments that she fears the worst. However, these first set of suitors leave without offering to choose and Portia is, for the time being, safe. But to her, the future appears bleak-

If I live to be as old as Sybilla, I will die as chaste as Diana, unless I be obtained by the manner of my father's will: I am glad this parcel of wooers are so reasonable, for there is not one among them but I dote on his very absence: and I pray God grant them a fair departure." (lines 105-110, 11)

Though more suitors enter immediately, like the prince of Morocco, the mention of Bassanio here, by Nerissa, as a suitor best deserving the fair lady seems to bear a kind of legitimacy because he had visited them in Portia's 'father's time'.

It is difficult, sometimes incredulous, to believe that Portia has been given Bassanio as husband. In his own words, Bassanio is someone who has "...disabled mine estate, /By something showing a more swelling port/Than my faint means would grant continuance :..."(I i, lines 123-125, 5). In the same conversation with Antonio, he adds that Portia is like the golden prize sought by all and that he wishes to hold a place among the suitors as his mind "presages me such thrift/ That I should questionless be fortunate." (lines 175-176, 7). Here "thrift" indicates "profit" in the mercenary sense. After Bassanio successfully selects the lead casket, Portia's words appear very uncharacteristic of the lady who later utters the 'mercy speech' in the Court Scene:

You see me Lord Bassanio where I stand,
Such as I am; though for myself alone
I would not be ambitious in my wish
To wish myself much better, yet for you,
I would be trebled twenty times myself,
A thousand times more fair, ten thousand times
more rich,
That only to stand high in your account,
I might in virtues, beauties, livings, friends
Exceed account: but the full sum of me
Is sum of something: which to term in gross,

Is an unlesson'd girl, unschool'd, unpractised,
Happy in this, she is not yet so old
But she may learn: happier than this,
She is not bred so dull but she can learn;

.....

But now I was the lord
Of this fair mansion, master of my servants,
Queen o'er myself: even now, but now,
This house, these servants, and this same myself
Are yours, - my lord's!

(III ii, lines 149-171, 52)

It is so strange that with a reigning female monarch, who remained unmarried in spite of repeated pressures created by the parliament, Shakespeare should choose to present such an intelligent heroine as Portia, not only ready to get married to someone who appears inferior and unworthy of her, but also ready to be 'schooled' by him. In fact, most of Shakespeare's heroines in his comedies are far superior to their male counterparts, but all of them accept happy matrimony and a subordinate role as wife at the end of the play, unlike the figure of the reigning Queen.

Jessica, another daughter in this play, is under the guardianship of her father, Shylock, who is universally hated. This daughter defies his orders, steals his money, changes her religion voluntarily and marries the Christian Lorenzo, for love. When Shylock advises her in Act II, Sc v-

....Hear you me Jessica,

Lock up my doors. And when you hear the drum

And the vile squealing of the wry-neck'd fife

Clamber not you up to the casements then

Nor thrust you head into the public street

To gaze on Christian fools with varnish'd faces:
(28-34, 31)

She keeps quiet, and later utters very flippantly, in Shylock's absence, "...and if my fortune be not crost/I have a father, you a daughter, lost." (55-56, 31).

Shylock later, in Act III, Sc i, cannot hide his shock at Jessica's betrayal- "My own flesh and blood to rebel!" (32, 44). When he hears from Tubal that Jessica had squandered his wealth and given away his ring 'for a monkey', Shylock laments- "it was my turquoise, I had it of Leah when I was a bachelor: I would not have given it for a wilderness of monkeys"(115-116,47). In the ring episode, these particular words of Shylock can be recalled in contrast to the behaviour of Christian husbands who give away their rings as souvenirs/prizes. It seems that just because Shylock is a Jew, he is made to suffer as a father and face betrayal, whereas Portia's dead father, being a Christian, is given all due reverence.

Ophelia in *Hamlet* is just as removed from Portia as Hamlet himself from Bassanio. Ophelia is a young girl, brought to court by her father, whose youth and innocence attract Hamlet. She appears in only five of the play's twenty scenes; and the story of her life before she comes to court is obscure. Lee Edwards says "We can imagine Hamlet's story without Ophelia, but Ophelia literally has no story without Hamlet"¹. In fact, what we see of Ophelia after she comes to the "at once rude, magnificent, corrupted"² court circle can be summed up as a story of betrayal - she suffers betrayal at the hands of her father, her brother, her lover, the court and society. Polonius, her shrewd, pompous and garrulous father, advises her to be cautious of Hamlet's advances; he uses her as a decoy to unearth the secrets in Hamlet's mind ("loosing his daughter to him", II ii) and hence gain favour with Claudius. Ophelia reveals Hamlet's love for her to her father, but can never fathom nor express her love for him. When Polonius quizzes her regarding Hamlet's affection for her and asks her if she believes him, she says, "I do not know, my lord, what I should think". To this Polonius replies, "Marry, I'll teach you:" and later urges her to be cautious of the Prince's advances which are "springs to catch woodcocks". Polonius then instructs her: "I would not, in plain terms, from this time forth/ Have you slander any moment's leisure/ As to give words or talk with Lord Hamlet", to which she replies, "I shall obey, my lord". Her brother Laertes, too warns her against Hamlet:

“For Hamlet and the trifling of this favour,
Hold it a fashion, and a toy in blood,
A violet in the youth of primy nature,
Forward not permanent, sweet not lasting,
The perfume and the suppliance of a minute-
No more!”

Ophelia is incredulous- “No more but so?” Laertes concludes for her, “Think it no more”, and cautions her that “...in the morn and liquid dew of youth/ Contagious blastments are most imminent”. Ophelia promises-“I shall th’ effect of this good counsel keep/ As watchman to my heart.” Accordingly, she repels Hamlet’s love letters and denies him access to her.

Ophelia, in surrendering to the dictates of her father and brother, stifles her own sense of reasoning. She is innocent but not mindless; she can understand Hamlet’s warmth of feeling but cannot comprehend his requirements. For Hamlet, Ophelia represents in miniature, a world of lost beauty, crystalline purity and nobility, a world to which he had belonged before being plunged into the murky world of revenge and deceit. Hamlet is unable to reconcile the incongruities and contradictions in his life. Moreover, his tragedy is intensified by his loneliness. Ophelia is his “nymph in thy Orisons” but she fails to deliver. Her father and brother have tutored her to such an extent that she fails to answer him with sincerity-“How does your honour this many a day?” (III,i). Her polite meaningless words infuriate Hamlet and come as a confirmation of his earlier “Frailty, thy name is woman.” Ophelia even offers to return his gifts. The lover is agonised and profoundly shocked where he had hoped and trusted most. His depth of love paradoxically inspires the degree of violence. Ophelia is torn asunder by Hamlet’s coarse verbal tirade and speaks very little. Later in her soliloquy she says: “And I of ladies most deject and wretched,/ That suck’d the honey of his music vows”. In remaining her father’s dutiful daughter, Ophelia betrays her lover.

The murder of Polonius at the hands of Hamlet entangles her in a web of horrors from which she cannot extricate herself and the result is inevitable—

she loses her sanity. Her bashful silence is replaced by meaningless babbling; impatient restlessness takes the place of her maidenly demeanour. She can say nothing in public terms defined by the court. Ophelia, ripped apart by conflicting loyalties to her father and her lover, is deprived of her thought, language and sexuality. Her madness can be taken as a revolt against the patriarchal order imposed on her.

Ophelia can be called a secondary tragic victim, caught up in the main tragic current and destroyed, as it were, in passing. Portia is a primary character in a comedy that pivots on her intelligence for the resolution of its conflicts. If Portia had occupied Ophelia’s space, she would have perhaps studied Hamlet more and avoided the catastrophe. In *The Merchant of Venice*, if the fates were eventually found to turn against Portia, a dead father could only be successful in jeopardising his daughter’s love life. In *Hamlet*, an interfering, dictating father successfully turns the fates against his innocent daughter Ophelia, resulting in the death of both.

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A Contribution to the Medicinal Weeds Growing in the Campus of Narasinha Dutt College, Howrah

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Weeds are considered as unwanted, aggressive and disturbing plants in the vegetation setting made by human. However, these plants are often found to be rich with medicinal properties. A survey of the weeds growing in the century old campus of Narasinha Dutt College of Howrah district, West Bengal, was conducted in 2018-19. All of the weeds were identified by standard Botanical procedure and consultancy of taxonomic literature. In the survey, 37 of them (from 20 families, with Asteraceae as most common group) were found to have medicinal properties. Some exotic weeds like Eclipta prostrata, Cleome viscosa, Croton bonplandianus, etc., were also recorded. To have an idea about awareness about their medicinal value as well as importance of their conservation in nature, a questionnaire survey was conducted. The study population (n = 117) included students of the college and other nearby area without or with Botany as their subject, faculty members and others. In the questionnaire survey, 98.29% of the total population expressed their belief about the medicinal properties of the plants growing around. Regarding the medicinal utility of individual weed species of the campus, the population response varied from 50.5% - 90.4%, whereas 7.0% - 39.4% were not sure about their medicinal usefulness and 0.9%-22.4% of them expressed that these plants have no medicinal values at all. Majority (89.7%) of the people, including students, affirmed that the conservation of commonly growing weed plants are also necessary for maintaining plant biodiversity spectrum in the environment. Such awareness level will be very much helpful in plant biodiversity conservation and sustainable development to protect environment.

Keywords: Weeds, Narasinha Dutt College Campus, medicinal value, awareness, biodiversity conservation.

1. Introduction

Over the centuries plants have important contribution in the health care system of local communities as the local population used the available plant resources for the treatment against different health problems. Interestingly, some common weeds also play a major role in treatment of ailments in different cases. Actually, the knowledge about traditional herbal medicines is the original source of many modern day medicines. Similarly, different phytochemicals with therapeutic properties are obtained from different plants growing around us in the environment.

Though most of the time weeds are unwanted, invasive, troublesome, but they have highly medicinal properties and cost effective also. A number of authors like Ambasta *et al.* (1986), Pal and Jain (1998), Majid *et. al* (2012), Bandyopadhyay *et al.* (2014) and others discussed about different medicinal uses of several plant species for the treatment of different disease.

However, sometimes people generally do not have any clear idea about such plants, which apparently seems not to be useful for mankind.

Narasinha Dutt College is one of the biggest and oldest colleges in Howrah district of West Bengal, India and established since 1924. This college covers 2.8 acre of land with good numbers of herb, shrub and tree including both aquatic and terrestrial plants. Present study aims to enlist and understand the medicinal uses of the weed species grown in the college campus in different seasons. In addition, an online questionnaire based population survey was also carried out to observe the level of awareness on the recorded weeds with medicinal properties.

2. Methodology

The weeds growing in the campus of Narasinha Dutt College were recorded throughout the year of 2018-2019. The identification of the plants was carried out by consultation of relevant literature (Anonymous, 1997-2020; Bennet, 1979; Prain 1903)) and matching with the authenticated herbarium specimens. Digital photographs of the weeds growing in the campus were also taken to confirm the identity. Medicinal properties

and the uses of the weeds growing in the college campus were studied and recorded with the help of literature on medicinal plants of India (Ambusta *et al.*, 1986; Anonymous, 1948-1976; Auti *et al.*, 2004; Bhattacharya, 1976-1993; Chatterjee and Pakrashi, 1991-2001; Chopra *et al.*, 1956, 1969; Zingare *et al.*, 2012) and West Bengal (Anonymous, 1997).

An online survey about the recorded medicinally useful weeds were conducted by Google Questionnaire among students and teachers of the college, students of other colleges and general people (n = 117) of the nearby districts of Howrah, Kolkata and North 24-Parganas was conducted in September, 2020. This questionnaire survey was carried out to get an idea about public awareness on medicinal value of different weeds growing around us. In the questionnaire, the local names of the relevant plants were mentioned for general understanding. The population was categorized into following groups - Students with Botany major from the college and other colleges, students with Botany combination (from the college and other colleges), students without Botany subject combination (from the college and other colleges), faculty members (of the college and other colleges) and others. The recorded responses were analyzed thoroughly to get the clear idea about awareness level in the population inside and outside the campus (Howrah, Kolkata, North 24 Parganas district of West Bengal) about the usefulness of the recorded medicinal weeds from the campus.

3. Results and Discussion

It was found that, some area of the college campus is covered with wild herbal flora which includes a number of plants with medicinal uses. Actually, the college campus is eco-friendly with rich flora of trees, shrubs, herbs, grasses and aquatic plants too. The weeds recorded are naturally grown in the campus. We have recorded 37 weed members with remarkable medicinal importance (Table 1, Figure 1a-b). These medicinal weeds belong to 20 flowering plant families altogether (Figure 2). Among these, Asteraceae was the highest contributor (six members, 16.21%), followed by Amaranthaceae, Euphorbiaceae, Poaceae and

Scrophulariaceae (three members each, 8.10%) and others.

The present study reveals that there are many herbal weed members growing in the college in different seasons, as confirmed by literature survey. Some exotic weeds like *Eclipta prostrata*, *Cleome viscosa*, *Croton bonplandianus*, *Mikania micrantha*, *Oxalis corniculata* and *Phyllanthus fraternus* (Maiti and Bakshi, 1981) are also luxuriously present in the campus, which have enormous medicinal value (Table 1). Hence much attention is needed for their *in situ* conservation in natural habitat.

