EDITORIAL NOTE

This research journal publishes high quality research papers and articles on various areas of humanities & Sciences. The Journal aims at scientists, academicians, research scholars and students working & studying in various International universities, Research Institutions, Governmental and Non-Governmental organizations. The main objective is to create an environment of learning & fruitful academic interactions on various aspects of humanities & Sciences with the attainment of scientific productivity in all these areas.

All the research paper /articles are peer reviewed by the editorial board consisted of eminent academicians. The submitted research papers / articles should meet internationally accepted criteria and manuscripts should follow the style of the journal for the purpose of both reviewing and editing.

Prof. Sugam Anand  Dr. Anil Kumar Verma  Dr. Jai P. Sharma  
Editor in Chief  Editor  Managing Editor
<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>CONTENT</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Indian Ethos—‘Peace with All’</td>
<td>1-9</td>
</tr>
<tr>
<td></td>
<td>– Prof. Sugam Anand</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Women and Profession In Later 19\textsuperscript{th} Century</td>
<td>10-15</td>
</tr>
<tr>
<td></td>
<td>– Prof. Nidhi Chaturvedi</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Computational Electromagnetic Techniques for Space Application Antennas - A Review</td>
<td>16-35</td>
</tr>
<tr>
<td></td>
<td>– Dr. Shatrughna Prasad Yadav</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Dr. S.S. Rathi</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>समझौता—जो एकता का मसीहा बन गया</td>
<td>44-48</td>
</tr>
<tr>
<td></td>
<td>– प्रो. (सीता) प्रतिमा अरस्थाना</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ब्रजभाषा की रूप—स्वनिमित्की</td>
<td>49-62</td>
</tr>
<tr>
<td></td>
<td>झंड़े विजेत्र न्रताप सिंह</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Fairness In Criminal Trial In India A Socio-Legal Analysis</td>
<td>63-70</td>
</tr>
<tr>
<td></td>
<td>– Dr. Sanjay Singh</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Medical Tourism in India with focus on NCR- Emerging Challenges in 21\textsuperscript{st} Century</td>
<td>71-81</td>
</tr>
<tr>
<td></td>
<td>– Dr. P.N. Asthana and Pankaj Gupta</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rural Development In Relation To Poverty &amp; Inequality</td>
<td>82-99</td>
</tr>
<tr>
<td></td>
<td>- Dr. Shubha Singh</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Study of Military System During Gupta Period</td>
<td>100-103</td>
</tr>
<tr>
<td></td>
<td>- Manish Prakash</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Biochemical Studies of \textit{Tinospora cordifolia} Plants in Agra, Mathura, Etah and Firozabad Districts</td>
<td>104-111</td>
</tr>
<tr>
<td></td>
<td>– Dr. Yugal Pratap Singh</td>
<td></td>
</tr>
</tbody>
</table>
EDITORIAL BOARD

1. Prof. Sugam Anand  
   (Head, Deptt. of History & Culture, Dr. B.R. Ambedkar University, Agra)
2. Dr. Anil Kumar Verma  
   (Associate Prof., Deptt. of History & Culture, Dr. B.R. Ambedkar University, Agra)
3. Dr. Jai P. Sharma  
   (Former, Director Anand Bhawan Allahabad, Faculty Member, Deptt. of History & Culture, Dr. B.R. Ambedkar University, Agra)
4. Prof. Subhash Chandra Sharma  
   (Deptt. of Law M.L.B. Collage of Excellence, Gwalior)
5. Prof. R.A. Sharma  
   (Deptt. of Archaeology, Jiwaji Uni. Gwalior)
6. Dr. Vibhuti Jain  
   (Associate Prof., Deptt. of History & Culture, Dr. B.R. Ambedkar University, Agra)
7. Dr. Anoop Kale  
   (University of Sydney, Australia)
8. Dr. V.K. Saraswat  
   (Head, Deptt. of Computer Science, Dr. B.R. Ambedkar University, Agra)
9. Dr. Neeraj Rani Sharma  
   (Yoga & Naturopathy)
10. Dr. Akhilesh Chandra Saxena  
    (Head Department of Physical Edu. Dr. B.R. Ambedkar University, Agra)
11. Dr. Vijendra Pratap Singh  
    (Assistt. Prof., Hindi Govt. Degree College, Jaleshar Etah)
12. Dr. Anil Kumar  
    (Assistant Professor Govt. Degree College, Jaleshar Etah)
13. Dr. Ranjay Kumar Singh  
    (Master of Computer Application & Master of Science in Electronics & Comm.)
14. Dr. Raj Nandani  
    (M.Tech., Ph.D., Electrical Engineering, Pune)

EDITORIAL ASSOCIATES

1. Dr. Ran Singh  
   (M.A., Ph.D.)
2. Dr. NeelKamal Verma  
   (M.A., Ph.D., Journalism & Mass Communication)
3. Chandra Lok Chaudhary  
   (L.L.M., Net, Human Rights)
THE INDIAN ETHOS—‘PEACE WITH ALL’

Sugam Anand

Peace with All signifies the Sarv Dharm Sambhav. It has ever been the pivot of cultural values and humanism in the long process of Indian History. It signifies a respect for all religious cults and mode of thought. It also denotes the feeling of tolerance and understanding to what others hold in esteem or faith. In the context of Indian government, it means that the government will not interfere in religion, neither encourage nor discriminate on the basis of religion. For the people at large, it has been a positive attribute of human mind that enables one to adjust and accommodate with others, who may be basically different in their religious faith. Secularism, in the opinion of some scholars is a modern term, but the origin of Sarv Dharm Sambhav has been embedded deep in the cultural moorings of this ancient land. The Indian view of life has maintained a unique correlation with the spiritual or the inner consciousness of man. Its integration with the totality of the Universe has been derived from the spiritual principles embodied in the social and cultural framework of this country. The unity of mankind has ever been an inspiring motive for the Indians at large. Maharishi Ved Vyas asserted centuries ago that, “All may be the source of happiness to others. All may enjoy good days, and no one may suffer any pain ......”

In the ancient Indian literary sources, references are available of such liberal and cosmopolitan ideas and ideals as have been based upon the basic assumption that the entire globe is ‘one family’ and all individuals have to cultivate a positive outlook embracing all humanity. Our ancient seers and sages asserted that the goal of human beings must be mutual tolerance.

---

1 Professor and Head, Dept. of History & Culture, Dr. B.R. Ambedkar University of Agra

[1]
“Let all ideas flow and enter into the fabric of our life and society. It shall certainly enrich us. Let us travel towards light, life and eternity. Let our hearts be one and let us live and let live. Let us tolerate others and be together in the journey of life.”

In the Indian epic, Mahabharata, it is upheld that a religion which opposes any other religion is the worst one.

The efforts of our thinkers have indeed been directed towards supporting an integrated development of socio-political life for the collective good of the entire humanity. India has always stood and stands even today for universal brotherhood, peace and harmony. The supreme goal of human life in India has been defined as the attainment of spiritual perfection and the final redemption from the cycle of birth and death. In the Shanti Parv of Mahabharata, the virtues incumbent on all the people have been non-hatred towards all beings in thought, deed and action. By 'all beings', it is implied that not only humans, but all creatures great and small, even the flora and fauna deserve our sympathy and positive feelings. Life in seclusion i.e. Sanyas (last Ashrama in Vedic Varnashram) was also governed by these injunctions. Love was considered to be the supreme virtue. Love and respect have always been the, basis of tolerance and a binding principle in social relationship.

The norms of Indian social life have been laid down in a manner that effectively ensure the right of each of its members to live, to grow and to work as individuals without any fear. All of them could enjoy the freedom of conscience. In the realm of thought and philosophy, both currents, the Vedic and the non-Vedic simultaneously flourished in India. New thought currents germinated through their peaceful interaction and confluence with each others. They also contributed their share in enriching Indian thought and philosophy. Many new thought currents were received in India from time to time from the outside world. The Indian mind did not feel
any hesitation in intermingling and interacting with them and finally assimilating them into the reservoir of Indian thought. The Indian society was mature enough to absorb alien influences coming to India either as peace loving people or as aggressors in the fold of Indian culture. If it could not be possible they were allowed to live side by side, with their own cherished values. The basic ideology that worked throughout Indian history and culture has been the visualization of the eternal Truth inherent in its social milieu. The moral responsibility of the individual was not identified with the glory of the Indian State or with the privilege and prestige of social groups or classes, but with the enormously unlimited vista of human life. The individual’s self-perfection and the brotherhood of mankind were seen as the facets of the same ideals that signified the eternal human spirit. The aim was to gradually develop a broad social order on a common system conducive to the highest good of the highest number. The social adjustments were first comprehended on the spiritual plane. This spontaneously infused humanism and universal tolerance among the people of different castes, creeds and ideologies in this country.

In ancient India, an ideal State presented the vast spiritual apparatus for the realization of the material as well as the spiritual wellbeing. The state was effectively concerned with the people's life, though its framework rested upon feudalism, autocratic kingship and centralized administrative machinery. The state owned the moral responsibility of social and intellectual betterment of its people and their economic and cultural interaction. Universal tolerance, justice and fair play were the keynote qualities of a Chakravartin emperor. Its rationale lay in the principle of realism and the question of a peaceful coexistence. If they all moved through creativity, equanimity and development, the state flourished and grew. If there were discords, tensions and moral pressures leading to violence and destruction, the state was ruined. Sarv Dharm Sambhav was
the keynote and an established principle of great kings like Ashoka and Akbar. In the XII edict of king Ashok, it has been clearly mentioned that: “His sacred and gracious majesty, the King, does reverence to all sects whether ascetics or householders. The man who praises his own particular religion and sneers at that of others, in order to enhance his own, inflicts great and grievous injuries on his own religion.”\(^1\) Ashoka quite realized that in a country like India with heterogeneous people inhabiting the vast land, the outward form of any religion or externelia could hardly prove significant. His Dhamm Vijay succeeded due to his broad outlook, forbearance and syncretic unity of the essentials of different religions prevalent during his time. The Gupta and the post-Gupta rulers pursued the principle of Sarv Dhamm Sambhav and provided the heritage of a unique strength and rare adaptability to posterity. The Guptas combined genius with synthesis which blossomed in a wonderful development with new trends in Indian art, literature, philosophy, science and religion. Dharma in ancient India, created and nourished an atmosphere of tolerance. The tradition of ‘Sambhav’ led to freedom of thought and expression for all. Kings and donors of one persuasion gave gifts to cults and institutions of other persuasions without any discrimination or preference.

The vital forces of assimilation and absorption latent in the dynamics of Indian culture were activated after some centuries of Muslim rule in India. Dr. Tarachand has analysed the tremendous effects of the Muslim conquest on the evolution of Indian culture.\(^1\) He believes that Muslims to a large extent shifted their loyalty to the place and considered India as their homeland. They came to realize that a state of perennial hostility and incessant warfare with the majority population of this land, among whom they have to live and stay, would certainly not pay. They concluded that it may prove rather injurious to their own life and interest if they did not practice tolerance. In the long run, mutual interaction led to
mutual understanding and India saw the emergence of an unparalleled
galaxy of saints like Kabir, Nanak, Raidas, Paltu, Dadu, Meera, Sahjo and
Jana. The Khanqahs of Sufis also became the shelters for the people of all
castes, communities and creeds. Hafiz Shirazi outlined the mutual relations
of the two communities on practical grounds as early as the 13th century. He
said,

“हाफिजा गर वस्तववाही बा सुलहकुल खासो आम। बा मुसलमाँ
अल्लाह-अल्लाह, बा बरहमन राम राम।”

He was the first Muslim saint to introduce the policy of
Sulah-i-kul or ‘peace be with all’ By living together in peace and harmony,
the trends of mutual understanding, friendship and goodwill led to
understanding the ideas, beliefs and lifestyles of each other. Prof Abdual
Majid Siddiqi has discussed this theme in detail in an article. Dr. R. C.
Majurndar has correctly observed about the mutual interaction of the two
communities that, “As regards dress, food, language, music, art and
architecture, each influenced the other to some extent. In religious matters,
there was also an interaction as is indicated by Sufism on the one hand and
the teaching of medieval Hindu saints on the other. The synthesis, instead of
acute social compartmentalization has been eloquent in the rural areas. Amir
Khusro was one such protagonist and propagator of this unique synthesis
and he felt proud of his Indian origin.”

Many Sultans and kings curbed the interference of orthodox class
and proceeded to solve administrative problems in their own secular style.
In one of his poems, Babur mentions a dream that he visited a beautiful
garden full of multicoloured flowers and felt there, a divine joy and bliss.
Dr. Yusuf Hussain believes that this dream signified his conquest of India
and the bliss was the mingling of different cultures.

Akbar was the real product of the much awaited Indian renaissance
of the sixteenth century. Through his policy, of Sulah-i-kul, he could herald
in India, a theory of peaceful co-existence based on love, mutual respect, humanism and universal brotherhood. Jahangir tried to emulate the ideals of his father and he records in his Memoirs, “The professors of various faiths had room in the broad expanse of his (Akbar’s) incomparable sway.......room for all classes and the followers of all creeds.......for beliefs good and bad and the road to altercation was closed.”18 Sulah-i-kul had become an ideal of the Imperial policy. Similarly, social integration became an unnoticed phenomena in a land of varied cultures and multiple religious cults due to living together in this land.

It is a fact of History that the rich heritage of the ideals and practices of Sarv Dharma Sambhav existed in this country for long. We can frankly admit that the devastating role of politicians and fundamentalists has been responsible for obstructing gravely - the observance of Sarv Dharma Sambhav in actual life. Maulana - Abul Kalam Azad who was a thorough nationalist rightly asserted that, "When India attains her destiny, she would forget the chapter of communal suspicion and conflict and face the problems of - modern life from a modern point of view.”19 He warned the Indians against the policy of British officials to divide and rule over the Indians.

What he actually meant was that differences would, no doubt, persist and remain but they will be economic and political but not communal. He exhorted upon the people to be totally dedicated to their mother land and desired that members of both the communities must work for making India, a great Nation.

As we see today, the spread of hatred among people on grounds of religion and caste still plague our country. Those responsible for such heinous crime as communal riots must be severely punished. Those who wish to disintegrate this great country and ruin it’s future must not be spared any more. They, of course, will not succeed in their evil machinations because the ethos of Sarv Dharma Sambhava remains overwhelmingly
strong in India. It has been the sustaining force in our history and will continue to be the ever guiding star even in face of modern challenges.

REFERENCES:

1. The unity and fraternity of the people of India, professing numerous faiths has been sought to be achieved by enshrining the ideal of a ‘secular state’ which means that the state protects all religions equally and does not itself uphold any religion as the state religion. (42nd Constitution Amendment Act, 1976), D.D. Basu, Introduction to the Constitution of India, 10th ed., New Delhi, 1983, p. 26.

2. सर्वं भवन्तु सुखिनः सर्वं संतुनिरमयः। सर्वं मद्याणि परस्ययुः कविदं दुःखभाव –भक्ति।।

3. आ नो महान कृत्यों येंतु विषयत।. Rig Veda Samhita, Nag Prakashak, Delhi, 1994, 1/89/1. Also Yajur Veda (Bhasha Bhashya) Sarvadeshik Arya Pratinidhi Sabha, New Delhi, 1991, 25/14

4. धर्मं येवाद तेघमं नस्यमं कृप्तमत्त।. अधिवेश्तु तुष्यवर्म, सध्य, सक्तिम।। Mahabharat, Vanparva, 131/10.


6. Ibid, p.4582. See Also, Manu Smriti, Chaukamba Sanskrit Pratishthan, Delhi, 1985, pp. 148-149.

7. The feeling of respect and hospitality for the Vratyas found in the Atharva Veda signifies that the people were not intolerant. Atharva Veda, Sarvadeshik Arya Pratinidhi Sabha, New Delhi, (1991), 15/11/13 and 5/8/3.

8. It was accepted that One Truth can be described in many ways by the learned. Also the Rig Veda says that there are many rathas but only one road. (10/142/5) The Atharva Veda also says that [7]
Earth holds people of many faiths and speaking many languages. It also holds people of both types—learned as well as dumb, good as well as bad. (12/1/45-48).

9. This was also a factor in the rise of the Puranic religion later. Padma Purana says that do not criticise other religions to safeguard your own. (Srishti Khand, 19/332) Gautam Buddha has indicated respect for the true principles of other religions. (Mahavagga, 1/7/5). See also Chulviyuhutta and Dutthakkasutta in the Sutta Nipata. The Puranic religion accepted Buddha as the incarnation of Vishnu. Jams used Brahmana-Purohits for their rituals and gave Rama and Krishna the place of ‘praise worthy great men’ in their pantheon. The 22nd Tirthankara Arishtanemi was related to Krishna. A Vaishnava sect developed among the Jams. (Dr. Radhakrishnan, Indian Philosophy, Vol. I, p.331). Respect for other sects was a cardinal principle of Bhagvatism. Later Shankaracharya validated the principles of the Shaiva, Shakta, Saur, Vaishnava, Ganapatya and Kapalika sects and testified to the inherent truth in them.


11. Shanti Parva, Mahabharat, op. cit., 96th Chapter, 1-10. From the Atharva Veda onwards the ideal of Chakravartin (universal sovereign) was extolled with almost religious fervour. Kautilya too paid homage to the idea of the Chakravartin ruler.


14. Khwaja Shamsuddin Muhammad Hafiz-i Shirazi was a thirteenth century Sufi poet of South-Central Iran. His tomb stands in Musalla Garden along the banks of river Ruknabad in Shiraz. His Diwan was compiled after his death. Many other couplets have also been attributed to him. He was against the orthodox clergy of his time.


16. Dr. R.C. Majumdar, ‘Hindu Muslim Relations’ in the History and Culture of Indian People, Vol. VI, The Delhi Sultanate, Bhartiya Vidya Bhawan, Bombay, 11 ed. 1967, p. 616.


WOMEN AND PROFESSION IN LATER 19th CENTURY

–Nidhi Chaturvedi

This presentation works out the prevailing gender problem in colonial India specially in the field of medical science, an important development during the later half of the nineteenth century. Since 1880, the reformists, both men and women, in Great Britain along with the missionaries and a number of Indian reformers were demanding western medical care to be extended to Indian women.

Women’s new professional opportunities as well as their employment in urban districts were the consequences of British Policies. In the late nineteenth century and the early decades of the twentieth century, demand for medical professionals largely grew. The demand came from the middle class Indian women working in the organized sectors, factories, mines and plantation where laws mandated the provision of medical services. As far as the Indian society is concerned, few parents of those times encouraged science courses for their daughters, as it was supposed too rigorous for female minds. Miss Janau, the Principal of Bethune College, observed that college girls became physically weaker with every year of study. She characterized them inadequately prepared for these subjects. It was not until 1885 that the British Raj became indirectly involved with providing medical care to Indian women through establishment of the Dufferin Fund (The Countess of Dufferin’s fund for supplying Medical aid to women of India). This new organization aimed to provide medical relief to Indian women, to build hospitals and encourage women to study medicines. While some Indian males applauded this attitude, others

---

1 Reader, Department of Medieval and Modern History, D.D.U. University of Gorakhpur.

[10]
denounced it as yet another intrusion by the imperial government into their private social lives.³

Dr. Kadambini Basu one of the first Indian women doctors, was the beneficiary of this scheme. In 1986, she was awarded GBMC (Graduate of Bengal Medical College). She established a thriving private practice and in 1888 she was appointed at lady Dufferins Women Hospital with a salary of Rs. 300 per month⁴. She also served as one of the first woman delegates to the Indian National Congress. Despite these accomplishments, the then orthodox magazine ‘Bangabasi’ indirectly went up to the extent of labelling her unethical⁵. Such attacks illustrated the widespread antagonism of orthodox Indians towards new professional courses for women.

Anandibai Joshi (1865-87) was the first Indian women who graduated from the Women’s Medical College in Philadelphia. She too had to face severe gender bias. She was verbally and physically threatened when she ventured to study medicine. She told her audience that she should not pursue her professional ambitions in India⁶. She was appointed resident physician of the Women’s ward of Albert Edward Hospital at Kolhapur but she never took charge of her post. She died soon after, not to face more stored music. Dr. Rukhmabai was another distinguished personality of the same era, (1864-1951) who attended the London School of Medicine for women and completed her education with MD from Brussels.

As per social norms, the, respectable Indian women were not expected to pursue career in Medicine as the prevailing gender ideology regarded both western medicine and science as incompatible with orthodox Hinduism. The women in purdah or seclusion required a need for a separate medical system employing female doctors in Zenana hospital (lady hospitals). The Dufferin Fund met this need. In 1983, the Calcutta Medical College which was established in 1935 became the first institution in Bengal to accept female students. In 1887, Campbell Medical School and College
(New Nilratan Sankar Medical College) opened its door to women to be trained as hospital assistants. These hospital assistants worked under British lady doctors. By 1887, there were just 150 Indian women enrolled in these programmes\(^8\). These hospital attendants were not given equal footing and were never intended to take independent charge with British lady doctors.

Dr. Haimvati Sen who had passed the Entrance Examination for Campbell Medical College narrates the hardships suffered by women who received Venacular degree. She narrates, that “in the early years of private practice, she was treated and paid as if she was a trained Dai (a traditional birth attendant).” In Dufferin hospital the pay was quite meagre and miserable. She began working in 1884 for Rs. 40 per month and in 1986 her salary was raised to Rs. 50 per month\(^9\).

After the first world war, due to more demands for the women doctors, science subjects were added to the curricula in women’s colleges and medical colleges accepted more women students. By 1929, nineteen men’s medical colleges and schools admitted men and there was one medical and four medical schools for women only\(^10\). Attending the men’s Medical college presented a district set of challenges for Indian women. All the female boarders stayed together making it impossible to observe caste rules and their relative suffered the consequences. If they chose to live in private homes, they had to endure public taunts as they travelled to and from classes. Dr. Muthulakshmi Reddy narrates that “like other women of her generation she was either the lone female in her classes or in the company of two. Professors usually placed women in one side of the room and few professors did not allow female students in their classes and assigned junior assistants to lecture them. It is no wonder so many women failed to complete medical degrees in such situations.”

There were some other challenges. It was difficult to combine joint family life with professional demands. Women also faced sexual
harassment. In 1930’s Dr. (Miss) Ahalyabai Samant was abducted and assaulted by Dr. Balabhai Harishand Bhatt the municipal councillor. The district & sessions judge said – “If women engaged in professional work come out into the open world they must adopt standards of the ordinary men and women of the world. They cannot expect to retain the hyper sensitive notions of modesty which their ancestors in purdah may have possessed”.

The women worked in a professional dominated by European & Anglo-Indian women. Salary discrimination was another problem. Indian women received less pay and had to contend with racial prejudices. Gender discrimination was also evident in salary structure. Theoretically, salaries depended on credentials but it was extremely difficult for Indian women to obtain the same degrees as their British colleagues. In Bengal, Indian women could earn the VLMS (the vernacular licentiate in Medicine and surgery) a certificate obtainable without knowledge of English, but it doomed them to a salary less than 1/10th that earned by a women holding a MB or MD degree.

In 1907, British women doctors practising in India formed the ‘Association of Medical Women in India’ and proposed the formation of a Woman’s Medical Service (WMS) modelled on IMS. In 1914, the became a reality. The WMS professed concern for the Indian women professionals and offered to integrate them through a two tier system of superior and inferior grades, but it was the British women doctors who gained the most from this measure. It further marginalized the Indian women doctors with vernacular degree. It was not until 1947, that Indian women, Dr. Lazarus, held the position of the Chief Medicine Officer.

Women practising the medical professional had to face a range of problems. Research on the impact of the Raj’s sponsorship of a medical system and in context of gender bias, the facts are yet to be fully explored. It
can be sorted out by the forgotten autobiographies and buried memoirs of Indian women who dared to adopt the medical profession.

REFERENCES:

10. Lazarus, Hilda (1976) : Sphere of Women in Medical Work (Vizayapatnam : SFS Printing) p. 51, Medical Colleges were able to issue university degrees, whereas Medical School’s often attached to hospital’s were regarded as training schools and could issue only certificates.


Computational Electromagnetic Techniques for Space Application Antennas - A Review

Shatrughna Prasad Yadav

Electrical and Electronics Engineering Department
Indus Institute of Technology and Engineering
Indus University, Ahmedabad, Gujarat-382115
spyadav68@gmail.com

ABSTRACT

Computational techniques are used to provide extremely accurate predictions for scattering and antenna structures. Many numerical methods are available for solving electromagnetic problems. Each has its own advantage and disadvantage associated with it and is well-suited for the analysis of a particular type of problem. Numerical techniques such as, the method of moments (MOM), finite difference time domain (FDTD) methods, finite element method (FEM), etc. are available for analysis of small structures but become less efficient as the electrical size of the computational domain increases. Whereas, high-frequency (HF) techniques like, geometrical optics (GO), geometrical theory of diffraction (GTD), uniform theory of diffraction (UTD), physical optics (PO) & physical theory of diffraction (PTD), based on the asymptotic solution of Maxwell’s equations, are more efficient for the structure of larger dimensions used for space applications. In this paper an effort has been made to review different CEM techniques and analyze performance of antennas used for space application taking an offset parabolic reflector antenna as an example.

Keywords—Antennas for Space Applications, Method of moments, finite element method, Geometrical optics, Physical optics, Offset parabolic reflector antenna.
I. INTRODUCTION

Computational Electromagnetics (CEM) have changed the way in which electromagnetic problems are analyzed. Antenna engineers rely heavily on numerical methods to analyze and evaluate new designs. Computational electromagnetics (CEM) are used effectively at frequencies spanning from DC to optics, for system sizes ranging from subatomic to intergalactic, and for application areas as design of antennas and microwave devices, components, and circuits, electromagnetic scattering, wireless communication systems, and electromagnetic compatibility, etc. It has evolved rapidly during the past decade to a point where extremely accurate predictions can be made for very general scattering and antenna structures.

As the size of the objects under consideration tends to be large according to the wavelength, numerical techniques such as the FEM, MoM, FDTD, FDFD methods require longer computer time and become resource prohibitive. High frequency techniques such as geometrical optics, geometrical theory of diffraction, uniform theory of diffraction, physical optics & physical theory of diffraction, provide physical insight into the dominant radiation and scattering mechanisms. This makes them a very powerful diagnostic and design tool for antenna engineers.

Geometrical optics method is sufficient for some applications at optical frequencies; it does have severe deficiencies at RF and microwave frequencies. To overcome its deficiencies, the geometrical theory of diffraction was originally developed by Keller [1], [2] around 1951. The GTD and its uniform version, commonly referred to as the uniform geometrical theory of diffraction solutions are presented for edge diffraction. All the techniques mentioned here use rays to calculate the fields. But, there is an alternative way to calculate the fields using surface currents. Technique based on this concept is physical optics (PO) where
approximate high frequency currents are used to obtain the fields. To improve the accuracy of PO, the physical theory of diffraction was developed in the former Soviet Union by P. Ya Ufimtsev [3]. PTD improves the accuracy of PO in the same manner as GTD improves the accuracy of GO.

II. ANTENNAS FOR SPACE APPLICATIONS

Reflector antenna shown in figure 1 is very popular for applications such as satellite communications, radio telescopes, radars, and remote sensing systems, etc. [4]. Mainly, the offset geometry of paraboloid reflector antenna brings attractive properties over its symmetrical-cut counterpart. First, it reduces the blockage of the feed and the supporting struts on the reflector illumination aperture, which in turn increases the gain and decreases the sidelobe levels of the secondary far-field patterns. Second, it provides excellent isolation between the reflecting surface and the feed. Third, it can accommodate larger focal length to diameter ratios, as well as, a larger feed array size in comparison to the symmetric configuration. But, the asymmetrical structure of the reflector generates a high level of cross polarization radiation in the plane of asymmetry, when it is illuminated by a conventional linearly polarized feed. For the circular polarization, the two orthogonal linear crosspolar components result in a copolar component with a squinted beam [5]. Normally low cross polarization levels are required in frequency re-use applications, in which two orthogonally linear or opposite circularly polarized signals are employed for each frequency band to enhance the channel bandwidth [6]. It has been investigated by many researchers that the cross polarization of offset reflector antennas can be reduced, or cancelled, using multimode horns as primary feeds to match the focal region fields of the reflector antenna.
Rudge and Adatia [7], have designed a trimode conical horn utilizing the TE$_{11}$, TM$_{11}$ and TE$_{21}$ modes to minimize the effects of cross polarization. Later, Jacobson [8], presented two solutions: one a dual-mode rectangular horn and the other a linear array of small aperture round waveguide feeds, with their axes parallel to the optical axis of the offset reflector, to reduce cross polarization in the offset reflector antenna. The trimode feed design has also been done by Bahadori and Rahmat-Samii [9], for balanced back-to-back reflectors with a reduced moment of inertia.

III. NUMERICAL METHODS

A. Finite Element Methods

Electrical engineers use finite element methods to solve complex, nonlinear problems in electromagnetics and electrostatics. An increasing availability of computer resources coupled with a desire to model more complex electromagnetic problems has resulted in a wave of renewed interest in finite element methods for solving EM radiation problems [10].

The first step in finite-element analysis is to divide the configuration into a number of small homogeneous pieces or elements. An example of a finite-element model is shown in Figure 2. The model contains information about the device geometry, material constants, excitations and
boundary constraints. The elements can be small where geometric details exist and much larger elsewhere. In each finite element, a simple variation of the field quantity is assumed. The corners of the elements are called nodes. The goal of the finite-element analysis is to determine the field quantities at the nodes. Most finite element methods are Variational techniques.

Variational methods work by minimizing or maximizing an expression that is known to be stationary about the true solution. Generally, finite-element analysis techniques solve for the unknown field quantities by minimizing energy functional. The energy functional is an expression describing all the energy associated with the configuration being analyzed. For 3-dimensional, time-harmonic problems this functional may be represented as,

\[
G = \int_V \left( \frac{\mu |H|^2}{2} + \frac{|E|^2}{2} - \frac{j\omega E}{2}\right) dv \tag{1}
\]

The first two terms in the integrand represent the energy stored in the magnetic and electric fields and the third term is the energy dissipated (or supplied) by conduction currents. Expressing H in terms of E and setting

[20]
the derivative of this functional with respect to $E$ equal to zero, an equation of the form $G(A,E) = 0$ is obtained.

\[
\begin{bmatrix}
A_1 \\
A_2 \\
\vdots \\
A_n
\end{bmatrix} = 
\begin{bmatrix}
S_{11} & S_{12} & \cdots & \cdots \\
S_{21} & S_{22} & \cdots & \cdots \\
\vdots & \vdots & \ddots & \cdots \\
S_{n1} & S_{n2} & \cdots & S_{nn}
\end{bmatrix}
\begin{bmatrix}
E_1 \\
E_2 \\
\vdots \\
E_n
\end{bmatrix}
\]

\[\text{……………..(2)}\]

The values of $A$ on the left-hand side of this equation are referred to as the source terms. They represent the known excitations. The elements of the $S$-matrix are functions of the problem geometry and boundary constraints. Since each element only interacts with elements in its own neighborhood, the $S$-matrix is generally sparse. The terms of the vector on the right-hand side Structure Geometry Finite-Element Model represent the unknown electric field at each node. These values are obtained by solving the system of equations. Other parameters, such as the magnetic field, induced currents, and power loss can be obtained from the electric field values.

**B. Methods of Moment**

Like finite-element analysis, the method of moments (or moment method) is a technique for solving complex integral equations by reducing them to a system of simpler linear equations [11]. In contrast to the Variational approach of the finite element method however, moment methods employ a technique known as the method of weighted residuals. Actually, the terms method-of-moments and method-of-weighted-residuals are synonymous. Harrington [12] was largely responsible for popularizing the term method of moments in the field of electrical engineering. The equation solved by moment method techniques is generally a form of the electric field integral equation (EFIE) or the magnetic field integral equation.
Both of these equations can be derived from Maxwell’s equations by considering the problem of a field scattered by a perfect conductor (or a lossless dielectric). These equations are of the form, where the terms on the left-hand side of these equations are incident field quantities and $J$ is the induced current.

\[
\text{EFIE: } \quad E = G_e(J) \quad (3)
\]

\[
\text{MFIE: } \quad H = G_m(J) \quad (4)
\]

The form of the integral equation used determines which types of problems a moment-method technique is best suited to solve. For example, one form of the EFIE may be particularly well suited for modeling thin-wire structures, while another form is better suited for analyzing metal plates.

Usually these equations are expressed in the frequency domain; however, the method of moments can also be applied in the time domain. The first step in the moment-method solution process is to expand $J$ as a finite sum of basis (or expansion) functions, where $B_i$ is the $i^{th}$ basis function and $J_i$ is an unknown coefficient.

\[
J = \sum_{i=1}^{N} J_i B_i \quad (5)
\]

Next, a set of $N$ linearly independent weighting (or testing) functions, $w_j$, are defined. An inner product of each weighting function is formed with both sides of the equation being solved. In the case of the MFIE (Eq. 4), this results in a set of $N$ independent equations of the form,

\[
<w_j, H> = <w_j, f_n(J)> \quad j = 1,2,\ldots,N \quad (6)
\]
By expanding J using Equation (6), we obtain a set of N equations in N unknowns,

\[ \langle w_j, H \rangle = \sum_{i=1}^{N} \langle w_j, f_n \rangle H_i \quad j = 1, 2, 3, \ldots, N \]  

(7)

This can be written in matrix form as,

\[ [H] = [X] [J] \]  

(8)

The vector H contains the known incident field quantities and the terms of the X-matrix are functions of the geometry. The unknown coefficients of the induced current are the terms of the J vector. These values are obtained by solving the system of equations. Other parameters such as the scattered electric and magnetic fields can be calculated directly from the induced currents.

C. Finite Difference Time Domain Method

The Finite Difference Time Domain method is a direct solution of Maxwell’s time dependent curl equations. It uses simple central-difference approximations to evaluate the space and time derivatives [13]. The FDTD method is a time stepping procedure. Inputs are time-sampled analog signals. The region being modeled is represented by two interleaved grids of discrete points. One grid contains the points at which the magnetic field is evaluated. The second grid contains the points at which the electric field is evaluated. A basic element of the FDTD space lattice is illustrated in Figure 3. Note that each magnetic field vector component is surrounded by four electric field components. A first-order central-difference approximation can be expressed as:

\[ \frac{1}{\Delta t} \left[ E_x(t+\Delta t) + E_x(t) - E_y(t) - E_y(t+\Delta t) \right] = \frac{\mu_0}{\Delta t} \left( H_{x0}(t+\Delta t) - H_{x0}(t) \right) \]  

(9)
Where, S is the area of the near face of the cell in Figure 3. $H_{xo}(t+\Delta t)$ is the only unknown in this equation, since all other quantities were found in a previous time step. In this way, the electric field values at time t are used to find the magnetic field values at time $(t+\Delta t)$. A similar central-difference approximation of Equation (15) can then be applied to find the electric field values at time $(t+2\Delta t)$ from the magnetic field values at time $(t+\Delta t)$.

![Figure 3: Basic Element of the FDTD Space Lattice](image)

By alternately calculating the electric and magnetic fields at each time step, fields are propagated throughout the grid. Time stepping is continued until a steady state solution or the desired response is obtained. At each time step, the equations used to update the field components are fully explicit. No system of linear equations must be solved. The required computer storage and running time is proportional to the electrical size of the volume being modeled and the grid resolution.

**D. Finite Difference Frequency Domain Method**

Although conceptually the Finite Difference Frequency domain method is similar to the Finite Difference Time Domain method, from a practical standpoint it is more closely related to the finite element method. Like FDTD, this technique results from a finite difference approximation of
Maxwell’s curl equations. Since, there is no time stepping it is not necessary to keep the mesh spacing uniform. Therefore optimal FDFD meshes generally resemble optimal finite element meshes. Like the moment-method and finite-element techniques, the FDFD technique generates a system of linear equations. The corresponding matrix is sparse like that of the finite element method [14].