For conservation of biodiversity, awareness among people is the most important aspect. Keeping this viewpoint, we conducted an online Google questionnaire survey on the recorded medicinal weeds in the campus. Among 117 responses (Figure 3), 12.82% and 28.20% was received from the students with Botany major from our college and other different colleges (of Howrah, Kolkata and North 24 Parganas districts). Students of the college with Botany combination contributed 23.07% of the population and similar group from other colleges contributed 5.98%. Students without Botany in the subject combination from the college and colleges outside contributed 0.85% and 9.4% respectively. There were 9.4% participation of the faculty members and 10.25% from others respectively. In the survey, we excluded the faculty members of Botany department, to avoid biasness.

It was found that, 98.29% of the total population expressed their belief that the plants growing around us have medicinal properties, whereas only 1.70% was not sure about it. This was really an unexpected positive observation about the awareness of people about naturally growing medicinal herbs. Furthermore, among them majority (89.7%) affirmed that the conservation of commonly growing weed plants are also necessary for maintaining plant biodiversity spectrum in the environment around us, whereas very less people (8.5%) of them was not sure about this. In the contrary, only 1.7% of the population expressed that conservation of such weeds are not necessary. More than 90% of the students (with plant science as a subject of not) are in the opinion of conservation of such weeds, even sometimes their medicinal properties are not clear to them. Such a strong notion (especially from students of present generation) will be very much helpful as a driving force for plant diversity conservation in the environment.

Regarding the idea about medicinal uses of the 37 individual weed plant species of the campus, the population response varied from 50.5% - 90.4%, whereas 7.0% - 39.4% were not sure about their medicinal usefulness and some of them (0.9%-22.4%) also expressed that these plants have no medicinal values at all (Figure 4). This was the overall response from all the students, faculties and others. This is obviously an awareness indicator among people from the study area and nearby districts of the southern part West Bengal.

Table 1. List of weed members of medicinal importance, growing at college campus during 2018-19

Sl No.	Scientific Name	Family	Vernacular name(s)	Uses
1	<i>Abutilon indicum</i> (L.)SW.	Malvaceae	Petari, Atibala	Roots used in fever, haematuria, leprosy, leucorrhoea, menorrhagia, stone in urinary bladder. Leaves used in bronchitis, fever, hemicrania, boils, toothache and in bleeding piles. Seeds used in dysentery, piles and has aphrodisiac properties.

2	<i>Acalypha indica</i> L.	Euphorbaceae	Muktajhuri	Roots are used as laxative, anthelmintic and to treat asthma & stomachache. Whole plant is used as diuretic, purgative and to cure cough, toothache and headache. Leaf juice is applied as eye drop and in scorpion sting.
3	<i>Aerva aspera</i> L.	Amaranthaceae	Apang	Roots used as contraceptive and as haemostatic agent after abortion. Whole plant is used in dropsy, dysentery, dyspepsia, piles. Seeds used in piles.
4	<i>Ageratum conyzoides</i> L.	Asteraceae	-	The whole plant is anti-inflammatory, anti-allergic, anti-diarrhoeal properties, leaves haemostatic, applied on wounds, boils and skin diseases. Roots used as antidysenteric and anthelmintic.
5	<i>Alternanthera sessilis</i> DC.	Amaranthaceae	Sanchi	The whole plant is used as galactogogue and febrifuge. Fresh leaf juice is applied to treat eye diseases. Young shoots taken as nutritious vegetables.
6	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kantanotey	The whole plant is used as laxative, diuretic, stomachic, antipyretic. Also used in the treatment of internal bleeding, excessive menstruation, ulcerated mouth and diarrhoea and anaemia. Roots used in leucorrhoea, menorrhagia, leprosy, gonorrhoea and eczema.
7	<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	Punornova	Plants used to cure intestinal colic, kidney disorder, dropsy, cough, haemorrhoids, insomnia, asthma, jaundice, skin and eye diseases. Roots are used as diuretic, expectorant and promotes delivery.
8	<i>Cleome viscosa</i> L.	Cleomaceae	Hurhure	Leaves are used in diarrhea, blood dysentery, boils, earache, skin diseases. Roots used to treat stones in urinary bladder.
9	<i>Coccinia grandis</i> (L.) Voigt.	Cucurbitaceae	Telakucha	Plant is laxative, used in gonorrhoea, cough and cold. Roots and leaves are given in diabetes, jaundice, asthma and cough. Fruits used to cure cough, asthma, bronchitis, foul breath and leprosy.

10	<i>Coix lacryma-jobi</i> L.	Poaceae	Gurgura	Grains are anti-inflammatory, antipyretic, antiseptic, hypoglycemic, hypotensive, sedative and vermifuge. In folk medicine used for the treatment of abdominal tumours and gastrointestinal lung cancer. Infusion is useful as immune enhancer. Roots are used to treat menstrual disorder.
11	<i>Commelina benghalensis</i> L.	Commelinaceae	Kanchira	The plant is astringent, demulcent, laxative and mucilaginous. It increases fertility of women and used to treat leprosy, dropsy, rheumatic pain, ringworm and eczema. Decoction of leaves and roots is given in diarrhoea and in stomach disorder.
12	<i>Cheilocostus speciosus</i> (J. Koenig) C. Specht	Costaceae	Keu	Rhizomes are astringent, cooling, aphrodisiac, purgative, anthelmintic, febrifuge, expectorant, tonic, improves digestion and clear toxins from body.
13	<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Bon Tulsi, Lankasira	Plant parts are useful for ring worm infection, improvement of liver function, wound healing, anti oxidant and anti-tumour activity.
14	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durba	Plants are used as anti-catarhal, antidysenteric, antipyretic, astringent, demulcent and laxative. Used to treat haemophysis, haemorrhoid, leprosy, diarrhoea and dysentery, general debility, dropsy and hysteria. Fresh juice and paste applied to stop bleeding from nose and cuts and wounds.
15	<i>Cyperus rotundus</i> L.	Cyperaceae	Mutha	Roots used to treat diarrhoea, dyspepsia and other stomach problem. Also used in fever with thirst, burning sensation in hands and feet and in epilepsy.
16	<i>Eclipta prostrata</i> L. (L.)	Asteraceae	Keshut	The plant is astringent, emetic, febrifuge, purgative and tonic. Leaves used in jaundice, dropsy, anaemia, eczema, dermatitis and bleeding wounds. Plants promote hair growth.
17	<i>Eleusine indica</i> (L.) Gaertn	Poaceae	Chamghas	Plant, especially root is anthelmintic, astringent, diuretic, febrifuge and laxative. It is used in liver complains and dysfunction of gallbladder. Paste of plant externally used in sprain and backache.

18	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dudhi	The plant is used to treat respiratory system disorder including bronchitis, asthma, cough, cold and laryngeal spasm. It is also used in diarrhoea, dysentery, colic, peptic ulcer. Latex is used in removing warts and in sores and wounds.
19	<i>Heliotropium indicum</i> L.	Boraginaceae	Hatisur	The plant is used to treat warts, inflammations and tumors. Decoction of plant is given to cure diarrhoea, diabetes, venereal diseases. Infusion of leaf is used as eye-lotion and to clean wounds. Flowers are used as abortifacient.
20	<i>Kyllinga brevifolia</i> (Rottb.) Hassk.	Cyperaceae	Nirbish	Plants are analgesic, anti-inflammatory, antimalarial, diuretic and febrifuge. Used in fever, throat pain, cough, bronchitis and diarrhoea.
21	<i>Leucas aspera</i> (Willd.) Link.	Lamiaceae	Swetdrone, Dondokalas	Leaves used as carminative, anthelmintic, antipyretic, expectorant. Used to treat colic, dyspepsia, skin eruption, psoriasis, intermittent fever, cough, amoebiasis, amenorrhoea and dysmenorrhoea.
22	<i>Lindernia crustacea</i> (L.)F. Muell.	Scrophulariaceae	-	Plant is used to treat dysentery, diarrhoea, vomiting, amenorrhoea. Leaf decoction is applied topically to boils and itches.
23	<i>Ludwigia octovalvis</i> (Jacq.) Raven	Onagraceae	Bon Lobongo	Plants used as vermifuge, purgative. Also useful in dysentery.
24	<i>Mazus pumilus</i> (Burm.f.) Stennis	Scrophulariaceae		Plant is aperients, emmenagogue, febrifuge and tonic. Juice of the plant is used in the treatment of typhoid.
25	<i>Mikania micrantha</i> H. B. K.	Asteraceae	Tara Lota/Japani Lota	Decoction of the leaves is used in skin rashes, useful as poultice in snake bite. Its extract has antimicrobial properties too.
26	<i>Mimosa pudica</i> L.	Fabaceae	Lajjabati	The plant is antibacterial, antivenom, antifertility, anticonvulsant, anti depressant and aphrodisiac. Roots are used to treat leprosy, dysentery, uterine complaint, asthma, leucoderma, piles, arthritis.

27	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	Khetpapra	The plant is anthelmintic, diaphoretic, digestive diuretic, febrifuge and stomachic. Leaves are used in stomach disorder and jaundice.
28	<i>Oxalis corniculata</i> L.	Oxalidaceae	Amrul	Plants are use to cure dyspepsia, dysentery, piles, anaemia, fever, boils and scurvy.
29	<i>Phyllanthus fraternus</i> Webster	Phyllanthaceae	Bhui-amla	Plant is antipyretic, antiseptic, diuretic. Used in dropsy, diarrhoea, dysentery, jaundice, asthma, gonorrhoea and menorrhagia.
30	<i>Phyllanthus virgatus</i> Frost. F.	Phyllanthaceae	Bhui-amla	Plants are used as antiseptic, treatment of jaundice, gonorrhoea, skin diseases, eye trouble. Paste of its root is applied to mammary abscess.
31	<i>Physalis minima</i> L.	Solanaceae	Bontepari	Plants are used as diuretic, carminative and antipyretic. Fruit is alterative, appetizer, laxative and tonic. Root is febrifuge and vermifuge.
32	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Bon dhone	Plant used to treat stone in gall bladder, diabetes, mouth ulcer, toothache. Roots used in diarrhoea and dysentery, menorrhagia.
33	<i>Sida acuta</i> Burm. F.	Malvaceae	Berala	Roots are antipyretic, stomachache and tonic. Used in nervous and urinary disorder. Leaves are demulcent and diuretic. Used for haemorrhoid and impotence.
34	<i>Solanum nigrum</i> L.	Solanaceae	Kakmachi	Plant used in asthma, bronchitis, rheumatism, gout, jaundice and general debility. Roots used in urinary disease. Leaves used as laxative.
35	<i>Sphagneticola calendulacea</i> (L.) Pruski	Asteraceae	Maha-Bhringaraj	Plant is astringent, acrid, anti-inflammatory, cardio tonic and vulnerary. Leaves promote hair growth and used to treat headache, skin problems and jaundice.
36	<i>Tridax procumbens</i> L.	Asteraceae	Tridaksha	Leave extracts are useful as anticoagulant, antifungal, anti-insect and healing of wounds.

37	<i>Vernonia cinerea</i> Less.	Asteraceae	Choto kuksim	Plants are stomachic, astringent and tonic. Possess anti-cancerous property. Roots used in stomachache, diarrhoea and dropsy. Seed cures diseases caused by round-worms and thread worms, cough, flatulence, intestinal colic, dysuria, leucoderma, psoriasis and other skin diseases.
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Figure 1a. Weeds growing in the campus during 2018-19 : (1) *Abutilon indicum*, (2) *Acalypha indica*, (3) *Aerva aspera*, (4) *Ageratum conyzoides*, (5) *Alternanthera sessilis*, (6) *Amaranthus spinosus*, (7) *Boerhaavia diffusa*, (8) *Cleome viscosa*, (9) *Coccinia grandis*, (10) *Coix lacryma-jobi*, (11) *Commelina benghalensis*, (12) *Cheilocostus speciosus*, (13) *Croton bonplandianus*, (14) *Cynodon dactylon*, (15) *Cyperus rotundus*, (16) *Eclipta prostrata*, (17) *Eleusine indica*, (18) *Euphorbia hirta*, (19) *Heliotropium indicum*, (20) *Kyllinga brevifolius*.