IV. HIGH FREQUENCY ANALYSIS TECHNIQUES

A. Geometric Optics

Geometric optics is an HF approximation of Maxwell’s equations that employs rays to describe EM field propagation [15]. According to GO, HF fields propagate along ray paths that satisfy Fermat’s principle and are orthogonal to the wave fronts in an isotropic homogeneous medium. Note that Fermat’s principle states that the ray trajectory is such that the optical path length is stationary. This normally implies that the path length must be a minimum, subject to some constrains. Although there are several ways to rigorously develop the GO field representation, the Luneberg–Kline series expansion is used here. This is done to clearly show that the GO field is simply an asymptotic approximation to Maxwell’s equations. The first step is to expand the electric field \( E(s, \omega) \) in terms of the series:

\[
E(s, \omega) \sim e^{-j\psi(s)} \sum_{n=0}^{\infty} \frac{E_n(s)}{(j\omega)^n}
\]  

(10)

Where \( \omega \) is the angular frequency, \( s \) is the position vector, \( k \) is the wave number of the homogeneous isotropic medium, and \( \psi(s) \) is the phase function. Note that the preceding series is in inverse powers (integers) of \( \omega \). The equations for GO electric field and magnetic fields are given by equations (19) and (20) respectively at a distance \( d \) from the reference location \( d = 0 \) where \( \eta \) is the intrinsic impedance of the medium. If the
medium becomes free space, \( \eta \) and \( k \) become \( \eta_0 \) and \( k_0 \), respectively. The parameters \( \rho_1 \) and \( \rho_2 \) are the principal radii of curvature of the wave front at the reference location \( d=0 \), and \( \vec{d} \) is the ray propagation direction.

\[
E(d) = E(0) \frac{\rho_1 \rho_2}{\sqrt{(\rho_1 + d)(\rho_2 + d)}} e^{-jkd} \tag{11}
\]

\[
H(d) = \vec{d} \times \frac{E(d)}{\eta} \tag{12}
\]

This direction is straight in a homogeneous isotropic medium. The distance \( s \) is positive in the direction of wave propagation and negative in the opposite direction. It can also be shown that

\[
\vec{d} \cdot E = \vec{d} \cdot H = 0 \tag{13}
\]

Which, implies that the GO fields do behave as plane waves. Now that we have introduced the GO field, we can consider the situation where this field is incident on an electrically large, smooth structure as depicted in Fig. 6. It is well known that the incident field is reflected and if the structure is penetrable, there could also be a transmitted field. This discussion initially concentrates on the reflected field. By assuming that the incident GO field is given in Eq. (19), then the reflected GO field can be written as eq.(22). Where, \( \vec{R} \) is the dyadic reflection coefficient, \( E^i(Q_r) \) is the incident field at the point of reflection \( Q_r \), and the reflected field is evaluated at a distance \( d_r \) from the point of reflection. The magnetic field can be obtained from Eq. (19) by replacing \( E^i \) by \( E^r \) and \( d \) by \( d' \) where \( d' \) is the direction of propagation of the reflected field.

[26]
Note that the reflected GO field has the same form as the incident GO field, except that its radii of curvature is dependent on the radii of curvature of the surface and the incident field wave front in the neighborhood of \( Q_r \) as well as the direction of incidence. Because Eq. (19) is similar to Eq. (22), the reflected GO field also fails at the caustics. The radii of curvature \( \rho_{1,2}' \) can be written as in eq. (23).

\[
\frac{1}{\rho_{1,2}'} = 0.5 \left( \frac{1}{\rho_1} + \frac{1}{\rho_2} \right) + \frac{1}{F_{1,2}} \tag{15}
\]

Where \( \rho_1 \) and \( \rho_2 \) are the radii of curvature of the incident field at the point of reflection \( Q_r \) and the parameter \( F_{1,2} \) is a fairly complex expression.

B. **Geometric Theory of Diffraction**

To overcome some of the shortcomings of the GO field, such as, the discontinuous fields at the shadow boundaries and the prediction of zero fields in the shadow regional method referred to as GTD was introduced by Keller, as previously mentioned [2]. It is an extension of geometrical optics [27].
which accounts for diffraction. It introduces diffracted rays apart from the usual rays of geometrical optics. These rays are produced by incident rays which hit edges, corners, or vertices of boundary surfaces or which graze such surfaces as shown in fig. 7. Modified forms of Fermat’s principle, equivalent to these laws, are also used. First, diffracted wave fronts are defined, which can be found by a Huygens wavelet construction. There is an associated phase or eikonal function which satisfies the eikonal equation. In addition to that complex or imaginary rays are introduced. A field is associated with each ray and the total field at a point is the sum of the fields on all rays through the point. The phase of the field on a ray is proportional to the optical length of the ray from some reference point. The amplitude varies in accordance with the principle of conservation of energy in a narrow tube of rays.

![Figure 5: Different types of ray paths predicted by the generalization of Fermat’s principle.](image)

Fermat’s principle states that a light ray between two points m and n has optical path length which is stationary with respect to perturbations of the path.

\[
\int_{m}^{n} F(x) \, ds
\]  

(16)

Here, s denotes arc length along the curve, and (x) is the refractive index. This method introduces diffracted rays that can penetrate the shadow region as depicted in Fig. 8. We must note that a ray hitting the edge of the [28]
structure can radiate into the shadow region as well as the lit region. Likewise, the incident field at grazing incidence on the convex surface can excite a surface diffracted field, which travels along the surface and penetrates the shadow region.

Fig. 6. Ray paths for diffracted fields (Roberto G. Rojas).

As a matter of fact solutions for the scattering of an object with an edge were obtained before Keller’s work; the key to Keller’s contribution was the interpretation in terms of rays of the various components of the solution. The total GTD field is given in equation (25). Where $E^d (P)$ is the diffracted field and $E^{GO}(P)$ is the GO field. The general form of the diffracted field, away from the point of diffraction, is as in equation (26).

$$E(P) \sim E^{GO}(P) + E^d (P) \quad (17)$$

$$E^d(s^d) = E^{id}(0) \sqrt{\frac{s^d}{1 + s^d + 2s^d}} \quad (18)$$

Where $E^d (0)$ is the diffracted field at the reference point $s^d = 0$. The diffracted field, away from the point of diffraction, has the same form as the GO field. To obtain this field in terms of the incident field and a diffraction coefficient, which plays the same role as the reflection coefficient, it is necessary to move the reference point to the diffraction point. The diffraction coefficient depends on the nature of the surface in the neighborhood of the diffraction point. In its original form, the diffracted fields developed by Keller were not continuous at the shadow boundaries.
C. Uniform Geometric Theory of Diffraction

Uniform Geometric Theory of Diffraction [16], is used for arbitrary electrical size structures without extra needs for computational resources. In the UTD method, objects are approximated by the combinations of boards, cylinders and cones which have analytical mathematical expression and are all developable surfaces. Geometrical information which is used in calculating ray fields can be easily obtained from the developable surfaces. ……..[20]

D. Physical Optics

The Physical Optics approximation method, also known as the surface current method is a well-known high frequency technique. It is based on the determination of the equivalent current densities induced on the surface of an illuminated perfect electric conductor (PEC) plane [17]. The GO, GTD and UTD asymptotic methods were in terms of fields and rays. An alternative approach is to start with the source of the fields itself. It is possible to obtain HF asymptotic expressions for the currents generating the fields. Once we obtain the currents, the fields can be evaluated using radiation integrals. The integral techniques are very useful in caustic regions where the UTD and other ray techniques fail. Let us consider a reflector illuminated by fields radiated by a feed as shown in Figure 7. The expressions can be derived from the physical equivalent for the electric and magnetic equivalent current densities, PO\textsuperscript{E} and PO\textsuperscript{M} respectively.

![Fig. 7. Physical optics methods for reflector pattern analysis (Roberto G. Rojas).](image-url)
The incident electric and magnetic fields due to external sources and in absence of any obstacle are $E_{1}^{\text{inc}}$ and $H_{1}^{\text{inc}}$. Whereas, the total fields inside the PEC are null ($E_{1}^{\text{tot}_{\text{PEC}}} = H_{1}^{\text{tot}_{\text{PEC}}} = 0$), while in the second medium $E_{1}^{\text{tot}}$ and $H_{1}^{\text{tot}}$ are calculated by adding those incident fields to the reflected ones denoted by $E_{1}^{\text{ref}}$ and $H_{1}^{\text{ref}}$. The electric and magnetic induced current densities, $J$ and $M$, at the boundary $S$ can be obtained from the tangential components of the total fields as depicted in eq. (27) and (28). Considering the characterization of the boundary $B$ as a PEC plane and taking into account the eq. (27) and (28), the Physical Optics approximation states that $H_{1}^{\text{inc}}$ and $H_{1}^{\text{ref}}$ at the boundary $B$ are in phase and also have the same amplitude.

\begin{align}
J &= \hat{\alpha} \times (H_{1}^{\text{ref}} - H_{1}^{\text{tot}_{\text{PEC}}})|_{S} = \hat{\alpha} \times H_{1}^{\text{ref}}|_{S} = \hat{\alpha} \times (H_{1}^{\text{inc}} + H_{1}^{\text{ref}})|_{S} \\
M &= -\hat{\alpha} \times (E_{1}^{\text{ref}} - E_{1}^{\text{tot}_{\text{PEC}}})|_{S} = -\hat{\alpha} \times E_{1}^{\text{ref}}|_{S} = -\hat{\alpha} \times (E_{1}^{\text{inc}} + E_{1}^{\text{ref}})|_{S} = 0
\end{align}

Thus, $P_{\text{OJ}}$ and $P_{\text{OM}}$ can be expressed as given in equations (29) and (30) respectively. An additional consideration to complete the PO formulation is included here when dealing with finite geometries,

\begin{align}
J_{\text{PO}} &= \hat{\alpha} \times (H_{1}^{\text{inc}} + H_{1}^{\text{ref}})|_{S} \approx 2\hat{\alpha} \times H_{1}^{\text{inc}} \\
M_{\text{PO}} &= -\hat{\alpha} \times (E_{1}^{\text{inc}} + E_{1}^{\text{ref}})|_{S} = 0
\end{align}

the PO current density is null in the regions not illuminated by the source.

\begin{align}
J_{\text{PO}} &= \begin{cases} 
2\hat{\alpha} \times H_{1}^{\text{inc}} |_{S} & \text{lit region} \\
0 & \text{Non-lit region}
\end{cases}
\end{align}

That is why the distinction between shadowed and illuminated parts of the scenario is one of the aforementioned constraints to correctly apply the PO approximation.
In PO, the equivalent currents need to be integrated over the surface to calculate the scattered field. Obviously, the larger the surface, the more time it takes to integrate the currents. Integration can be performed in two ways. One approach is to integrate using asymptotic techniques such as the method of stationary phase. This method is based on the idea that the contribution to the scattered field comes from a few isolated points on the surface as well as diffraction points along the edges. The former are called stationary points, whereas the latter are endpoints or diffraction points.

E. Physical Theory of Diffraction

It is important to be noted that the PO technique is accurate near and within the specular reflection region and becomes erroneous farther away from this region. This means that the PO-diffracted field $E^d_{\text{PO}}$ is not accurate because the PO currents are not accurate near edges. To improve the accuracy of the PO fields, it is necessary to improve the accuracy of the currents, especially in the regions where diffracted effects are important. As stated previously, PTD, originally developed by Ufimtsev, is an extension to PO where the induced surface current is improved by including a correction that accounts for diffraction effects such as the discontinuity of the surface currents at the lit and shadow region boundaries and near the edges of the surface [19]. Thus PTD refines the PO solution just like UTD refines GO. The PO current introduced earlier is corrected by a “non-uniform” current that accounts for diffraction effects.

$$J_s(r') = J_{\text{PO}}(r') + J_{\text{PTD}}(r')$$  \hspace{1cm} (24)

The field scattered by the above surface currents are more accurate because the currents account for diffraction effects. Again, the surface integration can be performed asymptotically or numerically. The corrected scattered field resulting from the surface currents can be expressed as
\[ E'(r') = E^{\text{PO}}(r) \times E^{\text{PTD}}_d(r) \] (25)

Where \( E^{\text{PTD}}_d(r) \) is the PTD correction term to the PO scattered field, \( E^{\text{PO}}(r) \). We must note that the PTD diffracted field \( E^{\text{PTD}}_d \) is not the same diffracted field as the GTD-diffracted field. The field \( E^{\text{PTD}}_d \) is radiated by the non-uniform or “fringe” currents only, whereas the GTD edge diffracted field is radiated by the total currents in the vicinity of the edge. The experimental study has been done by Pathak, Carluccio, and Albani [20] for wedge.

V. CONCLUSIONS

There are many efficient computational electromagnetic modeling techniques available and each has got its own advantage and disadvantage. Each technique is suitable for analyzing a particular problem. In some problem a mixed or hybrid techniques is used to obtain a specific solution pattern. In this paper, emphasis has been put to discuss numerical techniques like- FEM, MoM, FDTD, FDFM, and high frequency analysis technique like GO & GTD, UTD, PO & PTD, etc. for analysis of antenna used for space applications. References have been provided that direct the reader to more detailed information and sources of computer codes.

VI. REFERENCES


Pandit Jawahar Lal Nehru, who himself had been incarcerated for a number of times, described the deplorable condition of prisoners in ‘Prison Land’ and stated: “High Walls and iron gates cut off the little world of prison from the wide world outside. Here in this prison world, everything is different. There are no colours, no changes, no movement, no hope, no joy for the long term prisoner. Life runs its dull round with a terrible monotony: it is all that desert land with no high points and no oasis to quench one’s thirst or shelter one from the burning heat. Days run into weeks, and weeks into months and years till the sands of life run out”.

The above words of Pandit Nehru are relevant even today. Not much has changed in the Indian prisons, which are still being governed as per Prisons Act, 1894. However, Delhi State has enacted its own law, Delhi Prisons Act, 2001 with the Rules of 1988 which are applicable in Tihar Prison, made under the old and archaic Act.

Before taking up various aspects of human rights of prisoners, it would be appropriate to identify and enumerate such various rights. Constitution of India provides a number of rights to the individual in Part III which have been termed as “fundamental rights”, and for the sake of convenience, these rights may be divided in two categories, viz. Specified Fundamental Rights and other Fundamental Rights. ‘Specified’ Fundamental Rights are called as such, as they are mentioned in the constitutions by name. ‘Other’ Fundamental Rights are those which are not mentioned in the constitution, but are given in various landmark judgements by the Supreme Court of India.
In brief, such human rights which are applicable in case of prisons and prisoners, have been identified and enumerated with regard to—(1) Segregation of Juvenile Prisoners (2) Fetters and hancuffs of the Prisoners (3) Incarceratory torture (4) Inhuman treatment in execution of death sentence (4) Invoke the court's writ jurisdiction (5) Prison Vices (6) Solitary confinement (7) To live with basic human dignity (8) Speedy trial (9) Legal Aid (10) Bail (11) Communication with the outside world and Prison visits. (12) Wages (13) Release on parole (14) Property.

Presently, Tihar prison complex which has nine prisons including one for women and girls and another for young offenders of the age group of 18 years to 21 years, is meant for the people of Delhi comprising the population of 1,37,82,976 persons and covering an area of 1,483 sq. km. The population of Tihar Prison on 27.07.2005 was 13,000 whereas, the sanctioned capacity of the prison was for 5650 inmates. As per Prison Statistics, 3 out of total inmates, 79.4% are under trial, 20.1% are convicts, whereas, 0.5% are detainees. The total sanctioned strength of officers and men including D.G./I.G./D.I.G/ Supdt./Dy. Supdt./Asst. Supdt./Head Warder/Matrons / warders/ Medical /ministerial staff are 1365, whereas, the actual present strength is 1038. It shows a shortage of 327 officers and men.

The National Human Rights Commission, New Delhi in its Annual Report, 2000-2001. I has analyzed the prison population. It indicated that there were a total of 3,19,065 prisoners in the jails of all the states/ UTs, against the authorised capacity of 2,19,880 i.e. an overall crowding of approximately 31.2 per cent. A total number of jails in the country including Central Jail, District jail, Sub jail, Women jail, Open jail, Special jail, etc. are 1119.

Overcrowding in jails was being experienced in 10 states, namely, Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Jharkhand, Madhya Pradesh, Mizoram, Orissa, Uttar Pradesh, the UTs of Andaman and
Nicobar Islands and Delhi. Jharkhand had the most overcrowded jails in the country (260%) followed by Delhi (192%), Haryana (165%), and Chhattisgarh (150%).

Under trial constituted 74.18 percent of the total jail population in the country. Women account for 3.12 percent of the total jail population in the county Mizoram has the highest percentage of women in jail (11.02%) followed by Chhattisgarh (5.69%). Delhi has 4.45% women population in Tihar jail.

We should find out the reasons of overcrowding the prisons. In India, there are total 1119 prisons in a country of more than one billion of population. The total world’s population is estimated to be about six billions, i.e. every sixth person in the world is an Indian. In USA, which has the highest prison population rate in the world, every year about 100-150 new prisons are built and filled.

In India, there is slow disposal of pending trial cases in the courts, with the result that the under trial prisoners remain languishing in jails, as bail is generally denied to the accused. There is no satisfactory bail policy in India. It is purely the discretion of the Judge. In February 2003, Th Supreme Court of India had commented upon on the speed of trial in Bofors Pay off case during the hearing of application of Hinduja brothers. The Bench said this was an instance to show that criminal trial in India was like a slow-motion picture.

The Supreme Court has already said that the Judge-population ratio should be increased in phased manner. At present, it is 10.5 Judges per million of population in India It should be five times of the present one, which is insufficient to tackle the task of disposal of mounting arrears in the Subordinate Courts and High Courts. As of now, it has resulted in accumulation of arrears of 2.4 crores cases in the courts. There are 1854 vacancies which formed 15 percent of the total judges strength in the
subordinate judiciary (Total 12,780 judges post). The Law Commission of India has indicated that for every one million population, there are 50.9 judges in the U.K, 41.6 in Australia, 107 in the U.S. and 75.2 in Canada.

In petty offences and matters, police arrests the persons and sends them to jails. The National Police Commission in its 3rd report referring to the quality of arrest by the police in India, had mentioned that power of arrest was one of the chief source of corruption in the police. The report suggested that by and large, nearly 60% of the arrest were either unnecessary or unjustified and that such police action accounted for 43.2% of the expenditure of the prison department.

Following is the crime rate in the big metropolitan cities of the country, for the year 2001, of the cases per lakh of population.

<table>
<thead>
<tr>
<th>City</th>
<th>Cases per lakh of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>385.8</td>
</tr>
<tr>
<td>Cheunai</td>
<td>113.5</td>
</tr>
<tr>
<td>Kolkata</td>
<td>90.6</td>
</tr>
<tr>
<td>Mumbai</td>
<td>177</td>
</tr>
<tr>
<td>National average</td>
<td>172.3</td>
</tr>
</tbody>
</table>

The above table indicates that Delhi is the worst affected with spiraling crime rate resulting in the crowding of prison. The question of common man's interest regarding long vacations in the courts despite of huge pendency of cases in all courts was taken up by Justice V.S. Malimath Committee constituted for Reforms in Criminal Justice System in India.

Lawyers’ strike has been one of the important reasons for delay in the trial of cases. Due to one or the other reasons, the lawyers, particularly in District courts and also in the High courts have been going on the strike. In April 2000, a Division Bench of the Delhi High court on the lawyers’ strike and on the Public Interest litigation filed by Dr. B.L. Wadhera, Advocate, held that the litigant’s right to a speedy trial is above the lawyers’
right to strike work and also declared the strike illegal. The Bench further said that “Assuming the lawyers are trying to convey their feelings or ideas through the strike in exercise of their fundamental rights to freedom of speech and expression guaranteed in the constitution, the exercise of such right will come to an end when it threatens to infringe the fundamental right of another”.

Another reason for delay in criminal trial include delay in the investigation of cases by the police, wherein accused persons are in judicial custody, non-availability of all concerned in the court, eyewitness, case property, stenographer and record keeper of the court, advocates of both sides, accused person and of course, the presiding Judge. If any one of them is absent, the proceedings cannot be started and adjournment will have to be granted.

The evils in the jail include corruption/extortion at the hands of jail officials and convict officers (Munshi), smuggling of drugs and other contraband items in the jails, crime, violence, group clashes and use of improvised weapons in the jail. Famous and sensational Jail break from Tihar includes cases of Charles Sobraj and M.P. Phulan Devi’s killer Sher Singh Rana.

On the positive front of prison reforms in Tihar jail, various treatment programmes are being run by the jail department. The philosophy of reformation and rehabilitation of offenders casts upon prisons the responsibility of utilizing the period of imprisonment of offenders for their treatment with a view to modifying their behaviour to re-socialize them. Treatment of drug-addicts is being taken up in a special ward by an N.G.O. ‘AASRA’. There are 78 beds in the Jail Hospital to treat drug addicts.

**Motto in Jail:**

To instil confidence in the inmates and to maintain good working relations between the inmates and personnel of the jail, the mottos suggested
include :- (i) No torture or ill treatment to any prisoner, (ii) Equally good and dignified treatment to all prisoners and (iii) All human rights for all.

The last slogan was suggested by the U.N. on the occasion of celebration of Human Rights Decade from 1994-2004.

**Legal help to prisoners :**

Legal help to prisoners can be provided by - (i) Access to lawyers of prisoners' choice, (ii) Free Legal Aid through Legal Aid sells and Legal Panchayats and (iii) Lok Adalats for the final disposal of petty cases wherein accused are in judicial custody.

**Treatment and Welfare Programmes in Prison :**

Criminologists have recognized that every prison has its own sub-culture which gets concentrated over a number of years. This accumulated sub-culture is transmitted from prisoner to prisoner and taken to prison personnel. This sub-culture is reflected in many ways, such as, prison grapevine, prison-code language, prison jargon, under world in the prison, undesirable activities, such as gambling, homosexuality, auto-cratic practices etc. A large majority of prisoners consisting of first offenders have basically to be protected from getting contaminated by such prison-culture.

Various programmes are going on in Tihar prison including : (i) Education of prisoners, (ii) Recreational and cultural activities and (iii) Yoga, Meditation and spiritual courses.

Other such programmes include computer training, technological advancement and modernization, panchayat and participative management in prison and visits of VIPs and other celebrities in the prison. Vocational training and work programme being run in Tihar Jail include Jail Factory in respect of weaving, carpentry, chemical, recycled paper unit and tailoring section.

The concept of open prisons which is not in existence in Delhi should be encouraged. They are being run in Rajasthan (Sanganer, Jaipur),
U.P. etc. This can be highlighted and termed as “New Initiatives and Penal Reforms and Good Prison Practices”.

The system governing remission, leave and pre-mature release, has been an integral part of our prison administration. It has been functioning as a positive incentive to prisoners for good behaviour and work.

There are 39 N.G.O.s which are helping the Tihar Jail administration in their endeavour to reform the inmates by running various social and vocational activities.

The talk of human rights of prisoners will be futile if we do not discuss the problems of jail officials and police staff at the same time. With the jail officials, the IIIrd Battalian of Delhi Armed Police is also performing duties for production of prisoners before various courts. One Battalion of Tamil Nadu Special Police (T.S.P.) posted at Tihar Jail has been performing duty of providing security at the watch towers and peripheries, external and internal both.

There is an urgent need of reviewing the relevant laws an rules dealing with prisoners and their allied problems. Prison is state subject in the List-II of the constitution. It should be brought in the List III (concurrent) so that central government could make uniform prison laws for all the states. The whole laws relating to prisons should be consolidated. Bureau of Police Research and Development, Ministry of Home Affairs, New Delhi has brought out a good Model Jail Manual.

National Commission on Prisons should be created with legal teeth, through a proper legislation for the management superintendence of prisons in India with powers to recommend for enacting laws, rules and other guidelines for prisons and to enforce and implement.

The relevant recommendations of the various committees set up on Jail Reforms and particularly, the All India Committee Jail Reforms, 1980-83 alongwith the directions of the Supreme Court of India and High Courts
given in various landmark judgments and also recommendations of the National Human Rights Commission should be incorporated in the National Policy on Prisons. Judiciary and National Human Rights Commission have been working as great promoter and protector of the human rights of prisoners.

The appointment of Prison Ombudsman can remove the problems of lack of transparency, which is the root cause of all the Nils in Jail.

Various other recommendations for reforms in prison include the improvements in the areas of prison buildings, food, sanitation and hygiene, clothing, bedding and equipments, medical care, prison budget, admission & release, lock-in and lock out of prisoners, complaints, redressal system, production of the prisoners in the courts, other evils in the jail, for maintaining human dignity, security and discipline, communication with the outside world, women prisoners and their children upto the age of 5 years adolescents (18-21 yrs.), juveniles, prisoners sentenced to death and life imprisonment, under trial prisoners, detenus, etc.

If these recommendations are religiously implemented, then the saying of Mahatma Gandhi that the prisoner is to be treated like a patient and the jail must have an environment of hospital for treatment and care of patient, will stand the test of time.

REFERENCES:

1. India 2003, a Reference Manual issued by Ministry of Information and Broadcasting, Govt. of India, New Delhi.
2. Tihar Prisons; an overview issued by D.G. Prison, Tihar, New Delhi.
युद्धों और कूटनीतिक दावेदावों में असफल हो कर सम्राट हुमायूं को बाबर द्वारा स्थापित भारतीय राज्य छोटनाथ पड़ा। अपने कदम सहता हुआ वह अमरकोट के दुर्ग में पहुंचा, जहाँ राजा ने समायापूर्ण स्वागत किया। उसकी पत्नी हसनीदा बानो बेगम गर्मिवाती थी। कहते हैं कि रोगित्व में भटकते हुये बेगम को अनार खाने की इच्छा हुई। तभी एक व्यक्ति जवाब से भरा थैला लेकर आया। जब उसने थैला खाली किया तो उसमें 'रस से भरा हुआ एक बुद्धि बड़ा अनार निकला' जिसे बेगम की नजर किया गया। सभी कुर्दश के चमत्कार पर आश्चर्यचकित थे। बेगम को अमरकोट में छोड़कर भाग्य से टकराने लेने के लिए हुमायूं आगे बढ़ गया। रविवार 5 जून 1549 हि। अर्धशत 15 अक्टूबर, 1542 ई। को "दैवी नूर द्वारा पौष्टिक" पुत्र अकबर का जन्म हुआ, "ताकि संसार वालों के समस्त दुख स्वाभाविक पुरातन जनवर और हजरत जहांबानी हुमायूं के उस हृदय को जिसमें कदम के फक्रोले पड़ गये थे, आपका का मरहम प्राप्त हो जाए... ताकि बुद्धि को स्वाभाविक निर्देश, निर्देश की प्रतिभाशाली निर्देश, नवीकरण को सच्चा बादशाह, प्रेम का गम्भीर पारस्थ, कदरदानी, को प्रसन्न, सुलहकूल के लिए बुद्धि का आश्रयदाता भयस्क, प्राप्त हो जाए।" शुभ समाचार लेकर दुर्गामी दूत हुमायूं के पास पहुँचे। कृतज्ञ हृदय से हुमायूं ने इसवर के प्रति सिजदा किया और खुशी से भर उठा। उसने सभी साथियों को कसौटी बौंटी थी कि उसकी सुगंध की तरह उसके पुत्र (अकबर) की ख्याति चलकर फैले जाये।

जिस समय हुमायूं अपना राज्य पुनः प्राप्त करने के लिए कामगार से युद्ध कर रहा था, शिशू अकबर को कूर चाचा ने किले की दीवार पर खड़ा कर दिया था। युद्ध में हुमायूं बिजजी रहा। उसे शिया सेवक बाबस्थानी की भरपूर सहायता प्राप्त हुई। अकबर चार वर्ष का अबोध बालक था। जब अपने माता-पिता से मिलन हुआ। एक सी नकाब पहन कर बीसों महिलाएं पंकजबंब खड़ी कर दी गयीं और बालक अकबर को हुक्म
मिला कि वह माता-पिता का दामन पकड़ ले। कहते हैं कि असाधारण प्रतिभा सम्पन्न बालक सीधा हमीदाबानों बेगम की गोद में चढ़ गया। वह केवल तेजस वर्ष का था कि पिता हुमायूं पुस्तकालय की सीढ़ियों से लड़खड़ा कर गिर पड़ा और संसार से विदा हो गया। कलानीर के एक साथ किन्तु भव्य समारोह में अकबर के विश्वस्त संस्कार वैरामखों ने उसका राज्याभिषेक किया। नन्हे कन्दों पर बहुत बड़ा बोझ आ पड़ा। साम्राज्य के अन्तिम भागों का पुनर्निर्माण और प्रशासन के साथ ही विभिन्नताओं के में भरा था। अकबर ने भारत की एक सूत्र में बौंध कर अपने बाबा-बाबर और पिता हुमायूं के स्वान को स्वीकार करने का। अकबर अपने भाव के सामने स्थिर टीला पर बैठकर घटों ध्यानमंत्र रहता था। आंतरिक प्रेरणा से उद्वेगित उसका मन शान्ति ढूँढ़ता, दो पृथक संस्कृतियों के गित के दूसरे पिलोली, समस्या का मूल नम्बर प्राप्त करने के लिए तपस्या करता रहा।

अकबर ने बालू-बल से विशाल साम्राज्य की स्थापना की। वैरामखों की सहायता से उसने दिल्ली को जीत लिया। शेख भारत अभी अविजयित था। 1561 में उसने मालवा विजय की तथा जौनपुर और दुनार पर भी अधिकार कर लिया। 1562 में उसने आमेर और जयपुर के शासकों से संधि कर उन्हें अपने अधिन किया। इसी वर्ष उसने भड़ता विजय की। 1564 में उसने गोंडवाना के विस्तृत राज्य को जीत कर मुगल साम्राज्य की प्रतिष्ठा बढ़ाई। 1568 में उसने कलिंजर नरेश रामचन्द्र को पराजित किया। 1570 में जोधपुर, बीकानेर तथा जैसलमेर पर अधिकार किया। 1572–73 में उसने सम्पूर्ण गुजरात जीत लिया। 1574 और 1576 के मध्य उसने बिहार और बंगाल के प्रदेशों पर अधिकार कर लिया। 1581 में उसने काबुल पर विजय प्राप्त की। 1585 में उसने कश्मीर तथा 1592 में सिन्ध और उड़ीसा पर अधिकार प्राप्त किया। 1595 में सम्पूर्ण बलूचिस्तान एवं कन्दकार की विजय प्राप्त की। उसने 1593 और 1601 के मध्य दक्षिण भारत पर आक्रमण किया तथा खानदेश और अहमद नगर पर मुगलिया हुक्कम स्थापित की। उसने एक के बाद इन राज्यों पर राजनैतिक प्रभुत्व स्थापित कर लिया किन्तु, उसका आंतरिक मन समग्र राज्य को एकता के शक्तिशाली सूत्र में नवाचौड़ करने के लिए आलेह था। वह चाहता था कि इस पुरातन देश की गरिमापूर्ण धरती से [45]
सामाजिक स्थापना कर हिन्दू–मुस्लिम समन्वय के उस संदर्भ को साथीता प्रदान करे जो जनता के भाग संत कबीर, गुरु नानक, रामदास, मीराबाई और दादा पलटू आदि अनेक वर्षों से दे रहे थे।

अकबर का उत्कर्ष जिस गुरु में हुआ वह चतुर्विंद नवोमि और जागरण का युग था। सूरजवर्धन प्रवर्तियों का प्रस्फुटन हो रहा था। जहाँ एक ओर ब्रज प्रदेश में सूरदास जैसे महाकवि आध्यात्मिक जागरूकता उत्पन्न कर रहे थे और स्वामी हरिदास भक्ति की सरस्ता को संघटित में उतार कर जन–मानस में आनन्दात्मिक भर रहे थे वहीं भारतीय संस्कृति की अनुभुम परम्पराओं के बाहर संत तुलसीदास अपनी अनूठी रचना रामबरित मानस लिख कर जन–जीवन को मर्यादा पुरुष राम के माध्यम से सजाए और वैज्ञानिक बना रहे थे। भक्ति की इन दोनों सरस्ता धाराओं के द्वारा संकीर्ण विचारों का अन्त हो रहा था। व्यापक मानव–धर्म की विजय हो रही थी। अकबर के नवरतन अनुलोक, अयोध्या और शेख मुबारक उसके जिज्ञासु मन–मस्तिष्क पर उदारता का गहरा रंग बढ़ाने में व्यस्त थे। वैदिकों के साथ शिया विचारधारा की छाप उसके बाल–हृदय पर पड़ सकी थी। शिक्षक अनुभुत ललित की उदार एवं व्यापक शिक्षाओं से अकबर को अभिन्न श्रद्धा और रक्षित प्राप्त हुई थी। शेख सलीम विश्वी की दरगाह पर वह नंगे पैर चल कर अपनी श्रद्धा अर्पित करने के लिए गया था। पुत्र सलीम के जन्म के परवर्तन संगों के मार्ग की आनन्दिक अनुभूति उसे साक्षात् प्राप्त हो गई थी। फतेहपुर सीकरी का निर्माण करने के बाद उसने वहीं एक इबादतखाना बनवाया जहाँ सभी धर्मों के ज्ञाताओं और दार्शनिकों को आमंत्रित कर, वह विश्वास–विचार, वातालाप और वाद–विवाद करता था। वह एक जिज्ञासु और सत्य का परम अनुष्ठान था। वह इस निष्ठा पर पहुँचा कि मजबूत भौतिक निर्भरता है। वात्तिक में सभी धर्म 'परम सत्य' तक पहुँचने के भिन्न–भिन्न मार्ग हैं। धार्मिक विभिन्नता के बावजूद सभी मनुष्य समान हैं।

इन्सानियत प्रेम और भाईवास समाजिक महत्वपूर्ण है। अकबर पूर्णता: मानवता और बन्धुत्व के आदर्शों में विश्वास करने लगा। राजसिहासन के व्यापित आसन पर बैठ कर नव–प्रकाश और सत्य की सुनहरी किरणें बिखेरता हुआ भारत के गौरवशाली अतीत से आध्यात्मिकता और सहिष्णुता के अनमोल मोती बौन कर उसने राष्ट्रीय एकता और
समन्वय तथा शान्तिपूर्ण सह-असित्व के लिए शाही चमन में सुलहकुल का अनमोल गुणाव खिला दिया जिसकी सुगंध से देश की जनता न केवल फैज़याब हो उठी वरन जीने की बेहतर शैली विकसित कर सकी।

कौमी एकता का मसीहा सम्राट अकबर नहीं चाहता था कि कट्टर सुन्नी उलेमा वर्ग उसकी नीतियों के प्रति विरोधी अथवा उदासीन रहे। 1579 तक वह उस राजत्व सिद्धांत को क्रियाशील न बना सका जिसका निरूपण ‘आईन’ में उसके परम निर्देश अबुल मजल में निर्धारित किया था। उसने उलेमा वर्ग को किसी प्रकार समझा-बुझाकर अपने पक्ष में कर लिया। 26 जून 1579 को शाहीनता और पूर्ण गरिमा के साथ वह सवाय जामी मसजिद में गया जहाँ उसने राज कवि फंजी द्वारा लिखे खुदेवी को पढ़ा।

तीन महीने बाद उलेमा वर्ग ने उसके पक्ष से एक प्रत्येक प्रत्युत्तर किया जिसे ‘हज़र’ कहा गया। इसके द्वारा पवित्रता कुरान के आदेशों की व्याख्या करने का अधिकार उलेमाओं ने स्वीकार कर दिया। अकबर अब मुसलिम न्यायशास्त्रियों एवं परम्परा विरोधी व्याख्याओं में से किसी एक को चुन करता था अथवा स्वयं व्याख्या कर सकता था। सम्राट के इस कार्य की प्रतिक्रिया में भिन्न हाकिम के नेतृत्व में कट्टर सुन्नी मुसलिम वर्ग का भयंकर विद्रोह हुआ, जिससे अकबर का राजसंहार भी हिल उठा। अकबर ने फलहपुर छोड़कर आगरा में निवास करना अधिक सुरुशित समझा। जब वह इस विद्रोह का दमन करने के बाद आगरा वापिस आया तब उसने ‘सुलह-कुल’ की उद्धोषणा सम्राट के व्यापक हित के उददेश्य से जनता का समान नागरिकता को अधिकार देने के लिए की। उसने अबुलफजल द्वारा प्रतिपादित राजशाही सिद्धांत को पूर्ण शक्ति से साथ क्रियाशील किया जिससे कहा गया था मालिक की नजदीक में कोई पद इतना महत्त्वपूर्ण नहीं है जितना कि बादशाह का। मानव-सम्राट में प्रतिकृत स्वार्थों, कस्टों और अवांछनीय महत्वाकांक्षाओं को समाप्त करने के लिए राजनीति अभिव्यक्ति है।[......] राजत्व वह प्रकाश है जो मालिक से निकृत होता है जैसे सूरज से किरण। यह मालिक के द्वारा ‘बादशाह’ को दिया जाता है। इस प्रकाश से युक्त बादशाह अगणित गुणों का वाहक है और चार प्रकाश से वह इस
प्रकाश को अभिव्यक्ति करता है—प्रजा के प्रति पितृ तृत्य प्रेम, विशाल हृदय, मालिक में आस्था, प्रार्थना और भक्ति।"  