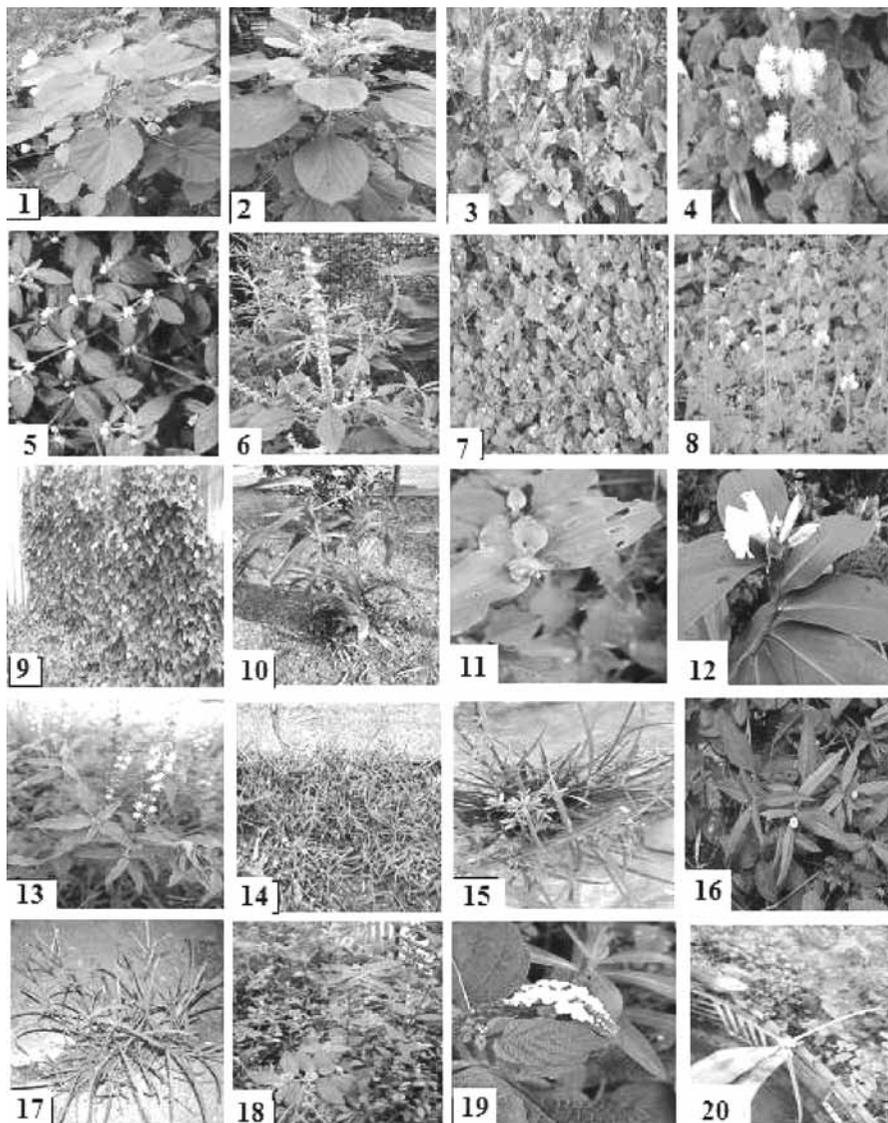


Figure 1b. Weeds growing in the campus during 2018-19: (21) *Leucas aspera*, (22) *Lindernia crustacea*, (23) *Ludwigia octovalvis*, (24) *Mazus pumilus*, (25) *Mikania micrantha*, (26) *Mimosa pudica*, (27) *Oldenlandia corymbosa*, (28) *Oxalis corniculata*, (29) *Phyllanthus fraternus*, (30) *Physalis minima*, (31) *Scoparia dulcis*, (32) *Sida acuta*, (33) *Solanum nigrum*, (34) *Sphagneticola calendulacea*, (35) *Tridax procumbens*, (36) *Vernonia cinerea*.

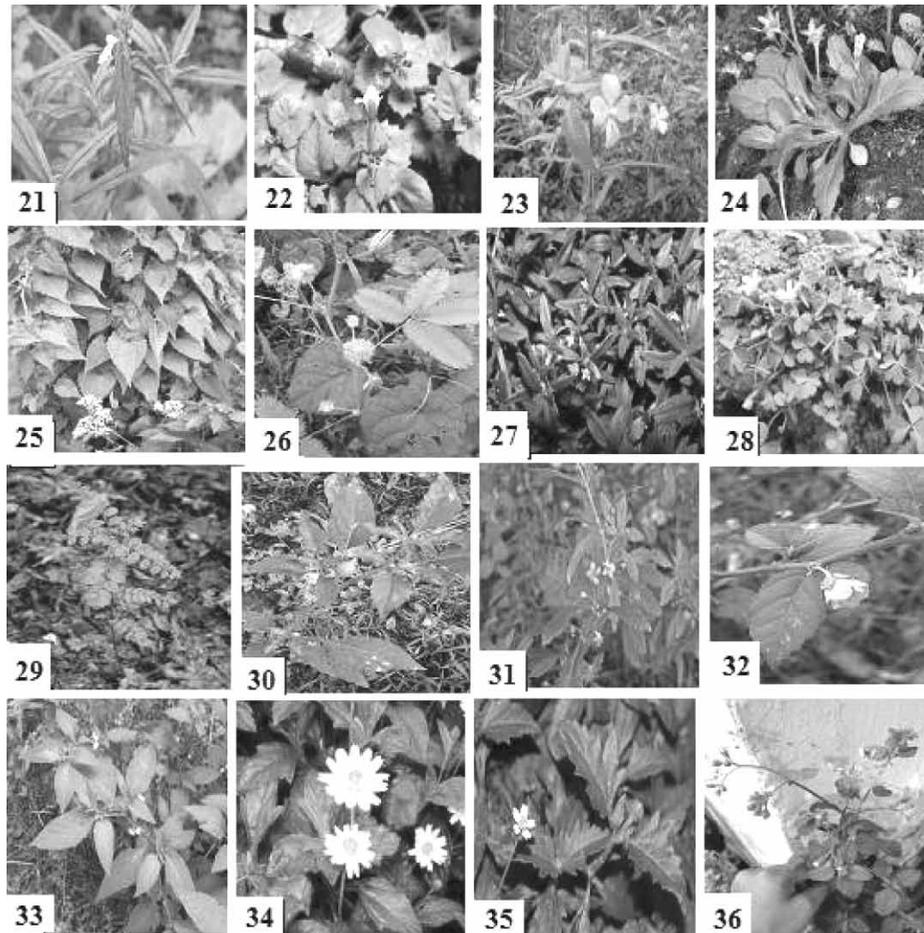


Figure 2. Weed members different flowering plant families (n=20) growing at college campus recorded during 2018-2019.

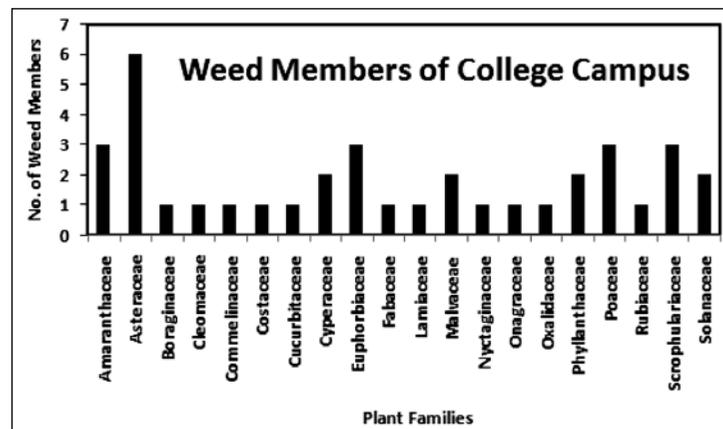


Figure 3. Percentage contribution of different study groups in the population (n = 117) of the online questionnaire on awareness about medicinally important weeds growing in college campus.

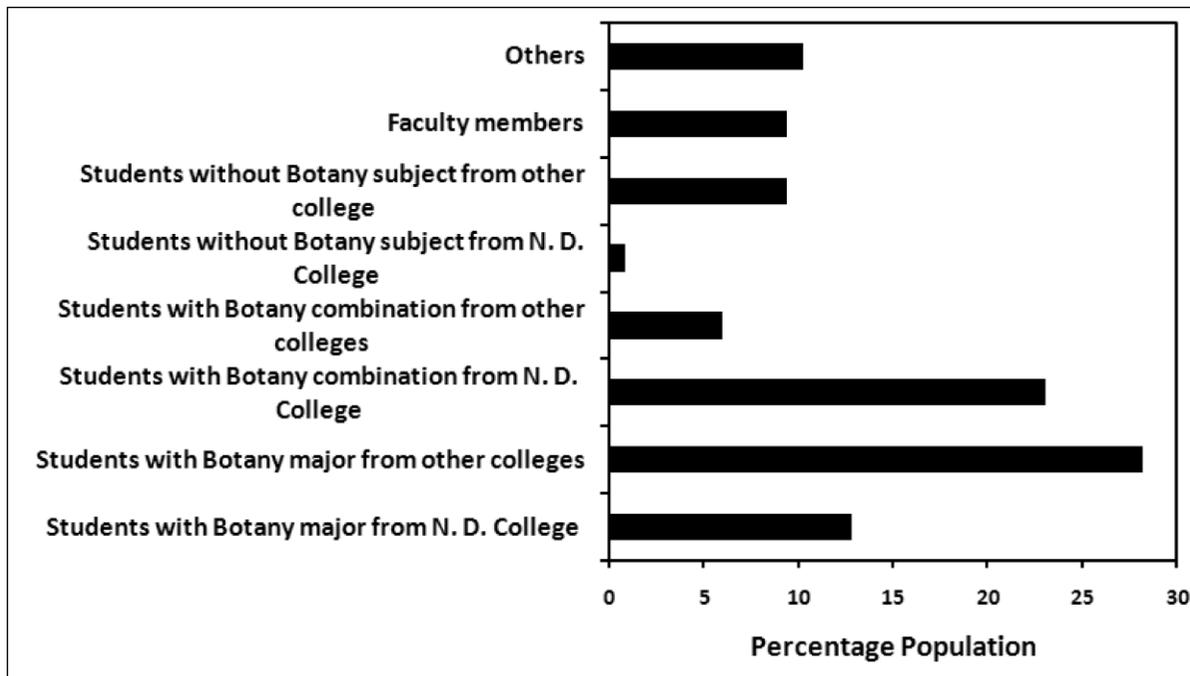
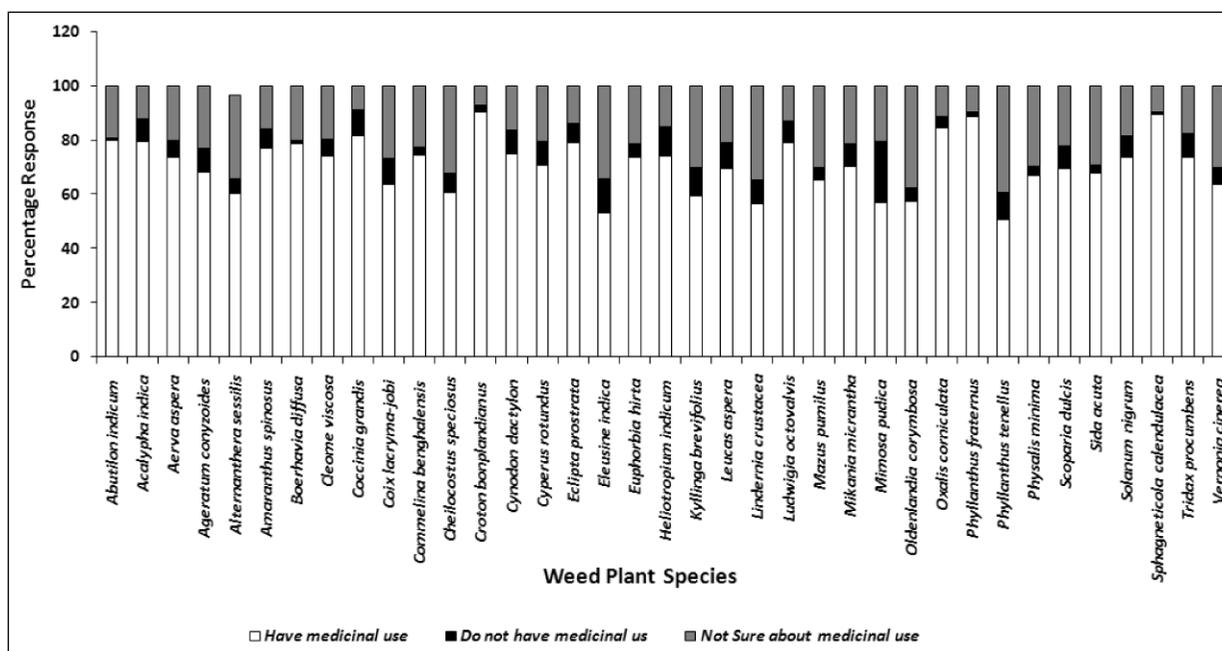


Figure 4. Outcome of the online awareness questionnaire survey conducted on medicinally important weeds growing in the college campus.



4. Conclusion

Biodiversity conservation is very much essential at the global, regional and local levels all around the globe. Most of the megadiversity nations have their so called 'development' by habitat destruction of different plant species leading to loss of biodiversity. As a result, the entire ecosystem of the world is going to lose its balance. We have to be aware that different levels of anthropogenic activities often endanger the existence and finally lead to the extinction of species. The educational institutes also have an important role to enlighten people, especially students, about the conservation of biological resource for long term sustainable development of the society. The present study clearly indicated that there are a number of weeds growing around us, which have medicinal values and most of the people are already aware about this. Such awareness will be very much helpful to develop environmental policies for sustainable development, based on the idea that "We have to nurture the nature for our future".

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Misir Ali, an interesting and mystic creation by Humayun Ahmed.