सम्राट अकबर के राजवंश सिद्धान्त का आधार सुलह—कुल था जिसके द्वारा उसने साम्राज्य के प्रत्येक नागरिक को धार्मिक स्वतंत्रता प्रदान की। उसने धर्म और राज्य—व्यवस्था को अलग—अलग कर, अन्तरात्मा की स्वतंत्रता को यथार्थ बना दिया। उसने अपने परिषद में हिन्दू, पारसी, ईसाई सभी को स्थान दिया। धार्मिक में बेड़खाँव करने वाले करों, जैसे जजिया एवं तीर्थयात्रा कर के समाप्त करने के लिए उसने राजाज़ा निकाली। प्रशासकीय नियुक्तियों का आधार जाति और धर्म के स्थान पर योग्यता और गुण बनाया गया। इसी सिद्धान्त के आधार पर राजा टाउनमेंट वकील के प्रतिदिन यह पद था। 1594 में सम्राट अकबर ने फारस के शाह अब्बास को एक पत्र लिखवाया जिसमें सुलह कुल की विवाद धारा व्यक्त करते हुए उसने व्यय को मानवता के हित और शान्ति के लिए सेरारत बताया। उसकी विवाद धारा थी कि “मानव समाज आध्यात्मिक दौलत से भरपूर है, अतः हृदयों के भिन्न और पारस्परिक स्त्रें बल देना चाहिए। देवी अनुक्रम तो प्रत्येक धर्म में निहित है। प्रयास होना चाहिए कि प्रत्येक मनुष्य उस सदाश्वार समन में प्रवेश कर सके जिस सुलह—ए—कुल कहते है।’’  

सुलह—ए—कुल द्वारा अकबर ने मानव एकता के स्वयं को साकार करने का प्रयास किया। उसकी सुलहकुल की विभागाधारा की पृथ्वैमि में निश्चय ही सामाजिक समन्वय की अदभुत पृथ्वैमि थी, जो सत्ता कबीर जैसे दार्शनिक कवि एवं भक्त—सन्तों एवं सूफियों ने इस देश में वैचारिक एवं व्यावहारिक धरातल पर बहुत पहले सृजित कर उसका कार्य सरल कर दिया था।
ब्रजभाषा की रूप–स्वनिमिकी

विजेन्द्र प्रताप सिंह

---संक्षिप्तः---

भाषा सम्प्रेषण का प्रभावशाली माध्यम है। इसी माध्यम से मानव समाज में अपने विचारों और भावों को सम्प्रेषित करता है। भाषा समस्त मानसिक व्यापारों, मनोभावों की अभिव्यक्ति का साधन है। भाषा सामाजिक संगठन, सामाजिक मान्यताओं और सामाजिक व्यवहार के विकास का एकमात्र साधन है। भाषा गौरव की दृष्टि से रूप–स्वनिमिकी का गौरव एवं उसकी अनिवार्यता निर्धारित है। प्रस्तुत भोगालेख में ब्रजभाषा की रूप–स्वनिमिकी का विवेचन भाषा गौरव की दृष्टि से प्रस्तुत किया जा रहा है।

कुंजीशब्दः— भाषा गौरव, स्वनिमिकी, रूप–स्वनिमिकी, प्रत्यय, परप्रत्यय, पूर्व प्रत्यय, इस्तीफक, दीर्घकरण, यौगिक भाव, सामाजिक भाव, ध्वनि परिवर्तन इत्यादि।

----------------------------------------

भाषा का परिप्रेक्ष्य अन्य विषयों की अपेक्षा अधिक व्यापक होता है। इसका संबंध भाषा सीखने के साथ–साथ सूचना, ज्ञान, अनुभव, संवेदना, कौशल व सम्प्रेषण–व्यक्तित्व के इन विविध आयामों से है। इसलिए  

---

3 सहायक प्रोफेसर (हिंदी), राजकीय स्नातकोत्तर महाविद्यालय, जल्लौल, एटा, उत्तर प्रदेश
आवश्यक है कि यह एक तरफ तो साहित्य में प्रयुक्त छन्द, लय, विभा आदि तथा व्याकरणिक स्वरूप का बोध कराने के साथ ही उसके विविध रूपों तथा पद्धतियों का बोध कराता है और साथ ही भाषा चूकिं सम्पूर्ण रूप में सामाजिक कार्य व्यापार है, सामाजिक परिदृश्य, उदात संवेदना और वैचारिक समझ को भी विकसित करता है। शिक्षा विषय में दो तरह की शिक्षा पद्धतियाँ का जिक्र होता है, प्रथम वर्ण शिक्षा पद्धति द्वितीय शब्द शिक्षा पद्धति। प्रथम पद्धति वर्ण शिक्षा पद्धति प्राचीन काल से प्रचलन में है। इसके अतिरिक्त वर्णमाला ज्ञान से लेकर जटिल व्याकरणिक संरचनाओं का विवेचन किया जाता है। रूप स्वर्णिमी के अध्ययन से इस प्रणाली में घटित विभिन्न परिवर्तनों से परिचित होता है जिससे वह भाषा प्रयोग करने में उत्सुकियों से न सिफ्ट बचता है बल्कि उनका स्तरीक प्रयोग भी करता है।

पारिवारिक दृष्टि से ब्रजभाषा (ब्रजमंडल की भाषा) का संबंध शौरसेनी अपमंथ से है। डॉ. सुनीती कुमार चटर्जी के शब्दों में “शौरसेनी अपमंथ उन दिनों की अंतः प्रादेशिक भाषा ही थी और आजकल ब्रजभाषा, खड़ीबोली आदि विभिन्न प्रकार की हिंदी का उदभव इस शौरसेनी अपमंथ से ही हुआ। ऐसा जानता है कि अपनी बेटी ब्रजभाषा में शौरसेनी अपमंथ को पहली कलेवर मिला। नए आयुकाल को उसने प्राप्त कर लिया।” (डॉ. सुनीती कुमार चटर्जी: पोदार अमितांडन गंध, पृष्ठ सं. 80) श्री मोतीलाल मेनारिया ने ‘राजस्थान के पिंगल साहित्य,’ में उल्लेख किया है कि “बौद्धबी शहाबदी में जिस समय राजस्थानी भाषा का उदय हो रहा था, लगभग उसी समय शौरसेन देश अथवा ब्रज मंडल में ब्रजभाषा विकसित हो रही थी, जिसका आधार शौरसेनी अपमंथ था। आरंभ में यह शौरसेनी भाषा कहलाती थी, पर बाद में ब्रजभाषा नाम से पुकारी जाने लगी।” (लोकभाषा:[50]
पृष्ठ सं. 61) डॉ. भाटिया के अनुसार “शौरसेनी अपमंश जो नागर अपमंश भी कहलाने लगी, उत्तर भारत में एक विराट साहित्यिक भाषा के रूप में मान्य थी। चार-छह वर्षों तक सिंधु प्रदेश से पूर्वी बंगाल तक और कश्मीर, नेपाल, मिथिला से लेकर महाराष्ट्र और उड़ीसा तक तमाम आर्यवर्ती देश इस शौरसेनी अपमंश या नागर अपमंश का साहित्यिक भाषा क्षेत्र बन गया।” (डॉ. कैलाशचंद्र भाटिया: लोकभाषा, 2009, पृष्ठ सं. 62)

डॉ. धीरेन्द्र वर्मा ने 1951 की जनगणना के आधार पर ब्रजभाषा प्रयोक्ताओं की संख्या 1 करोड़ 23 लाख बताई थी। (डॉ. धीरेन्द्र वर्मा: ब्रजभाषा, 1954, पृष्ठ सं. 33–34) डॉ. हरदेव बाहरी ने सन 1966 में ‘हिंदी की ग्रामीण बोलियाँ’ नामक लेख में इनकी संख्या 1 करोड़ 25 लाख मानी। वर्तमान में यदि मात्र ब्रज मंडल को ही लिया जाए तो इसके बोलने वालों संख्या 24,58,9416 हैं। (2011 की जनगणना, वर्तमान की संख्या ब्रजभाषा, 2011, पृष्ठ सं. 33–34)

इस आंक़ के मध्य में मथुरा, आगरा, फिरोजाबाद, हाथरस, कासगंज, एटा, मैनपुरी, अलीगढ़, बुलंदशहर, गोतमबुद्धनगर, बदायूं, बरेली, उद्धमसिंह नगर, भरतपुर, घोलपुर, करोली, फसीदाबाद, गुडगांव जिलों की जनसंख्या ही शामिल है। इसके अतिरिक्त उत्तर भारत के बहुत से ब्रजभाषी अन्य राज्यों तथा विदेशों में बोले गए हैं। यदि उनको शामिल किया जाए तो निश्चित रूप से यह संख्या अधिक होगी।

‘ध्वनि’ के बिना भाषा की कल्पना ही नहीं की जा सकती। बल्कि कहा जा सकता है कि ध्वनि भाषा की आधारशिला है। वस्तुतः हम अपनी वागन्द्रियों द्वारा जो बोलते अथवा उच्चारण करते हैं, वह ध्वनि है। इस प्रकार मनुष्य की वागन्द्रियों से अभिव्यक्त सुनी जाने योग्य वाणी ध्वनि
है।” (डॉ. हरिवंश तरकारी, मानक हिंदी व्याकरण और रचना, पृष्ठ सं. 26) ध्वनि शब्द का सामान्य अर्थ आवाज है। ‘हिंदी साहित्य-कोश’ में सामान्य व्यवहार में कानों के सुनाई पडने वाला नाड ध्वनि है। ध्वनि सिद्धांत के प्रतिपादक आनन्दवर्धन हैं। ‘ध्वन्यालोक’ में ध्वनि की परिभाषा इस प्रकार दी गयी है—“यत्रार्थः शब्दों वा तर्कध्वनिपरिवर्तनीकृत स्वाभाविक व्यक्त-कार्यविशेषः स क्षमिति सूरमिति क्षमिति। “अर्थात् ‘ जहाँ शब्द और अर्थ अपनी-अपनी सत्ता को गौरूण करके लिख विशेष अर्थ को प्रकाशित करते हैं वहाँ ध्वनि अथवा व्यंग्यार्थ कहलाता है।”(डॉ. अ. गोकुल, भाषा-भारतीय काल्यास्त्र, पृष्ठ सं. 132) ध्वनि एक प्रकार का कम्यण या विशेष है। जो किसी ठोस, द्रव या गैस से होकर संचारित होती है। किंतु मुख्य रूप से वह कम्यण ध्वनि है, जो मानव के कान से सुनाय गयी है। प्रत्येक ध्वनि के उच्चारण में स्वरतत्रयों की झंकार अधिक या कम होती है। अधिक झंकार होने पर सुर ऊँचा होता और कम झंकार होने से सुर नीचा होता है। स्वरतत्रया यदि दीर्घकार हैं, तो झंकार कम होता है। पुरुष की तत्तत्रया स्त्रियों की अपेक्षा बड़ी होती हैं। इसलिए उनका सुर स्त्रियों की अपेक्षा नीचा होता है। प्रत्येक ध्वनि के उच्चारण में कुछ समय लगता है। उच्चारण समय की माप, मात्रा के द्वारा की जाती है। इसका विभाजन हल्द स्वर, दीर्घ स्वर आदि रूपों में किया जाता है। जीवित भाषा“ भाषा की रक्षा, देश की सीमाओं की रक्षा से अधिक जरुरी है।”  भाषा वैज्ञानिक थॉमस क्लिंड

जीवित भाषा में परिवर्तन शास्त्र वत्तहैं। परिवर्तन ही भाषा का विकार है। ध्वनि विकार मुख्यतः मुख—लुक और अपूर्ण अनुकरण से होता है। ब्रज में ध्वनि परिवर्तन बाह्य कारणों में भौगोलिक वातावरण समाज की राजनीतिक, सांस्कृतिक और धार्मिक अवस्थाएं प्रमुख, आत्मिक कारणों से
प्रयोगाधिक्य स्वरूपात्रु आदि को लिया जा सकता है। ध्वनि परिवर्तन कोई एक कारण से नहीं होता है। उसे बाह्य एवं अंतर्गत कई कारण प्रभावित करते हैं। अज्ञातता, शिक्षा एवं श्रवणनिद्रा के कारण किसी दो व्यक्तियों की भिन्नता के कारण किसी दो व्यक्तियों का वाक्यांश ठीक–ठीक प्रकार का नहीं होता है। इसलिए एक ही ध्वनि के उच्चारण में एक से दूसरे से तीसरे व्यक्ति तक पहुँचते–पहुँचते कुछ न कुछ अंतर अवश्य पड़ता है। परिवर्तन ही भाषा का विकार है। ध्वनि विकार मुख्यतः भाषा-भाषा और अपूर्ण अनुकरण से होता है।

ध्वनि परिवर्तन बाह्य कारणों में भौगोलिक वातावरण समाज की राजनीतिक, सांस्कृतिक और धार्मिक अवश्यथाएं प्रमुख, आंतरिक कारणों से प्रयोगाधिक्य स्वरूपात्रु आदि को लिया जा सकता है। ध्वनि परिवर्तन कोई एक कारण से नहीं होता है। उसे बाह्य एवं अंतर्गत कई कारण प्रभावित करते हैं।

परिवर्तन प्रकृति का नियम है। जिस प्रकार अन्य घटकों में परिवर्तन देखा जाता है वैसे ही भाषा में विभिन्न कारणों से परिवर्तन देखे जाते हैं। भाषा में परिवर्तन के मुख्य कारण होते हैं—

दो शब्दों के संयोग से होने वाला ध्वनि परिवर्तन होता है वह रूप संधि कहलाता है। संधियों के फलस्वरूप होने वाला परिवर्तन स्वन एवं रूप आश्रित होता है। ब्रज भाषा में, ये परिवर्तन मिम्मूलिखित तीन रूप में पाया जाता है—1. शब्द स्तर पर 2. पद स्तर पर तथा 3. वाक्य स्तर पर।

स्वन आश्रित :

शब्द के गठन या निर्माण में ध्वनि परिवर्तन स्वरों तथा व्यंजनों के स्तर पर होता है। कहीं पर स्वर इस्पृश रूप में परिवर्तित हो जाते हैं तो
कहीं उनका दीर्घीकरण हो जाता है। इस प्रकार की संधि को सामान्यतः स्वर संधि कहा जाता है।

1. दीर्घ स्वरों का इक्कीकरण :-

/आ>अ/ :-

समास प्रक्रिया में किसी शब्द में अवस्थित /आ/ में यदि पर-प्रत्यय जोड़ा जाता है तो बलाघात से दीर्घ /आ/ इस्क /अ/ में परिवर्तित हो जाता है, यथा-

भाड़ भूंजा भड़भूजा
गाम आरु गमारु
आम चूर अमचूर

/ई>इ/ :-

यदि शब्द ‘ईकारांत’ या ‘एकारांत’ हो तो प्रत्यय के संयोग के पश्चात संधि रूप में शब्द ‘इकारांत’ हो जाता है, यथा–

पी + आस = पियास
P + अक्कड़ = पिअक्कड़
मेल + आप = मिलाप
खेल + आड़ी = खिलाड़ी
अंधेरो + आरो = अंधिआरो

/ऊ,ओ>उ/ :-

यदि शब्द “ऊकारांत या ओकारांत” हो तो प्रत्यय के संयोग के पश्चात संधि रूप में शब्द ‘उकारांत’ हो जाता है, यथा–

भूल + अक्कड़ = भुलक्कड़
मोटो + आपो, आपी = मुटापो, मुटापी
‘अ’ का लोप :-

do वर्णों के मेल में यदि द्वितीय वर्ण में /अ/ स्वर है तो स्वर से आरंभ होने वाले परिवर्तन के संयोग की प्रक्रिया में द्वितीय वर्ण के /अ/ लोप हो जाता है,यथा–

समज + औता = समजीता
सर + औता = सरीता
काजर + औटा = काजरीटा
मुख + औटा = मुखीटा

समीकरण :-

ब्रज में समीकरण की प्रवृति है, जिसे अप्रभित रूप में देखा जा सकता है–

1. यौगिक शब्दों तथा समासों में समीकरण :-

   त + द = द : रात +दिनु = रादिन
   च + स = सस : पांच +सेरी = पस्त्सेरी
   र + स = सस : चार +सेर = चास्सेर
   त + स = सस : सात +सेर = सास्सेर
   द + स = सस : आदो +सेर = आस्सेर
   र + नू = नू : धर + नो = धन्नो
   ब + नू = नू : बन + नो = बन्नो
   क्र + ल = लल : कल +ओ = कल्लो
   च + क्र = कक : चम +को = चम्मको
2. पदों में शब्द के अंतिम व्यंजन वर्ण तथा कारक परस्पर के पूर्व समीकरण निम्नानुसार होता है—

ब + प = प : सब + पै = सपै

t + स = सस : रात, हात + से = रास्से, हाससे

स + स = सस : घर + से = घरसे

स + स = सस : किस + से = किससे

t + t = t : घर + ते = घर्ते

न + न = नन : चौधरी + ने = चौधरने

ब + न = नन : घर + नो = घरनो

न + त = नत : कोन + ते = कोन्ते

टिप्पणी :— रास्से, रास्से, हाससे, घरसे, घर्ते, चौधरने, कोन्ते आदि अनुनासिक रूप भी प्रयोग में पाए जाते हैं। उदाहरण—

1. बु तो रास्से चलो गयी।
2. हास्से खाए लेओ।
3. घरसे ले आओ।
4. घर्तक ले गयी ओ।
5. चौधरने न्यात करो।
6. कोन्तेन ले आऊ।