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During the world pandemic, where the restless souls are confined within the four walls, it seems really impossible to imagine a character who is amazingly self-oblivious and extremely concern to the future of the human race. Here in this article, the centre of discussion will be Humayun Ahmed's portrayal of Misir Ali, a different kind of take on the character by going against of the flowing along with an undercurrent note of creative reading during this turbulent time. In the world of mystery, Misir Ali stands individually-apart from the typical novels, on the shoulder of a fearless persona to challenge the set rules of society – a great learning indeed !

Keywords: *Mystery, Thriller, Character Analyse, Creative reading, Logical explanation, Human psychology.*

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Author – Humayun Ahmed.

Publisher – Protik. 46/2 Hemendra Das Road, Sutrapur, Dhaka – 1100.

Published – February, 1993. Fifth edition.

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Book Series – Misir Ali.

Contents – 1. Debi.

2. Nishithini.

3. Nishad.

4. OnnoBhuban.

5. Brihonnola.

6. Bhoy.

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Suspense and mystery along with a spine-chilling and nerve-wracking thrilling plot appeal to any human mind most. This genre has been revisited several times by multiple authors for centuries in various countries. The cathartic effect of a good thriller can leave a long lasting effect upon a reader's mind by arising a few conflicted fundamental questions of belief and complexity. In this context Humayun Ahmed's **Misir Ali** is probably one of the finest creations to define such characteristic traits. In **Misir Ali**, the blend of mystery along with a bone-chilling suspenseful ambience happen just so seamlessly with utmost ease.

Categorizing the character of Misir Ali into any particular format is nearly impossible as it displays combination of various sights of complexity level as his conscious mind gets unravelled with every layer of story – something impossible to understand just by having a peek on the surface in his unorganized lifestyle. From outer side he appears to be a normal mid-age professor of psychology department in Dhaka university who leads a single life – the simplicity of his outer side was the actual complexity of the plot. Logical approach and a sympathetic view upon human race can't go along due to its two completely detached facing of journey and the ultimate destination. This almost two different and nearly contradictory quality have found their path in Misir Ali who loves the human race and deeply worried for its future on one hand and on other he has this very shrewd mind and sharp observation skill to analyse everything under the light of logic.

Ahmed skilfully represented a unique combination of human impulses in Misir Ali's character. In most cases the people who observes and studies human psychology for a long time generally tend to devoid of any personal sensitivity, they incline to criticise other over on the smallest or trivial thing, here the exception is Misir Ali. He tries to understand the logic behind every incident or human reflection without any judgement or harsh feeling towards that other person. He is a sharp observer and a meticulous listener. Though at times, he can appear as a careless person who is oblivious to his duties or responsibilities (including self-improvement) but in deep down he

cares for others seriously as we notice how desperately he searches for the parents of a little girl who lives in his house and even hires a boy to look for any missing news in old newspapers or the way he takes care of her when she caught fever even the girl was wondering that nobody actually thought of his worker with such earnest caring way in **Nishithini**. Though he appears to be an ordinary mid-age person, he possesses great inherent love for the whole world. He can be calm and deliver his logical explanation even in a very awkward, tough and nerve-wracking situation – he can be that composed in a tensed circumstance, appear at times as if highly detached from any worldly pleasure or attachment. You can notice a strong calmness in his whole appearance almost hidden underneath his oblivious outer side.

There is a part in **Brihonnala**, where Misir Ali finally confronts the criminal in such a calm and composed manner with such a confidence that actually elevates him from just an ordinary truth-seeker man. Also, the pin-drop silence of the night blends smoothly with an undercurrent of ghostly ambience adds an extra layer of thrill and suspense which inturn beautifully heightened the climactic effect upon the readers. There is another scene where in **Nishithini**, where Misir Ali, with immense control in his nerves, talked with the murderer who came to kill him actually. The whole scene is so intense in terms of its narration that left the reader's mind numb with the explosion of various feelings – a masterstroke of the author which is bound to attack on a reader's mind.

There are multiple detective novels in Bengali and world art literature. Detective novel are basically take the readers on a journey of mystery and problem-solving skill of a particular individual to reach to the ultimate destination. Though Ahmed never claimed it to be an acknowledged detective novel rather his claims were inclined more towards on the free personal quest of a mid-age professor who seeks logic behind everything, for whom there is no place for mystery in physical world, there is a tinge of detection in Misir Ali's work process but oversimplification of his character can lead us to a wrong direction rather what makes Misir Ali a stand apart is his being different from the typical

norms, for example, there is no proper ending of the stories, Misir Ali will take you on the journey and you will understand everything slowly as layers would start unravelling one by one and Misir Ali would dive into them. In typical detective novels, the detective would narrate the actual story behind everything by explaining the layers and how he/she reached to it but in Misir Ali there is no particular division or ending like that, it is as if you would understand everything by yourself and there is absolutely no need to let other to explain, it is more like a narration of incidents rather than a detective novel – an Ahmed's masterstroke to underline the difference from typical detective novels which in turn makes Misir Ali a highly relatable character for the readers. Ahmed probably wanted to be documentation of a work-lover professor who love to search logical explanation behind things, for that he didn't provide Misir Ali a sidekick or a partner as any mainstream detective novels would do. Therefore, the readers get the chance to have a first-hand experience in the journey without the interference of any third person's presence or point of view. The description and the incidents are very rich in its own individuality. In mostly mystery or detective thrillers we might have come across the narration where the author only showcases the part of the protagonist or the detective individual who is searching the truth and the rest remains under the carpet. In **Misir Ali**, we notice a thorough study of the antagonist also without any judgement in a very detached style placing itself in a parallel universe. Unlike typical novels which place protagonist in centre, Ahmed actually represents a well-knitted parallel storyline for those antagonist's psychology along with each and every other character – a fantastic way of narration which actually triggers the mind of readers to imagine the story beyond the book and all the possible conclusion and explanation can be derived from this.

There is no set one way of narration, Ahmed skilfully employed artistic technique to capture not only the progress of Misir Ali but also of other characters. The development or the pace of the narration mostly depends upon Misir Ali's innovative way of investigation, totally different from any typical set

storyline, he would follow each and every place where he can get any piece of information related to that particular case even if it is trivial. He can employ his time, energy and money to any particular unknown case if it appeals to his conscious mind even if he is not getting any money for that (which he doesn't get in most places). Misir Ali is someone who loves to build his mansion of consecutive happenings with the brick of logical explanation.

For me **Nishithini** has appealed to my senses mostly because it somehow underlines more maturity and responsible sight of Misir Ali along with a slight undercurrent vibe of his romantic persona, also the development of side characters like Firoz or Naznin or even Misir Ali's bond with that little girl Hanifa work as an extra point of interest to me. The story revolves around Feroz, a twenty-two years old medical student and his mental or psychological conflict or disorder. As the narration captures pace, one by one we explore the mental layers of each and every character including Misir Ali himself, not a lightweight peek through rather we get a deep observation or study of their mental appearances and conditions. Slowly he untangles the mystery one by one even putting his own life at risk. There are multiple interesting subplots which include Nilu, a young student of university and Hanifa, a little girl who works in Misir Ali's house. Though in the preface of this book Ahmed clearly mentions that development of romantic feeling is a casual thing for any normal living being yet for a persona like Misir Ali it should be contented only in himself and not actually take a shape in his real life also (as he shows Misir Ali's marriage to Nilu in **OnnoBhuban**, which Ahmed clearly mentions as a "huge mistake" in the preface). Misir Ali somehow feels strong reluctance with any emotional attachment to any individual. He has a very deep inherent romantic soul in himself which should be left in himself as a hole so that his work can slowly fill in with logical interrogation and quest of the outer world. There is also a strong gothic element to the overall theme of the story, it is like a rollercoaster of thrilling experience that mixes mystery and ghostly atmosphere – so intricately woven together that the grip will make the readers glued to the end.

According to Humayun Ahmed, often readers complain that the endings doesn't consist carpe diem effect upon readers which actually give a sense of joy of final completion of the mystery. The joy of getting a final closure at the end of any mystery thriller is a something every reader want to experience. But according to my personal opinion, the never ending thread is another beauty of Misir Ali, it actually leaves a long-lasting effect on mind. The endings are often so complex and intrigued that it is almost impossible to give any concrete ending to those narratives. Providing it with any perfect direction can actually disrupt the the path of endless imagination for readers. This never-ending sense actually accentuates the relatable features of Misir Ali with real life figure. He is an oblivious man with no self-awareness and with no absolute fiendish mentality to others, a logic lover person who continuously wants to discover the hidden logic beneath the surface, a lively person with no absolute ambition for money or position or power but only deconstruct the mystery, a mid-age alone man who has nothing to fear but only the hunger to discover the new, his only wish or demand is to extract the logic from the veil. Though at times, he can appear as a madman (since he appears to give more than what he gets) but deep down he loves the human race and wants to help them. Often a great observer of human psychology can

be devoid of any emotional feeling but not in the case of Misir Ali, he is a deeply emotional individual but at the same time doesn't believe in any type of mysticism. At one place Humayun Ahmed even states Misir Ali loves the world unconditionally and in his character emotion and logic walk hand in hand.

In this pandemic where confinement is becoming new normal day by day and a restless, overwhelmed feeling slowly crawling towards us, Humayun Ahmed's **Misir Ali** will help you to engross yourself in a journey of mystery and thriller. In this turbulent time where everyone is freaking out for future, Misir Ali's casual approach will wonder you and may help you to reinvent your core logical system and beliefs. His simple yet captivating life lesson will fascinate you and can actually make you rethink your point of view of seeing the physical world – a piece of solace to the restless soul in this conflicted, confused time.

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The Unwomanly Women in Shaw's Plays.

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*The concept of the “unwomanly woman” is closely linked to the cult of the Ibsenite New Woman. The New Woman, appearing again and again in George Bernard Shaw’s plays is a product of his social speculations after he joined the Fabian Society as its principal spokesperson and editor of its pamphlets. The concept of the “unwomanly woman”, another version of the New Woman carries a long lineage in literature since the 14th -15th century and looks forward to a development of an enriched academic pursuit of gender studies in the 20th century. Now who is an “unwomanly woman? Any rebel or protesting woman, who denied to abide by the dictates of the patriarchs as per the age-old societal practices was branded as “unwomanly woman”, a term borrowed from Shaw’s play **The Philanderer**. She was singled out as a woman of considerable power, having the potential to subvert masculine domination. Shakespeare’s depiction of the strong assertive female in Helena in **Measure For Measure** especially encouraged Shaw to portray heroines of similar mindset. Hence we have a series of “unwomanly women” in Shaw’s 19th century plays starting from Blanche in **The Widower’s Houses**, Grace Tranfield, Julia Craven and Sylvia Craven in **The Philanderer** and Mrs Warren and her daughter in **Mrs Warren’s Profession**. Subversive strong minded heroines recur even in the late 19th and early 20th century plays of Shaw, not to forget the upright Candida and Saint Joan in his respective plays *Candida* and *Saint Joan*.*

Keywords: *New Woman; Unwomanly Woman; Ibsenite: Female Empowerment; Shavian.*

Emilia: ...it is their husbands’ faults
If wives do fall. Say that they slack their duties,
...break out in peevish jealousies,
Throwing restraint upon us.
(*Othello, The Moor Of Venice*, 4, 3, 84-88).

Some lines later, she again repeats:

Emilia: ...Let husbands know
Their wives have sense like them; they see and smell,
And have their palates both for sweet and sour.
As husbands have...
...
...have we not affections

Desire for sport, frailty, as men have?
Then let them use us well; else let them know
The ill we do their ills instruct us so.

(*Othello, The Moor Of Venice*, 4, 3, 91-94, 98-101).

In Shaw’s *Mrs. Warren’s Profession*, we hear Mrs. Warren declaring her opinions in the same robust tone:

Mrs. Warren: If theres a thing I hate in a woman, its want of character...And whats a woman worth? Whats life worth? Without Self-respect! I have always knew to respect and control myself.

(*Mrs. Warren’s Profession*, Act II)

Emilia in Shakespeare and Mrs. Warren in Shaw represent the Ibsenite Women. My speculation in this paper is with such female protagonists who appear again and again in Shaw's nineteenth century plays like *The Philanderer* (1893), *Mrs. Warren's Profession* (1893) and *Candida* (1894) as the most "Unwomanly Woman", who in Shaw's words "know how to take care of themselves" (*The Philanderer*, Act 1).

Probably the most momentous experience in Shaw's early years in London came when he joined the Fabian Society, for it was a meeting of kindred spirits with a common aim. The Fabians' declared purpose, around the time the society was founded (January, 1884), was that of 'reconstructing society...in such manner as to secure the general welfare and happiness' (Pease, Edward R, *The History of the Fabian Society*, 1925, p.193). It was a society of socialists, aiming at "the reorganization of Society by the emancipation of Land and Industrial Capital from individual and class ownership and vesting of them in the community for the general benefit" (Shaw, *Sixteen Self Sketches*, p. 39). They had a famous motto, "Educate, Agitate, Organise", which marked them as propagandists. Theirs was to be a new kind of socialism, spread by evolution rather than by revolution. Shaw, as the Society's principal spokesperson and editor of its pamphlets, made an enormous contribution to the Fabian Society. He spread the Fabian word by articulating the Society's corporate thinking through tracts and the *Fabian Essays in Socialism*. Shaw valued his Fabian experience, seeing it as of great significance to his playwright's role. He describes how he was able "to write with a Fabian purview and knowledge which made my ... literary performances quite unlike anything that the ordinary literary hermit-crab could produce...He had in the *Fabian Politbureau* an incomparable critical threshing machine for his ideas" (Shaw, *Sixteen Self Sketches*, p. 68).