3. वाक्य स्तर पर समीकरण निम्नानुसार होता है—

क् + ग् = ग् : रुक + गई = रुग्गाई

शुक + गई = शुगुई

कह + गई = कृगुई

एक + गओ = एग ओ

[56]
ग्र+क्र = क्र : साग + करी = साकरी
च्र+ड्र = ड्र : सच + डर लगतु ऐ = सड़र लगतु ऐ
छ्र+ड्र = ड्र : कछु + डारी = कुढारी
छ्र+ड्र = ड्र : कछु + देओ = कुढेओ
ज्र+ड्र = ड्र : नाज+ डारो = नाडारो
द्र+ज्र = ज्र : बैठ + जाओ = बैज्जाओ
ए + च्र = च्र : हात + चलाओ = हाच्चलाओ
भाजत+ चले = भाजजचले
हापत+ चले = हापचले
त+ द्र = द्र : भौत + ठीक = भोठीक
त+ छ्र = छ्र : भौत + अछे = भोछे
र+ न्द = न्द : चौधरी + ने = चौधनी
त+ ड्र = ड्र : तोड़+ डारे = तोडारो
र + द्र = द्र : मार + दूगो = माहूगो
र + ज्र= ज्र : मार + जा = मज्जा
र + ल्द = ल्द : टेर + ले = टेरले
र + ल्द = ल्द : कराए+ लिंगे = कलाएलिंगे

टिप्पणी :-
1. रुग्गणई, झुग्गमई, कैग्गोई, एग्गओ आदि उदाहरणों से रुग्गट होता है कि किसी परवर्ती शब्द में स्पर्श होने की दशा में शब्दांत में प्रयुक्त /ई/ अघोष स्पर्श की अनुरूपता उसी वर्ग के घोष स्पर्श से होती है। इसी प्रकार बाप गओ का बापबाबुओ हो जाता है।
2. /त/ तथा /ठ/ के अनुरूप भौतअछी ‘भोअछी’ हो जाता है परंतु यहां द्वितीय शब्द में अवस्थिति स्वर की होती है।

[57]
3. जलेसर के उत्तरी भाग में /ओ/ तथा /ओ/ के प्रयोग के फलस्वरूप /गयी/ रूप भी प्राप्त होते हैं,यथा— एगयी इत्यादि।

रूप आश्रित :-

1. शब्द तथा प्रत्यय के योग के फलस्वरूप घटित ध्वनि परिवर्तन :-

1.1 पूर्व प्रत्यय एवं शब्द संयोग के फलस्वरूप ध्वनि परिवर्तन—

1/ /सु/,/कु/, पूर्व प्रत्यय का संयोग /फल/ प्रातिपदिक से होता है तो/फ/ /प/ के रूप में परिवर्तित हो जाता है,यथा— सुफल=सुपल, कुफल=कुपल इत्यादि।

2. /उन/ पूर्व प्रत्यय के संख्यावाचक विशेषणों से संयोग पर /न/ संख्यावाचक परिवर्तन घटित होता है, यथा— बीस+उन=उन्नीस, अर्सी+उन=उनासी इत्यादि।

3. ओकारांत तथा उकारांत धातुओं के साथ /आई/ प्रत्यय के संयोग पर शब्द के मध्य में /ब/ का आगम हो जाता है, यथा— बो+आई=बुबाई, धा+आई=धुबाई इत्यादि।

4. /उ/ से प्रारंभ होने वाली धातु में /आई/ प्रत्यय के संयोग से ध्वनि परिवर्तन देखा जाता है यथा— रू+आई=रुबाई, खुदा+आई = खुदाई, जु+आई=जुताई इत्यादि।

5. /आर/ प्रत्यय के संयोग से महाप्राणीकरण हो जाता है, यथा— दूढ+आर=दुधारा,जूजा (जुजा)+आर=जुजारा (जुज्जारा) इत्यादि।

6. द्वितिय वंशों में से एक ही रह जाता है, यथा— चच्चा+एरो =चचेरो इत्यादि।
7. प्रत्यय के संयोग के पश्चात अनुनासिकता समाप्त हो जाती है, यथा—रांड+आपी = रडापी, पूंछ+अलो= पुछल्ला इत्यादि।
8. कुछ शब्दों में प्रत्यय जुड़ने से /उ/ का आगम हो जाता है, यथा— चुगली+खोरी=चुगुल इत्यादि।
9. स्वरांत शब्द व्यंजनांत हो जाते हैं, यथा—खट्ट+आस=खटास, बूड़ी+आपी=बुडापी, झगड़ा+एल=झगड़ैल इत्यादि।
10. व्यंजनांत शब्द स्वरांत हो जाते हैं, यथा—जवान+आनी =जबानी इत्यादि।
11. मूल धातुओं में प्रेरणांत्रक प्रत्ययों के प्रयोग से धातुएं इस्वकृत रूप में परिवर्तित हो जाती हैं, यथा—काट > कट, पीट >पिट, लूट>लुट इत्यादि।
12. व्यंजन धातुएं भी हस्त हो जाती हैं, यथा— फोर>फूट, तोर>टूट इत्यादि।
13. /च/ के स्थान पर /क/ का आगम हो जाता है, यथा—बेच>बिक,बेंच>बिंच इत्यादि।
14. /ड/ के स्थान पर /ट/ का आगम हो जाता है, यथा—छोड>छूट इत्यादि।
15. संज्ञावाचक विशेषण प्रतिपदिकों में /का, की, गी/प्रत्यय के संयोग से ध्वनि परिवर्तन हो जाते हैं, यथा— दुक+की=दुक्की, छक+का=छक्का, तिंग+गी=तिम्गी इत्यादि।

[59]
16. संख्या वाचक विशेषण प्रातिपदिक /आ/ प्रत्यय के जुड़ने से परिवर्तित हो जाते हैं, यथा— चउ+आ=चउआ, पंज+आ=पंजा, सत+आ=सत्तास, अड+आ=अड्डा इत्यादि।
17. संख्यावाचक 'दुएं' में भी प्रत्यय जुड़ने कई प्रकार के परिवर्तन हो जाते हैं, यथा— दु+सरी=दूसरी, दो+बर=दोबर इत्यादि।
18. संख्यावाचक 'तीन' में भी प्रत्यय जुड़ने कई प्रकार के परिवर्तन हो जाते हैं, यथा— तिस+अर=तिसरी, तिल्ल+अर=तिल्लर, तिह+छै=तिहरी इत्यादि।
19. संख्यावाचक 'चारि' में प्रत्यय प्रयोग से परिवर्तन होते हैं, यथा— चौ+लर=चौलर, चौ+थो=चौथो, चउ+आ=चउआ इत्यादि।
20. तिथिवाचक 'एक','दो', 'तीन', 'चार','पांच','छ','सात','आठ','नौ','दस' में प्रत्यय जुड़ने से परिवर्तन होते हैं, यथा— एक+अदसी=एकादसी, दो+अदसी=दोआदसी, ती+ज=तीज, चौ+थ=चौथ, पांच+एं=पांचे, छ+अठ=छठ, सात+एं=साते, आठ+एं=आठे, नव+अमी=नवमी, दस+मी=दसमी इत्यादि।
21. दो संख्यावाचक प्रातिपदिकों के संयोग से घटित होने वाले परिवर्तन को अग्रलिखित रूप में देखा जा सकता है, यथा— इक+बीस=इक्कीस, इक+चालीस=इक्कालीस, बाह+सात=बासट, बि+चालीस=बिगालीस, ते+बीस=तेस, तिर+सात=तिरेसट, चौ+सट=चौसट, पै+सट=पैसट, छिय
2. विभिन्न प्रत्यय के संयोग के फलस्वरूप ध्वनि परिवर्तन :-

संज्ञा:-

कवरा अच्छी ऐ। बनरिया अच्छी ऐ। गाड़ी चली गई।

रबान चलो गयी। इत्यादि

सर्वनाम:-

सर्वनाम प्रतिपदियों में विभिन्न प्रत्यय के मेल से ध्वनि
परिवर्तन होता है, यथा—‘मे’>मि>मो>में, ‘तू’>तो>ते,
‘तुम’>तोय >त्या, ‘कोन’>को, का>कहा, जि>जो>जा, बु>बे>बा,
गो>ग्वा>वा , बे>बिन>बिन इत्यादि।

क्रिया :-

जा>जाआ, पै>परि,चल>चलि,आ>आओ, खा>खाओ

इत्यादि।

निष्कर्ष :-

उपर्युक्त विवेचन से समझा जा सकता है कि ब्रजभाषा में
किन-किन कारणों के फलस्वरूप ध्वनियों में परिवर्तन होता है। ध्वनि
परिवर्तन संदर्भ एवं अर्थ में भी परिवर्तन का कारण बनते हैं। भाषा प्रयोक्ता
का अच्छे भाषा प्रयोग के लिए इन विश्लेषण बिन्दुओं पर सम्यक ध्यान देना
चाहिए नहीं तो भाषा प्रयोग तुलिपूर्ण रहेगा।
संदर्भ सूची :-
1. डॉ. सुनीति कुमार चटर्जी: पोद्वार अभिनंदन ग्रंथ, अखिल भारतीय ब्रज साहित्य मंडल, मथुरा
2. डॉ. कैलाशचंद्र भाटिया: लोकभाषा, 2009, कुसुम प्रकाश, अलीगढ़
3. डॉ. धीरेन्द्र वर्मा: ब्रजभाषा, 1954, हिंदुस्तान अकादमी, इलाहाबाद
4. 2011 की जनगणना, http://www-census2011.co.in
5. डॉ. हरिवंश तत्त्वं बाँसक हिंदी व्याकरण और रचना
6. डॉ. अ शोक के. भाषा-भारतीय काव्य गार्ड
7. मिर्जा खां:ब्रजभाषा व्याकरण, मूल 1676 एडी, अनुवाद जियाऊद्दीन सन् 1635, जांतिनिकेतन
Our justice system with ideology of distributive justice never looks at multipronged procedural technicalities baffling legal world. No wonder it sleeps over maladies of masses. In India too workingmen and peasants are administering justice rightly through panchayat system, which is oldest indigenous political institution. But it is not only courts or men who administer justice that are responsible for laws delays. The responsibility lies at other quarters also. The former Chief Justice of India Justice Y.V. Chandrachud said that courts were in no way an impediment in securing social justice, but they could not help people to achieve desired ends even when they wished to do so because of constraints and defects of existing laws. He attempted to persuade two successive Prime Ministers to take up some practical steps to solve problem of arrears. His attempts were in vain. Reports after reports from Law Commission gathered dust. Failure of judicial system in long run will undermine democratic structure and rule of law.

Three wings have well-defined roles and functions under our constitution. However, all wings have a common goal which is fulfillment of hope of Founding Fathers of our Republic and as spelt out so clearly in our magnificent constitution. Government accords high priority to judicial reforms. The National Common Minimum Programme (NCMP) envisages judicial and legal reforms and one of thrust areas in promoting good governance. It has amended procedural laws with a view to improve criminal justice system. Plea-bargaining has been introduced in Criminal Procedure Code.
Our government places special emphasis on professionalism in investigation and prosecution as well as providing protection to our citizens, particularly women, against arbitrary harassment from police. There is a bill now before parliament that seeks to amend Criminal Procedure Code to deal with problem of witnesses turning hostile. It also seeks to provide legal rights and compensation to victims. It will also facilitate use of modern techniques in investigation. The bill will make summary trial mandatory in cases with imprisonment up to 3 years.

Fast Track Courts are another answer to dealing with problem of arrears. Fast Track Courts have reportedly established a good track record. New initiatives will undoubtedly be taken to provide relief to litigants and faith of people in judiciary will be reinforced and strengthened. As mentioned by Shri Bharadwaj, a ten year perspective plan has also been drawn up for construction of court buildings and residential accommodation for judges. Family courts will be set up at earliest.

In case of resignation and death, selection process should come into play without any delay, ensure that benches work with full strength. If wholesome principle of “merit”, enunciated by law commission is accepted in principle, there is no reason why there should be any delay determining appointments or filling resultant vacancies.

Judiciary deserves full financial autonomy funds are required for creating new posts of judges, increasing no. of courts and providing infrastructure needs finance. Judiciary has to petition Law Ministry each time it needs funds. Less than 0.3 % of GNP or 7.8 % of total revenue is spent on judiciary in India (when half of this is realized by states through courts fee and fines) compared to UK, the USA and Japan where it is between 12 and 15 % of total expenditure.

Together with adequate manpower, it is necessary to simplify and reform the current procedural laws, which provide ample scope for
obstructing and stultifying legal process. In addition there are myriad laws, which have no relevance today but are frequently invoked. These must be repealed to expedite the judicial processes. “The court procedure is not to be a tyrant but a servant, an obstruction but an aid to justice, a lubricant not a resistant in the administration of justice.”

In a broad sense, due to process is interpreted here as the right to be treated fairly, efficiently and effectively by the administration of justice. The rights to due process place limitations on laws and legal proceeding, in order to guarantee fundamental fairness and justice. Due process is interpreted here as the rules administered through courts of justice in accordance with established and sanctioned legal principles and procedures, and with safeguards for the protection of individual rights. The rules applicable to the administration of justice are extensive and refer to, inter alia, fair trial, presumption of innocence and independence and impartially of the tribunal. In most conventions, the various rules are included in several articles. As this handbook focuses on a variety of conventions, four elements of due process are discussed - (a) quality in terms of administration of justice; (b) quality in terms of protection of the rights of the parties involved; (c) efficiency; and (d) effectiveness. As due process rights are traditionally known among human right experts to centre on the right to fair trial and the right to an effective remedy, the first three elements are discussed under the heading of fair trial, while effectiveness is discussed under the right to an effective remedy.

The right to a fair trial does not focus on a single issue, but rather consists of a complex set of rules and practices. The right to a fair trial is interpreted here as the rules administered through courts of justice in accordance with established and sanctioned legal principles and procedures, and with safeguards for the protection of the individual rights. The rules applicable to administration of justice are wider and refer to, inter
alia, a fair and public hearing, the presumption of innocence and the independence and impartiality of the tribunal.

The importance of these rights in the protection of human rights is underscored by the fact that the implementation of all human rights depends upon the proper administration of justice. Whenever a person’s rights are interfered with, he/she can only defend himself/herself adequately if he/she enjoys an effective recourse to due process.

The Trial is the principle method for resolving legal disputes that parties can not settle by themselves.

The chief purpose of a trial is to secure fair and impartial administration of justice between the parties to the action. A trial seeks to ascertain the truth of the matter in issue between the parties and to apply the law to those matters also a trial provides a final legal determination of the disputes between the parties.

At present stage of civilization fairness in criminal trial has been universally accepted as a human value that a person accused of any offence should not be punished unless he has been given a fair trial and his guilt has been proved in such trials. India has accepted a democratic constitution which guarantees Justice, Liberty and Equality to all its citizens.

In view of constitutionals goals many penal laws especially procedural laws contains numerous requirement securing fairness in trial these provision lay down detailed provision for rights like fair hearing, honest investigation, impartial judiciary that ensures elimination of all kind bias or prejudice for or against the accused for the witness and aims to find out the truth. The major panel procedural statutes like Cr.P.C, Evidence etc. contains many such provisions whenever it has come to know that notice of courts any provision of law or any area affecting adversely the fairness element of criminal trial. The courts have stepped in with effective and landmarks decisions in case the court finds in accuracies in any area of law
violating guarantees of fair trial they have issued direction from time to
time to fill the legislative vacuum.

A fair trial has been taken from the principles of natural justice. The
principle of natural justice has two main components first one is that rule
against bias according to which no person can be judge of his own case
second one is that every person is entitled to have right of hearing before
pronouncing the judgment. Fair trial is broad concept generally it is process
through which guilt & innocence of the accused is decided and
manifestation of criminal trial includes various safeguard for this purpose.
Such as adverse system of justice fair trial the concept of presumption of
innocence of fair trial, public trial and independent, impartial and
competent judge are also required for proper functioning of fair trial.

In context with international law regarding a right to a fair trial is
that it is considered an ancient one and synonymous with trial process
itself. It would non-sense to speak of the permissibility of an unfair trial.
After centuries of implementation in practice the right which was finally
confined in the international human right instrument following World War
II, is now universally recognized.

The right to fair trial is norms international human law protects
unlawful and arbitrary under these instruments are trial rights, during the
final right and post trial rights are blessed to the individuals.

Fairness in an ancient phenomenon, it is considered as a part of Raj-
Dharma in ancient India. There is no relaxation for the individual
belonging to High cast through the cast system was prevailing at the time.
In the British fairness in criminal trial is crushed for in the Raja Nand
Kumar and Nuremburg trial fairness is not maintained. Many constituent
assembly debates have been held to make amendments in the law to ensure
fairness. The exertions have been continued after independence also.
Judicial emphasis is late on just and fair trial and the recommendations
made by Malimath committee plays an important role to ensure fairness in criminal trials in India.

In the constitution part three deals with the fundamental rights which are conferred to the people of India. These rights are fundamental because they are not violated by the state. There is no provision which directly guarantees the fair trial. But the Articles 14, 20, 21 and 22 have given the safeguard to fair trial. These articles provide equality before law, equal protections of the laws, protection in respect of conviction for offence, protection against ex-post facto law, guarantee against double-jeopardy, prohibition of self-incrimination, protection against compulsion to be a witness, protection of life & personal liberty and protection against arrest and detention in certain cases.

The constitution has provided legal framework for Fair trial in Cr.P.C, The Evidence Act, MCOCA, TADA, POTA, FEMA, Juvenile Justice Act and Women Violence Acts.

Justice provided the state because state is the protector of public in its territory. This good work of providing justice is done through the third pillor of government i.e. Judiciary. The Indian judiciary plays a very vital role in various pronouncements of the supreme court of India on the subject of the fair trial. The judicial approach on the fair trial as a part of the criminal justice system can be divided into two period viz. Pre Menaka Gandhi Period and Post Menaka Gandhi Period.

Post Menaka Gandhi period consists various provisions for the accused to ensure fairness in criminal trial such as speedy trial, safeguards for arrest, The right to arrest and detention, information about ground of arrest, bail - Is it a rule or an exception?, Courts power to ensure fair investigation, The right of courts, establishing more criminal courts, The right to humane condition during Pre-trial detention and prohibition of torture, right to legal counsel, right to legal-aid, handcuffing of under-trials,
transferring trial outside the state, the right to self defense, requirement of notice, the right to a fair hearing, the right to a presumption of innocence, safety of witnesses, right against self-incrimination, the prohibition double-jeopardy, right to appeal, the right to compensation for miscarriage of justice.