It is my conviction that Shaw's idea of the *New Woman*, the *Unwomanly Woman* emerged from his broader concept of Fabian socialism. What, according to Shaw is this Fabian socialism? Shaw brilliantly defines it in

the *Fabian Essays in Socialism*:

Since inequality is bitter to all except the highest, and miserably lonely for him, men come greatly to desire that these capricious gifts of Nature might be intercepted by some agency having the power and goodwill to distribute them justly according to the labour done by each in the collective search for them. This desire is Socialism.

Regarding the "second sex" Shaw is found to be more vocal in his tract, "A Manifesto" (Fabian Tract No. 2). The tract was read at a Fabian meeting on September 19, 1884, just two weeks after Shaw had been elected to membership and it was duly published. In the context of bringing up of children Shaw opines:

That the State should compete with private individuals- especially with parents- in providing happy homes for children, so that every child may have a refuge from the tyranny or neglect of its natural custodians.

The proposition that he makes here about women in a neatly turned phrase has more of a Fabian flavor about it:

That Men no longer need special privileges to protect them ... and the sexes should henceforth enjoy equal political rights.

(Pease, *The History of the Fabian Society*).

It was to be some years before Shaw, in his highly practical play, *The Apple Cart*, was able to celebrate the first woman to hold the rank of Cabinet Minister.

Shaw's conception of the *New Woman* out of which stems the idea of the *Unwomanly Woman* may trace a close follow-up in the recent academic pursuit of "gender studies". Gender studies" was initiated in the late 1960s and its development was advocated by the second wave feminism. Along with developing a critique of gender inequalities, second wave feminism drew attention to the ways in which academic disciplines and social and political theories excluded the experiences, interests and identities of women. Women were almost invisible in the pre-1970s gender-blind sociology, only featuring in their traditional roles as wives and mother within families. Differences and inequalities between men and women at this time were not recognized as an issue of sociological concern and were not seen as problems to be addressed. In the

context of the second wave feminist critiques, the arts and humanities began to pay increasing attention to gender. In sociology during the 1970s, the differences and inequalities as created by patriarchal society came to be regarded, especially by women sociologists, as problems to be examined and explained. Studies were focused on filling in the gaps in knowledge about women, gaps left unresolved by prior male bias.

Now this context of sociological speculation claims that the idea of the *Unwomanly Woman* should be clarified. Her existence was already quite perceptible in the preceding literature. Any rebel or protesting woman, who denied to abide by the dictates of the patriarchs as per age-old societal practices were branded as an “unwomanly woman” (a term borrowed from George Bernard Shaw’s *The Philanderer*). She was singled out as a woman of considerable power, having the potential to subvert masculine domination. It is interesting to notice that examples of such “unwomanly women” were not few in number either in *The Bible* and medieval literature or in real life. Lilith, Adam’s first wife abandoned her husband for good, after quarrelling with him, regarding their equality. The Wife of Bath in Chaucer’s *The Canterbury Tales* and Noah’s wife in the *Miracle Plays* are well known examples of female rebels. In the early Tudor Plays, *Johan Johan* (1533/34) and *Tom Tyler and his Wife* (c. 1561), similar cantankerous characters appear in the persona of Tib, Johan’s wife and Strife, the wife of Tom Tyler.

The social history of sixteenth century England records that the Renaissance witnessed a new kind of visibility for outraged women, armed with household weapons and a moral authority, who united in a fearsome front against those unfortunate enough to meet them. The traditional form of protest most associated with women of the lower classes centered on bread riots resulting from grain shortages, which especially became acute during the instabilities of the sixteenth and the seventeenth centuries, directly threatening the domestic spheres over which the women reigned. The most potent symbol of the independent “unwomanly woman” was Queen Elizabeth herself. “I have the body

of a weak and feeble woman, but I have the heart and stomach of a king and a king of England too”, was her famous declaration to the troops at Tilbury in 1588, where the Queen was reported to have appeared in a quasi- military costume. As Jonathan Dollimore speculates in his book *Radical Tragedy*, there went on “a serious undercurrent of intelligent thinking about women’s status in a new commercial society” in early modern England (Dollimore 239). It is no wonder that all the exceptional female models, mythic and real-life, inspired both humanists and reformers to reconsider their estimate of women, especially the basic assumption of their natural inferiority. They might have also served as notable instances of inspiration for dramatists like Shakespeare and Shaw, eager to advocate female empowerment in their plays.

Shaw maintained that he had the support of Shakespeare’s plays since in them “woman always takes the initiative”. As for instance, Shaw strongly approved a character like Helena in *Measure For Measure* whose self-determination and her successful perseverance in her mission proves her to be a truly Ibsenite heroine and an Unwomanly Woman. In the Preface to *Man and Superman*, Shaw writes:

I find in my own plays that Woman, projecting herself dramatically by my hands,...behave just as Woman did in the plays of Shakespear.

In Shaw’s plays, woman is the dominant partner and man becomes a subject of complete domination. The man is visualized as the instrument employed by the female in her instinctive compliance with the Life-Force, its demand for fertility and its self-continuing process. The woman selects her mate and the man, though he may attempt to decide his own destiny, is overruled.

Shaw’s *Unwomanly Woman* makes her appearance since very early in his plays. Blanche, the female protagonist in Shaw’s *The Widower’s Houses* (1893) appears as the first of the many New Woman that Shaw was to present on the stage. Unlike the traditional heroine, Blanche is violent. When she loses her temper with her maid, she seizes her by the hair and throat. Sartorius’

comment about his daughter Blanche to Trench is most noteworthy:

It is part of her strong character and her physical courage, which is greater than that of most men, I can assure you.

(Act 2)

Blanche is defiant of all obstacles that may hinder her attachment to Trench. The text states:

she is provocative, taunting, half defying, half inviting him to advance, in a flush of undisguised animal excitement. It suddenly flashes on him that all this ferocity is erotic: that she is making love to him.

Blanche retorts back to Trench:

I release you. I wish you'd open my eyes by downright brutality; by striking me; by anything rather than shuffling as you have done.

(Act II)

Does not Blanche remind us of a much earlier rebel woman like Katherine or Kate who in Shakespeare's *The Taming of the Shrew* is branded as a "shrew" because of her unconventional aggression and virility? In her exchange with Petruchio, the gentleman who has come to court her, Kate makes the strongest bid for linguistic freedom:

Why sir, I trust I may have leave to speak,
And speak I will. I am no child, no babe.
Your betters have endur'd me say my mind,
And if you cannot, best stop your ears.
My tongue will tell the anger of my heart,
Or else my heart concealing it will break,
And rather than it shall, I will be free
Even to the uttermost, as I please, in words.

(4, 3, 73-80).

Theatre-goers are to be accustomed not only to this New Woman but a new kind of courtship. Interestingly, this motif is seen to further develop in Shaw's next play *The Philanderer*.

The Philanderer (1893) exhibits novelty of ideas in its changed social codes of manners and behavior, especially between the sexes. In the *Preface* of this play, Shaw describes this behavior as "unpleasant": he says that it arises from outmoded marriage laws. Central to the play is the Ibsen Club, in the sheltered environment of which a new code of conduct can be acted out without incurring opprobrium. The traditional

London club, the refuge of the well-to-do man who seeks to escape domesticity and femininity, is turned inside out, for this club is open to both sexes, and the "manly man", together with the "womanly woman" is excluded. The club also stands as a metaphor for the sheltered environment in which the Ibsenite woman, also known as the New Woman, and her corollary, the Ibsenite man act out their new patterns of behavior. The use of clubland and the many inversions of its customs, such as Sylvia Craven's wish to be addressed as "Craven, old boy" make good theatre. It is significant that Sylvia, when in the club, wears a Norfolk jacket and breeches, but has a detachable skirt ready at hand, presumably for when she emerges into the outer world.

Mrs. Jeremy Patterson was the model for Julia Craven in *The Philanderer* while Charteris was mainly a self-sketch of the early Shaw. Jeremy Patterson was tempestuous in nature who first fascinated and finally exasperated Shaw beyond endurance.

Grace Tranfield, Julia Craven and Sylvia Craven: each of these three women in *The Philanderer* represents some aspects of the New "Unwomanly" Woman. Grace, the widow, who is in love with Charteris, the philanderer of the title has learned to look with dispassionate eyes at the institution of marriage. She makes this anti-romantic pronouncement:

I am an advanced woman. I'm what my father calls the New Woman... That is why I will never marry a man I love too much... I should be utterly in his power. That's what the New Woman is like. Isn't she right, Mr. Philosopher?

Julia Craven, who, far from rejecting the philandering philosopher, actively pursues him. She represents the more flawed New Woman. In behavior she follows fashion, rather philosophy. When previous conventional restrictions on behavior are removed as far as Ibsenites are concerned, she finds it difficult to contain the passion of her emotions.

When Charteris, for his own preservation, engineers a match for Julia and she realizes what he has done, her first response comes in physical terms:

In a paroxysm half of rage, half of tenderness, she shakes him, growling over him like a tigress over her cub.

The young Sybil Craven, sister of Julia, is as yet

untouched by sexual love, but she has an important contribution to make concerning the attitude of Ibsenite men towards women: it is of the essence of Ibsenism. She tells Charteris:

You talk to them [i.e., women] just as you do to me or any other Fellow. That's the secret of your success. You can think how sick they get of being treated with respect due to their sex.

Shaw's own later attitude to the play raises further problems. In June 1896, he told Golding Bright:

In *The Philanderer* you had the fashionable cult of Ibsenism and New Womanism on a real basis of clandestine sensuality"

(Dan H. Lawrence. ed., *Bernard Shaw. Collected Letters*, Volumes 1 to 4).

Later in the year he wrote to Ellen Terry:

I cannot make up my mind about 'The Philanderer'. Sometimes I loathe it, and let all my friends persuade me... that it is vulgar, dull, & worthless. Sometimes I think that it is worth playing.

The last of the "unpleasant plays", *Mrs. Warren's Profession* (1893) is undoubtedly the most challenging, because in this play, the "Woman" question is inextricably tied to the issue of Fabian Socialism. Shaw makes Mrs. Warren's profession a metaphor for prostituted society by which he roundly condemns that society as one where the rich and the seemingly respectable prey upon the poor and unprivileged. The theme of this play illustrates the first maxim that Shaw wrote on behalf of the Fabian society:

That under existing circumstances wealth cannot be enjoyed without dishonor or foregone without misery.

(Pease, 41).

Widower's Houses had already broken new ground in entering the sociological arena. *Mrs. Warren's Profession* continued to do this, but in a much more sensational way. Typically in the past, if an ex-prostitute were presented on stage, she was shown as a tragic and repentant figure, hoping to shield her innocent daughter from knowledge of her blameful past. Here we have the respectable Mrs Warren, the ex-prostitute, living on the income derived from a chain of Brussels brothels (euphemistically known as hotels) of which

she is part owner, and holding her own in society. She lives, with other members of the cast, in a sort of enclosed garden, distanced from the source of her income and other unpleasantnesses of life.

When Mrs. Warren's past is revealed and she talks to her daughter, Vivie, she tells her about the economics of the situation, and how respectable society derives its income from the poor and exploited. Speaking from an environment that includes her own country cottage and the nearby rectory garden, she tells Vivie, who is newly graduated from university:

You think that people are what they pretend to be: that the way you are taught at school and college to think right and proper is the way things really are. But it's not: it's all a pretence, to keep the cowardly slavish common run of people quiet... the big people, the clever people, the managing people, all know it. They do so as I do, and think what I think.

Mrs. Warren had her origins from this cowardly slavish common run of people and it was from these that she made her escape. Her sisters were less fortunate: they were not eligible for prostitution. One of them worked in a white lead factory, a notoriously dangerous occupation. The other married a poorly paid Government labourer and struggled to raise a family on his wages until he took to drink.

Shaw's New Woman in this play is Mrs. Warren's daughter, Vivie, university educated and independent minded, who has won a scholarship to Cambridge. Shocked at the evils of society newly revealed to her, Vivie leaves the enclosed garden, rejects her mother and finds employment in the chambers of a woman in the city. From this vantage point she utters what might be well regarded as the key passage of the play:

I am sure that if I had the courage I should spend the rest of my life in telling everybody... The two infamous words that describe what my mother is are ringing in my ears and struggling on my tongue; but I can't utter them: the shame of them is too horrible for me.

Candida (1894) does not belong to the previous group of *Plays Unpleasant*, but is rather considered as one of the *Plays Pleasant*. It is the reappearance of the Ibsenite woman in this play that I feel to bind it with the preceding three. The New Woman here emerges

in the title role of the Reverend James Mavor Morell's wife, Candida. She is the Mother- Woman and in that capacity dominates the play. Candida, as a mother figure does not exercise the maternal function over her children- no play by Shaw has young children in it- but over her husband and boy-poet. Morell finally kneels beside Candida and confesses:

What I am you have made me with the labour of your hands and the love of your heart. You are my wife, my mother, my sisters: you are the sum of all loving care to me.