The judicial process of delay, awareness, fair treatment for accused persons and sanctity of trial has been examined in Aligarh district through a socio legal survey. In the socio legal survey the questionnaire of twenty questions has been provided separately to judges/magistrates and academicians, government councils, private advocates and accused persons. The answers of questionnaires reveal that the condition of fair trial in District courts, Aligarh is not satisfactory.

Various extraneous factors influencing fairness of criminal trial in our country enshrined in the constitution have been discussed. The constitution of India guarantees rights to equality (article-14), right to six basic freedoms (article-19), protection to accused against ex-post facto law double-jeopardy and testimonial compilation (article 20 {1},{2}and {3}), protection to life and personal liberty (article 21), protection against arrest and detention(article 22) and rights to remedies before the supreme court and high courts (article 32 & article 226-227). There is also analysis of various recommendations and the judiciary with a view to augment fairness in the criminal justice system in country specially in criminal trials such as limitations on the power of arrest, police remands, pre-hearing rights for accused persons, right to a counsel, right to bail, right to free legal aid, right to fair treatment in police custody or in prison etc.

The concept of fair trial has been taken from the principle of natural justice. The principle of natural justice has two main components no person shall be a judge of his own case and every person is entitled to have right of hearing before pronouncing the judgment. The concept of fair trial is
recognized in almost all the countries to provide fairness to the individuals without distinctions. In India the concept of fair trial is recognized in the constitution and criminal law. There is lot of provisions regarding fair trial but some are very important. “A man is presumed innocent until he is proved guilty”, is a well known common law maxim. Criminal policy considers that it is better if several guilty persons should escape punishment then one innocent person should suffer.

The police man and prison officials should be made familiar with the education in human rights. Special training should be given to the police for adopting scientific aids and techniques in the matter investigation of crimes. There are several sections which has been amended but they are not implemented even today thus the fairness in criminal trials has been effecting.
Medical Tourism in India with focus on NCR-
Emerging Challenges in 21st Century

Dr. P.N. Asthana* and Mr. Pankaj Gupta**

Medical tourism is the practice of traveling to other countries for
taking the advantage of the world class health care facilities at an affordable
cost. Medical tourism is not a new concept. It is being in practice since
olden days. In the olden days the patients from different parts of the world
use to travel to Greece and Egypt for the treatment. In later days the wealthy
patients from Middle East, Africa, Latin America and Asia travels to the
developed countries such as USA, UK and European countries like
Germany, Hungary and Turkey etc. for treatment to get the highest quality
medical care using latest technologies and advance medical infrastructure
which was not available in their home country consequently the hospitals in
the developed countries become overcrowded. The patients have to wait
even for months to get the treatment in their home country. As a result the
patients from the developed countries are looking to developing countries
like India, Thailand, Malaysia and Singapore etc. for medical treatment
having advance medical infrastructure and state of art accredited hospitals at
par with the international standards with zero waiting time at very less cost
for the same treatment as compared to their home country. India has
emerged as a hub for Medical tourists offering wide variety of medical
treatments such as Cardiology, IVF, orthopedic and joint replacement, stem
cell therapy, organ transplant, oncology, Surrogacy, Bone marrow
transplant, cosmetic surgeries, alternative therapies like Ayurveda, Yoga,
Naturopathy and other rejuvenating therapies with success rate at par with
the best in the world. Medical tourism is the largest and fastest growing
industry in the world as a result the developing countries have recognized
the potential which medical tourism hold for their economies.
Major competitors for India in medical Tourism Industry-

Globalization of health care resulted in the growth of medical tourism at a rapid pace. Growing number of patients from the developed countries are travelling to the third world countries for the medical treatment including India. More than 50 countries have identified medical tourism as one of the fastest growing industry and taken steps to promote it. The table 1.1 exhibits the important destinations promoting medical tourism from all around the world.

Table 1.1 Medical Tourism Destination (World)

<table>
<thead>
<tr>
<th>Block-1 America</th>
<th>Block-2 Europe</th>
<th>Block-3 Africa</th>
<th>Block-4 Asia/ Middle East</th>
<th>Block-5 Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>UK</td>
<td>South Africa</td>
<td>China</td>
<td>New Zealand</td>
</tr>
<tr>
<td>Canada</td>
<td>Turkey</td>
<td></td>
<td>India</td>
<td>Australia</td>
</tr>
<tr>
<td>Colombia</td>
<td>Germany</td>
<td></td>
<td>Israel</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Hungary</td>
<td></td>
<td>Jordan</td>
<td></td>
</tr>
<tr>
<td>Panama</td>
<td>France</td>
<td></td>
<td>Malaysia</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>Lithuania</td>
<td></td>
<td>Singapore</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>Poland</td>
<td></td>
<td>UAE</td>
<td></td>
</tr>
<tr>
<td>Cuba</td>
<td>Estonia</td>
<td></td>
<td>Thailand</td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>Romania</td>
<td></td>
<td>Philippines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Czech Republic</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source- [http://en.wikipedia.org/wiki/Medical_tourism](http://en.wikipedia.org/wiki/Medical_tourism)

India has the strong competition from the Asian countries such as Malaysia, Singapore, and Thailand. India is the new entrant in the medical tourism
industry as compared to its Asian competitors. The Asian medical tourism industry has been growing at a double-digit growth rate for the past few years. The major reason for expansion of medical tourism in Asia is that the Asian countries offer quality medical services at a very low cost as compared to the western countries with nearly zero waiting time. Thailand, India, and Singapore dominated the region’s medical tourism industry, with a combined market share of over 89% in 2010.

**Medical tourism Industry in India-**

India is one of the important players in the medical tourism industry in the world. Patients from the foreign countries are visiting India for the medical treatment in large numbers. India with its 5000 year old civilizations and rich historical and cultural diversity has always attracted the foreign tourists. India with its low cost quality medical treatment like Cardiac surgeries, IVF, Joint replacement and other Orthopaedic procedures, stem cell therapy, organ transplant, oncology, Surrogacy, Bone marrow transplant, cord blood banking and cosmetic surgeries along with alternative therapies like the Ayurveda, naturopathy, yoga and other rejuvenation therapies is attracting medical tourist from Europe, South Asia and Middle East. In India Chennai, Bangalore, Mumbai and NCR have emerged as noticeable medical centre for the medical tourists. India has 22 JCI and 191 NABH accredited hospitals promoting medical tourism. Indian corporate hospitals have large pool of doctors, nurses and support staff ensuring individualized treatment with wide experience and international exposure. India has state of art medical investigation laboratories using latest technology and cutting edge diagnostic equipment. India’s strong pharmaceutical sector has gained international recognition and contributed to the growth of medical tourism. India has several advantages over its competitors making it a pioneer in the medical tourism industry.

[73]
The cost of the treatment in India is the lowest in the world.

Hospitals in India have doctors and medical staff having world class exposure and fluency in English.

Waiting time for the treatment in India is nearly zero.

India has rich history of alternative medicine and rejuvenation therapies which has attracted the attention of western world.

The favourable currency exchange rate makes India a favourable destination for medical tourists. Fall of rupee versus dollar has proved to be advantageous to the patients from Middle East, Africa, US, UK and SAARC countries to the extent of 35 to 45 per cent on complex surgeries as a result the number of medical tourists coming to India has jumped by 40 per cent in the past six months as per report from ASSOCHAM.

**Hospitals promoting medical tourism in NCR**

NCR is the prominent hub for the Medical tourists coming to India for Treatment. NCR has large number of corporate hospitals promoting medical tourism. In the last two decades, the economic boom in India has led to the building of medical facilities and infrastructure which is at par with the very best in the world. Hospitals in NCR are having thousands of skilled physicians, nurse and other paramedical staff. Many of the physicians that practice in these hospitals have returned to India from the U.S. and Europe, leaving behind successful practices having international exposure. India is one of the countries that offers a comprehensive solution for all medical needs, and does this with the highest levels of success and professional skills. A complex transplant or bypass procedure can be done for a 1/10th of the cost for the same procedure in the U.S. and Europe. The costs are usually a lot lower than even the premium deducted by most of the insurance companies from patient.
There are many corporate hospitals aggressively promoting the medical tourism in NCR region.

1. Indraprastha Apollo Hospital, New Delhi
2. Medanta – The Medicity, Gurgaon
3. BL Kapur Hospital, New Delhi
4. Artemis Health Care Institute, Gurgaon
5. Moolchand Hospital, New Delhi
6. Sir GangaRam Hospital, New Delhi
7. Columbia Asia Hospital
8. Fortis Hospital, New Delhi
9. Max Health care, New Delhi
10. Paras Hospital, Gurgaon

A survey was conducted in all the major corporate hospitals promoting medical tourism in NCR region. The data was collected from 100 foreign patients from 16 countries visited India especially NCR for the medical treatments to find out the disease for which they are taking treatment in India. The survey revealed that 34% patients visited India for cardiology, 20% patients for orthopedic and joint replacement, 16% for oncology, 12% for IVF and problem related to gynecology, 6% for neurology, 4% for urology, 4% Kidney transplant surgery, 2% for gastroenterology, 2% for ophthalmology.
Chart-1 Treatment taken by medical tourists

Majority of the foreign patients visited India for Cardiac treatment followed by orthopedic & joint replacement followed by IVF & Gynecology. 10% of all the patients visited hospitals in India have taken the advantage of wellness therapies such as Ayurveda, Yoga and other rejuvenating therapies for reducing stress, preventing many life style related disease, promoting general health and recovery from the ill effect of the allopathic medicines.

Medical Tourism Growth-

India is gradually becoming a major healthcare destination of the world. India's medical tourism sector is expected to grow at the annual growth rate of 30% which makes it as one of the fastest growing industry in the world. Confederation of Indian Industry reported that 150,000 medical tourists came to India in 2005, based on feedback from the organization's member hospitals. The number grew to 200,000 by 2008. A study by ASSOCHAM reported that the year 2011 saw 850,000 medical tourists in India and projected that by 2015 this number would rise to 3,200,000. It is been predicted that India will be one of the fastest growing medical tourism
destinations in the world and will become a market leader by 2015. Despite of massive growth in the Indian medical tourism industry still there are certain grey areas we must certainly look into to consolidate the growth.

**Constraints for medical tourism in India**-

Despite of upsurge in the medical tourism industry there are some constraints which India has to tackle to consolidate its position as the most preferred destination for the medical tourists in the world. As per the survey conducted in the 10 hospitals promoting medical tourism in NCR and feedback given by the foreign patients the main constraints in the development of the medical tourism in India are-

- In India not much legal option available to the foreign patients in case anything goes wrong during the treatment. India does not have any well-established malpractice law as a result proving the negligence of the treating doctors during the treatment is difficult. Hospitals are incompetent to manage the complaints of the patients in case of medical negligence.

- India is perceived as one of the most un-hygienic countries in the world. The negative perception about the public sanitation and hygiene standard, outbreak of contagious disease, rumour about super bug and the waste management practice adopted in the country has hit the medical tourism sector the most. The well to do patients from developed countries prefers to go to Thailand, Malaysia and Singapore nullifying the cost advantage of Indian health care system.

- There is disparity in the price charged for different treatments across the hospital all around the country. This inconsistency in the price creates confusion in the minds of the foreign patients about the quality of the treatment.

- Lack of proper infrastructure in terms of inadequate flight connectivity, poor roads as compared to developed countries, Traffic jam, insufficient
accommodation facility around the hospital for the medical tourists, sewage, water and electricity problems are hindrance in the growth of the medical tourism in India.

- Poor experience of foreign visitors about the incidents of touting and harassment of the medical tourists coming to the country. Hospitals are also harassing the foreign tourists by giving wrong estimate of the treatment and later charging more than the estimate.

- Medical tourism is totally dependent on the western countries due to high cost of health care services and rising number of uninsured citizen having medical insurance. In US the patient protection and affordable care act (PPACA) passed in 2010 with the objective to increase the access to medical insurance and reducing health care cost. This act will raise the demand for domestic healthcare and reduce the demand for medical tourism.

- Increase in the competition for its share among the countries in the medical tourism industry lead to the state of saturation. The entire player in the medical tourism industry offers similar products; success can only be achieved if countries can do macro level differentiation such as promoting better infrastructure, supportive government policies and greater number of accredited hospitals and medical staff. These advantages have to be properly managed otherwise countries like India will be on the losing side in future.

Suggestions-

As per the survey conducted in the 10 hospitals promoting medical tourism in NCR and feedback given by the foreign patients the following suggestions have been framed-

- The government of India has to work for improving the status of medical tourism by removing political instability, terrorism, Bureaucratic roadblocks, and Taxation anomalies. Government should
introduce long term revenue generating projects and investor friendly policies to get benefit from medical tourism. Government should make provisions to provide Quality accreditations to the Indian health centres and should apply the customer oriented approach to improve the image of Indian hospitals.

- Government has to simplify the norms for medical Visas to make the international patients travel across the border easy. The procedures for obtaining medical visa, the subsequent registration and visa extension procedures are complicated and time consuming as a result the patients has to come for treatment on tourist Visa. There is a need to simplify and speed up these procedures to make India a more attractive medical tourism destination. Lot of reforms has been done in this regard such as Visa on arrival but still it is not enough.

- Indian corporate hospitals should make Joint ventures and alliances with capacity constraint hospitals, NHS, leading insurance companies to counter the competition in the medical tourism industry. The tie ups will ensure continuous supply of medical tourists to India.

- Focus on the standardization by establishing price parity for similar kind of treatment in all the hospitals across country. The stringent rules and regulation and standards have to be framed to ensure quality treatment to foreign patients at same price.

- India has to launch an integrated marketing campaign using print media, international trade fairs, media campaigns and road shows. The campaign should highlight the medical tourism by focusing on high quality medical service, value for money and country with rich cultural heritage with history of alternative therapies.

- Inter sectorial coordination is the key for the success of medical tourism. All the stake holders such as Tourism department, transport operators,
hotel associations, escort personnel, language translators have to work in the synchronous manner to promote medical tourism.

- Hygienic food and international cuisine should be made available to the international patients especially from Africa, and Middle East countries. Most of the patients and their relatives have the problem with the food available for them in the hospital cafeterias.

**Conclusion**

India has a vast potential for improving medical tourism for which it is imperative for the government to undergo changes in the rules and regulations related to medical tourism. Government should also encourage implementation of PPP Model where all the stakeholders work together to promote medical tourism. Integrated marketing campaign has to be planned focusing to build brand “India” highlighting the quality of the medical services at a very low cost keeping in view rich cultural heritage which India has.

**REFERENCES**

   Publication, 2003


WEB SITES-


5. http://en.wikipedia.org/wiki/Medical_tourism_in_India

Indian Economy is the second fastest growing economy of the world after China. The strength of the Indian Economy lies in the fact that it survived from historic economic recession of 2008 and the subsequent European economic crisis. The 8.5% plus growth rate of GDP during the last decade seems quite impressive but all these glittering achievements fade their shine when the assessment of the economy is done in terms of poverty and inequalities especially in rural areas of India. It is true that per capita income in rural areas grew significantly as a result of various rural development programmes such as IRDP, JRY, SGSY, National Rural Livelihood Mission and MNREGA. Various studies have shown that average wages of rural agriculture labourers have increased considerably because of successful implementation of MNREGA. But there are many pitfalls in the growth story of rural India. Inequalities of income and wealth have grown in the post independence era especially during the era of economic reforms. Majority of the economists and policy makers are of the view that economic growth is an important factor to mitigate the curse of poverty and inequality. Economic growth creates more resources and also the potential of creating more space for the involvement of poor. But the involvement of poor, depends on the sources of employment, the growth of employment depend upon the economies of the activities which have a tendency to create employment. Such growth helps poverty eradication.
So for as the Indian economy is concerned, the growth trends during the post independence economies do not match with these premises. The average annual growth during the last two decades has been to the order of 6 percent plus. In some years an annual growth rate of GDP has been 9 percent plus but sectoral analysis of growth outcome shows that the high growth rate of GDP has been the outcome of high performance of service sector.

On the contrary the growth rate of agricultural and allied activities has remained to the order of 2-3 percent which resulted into the decline of its share in GDP at the level of 14.2 percent during 2011-12. All the data pertaining to the growth of GDP and the social indicators show that growth pattern during the last two decades has not been inclusive.

As a result the inequalities of income and wealth have widened considerably. Although policy makers and the political leadership often claim that incidence of poverty in India has reduced considerably, during the last two decades. But the recent affidavit submitted by Planning Commission in Supreme Court tells a different story. According to Planning Commission, a person with Rs. 32 per day per capita expenditure in urban areas and Rs. 22 in rural areas is no more a poor. It is the irony of the data conquoted in Planning Commission as well as the other agencies of the government that the true picture of poverty and inequality does not reflect official sources.

The economic and social indicators, that are being used to construct human development and socially useful indicators did not coincide with the claim of Government. As per the Human Resource Development report 2011 prepared by UNDP, India’s rank is 134th in 2011 among 187 countries. India’s-HDI is 0.5 which is below than that of China and Sri Lanka. In view of this the present paper entitled ‘Rural Development in Relation to Poverty and Inequality’ analyses the pattern of growth in
relation to the poverty and inequality in India. The paper is divided into five sections:

1. Introduction

Although poverty and inequality are the two faces of the same point that is standard of living, their magnitude and interrelationship have different aspects of policy interventions on the part of the state. Growth in itself is treated as fundamental requirement for the elimination of poverty. However the economists have different views on the elimination of poverty and inequality for the growth of GDP. Some of the economists are of the view that inequalities of the incomes and the wealth can be compromised if higher growth has a direct impact on the reduction of poverty, it means in monetary terms if higher growth rates of GDP results into a significant decrease in a number of persons living Below Poverty Line (BPL) then it hardly matters that high growth rate of GDP has widened the gap between rich and the poor. The other school of the thoughts gives greater attention to the reduction of inequalities of income and wealth for them. Growth of the GDP matters but not at the cost of the widening of the gap between the rich and the poor. In this case the policy interventions must be pro-poor even if the growth rate is moderate.