But the more disturbing fact to note is that there exists an undertone of eroticism between this Mother Woman and the boy-poet, Marchbanks, especially at the beginning of Act III. Michael Holroyd, Shaw's latter -day biographer is perceptive of the situation:

The affinity between them is that of mother and son, and the weapon that guards them from Hell is the taboo of incest.

The character of Candida has other Ibsen connotations. As for instance, when Candida has made her choice in favour of Morell, whom she sees as the weaker of the two men, she paraphrases Nora's famous words, saying: "let us sit and talk comfortably over it like three friends". But unlike Nora, Candida has no need to leave home: she has established herself as the dominant partner, and has joined the ranks of Shaw's New Woman.

I have limited my speculation to only some of the nineteenth century plays of George Bernard Shaw and focused on the Shavian treatment of the Ibsenite woman. The Unwomanly or Ibsenite woman has reappeared in different forms in Shaw's later twentieth century plays. In *Man and Superman* (1905), the New Woman is impelled by the Life Force to give birth to a superman and a new and imperial race. It is to this

Life-Force that Tanner yields at the climax of the play. He tells Ann:

I love you. The life- Force enchants me. I have the whole world in my arms when I clasp you.

In *Saint Joan* (1923), a much later play, Saint Joan, represents the voice of will or the Life- Force. But here she is the harbinger of nationalism, whereby each man shall be loyal to his king and country. Joan represents the New "Unwomanly" Woman in another way. What she asks for is not limited social freedom, but a cosmic emancipation in which the Life-Force will thrive unbounded:

Bread has no sorrow for me, and water no affliction. But to shut me from the light of the sky and the sight of the fields and flowers; to chain my feet so that I can never again ride with the soldiers nor climb the hills... without these things I cannot live; and by your wanting to take them away from me...I know that your counsel is of the devil, and that of mine is God.

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Historical Evolution of Monetary Policy and India's Standpoint

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Monetary policy refers to actions taken by central banks to affect monetary and other financial conditions in pursuit of the broader objectives of sustainable growth of real output, high employment, and a reasonable degree of price stability. It has emerged as an important tool of economic policy in the developed, developing developed and developing economies. And major reforms in monetary policy occurred in the last two decades of the 20th Century and, more or less, in the first two decades of the 21st centuries, augmenting in fact the globalization of monetary policy. It is clear now that the challenge for monetary policy have been changing over time, even though some basic issues have remained of perennial concern.

It is in this backdrop, the objective of the chapter is to report the historical evolution of the monetary policy across the globe within which we include classical monetary policy, monetary policy during the Great Depression, the goals of monetary policy, instruments of monetary policy, intermediate targets, theories of monetary policies, rules versus discretions as well as pinpoint the trends of India's monetary policies over time.

Keywords: Great Depression, Systemic risk, Macro prudential regulations, Bretton woods System, Inflation Targeting

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The conduct of monetary policy is complex. It has not only to be forward looking, but has to grapple with an uncertain future....The challenge facing a monetary authority is to balance the various choices into a coherent whole and to formulate a policy as an art of the possible.

–Y.V.. Reddy, Former Governor, RBI

I. Introduction

Monetary policy that refers to actions taken by central banks to affect monetary and other financial conditions in pursuit of the broader objectives of sustainable growth of real output, high employment, and a reasonable degree of price stability, has emerged as an important tool of economic policy in the developed, developing developed and developing economies. And major reforms in monetary policy occurred in the last two decades of the 20th Century and, more or less, in the first two decades of the 21st centuries. It is clear now that the challenge for

monetary policy have been changing over time, even though some basic issues have remained of perennial concern. As the institutional environment—both domestic and global—changes, the tasks of monetary policy also undergo a change. Today's monetary and financial system is far more complex than it has been the past. The channels of financial intermediation have also changed. While only in 2009 most business flowed through the balance sheets of banks or insurance companies, or through a limited range of investment funds, the explosive increase in wealth held privately (partly as a result of greater dispersion of income) has led to the creation of a wide range of other investment vehicles, of which hedge funds and private equity are the most prominent. New instruments have emerged which make it possible to transfer risk of all kinds on a far larger scale and in more complex ways. Financial intermediation has reached a level of sophistication which has itself become a source of concern in recent days. The menu of financial products available has expanded enormously. Derivative products which were unknown till a few decades ago, have become common. All these changes have an important role to play in relation to the transmission mechanism. The impact of monetary policy action can be felt through a variety of channels some of which though recognized in the past have become more important. The speeds with which funds nowadays move across borders have raised issues regarding the coordination of monetary policies among countries. Prices and interest rates are no longer determined by domestic factors.

In the industrial advanced countries, after the World War II, there had been many changes in monetary policies in the fight against inflation and other matters. Also the relative importance of growth and price stability as the objectives of monetary policy as well as the appropriate intermediate target for monetary policy became the focus of attention. The recent churning of the financial system has raised several new questions not only with respect to objectives but also to the overall conduct of monetary policy itself.

A similar trend regarding monetary policy is discernable

in developing economies as well. The importance of price stability and, therefore, the need to use monetary policy for that purpose assumed importance in developing economies. The impossible trinity¹ is now a reality and the countries have to make the relevant choice.

II. Objectives

It is in this backdrop, the objective of the chapter is to report the historical evolution of the monetary policy across the globe within which we include classical monetary policy, monetary policy during the Great Depression, the goals of monetary policy, instruments of monetary policy, intermediate targets, theories of monetary policies, rules versus discretions as well as pinpoint the trends of India's monetary policies over time.

III. Historical evolution of monetary policy

From the First World War onwards, central banks focused entirely on public objectives. Their objectives also changed towards shielding the domestic economy from external shocks and stabilizing real output and prices. The trend continued in the 1930s and after the Second World War.

Classical Monetary Policy

The true origin of the modern monetary policy occurred under the classical gold standard, which prevailed from 1880 to 1914. Under the gold standard all countries would define their currencies in terms of a fixed weight of gold and then all fiduciary money would be convertible into gold. The key role of the central bank was to maintain gold convertibility. Central banks were also supposed to use their discount rates to speed up the adjustment to external shocks to the balance of payments, that is, they were supposed to follow the 'rules' of the game (Keynes, 1930). There is considerable debate on whether the rules were actually followed (Bordo and MacDonald, 2005). There is evidence that central banks sterilized gold flows and prevented the adjustment mechanism.

After the First World War, the gold standard was restored, but in the face of a changing political economy

— greater emphasis was placed by central banks on the domestic objectives of price stability and stable output and employment than on external convertibility.

The Federal Reserve followed the flawed real bills doctrine, which exacerbated the downturn, and the gold sterilization policies followed by the Fed and the Banque de France weakened the adjustment mechanism of the gold standard.

Monetary policy during the Great Depression

Monetary policy during the Great Depression had four phases. The first phase is the Great Contraction. 1929-33 is referred to as the contraction or downturn phase of the Depression. The second phase of the Depression is a brave recovery from 1933 through 1939. Monetary policy during this period was dominated by President Roosevelt's decision to devalue the dollar in terms of gold. Besides, numerous pieces of legislation were enacted increasing and altering Federal Reserve's powers. The third phase was another depression that occurred in 1937. The final phase was to some extent a recovery. In fact, monetary policy during the Great Depression is largely a study of failure: a lack of leadership, an incorrect theory of policy, the constraint of the gold standard and a lack of understanding. But the failure gives the pillar of future success in the pursuit of price stability and maximum sustainable growth.

Monetary policy was restored to the central banks in the 1950s and 1960s. But inflation was broken in the early 1980s by concerted tight monetary policies in the United States, the UK and other countries and a new emphasis was placed on the importance of low inflation. Central banks in many countries were granted goal independence and were given a mandate to keep inflation low.

The Goals of Monetary Policy

Until 1914, the dominant monetary regime was the gold standard. Since then, the world has gradually shifted to a fiat money regime. Under the classical gold standard the key goal was gold convertibility with limited focus on domestic economy. By the interwar period convertibility was being overshadowed by

emphasis on domestic price level and output stability, and the regime shifted towards fiat money. This continued after the Second World War. Under the 1944 Bretton Woods Articles of Agreement, member countries were to maintain pegged exchange rate and central banks were to intervene in the foreign exchange market to do this, but the goal of domestic full employment was also given predominant. The Bretton Woods evolved into a dollar gold exchange standard in which members' currencies were convertible on a current account basis into dollar and the dollar was convertible into gold (Bordo, 1993). A continued conflict between the dictates of internal and external balance was a dominant theme from 1959 to 1971 as it was the concern over gold imbalance.

The collapse of Bretton Woods between 1971 and 1973 was brought about largely because the United States followed an inflationary policy to finance both the Vietnam War and expanded social welfare programmes. There was a belief that the Phillips' Curve trade-off between inflation and unemployment existed: this led to a focus on maintaining full employment at the expense of inflation.

Since the end of the World War II, the countries across the globe have had witnessed relatively stable inflation and a high growth regime. But the happy mirror soon faded out. That period of "stable inflation and high growth" came to a halt during the oil price spike in the 1970s — the period known as the period of 'stagflation'.

The resulting 'great inflation' of the 1970s finally came to an end in the early 1980s by central banks following tight monetary policies. Since then the pendulum has again swung towards the goal of low inflation. (Friedman, 1968; Phelps, 1968). From the late 1980s the inflation came down to a stable level and the growth again picked up in the countries. This period is sometimes called period of 'great moderation'. Significantly, during this period the US Federal Reserve was chaired by Paul Volker and Alan Greenspan (the latter became Chair of the Fed in 1987), two legendary central bankers. That is why this period is sometimes referred to as Volker-Greenspan era.

This period continued upto the time of global financial crisis 2007-08. One significant aspect of this period is that the central banks across the world assumed a kind importance which was never observed before.

Instruments of Monetary Policy

The original policy instrument was the use of the discount rate and rediscounting. Open market operations (the buying and selling of government securities) was first developed in the 1870s and 1880s by the Bank of England in order to make bank rate effective, that is to force financial institutions to borrow.

In the interwar period the newly established Federal Reserve initially used the discount rate as its principal tool, but heavy criticism for its use, the Fed shifted to open market policy, its principle tool ever since.

Intermediate Targets

Traditionally, central banks altered interest rate as the mechanism to influence aggregate spending, prices and output. In the 1950s, the monetarist revived the Quantity Theory of Money and posited the case for using money supply as the intermediate target. But this process generated the great inflation of the 1970s.

By the 1970s most central banks had monetary aggregate targets. However, the rise of inflation in the 1970s as well as continuous financial innovation made the demand for money functionless. This meant that central banks had difficulty in meeting their money growth target. In addition the issue was raised as to which monetary aggregate to target (Goodhart, 1984). By the late 1980s most countries had abandoned monetary aggregates and returned to interest rates.

In sum and in addition, monetary policy has had its ups and downs in the post-Second World War period. In industrially advanced countries, after decades of eclipse, monetary policy re-emerged as a potent instrument of economic policy, in the fight against inflation in the 1980s. Issues relating to the conduct of monetary policy came to the forefront of policy debates at that time. The relative importance of growth and price stability as the objective of monetary policy as well as the appropriate intermediate target

of monetary policy became the focus of attention. Over the years, a consensus has emerged among the industrially advanced countries that the dominant objective of monetary policy should be price stability. Differences, however, exist among central banks even in these countries as regards the appropriate intermediate target. While some central banks consider monetary aggregates and, therefore, monetary targeting as operationally meaningful, some others focus on the interest rate. There is also the more recent practice to ignore intermediate targets and focus on the final goal such as inflation targeting.

But since early 1990s monetary policy in many countries had been based on pursuing an inflation target (implicit or explicit) with the policy rate set to allow inflation to hit the target, a policy which seems to be successful.

Theories of Monetary Policies

The development of practice of monetary policy described above was embedded in major advances in monetary theory that began in the first quarter of the 19th century.

Two principles became embedded in central banking lore — gold standard and the real bill doctrine. Adherence to the two pillars led to disaster in 1930. The depression was spread globally by the fixed exchange rate gold standard. In addition, the gold standard served as 'golden fetters' for most countries because they could not use monetary policy to allay banking panics or stimulate the economy lest it triggers a speculative attack (Eichengreen, 1992)

The Great Depression gave rise to the Keynesian view that monetary policy was impotent. This led to the dominance of fiscal policy over monetary policy for the next two decades. The return to traditional monetary policy in the 1950s was influenced by Keynesian monetary theory. According to this approach monetary policy should influence short-term rates. This money market approach dominated policy until the 1960.

Rules versus Discretion

A key theme in the monetary policy debate is the issue of rules versus discretion. The theoretical literature

suggests that a rule-based monetary policy is preferable to discretionary monetary policy. Taylor votes for rule based policy. Taylor(2012) argues that the monetary policy in the United States can be divided into two periods— while 1985- 2003 is marked by rule based period, the period thereafter culminating in the global financial crisis is characterized by discretionary policy.

A more recent approach focuses on the role of time inconsistency. According to this approach, a rule is a credible commitment mechanism that ties the hands of policymakers and prevents them from following time-inconsistent policies — policies that take past policy commitments as given and react to the present circumstances by changing policy. (Kydland and Prescott, 1977; Barro and Gordon, 1983).

Today's central bank, dedicated to low inflation, can be viewed as following the Taylor rule (Taylor, 1999). The chief merit of Taylor's rule is its transparency. It clearly provides a formula how to set the policy interest rate in keeping with the inflation and output gap in the economy. That is why it has become very popular with the policy makers at the central banks. This rule talks about inflation target. The countries adopted inflation targeting based on this rule.

In this vein, today's central bankers place great emphasis on accountability and transparency to support the credibility of their commitments to maintain interest rate geared towards low inflation (Svensson, 1999).

Though the central banks across the globe have embraced the Taylor rule as the major plank of their policy making, the global financial crisis put a big question mark on the efficacy of such rule. Many economists believe that Taylor rule should consider many other variables like asset markets parameters etc. in addition to inflation and output gap.

IV. Trends in India's monetary policy

Though the RBI played a major role during first three decades after Independence, it ought to abide by the guideline of the government. And so long as inflation was moderate, this approach worked well. But in keeping abreast of the world-wide inflation broken in the early 1970s and continued to the whole decade by

the whirl of tight monetary policy in the United States, the UK and other countries, India only saw inflation at that period and it, in the 1970s, touched unacceptable levels and as a result, growth of the money supply had to be tamed and reigned in.

A continuous 'battle' between the RBI and the MoF on the control of inflation and the need to contain fiscal deficit came to the fore in the 1980s. The period was marked by uneven growth though accompanied by even an average growth of little over 5 per cent. The average inflation was close to 7 per cent. The annual M_3 growth was 17 per cent. Submitting its report in 1985, the Chakravarty Committee recommended that in a need to regulate the money supply, the money supply growth ought to be consistent with real growth and acceptable level of inflation. It also stressed for close co-ordination between monetary policy and fiscal policy. Thus Committee's vision converted into a scheme what came to be described as flexible monetary targeting. But in the latter of the 1980s the Indian economy still saw a higher fiscal deficit and higher money supply growth, in spite of the acceptance of the recommendations. All these propelled us to dip into the crisis of 1991.

The 1990s saw a sea change in the contour of monetary policy. For example, (i) the issue of ad-hoc treasury bills was done away with. It was replaced by a system of Ways and Means Advances which had a fixed ceiling. The Reserve Bank of India continued to subscribe to the dated securities at its discretion. (ii) During 1993 and 1994, for the first time monetary policy had to deal with the monetary impact of capital inflows with the foreign exchange reserves increasing sharply from \$ 9.2 billion in March 1992 to \$ 25.1 billion in March 1995. As a result, the automatic monetization of fiscal deficit came to an end. (iii) Besides, by moving to market-determined rate of interest, government securities became marketable and it has enabled the emergence of open market operations (i.e., selling and buying of government securities) as an instrument of credit control. The dismantling of the administered structure of interest rate enabled the rate of interest to emerge as a policy variable. The RBI was deeply concerned with price stability as a dominant objective

of monetary policy and therefore, regarded regulation of money supply as a key factor in monetary policy.

Monetary policy has begun to operate within a changed institutional framework brought about by the financial sector reforms. It is this change in the institutional framework that has given a new dimension to monetary policy. New transmission channels have opened up. Indirect monetary controls have gradually assumed importance. With the progressive dismantling of the administered interest rate structure and the evolution of a regime of market determined interest rate on government securities, open market operations including 'repo' and 'reverse repo' operations emerged for the first time as an instrument of monetary control.

Post-1997 was earmarked by a series of approaches of multiple indicators. For example, the Liquidity Adjustment Facility introduced first in 1999 and refined later is emerging as a principal operative instrument to manage market liquidity on a daily basis. Bank Rate acquired a new role in the changed context. So too the repo and reverse repo rates. The Nineties have paved the way for the emergence of monetary policy as an independent instrument of economic policy (Rangarajan, 2002). But the issue connected with multiple objectives such as to (i) maintain a reasonable degree of price stability and (ii) to help accelerating the rate of economic growth) remained the same.

Financial Crisis, 2007-08

After the onset of financial crisis, monetary policymakers faced significant challenges. Financial markets were in trouble, normal credit flows were significantly disrupted, and economies moved into recession. Central banks sharply reduced their policy rates and tried to improve the functioning of financial markets. As "lender of the last resort" central banks provided liquidity to financial market participants. A number of other important measures were also initiated to quell the situation. The actions of the central bank mitigated the effects of the crisis and fostered recovery. As a result the size of the balance sheets of major central banks, reserves and the monetary base rose after September 2008. Over time, balance sheets came to a normal level.

The 2007-08 crisis and central bank responses have stimulated discussion of the appropriate way to implement monetary policy and the role of the central banks in both micro-prudential and macro – prudential regulation (Table). It is worth-mentioning that based on the 1988 Basle accord, prudential norms were introduced in India in 1992. Since then there has been a progressive move towards international norms. An important lesson from the 2007-08 crisis is that central banks, whether they are ultimate micro- or macro-prudential regulator or not, must pay more attention to the level of systemic risk in formulating policy and to how their monetary policies might affect the degree of systemic risk. Accordingly, central banks have begun the task of identifying indicators of the level of systemic risk² and have begun the discussion of how this information will be used in monetary policy decisions. It is well recognized that in a globalization context, policy conducted with data of poor quality could be very inefficient.

Table : Micro and Macro Approach

	Macro-prudential	Micro-prudential
Objective	Limiting systemic risk of the financial system: Mitigating the failure of a large segment of the financial system	Limiting idiosyncratic risk of individual institutions: Protection of depositors and investors
Implementation of supervisory controls	Top-down: setting prudential control in terms of the probability and costs of systemic distress	Bottom-up: Setting and aggregating prudential control in relation to the risk of each institution
Characteristics of risk	Endogenous: Originating in the collective behaviour of and interactions between institutions	Exogenous: Given to individual institutions and the disregard of feedback of collective actions
Common exposure to systemic risk	Relevant and important: Causes of the fallacy of composition	Irrelevant

Use of instruments	Standard prudential tools plus linking provisioning and pricing of risk to the volume of loan	Uniform solvency standards and codes of conduct
Focus of supervision	(i) A greater weight given to banks and larger and more complex institutions; (ii) Market monitoring; and (iii) Countercyclical orientation	Protection of individual institutions

Sources: Crockett (2000), Borio (2003)

India's Standpoint

In the years before and after the 2008 global crisis, RBI focused on financial stability that applies to both institutions and markets and that implies ability of the institutions to meet their obligations on their own without interruption or outside assistance. And markets are said to be stable when prices in financial markets are not volatile and participants can confidently transact in them at prices that reflect fundamental forces. In 2016, RBI moved to a new monetary policy framework which may be described as one of flexible inflation targeting. The interest rate (Repo Rate) became the operating target. Moving to the new policy framework, clarified the objective of monetary policy. But RBI has to contend with many other issues with respect to monetary policy. The question of when to raise or lower the interest rate will always be a contentious issue.

Changes in the exchange rate and foreign trade regimes have added an additional dimension to India's monetary policy. External considerations

have now to be taken into account in the conduct of monetary policy. Central Bank has also expanded hands in external sector management, whether it was meeting the balance of payment crisis in 1991, or managing the transition to a liberalized exchange rate, unified exchange rate, current account convertibility and capital account liberalization. There have been years in which the Reserve Bank had to fight the impact of capital outflows and there have also been years in which the major concern is how to deal with the large capital inflows.

V. Conclusion

A policy is said to be monetary if relevant actions are those generally undertaken by a central bank. They may include the size of the monetary injections, reserve requirements, the discount rate, or the scale of intervention in local or foreign exchange market.

Today monetary policy is the principle way in which governments influence the macro economy. To implement monetary policy the monetary authority uses its policy instruments (short-term interest rate or the monetary base) to achieve its desired goals of low inflation and real output close to potential. It is widely accepted that well-developed monetary policy can counteract macroeconomic disturbances and dampen cyclical fluctuations in prices and employment thereby improving overall economic activity and welfare. In other words, central banks conduct monetary policy with the ultimate aim of promoting sound economic performance and thereby ensuring the well-being of people. While there is a rich diversity in the way monetary policy is formulated and conducted across the world, the success of central banking in India lies in steering the economy to a higher growth path without generating inflationary pressures which themselves may hinder growth.

Note:

1. Impossible trinity disallows the simultaneous achievement of exchange rate stability, monetary independence and capital market integration. Any

two of these goals may be attained but never all three. The combination of managed flexibility and partial capital account controls has allowed India, to a large extent, the trilemma of the famed Impossible trinity. India never took three as with the case of East Asian Countries in 1997.

2. Systemic risk is nothing but the risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy.

Systemic risk(Karmakar and Jana,2019) occurs from the following sources:

- a) Exposure to asset price (real estate) bubbles resulting from loose monetary policy due to the presence of global imbalances that led to excessive credit availability;
- b) Multiple equilibria and panics— the latter that deserve some attention as one of the macroeconomic aspects of systemic risk ;
- c) Inefficient liquidity provision and the mispricing of assets;
- d) Contagion (possibility that the distress of one financial institution spreads to others in the financial system, thus leading ultimately to a systemic risk);
- e) Sovereign default— a serious problem occurred in Europe in the spring of 2010 in its own right because of its effect on the stability of the banking system; and
- f) Currency mismatches in the banking system.

To tame the systemic risk is the most important task of the RBI as a central

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Studies on *in vitro* callus induction and proliferation from leaf explants of *Withania somnifera* (L.) Dunal

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Withania somnifera (L.) Dunal (Solanaceae) also known as Ashwagandha, is a valued medicinal plant known since antiquity. This plant is of high commercial value due to its medicinal property. This study shows the proper sterilizing protocol and effect of different combination and concentrations of plant growth regulators on the rate of callus induction and proliferation. Three types of combinations used were 1mg/l 2,4-D, 2mg/l 2,4-D and 0.2mg/l Kinetin and 0.5mg/l BAP and 0.5mg/l NAA. The callus growths were observed for around 6 weeks. It could be inferred that the combination of best suited plant growth regulators for callus induction and proliferation was 2,4-D and Kinetin.

Keywords: *Withania somnifera* (L.) Dunal, explant, MS media, 2,4-D, IAA, BAP, Kin, callus induction, contamination.

Abbreviation: Murashige and Skoog media (MS), 2,4 Dichlorophenoxyacetic acid (2,4-D), Indole Acetic Acid (IAA), 6- Benzylaminopurine (BAP), Kinetin (Kin).

I. Introduction

Withania somnifera (L.) Dunal has long been considered as an excellent rejuvenator, a general health tonic and a cure for several health complaints (Umadevi *et al.*, 2012). The drug has been positively tested for neuroprotective (Jain *et al.*, 2001; Ahmad *et al.*, 2005) properties. It is a commended genus described in Indian Ayurvedic System of medicine and also enlisted as important herb in Unani and Chinese traditional medicinal systems (Mir *et al.*, 2012). *W. somnifera* is widely distributed around the world and is mainly adapted to xeric and drier regions of tropical and subtropical domains, ranging from Canary Islands, the Mediterranean region and North Africa to South-west Asia (Mirjalili *et al.* 2009).

W. somnifera has not yet been assessed for the IUCN Red List. However, in Pakistan, *W. somnifera* is falling under criteria A of endangered category (Alam *et al.* 2009 and Haq 2011). Plant tissue culture offers opportunity for improvement of Ashwagandha in many ways such as, development of a mass propagation system, to obtain somaclones or mutants with desired chemical constituents, genetic transformations and *invitro* production of biologically active metabolites (Sharada *et al.*, 2008). *Withania* propagates vegetative in its natural state, but this propagation rate is much slower to meet demand of high-quality planting material for commercial cultivation. Its seeds are hard to germinate due to the presence of germination inhibitors (Karnik, 1978). Biotechnological techniques can help us to conserve this miracle plant. A swift and extremely effective method is micropropagation in which selected elite *Withania* plants, can be used as explants. This fast and competent regeneration protocol could be used for large production of selected cultivated varieties at commercial scale.

Many earlier studies have reported *invitro* propagation of Ashwagandha by using different explants, such as shoot tips (Rani *et al.*, 2014; Baba *et al.*, 2013; Sivanesan, 2007; Ray & Jha, 2001 and Roja *et al.*, 1991), axillary bud (Rani and Grover, 1999), hypocotyl (Kulkarni *et al.* 2000), cotyledon (Kumar *et al.*, 2013), leaf (Joshi and Padhya, 2010 and Kulkarni *et al.*, 1996), seed (Supe *et al.*, 2006), cotyledonary leaf segments (Rani *et al.*, 2003), callus from leaf (Arumugam and Gopinath, 2013), shoot tip and root (Shrivastava and Dubey, 2007) and the nodal areas, (Kumar *et al.*, 2011). This study envisages an efficient method of callus induction from *in vitro* culture of leaf explants of *Withania somnifera*.

Materials and Methods

Saplings of *Withania somnifera* was collected from Roy Nursery located at Tribeni, Hoogly, West Bengal, Gour-Nitai Nursery, Dum Dum, Kolkata, West Bengal and a nursery in Sealdah, Kolkata, West Bengal. Plants maintained in earthen pots at normal environmental conditions in polyhouse. Plants were regularly watered

and treated with fertilizers. Insecticides like 0.01% v/v Rugor and fungicides like 0.001% w/v Bavistin were used in regular interval to keep the plant uninfected and disease free. Suitable juvenile young leaf explants, that is, the 3rd leaf from the apex of the plant were selected from these saplings after a month.

Glass goods and instruments were sterilized by autoclaving in 15lb/inch² pressure at 121°C for 15 mins and stored in incubator for later usage. The culture room and laminar airflow were exposed to UV light for 30 mins. After UV treatment, the hood of the laminar airflow was kept open to allow the air to stabilize. The table of the laminar air flow was cleaned with alcohol. Scalpels and forceps were dipped in 70% v/v rectified spirit (Bengal Chemical Ltd.) poured in coupling jar prior to work.

Young leaves were collected and washed thoroughly under running tap water for 15 minutes. Washed explants were treated with 1% v/v ionic surfactant (Tween 20) for 5 minutes. Then the explants were washed again under tap water until there was no trace of detergent. The explants were then washed again in 0.1% w/v HgCl₂ for 2 minutes. Again, the explants were washed in double distilled water thoroughly to remove traces of HgCl₂. The explants were then cut into different sizes on an autoclaved petridish and excess water was blotted off using blotting paper.

The cut explants were then transferred to culture tubes containing MS media (Murashige & Skoog, 1962) with three combinations of growth regulators: 2,4-D, 2,4-D + Kin and BAP+NAA.

Results and Observation

Leaf explants of approximately 0.7- 0.9 cm² were taken, the callusing did not initiate for a long time, ultimately the most of the leaf explants degenerated. When leaf explant of 0.2-0.3 cm² were taken, all the explants were unresponsive and quickly degraded. But, intermediate 0.5 cm² size of the explants, were taken, appeared to be comparatively more responsive. Further, when older leaves from 5-6th leaf positions from apex were taken up, callusing were not observed. While leaves from 1st position from apex when taken,

it was difficult to work, moreover, being smaller in size meristematic tissues could not be dissected out properly. Hence, the optimum responsive explant was obtained from 3rd leaf of 0.5 cm² of size.

Three different durations of HgCl₂ treatment were applied for surface sterilization, mainly 2 mins, 3 mins and 10 mins. It was observed that the highest contamination percentage was obtained in 2 mins incubation, i.e., 44.44%, However, 10 mins of incubation of surface sterilization showed 19.05% contamination but most of the explants were not responsive in culture. However, the duration of 5 mins, which showed 28.60% contamination, but rest of the uncontaminated explants responded better in culture. [Fig. 1(a)]

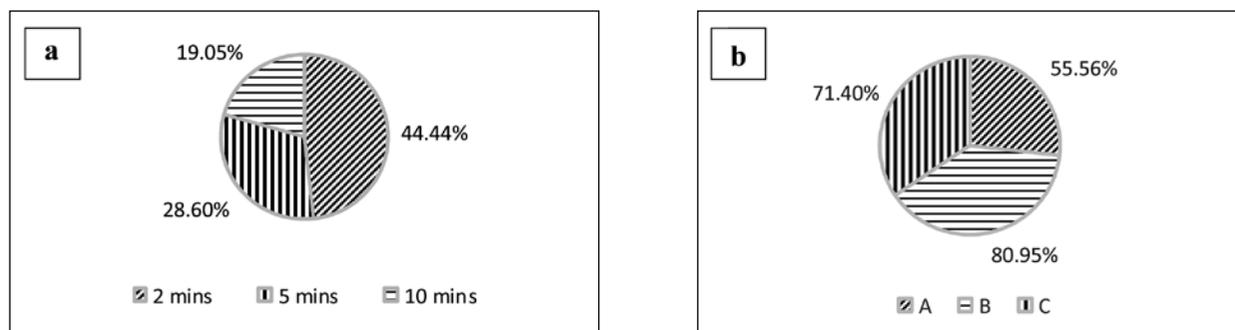


Fig 1. Pie Charts showing (a) Percentage of contamination, (b) Percentage of callus induction in various combinations of growth regulator supplemented MS media after 42 days A: 2,4-D(1mg/l), B: 2,4-D(2mg/l) + Kin(0.2mg/l), C: BAP(0.5mg/l) + NAA(0.5mg/l)

The explants initially swelled and appeared contoured after 7-10 days depending upon their growth regulator combination [Fig. 2(A, I)]. Thereafter, small, round colonies of micro callus started appearing within 25 days [Fig. 2(B, F, J)], which further proliferated covering the entire cut surface of the explant [Fig. 2(C, G, K)]. After 42 days in culture, in each combination different quantum of callus was generated [Fig. 2(D, H, L)]. This pattern of callus induction was also reported by Joshi & Padhya, (2010) and Srivastava, (2007).

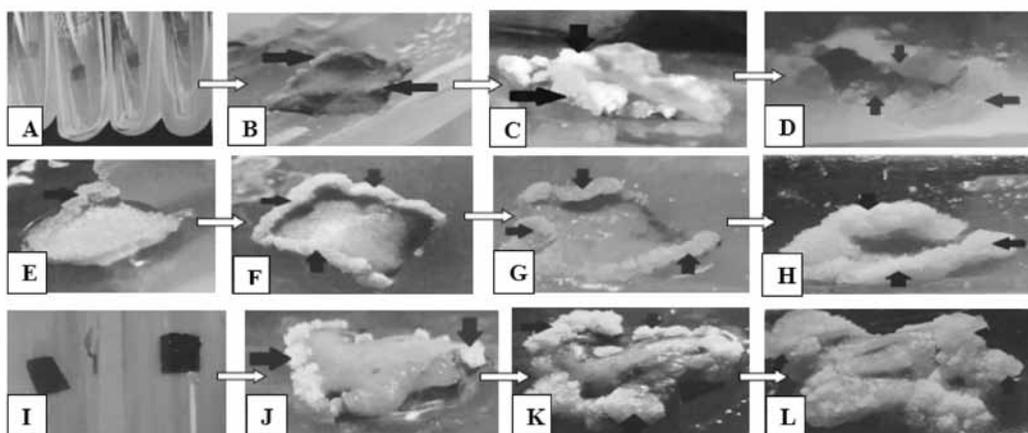


Fig 2. Pictures of gradual callus induction of leaf explants of *W. somnifera* in MS media supplemented with various growth regulators, taken through Olympus Stereo-microscope in 4X magnification except A and I. In MS + 2,4-D(1mg/l), (A) culture was initiated, (B) first callus initiation was observed around 25th day, (C) callus started to proliferate, (D) development of a dry yellowish callus. In MS + 2,4-D(2mg/l) + Kin(0.2mg/l), (E) callus initiation started by 14th day, kept on proliferating, (F) proliferation of callus on the edges of explant, (G) further swelling and proliferation of callus, (H) development of a friable and white callus. In MS + BAP(0.5mg/l) + NAA(0.5mg/l), (I) culture initiation, (J) callus initiation observed on 18th day, (K) further swelling and callus proliferation, (L), development of a compact, yellowish callus.

It was observed that when callus induction in MS medium supplemented with various combination of growth regulators were conducted, the responsive explants in general transformed to colourless tissues which subsequently became whitish swelled outgrowths. After culturing for 42 days, amongst other combinations, 80.95% of callus induction, followed by combination of BAP(0.5mg/l) + NAA(0.5mg/l), which gave 71.4% and 2,4-D(1mg/l) gave 55.56% [Fig. 1(b)]. Even the early callus induction efficacy was higher (14 days) in growth regulator combination of 2,4-D (2mg/l) + Kin (0.2mg/l), followed by 18 days for BAP (0.5mg/l) + NAA (0.5mg/l) and 25 day for 2,4-D (1mg/l) [Fig. 3(a)]. Therefore, combination of 2,4-D and Kinetin proved to be best for early callus induction and high percentage of response.

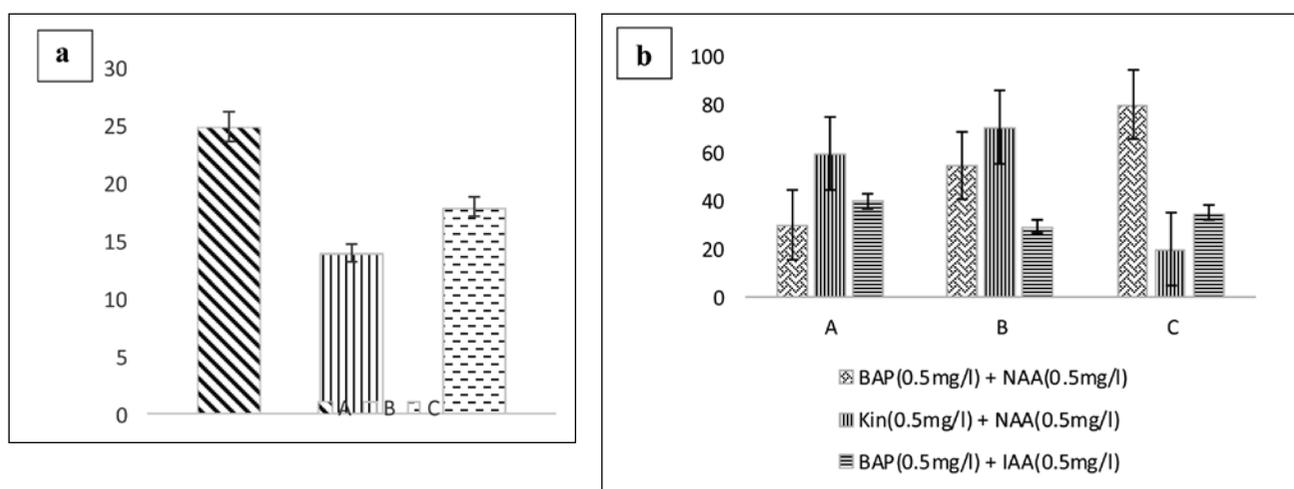


Fig 3: (a) Graphical representation of average number of days taken for callus initiation within a total observation period of 42 days, (b) Graphical representation of callus proliferation over a total observation period of 42 days in MS media supplemented with various growth regulators.

A: 2,4-D(1mg/l), B: 2,4-D(2mg/l) + Kin (0.2mg/l) and C: BAP(0.5mg/l) + NAA(0.5mg/l)

After 6th week, three types of callus, namely dry callus, friable callus and solid callus were observed. Callus obtained from MS media supplemented with 2,4-D was observed to be dry in nature. While callus obtained from combination of 2,4-D + Kin appeared friable and BAP + NAA was compact and hard. Friable callus generally is suitable for further subculturing, organogenesis and cell culture initiation. Therefore, the combination of 2,4-D + Kin was best for callus formation as it resulted in friable callus.

The proliferated callus was further sub-cultured in different sets of growth regulator combination to observe the rate of callus proliferation. Callus proliferated in the media supplemented with 2,4-D, 2,4-D + Kin and BAP + NAA were further sub-cultured in 3 sets of growth regulator combinations, namely BAP(0.5mg/l) + NAA(0.5mg/l), Kin(0.5mg/l) + NAA(0.5mg/l) and BAP(0.5mg/l) + IAA(0.5mg/l) [Fig. 3(b)]. In 2,4-D cultured callus, BAP+NAA showed minimum callusing of 30%, Kin+NAA showed moderate callusing (60%) and BAP+IAA showed minimum (40%). However, 2,4-D+Kin, BAP+NAA showed moderate callusing, 54.76% while Kin+NAA showed 70.59% callusing and BAP+IAA showed minimum callusing, 29.41%. In case of BAP+NAA, the first combination of BAP+NAA showed 80% callusing, Kin+NAA showed 20% and BAP+IAA showed 35.08%.

Discussion

The explants when derived from third leaves of juvenile plants, showed good response after surface sterilization for 5 mins in HgCl₂. The study also found that 2,4-D + Kin combination gave maximum response for dedifferentiation and subsequent callus induction. Manickram *et al.*, (2000) reported that 2,4-D when used singly turned out to be potent growth regulator for callus induction from leaf explant of *Withania* too. Similar results were observed with Kin using leaf explant for shoot bud induction and *in vitro* proliferation by Sivanesan & Murugesan, 2005. However, after callus initiation, the further development was found to be optimum when BAP + NAA combination was used with MS medium. Detailed study by Adhikari and Pant, (2013) showed that BAP (0.5mg/l) + NAA (1.5mg/l) was best among other concentrations of same combinations of growth regulators supplemented in MS medium. Ghimire *et al.*, (2010) emphasized on the use of NAA for callus maintenance for future regeneration and shoot bud induction from petiole and leaf explants. Therefore, after initial induction of callus, the growth regulators are to be substituted for maintenance and proliferation during subsequent sub-culture as each growth regulators perhaps have specific physiological role in tissue orientation, redifferentiation and growth.

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