The state has started intervening in poverty reduction strategies since 1972 either in the form of employment generating programmes such as Prime Minister’s crash Programme, Employment Generating Programme, Food for Work Programme, NREP, Rural Landless Labourer Employment Guaranatee Programme, Jawahar Rojgar Yojana, Sampurna Gramin Rojgar Yojana and Mahatma Gandhi National Rural Emlyment Guaranatee Programme (MNREGA) or in the form of SFDA, IRDP, TRYSEM, DWACRA, SITRA, SGSY and National Rural Livelihood Mission. The era of economic reforms stated two decades ago have brought certain changes in developmental strategy. The programme of
structural changes in the economy give greater attention to higher GDP growth in the process the public expenditure in social sector proned so as to resumed if skilled deficit. The private sector has been given a free hand to run educational and medical institutions. GDP and per capita GDP grew at higher rates during this period. Average annual growth rate in GDP at constant price during 2005-11 is 8.6 percent but this higher growth rate of economy was service sector oriented, the average annual growth rate of agricultural sector was 3.4 percent. Since more than 2/3 of the population of the country depends on agriculture for their survival and lower growth rate in agricultural sectors means lower share of 2/3 population of the country in the overall GDP. The above simple mathematics shows that the growth of the economy has not been inclusive. The higher GDP did not percolate downward as it would have been perceived. A data on poverty reduction might give a chance to policy planners to claim the overall reduction in poverty, but the quantum (in) and per capita expenditure during 2010 shows that inequalities of income have widened. The India Human Development Report 2011 also confirms the above observations. The Planning Commission’s affidavit in Supreme Court says that per capita per day expenditure of Rs. 32/- in urban areas and Rs. 22/- in rural areas is the poverty line. It is the mockery of the system that the cost of a drinking water bottle is Rs. 15/-, then the survival of the poor Rs. 32/- per day per capita is eye opening.

2. Methodology

The present paper is based on the secondary data collected from Ministry of finance, The Planning Commission, Ministry of Rural Development, and the UNDP and the World Bank. Data regarding poverty have been used from Tendulkar committee. Various statistical tools have been used as and where found necessary. The nature of paper is analytical.

3. Objectives of the Study

[85]
- To understand the basic obstacle in the rural development.
- To understand the gap in level of living between high income and low Income.
- To analyse the impact of government programmes on poverty reduction.

4. Analysis of Growth and Poverty in India

It is a proven fact that growth is essential for poverty reduction. Experiences of many countries show that they reduced poverty successfully with higher growth rates of national income. But it is a million dollar question. How can we promote growth in which poor people are able to participate- in other words, pro poor growth? A strategic policy frame work for pro poor policies can be built upon the twin pillars of improving the investment climate to accelerate growth and empowering poor people to contribute to and benefit from the growth. Investment climate is concerned with the factors that determine the level of current investment, as well as productivity of ongoing investments and the stability of those with returns over the medium term. The investment climate necessarily involves institutions, rules and governance as well as traditional questions of fiscal policy, public expenditure management and taxation. So far as the eradication of poverty is concerned the role of small and medium sized enterprises is critical. It they grow, it is likely that larger firms will benefit as well and the growth will precipitate downward. (i) Marco economic stability and openness (ii) Economic governance and institutions, including both implementation of efficiency- enhancing regulation and elimination of regulations that lead to waste and rent seeking behaviour and (iii) infrastructure and fundamental for the improvement of climate for investment.
Indian economy has grown at an average rate of 06.5 percent during the last twenty years. In per capita terms income growth has accelerate from the Hindu rate of less than 1 percent prior to the 1980s to 03.7 percent per annum since 1980-81.

In more specific terms the growth rate of GDP has reached to 8.6 percent plus level during 2005-06 to 2010-11. Even during the era of historic global recession in 2008-09 Indian economic grew by an impressive rate of 6.7 percent in comparison to negative growth rates in many developed countries. These achievements present a rosy picture of Indian Economy.¹

However, the acceptance is considerably different on the flip side of growth, poverty levels and changes in the levels of poverty. The definitional aspect in itself is a complicated issue. The accepted and official, definition of poverty in India, based on the recommended methodology of Expert Group (1993) ,consumption of goods worth Rs. 49 (per capita per month) in the rural areas and Rs. 57 in Urban areas according to 1993-94 prices-has been rejected by another expert group (2009) appointed by Planning Commission under the chairmanship of Prof. S.D. Tendulkar. As per the recommendations of Tendulkar Committee the all India rural poverty headcount ratio is 41.8 percent in 2004-05 (at 2004-05 prices) in comparison to 28.3 percent (at 1993-94 prices) of old methodology. By this exercise poverty at all India level in 1993-94 was 50.1 percent in rural areas, 31.8 percent in urban areas and 45.3 percent in the country as a whole as compared to the 1993-94 official estimates of 37.2 percent rural, 32.6 percent urban and 36.0 percent combined. Expert group claims that even though the suggested new methodology gives higher estimates of rural head count ratio at the all India level for 2004-05, the extent of poverty reduction in comparable percentage point decline between 1993-94 and 2004-05 is not different form that inferred using the old methodology.²
As per the new methodology the reduction in poverty incidence in rural areas is 8.3 percentage points as compared to 5.0 percentage point according to old methodology. But, the reduction levels in urban areas and country as a whole are almost the same in both the methodology. But the reduction levels in poverty incidence in different states is highly skewed.

Another expert group under the chairmanship of N.C. Saxena (Ministry of Rural Development, GOI) has pegged up poverty line to 50 percent for the purpose of below poverty line Census 2009. World Bank’s recent estimates states that 42 percent of Indian population is living below new poverty line of US $ 1.25 per day per capita income. Thus, there is no dearth of data on poverty and income levels of Indian households.

Yet there is raging controversy about whether poverty levels in India have increased in the 1990s and post 1990s a period coincident with the ushering in of macro economic reforms. India, containing the largest number of poor in the world is an obvious test case for whether economic liberalisation work. Whether economic reforms have a human face etc.

Prof. Surjit S. Bhalla, came across a bizarre situation presented by NSS data. As per Planning Commission’s estimates of poverty reduction from 54 percent in 1973-74 to 43 percent in 1983-84 and further declined to 36 percent in 1993-94. However, for 1998, poverty was reported to have increased by about 6 percentage points to around 42 percent in spite of per capita consumption and income having grown by about 4.5 percent per annum or about 20 percent during the 4 years intervening period.

Prof. Bhalla questioned the ‘findings’ of NSS on the ground of spurt in growth during 1980s and awards. Indian economy grew by an average rate of 5.5 percent during 1980s, 6 percent during 1990s and 7.56 percent during post 1990s, what is more relevant for the measurement of
poverty point is the growth in per capita income (and/or consumption). Per capita growth has gone up from 3.6 percent in 1980s to 4.2 percent in the 1990s and further to 5.5 percent in post 1990s and further to 8 percent plus during the first decade of twenty-first century. Thus, collecting the NSS data and National Accounts statistics, one is confirmed with a bizarre situation of accelerated growth higher per capita income and an increase in absolute poverty to levels observed in the early 1980s.¹

Datta (1999), Dubey and Gangopadhayay (1981), Deaton and Tarozzi (1991) also do not indicate a wide acceptance of NSS data and the whole process of estimation of poverty incidence in India more over different set of estimation of poverty line and number of poverty head count has made the whole issue more complex and complicated.⁹
Poverty Incidence and growth of the Indian Economy

Table No. 1

<table>
<thead>
<tr>
<th>Year</th>
<th>Average annual growth rate of constant (2004-05) price constant</th>
<th>Poverty HCR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GDP</td>
<td>Per Capita NDP</td>
</tr>
<tr>
<td>1973-74</td>
<td>01.73</td>
<td>-0.73</td>
</tr>
<tr>
<td>1977-78</td>
<td>04.53</td>
<td>02.43</td>
</tr>
<tr>
<td>1983</td>
<td>05.47</td>
<td>03.07</td>
</tr>
<tr>
<td>1987-88</td>
<td>06.00</td>
<td>03.57</td>
</tr>
<tr>
<td>1993-94</td>
<td>05.83</td>
<td>03.77</td>
</tr>
<tr>
<td>1999-00</td>
<td>05.03</td>
<td>03.57</td>
</tr>
<tr>
<td>2004-05</td>
<td>06.50</td>
<td>04.87</td>
</tr>
<tr>
<td>2009-10</td>
<td>08.00</td>
<td>06.1</td>
</tr>
</tbody>
</table>

* Trinial average for GDP, per capita NDP and per capita income.


Source Vivek Oberai (2012), Planning Commission and Poverty blogs Economic Times, India Times.com

Poverty incidence in relation to growth to GDP and per capita NDP has been given in Table No. 1. The table shows that rural poverty has come down from 56.44 percent in 1974 to 33.8 in 2009-10; urban poverty declined from 49.0 percent to 20.9 percent and combined poverty incidence declining from 55.88 percent to 29.8 percent. It shows that incidence of poverty has a declining trend so far as the growth rate of GDP and per capita NDP is concerned both show arising trend. (Table No. 1)
Coefficient of correlation between real GDP growth and poverty HCR (%) in rural urban areas and in combined forms are highly negative (Table 1.) then also confirms hypothesis that higher growth rate leads to decline in poverty. But the resents of (Table 1.) should be considered cautiously because figures of poverty HCRs for 2004-05 are not strictly comparable with those of 1993-94 and 1999-2000. The poverty estimates in 2004-05 based on URP consumption distribution (27.05 percent) are comparable with the poverty estimates of 1993-94 (35.97%). The poverty estimates in 2004-05 based on MRP consumption (21.8%) are roughly (but not strictly) comparable with the poverty estimates of 1999-2000 (26.1%). Higher estimates of poverty incidence in 2004-05 by Expert Group (2008) made the whole issue more complicated and it is rather difficult to draw any conclusion, based on poverty data regarding the exact impact of growth on poverty. However it is beyond doubt that despite a high growth of real GDP and per capita NDP more than 40 crore people in India are still living below poverty line.

Table No. 2
COMPARISON OF POOR IN RURAL & URBAN AREAS

<table>
<thead>
<tr>
<th>Survey Years</th>
<th>Percent of BPL Population</th>
<th>Poverty line</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>1973-74</td>
<td>56.44</td>
<td>49.01</td>
</tr>
<tr>
<td>1977-78</td>
<td>53.1</td>
<td>45.24</td>
</tr>
<tr>
<td>1983-84</td>
<td>45.7</td>
<td>40.79</td>
</tr>
<tr>
<td>1987-88</td>
<td>39.1</td>
<td>38.2</td>
</tr>
<tr>
<td>1993-94</td>
<td>37.3</td>
<td>32.4</td>
</tr>
<tr>
<td>2004-2005</td>
<td>28.3</td>
<td>25.7</td>
</tr>
<tr>
<td>2004-2005 (Revised)</td>
<td>42.0</td>
<td>25.5</td>
</tr>
<tr>
<td>2009-10</td>
<td>33.8</td>
<td>20.9</td>
</tr>
</tbody>
</table>
Source: Poverty estimates given by Shafeeq Rahman based on recommendations of Tendulkar Committee.

The Table No. 2 shows that poverty line in terms of Rs increased from Rs.49.63 for rural areas and Rs.56.76 for urban areas in 1973-74 to Rs.672.8 and Rs.859.56 respectively in 2009-10. The budget for the poverty line was undervalued in the previous survey years too. Comparison of Indian BPL estimates with the UNDP’s human Development Report (HDR) 2010 reveals sharp contrast with the national estimate that roughly half of India’s population suffers from poverty. HDR released two different dimension of poverty: one is Purchasing Power Parity (PPP) at $1.25 a day, an UN-calculated international line. It shows population below income poverty line is 41.6 percent. The second classification as per the national line is 28 percent. HDR data also estimates that the headcount of population with multi-dimensional poverty in India is 55.4 percent and intensity of deprivation is 53.5 percent. (Table No. 2)

Table No.3
POVERTY LINES AND BPL POPULATION
(Poverty Lines 2009-10, monthly per capita `)

<table>
<thead>
<tr>
<th>States</th>
<th>Rural</th>
<th>Urban</th>
<th>Total BPL Population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004-05</td>
<td>2009-10</td>
<td></td>
</tr>
<tr>
<td>Bihar</td>
<td>655.6</td>
<td>775.3</td>
<td>54.4</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>617.3</td>
<td>806.7</td>
<td>49.4</td>
</tr>
<tr>
<td>Manipur</td>
<td>871</td>
<td>855</td>
<td>37.9</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>616.3</td>
<td>831.2</td>
<td>45.3</td>
</tr>
<tr>
<td>Assam</td>
<td>691.7</td>
<td>871</td>
<td>34.4</td>
</tr>
<tr>
<td>J.P.</td>
<td>663.7</td>
<td>799.9</td>
<td>40.9</td>
</tr>
<tr>
<td>Orissa</td>
<td>567.1</td>
<td>736</td>
<td>57.2</td>
</tr>
<tr>
<td>M.P.</td>
<td>631.9</td>
<td>771.7</td>
<td>48.6</td>
</tr>
<tr>
<td>W. Bengal</td>
<td>643.2</td>
<td>830.6</td>
<td>34.2</td>
</tr>
<tr>
<td>State</td>
<td>TPL</td>
<td>BPL</td>
<td>Rural Poverty Line</td>
</tr>
<tr>
<td>--------------</td>
<td>-------</td>
<td>--------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Arunachal</td>
<td>773.7</td>
<td>925.2</td>
<td>31.4</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>755</td>
<td>846</td>
<td>34.4</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>743.7</td>
<td>961.1</td>
<td>38.2</td>
</tr>
<tr>
<td>Karnataka</td>
<td>629.4</td>
<td>908</td>
<td>33.3</td>
</tr>
<tr>
<td>Gujarat</td>
<td>725.9</td>
<td>951.4</td>
<td>31.6</td>
</tr>
<tr>
<td>Mizoram</td>
<td>850</td>
<td>939.3</td>
<td>15.4</td>
</tr>
<tr>
<td>Andhra</td>
<td>693.8</td>
<td>926.4</td>
<td>29.6</td>
</tr>
<tr>
<td>Nagaland</td>
<td>1016.8</td>
<td>1147.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Haryana</td>
<td>791.6</td>
<td>975.4</td>
<td>24.1</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>719.5</td>
<td>898.6</td>
<td>32.7</td>
</tr>
<tr>
<td>Tripura</td>
<td>663.4</td>
<td>782.7</td>
<td>40</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>686.9</td>
<td>989.8</td>
<td>16.1</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>639</td>
<td>800.8</td>
<td>29.4</td>
</tr>
<tr>
<td>Punjab</td>
<td>830</td>
<td>960.8</td>
<td>20.9</td>
</tr>
<tr>
<td>Delhi</td>
<td>747.8</td>
<td>1040.3</td>
<td>13</td>
</tr>
<tr>
<td>Sikkim</td>
<td>728.9</td>
<td>1035.2</td>
<td>30.9</td>
</tr>
<tr>
<td>Kerala</td>
<td>775.3</td>
<td>830.7</td>
<td>19.6</td>
</tr>
<tr>
<td>Himachal</td>
<td>708</td>
<td>888.3</td>
<td>22.9</td>
</tr>
<tr>
<td>J &amp; K</td>
<td>722.9</td>
<td>845.4</td>
<td>13.1</td>
</tr>
<tr>
<td>Goa</td>
<td>931</td>
<td>1025.4</td>
<td>24.9</td>
</tr>
<tr>
<td>Puducherry</td>
<td>641</td>
<td>777.7</td>
<td>14.2</td>
</tr>
</tbody>
</table>

Table No.3 shows that the all-India poverty ratio declined from 37.2% in 2004-05 to 29.8% in 2009-10 by using the Tendulkar committee methodology. These data further reveal that Poverty ratio in Himachal, Madhya Pradesh, Maharashtra, Orissa, Sikkim, Tamil Nadu, Karnataka and Uttarakhand declined by about 10% or more. In Assam, Delhi, Manipur, Meghalaya, Mizoram and Nagaland, poverty increased in 2009-10.

**Rural Poverty**

The all-India poverty ratio declined from 37.2% in 2004-05 to 29.8% in 2009-10, by using the Tendulkar Committee Methodology. Poverty ratio in Himachal, MP, Maharashtra, Orissa, Sikkim, TN, Karnataka and Uttarakhand declined by about 10% or more. In Assam, Delhi, Manipur, Meghalaya, Mizoram and Nagaland poverty increased in 2009-10. Rural poverty has declined by eight percentage points, from 41.8 percent to 33.8 percent, and urban poverty by 4.8 percent, from 25.7 percent to 20.9 percent. At the national level, anyone earning Rs. 672.8 monthly that is earning Rs. 22.42 per day in the rural area and Rs. 859.6 monthly or Rs. 28.35 per day in the urban area is above the poverty line. Population as on March 1, 2010 has been used for estimating the number of persons below the poverty line.

The Total number of people below the poverty line in the country is 35.46 crore as against 40.72 crore in 2004-05. In rural areas, the number has come down from 32.58 crore five years ago to 27.82 crore and the urban BPL number stands at 7.64 crore as against 8.14 crore five years ago.

One of the most astonishing revelations is that poverty has actually gone up in the north-eastern States of Assam, Meghalaya, Manipur, Mizoram and Nagaland. Even big States such as Bihar, Chhattisgarh and
Uttar Pradesh registered only a marginal decline in poverty ratio, particularly in the rural areas, whereas States such as Himachal Pradesh, Madhya Pradesh, Maharashtra, Odisha, Sikkim, Tamil Nadu, Karnataka and Uttarakhand saw about 10 percent decline in poverty over the past years. States with high incidence of poverty are Bihar at (53.5 percent), Chhatisgarh (48.7 percent), Manipur (47.1 percent), Jharkhand (39.1), Assam (37.9 percent) and Uttar Pradesh (37.7 percent). However, it is in poverty-ridden Odisha that monthly per head expenditure of just Rs. 567.1 and Rs. 736 in rural and urban areas respectively puts one above the poverty line, while in Nagaland, where the incidence of poverty has gone up, the per capita consumption expenditure of Rs. 1016.8 and Rs. 1147.6 is rural and urban areas puts one above the poverty level.

Among social group in the rural areas, Scheduled Tribes (47.4 percent) suffer the highest level of poverty, followed by Scheduled Castes (42.3 percent), Other Backward Castes (31.9 percent) as against. 33.8 percent for all classes. In rural Bihar and Chhattisgarh, nearly two-third of the SCs and the STs are poor where as in States like Manipur, Orissa and Uttar Pradesh It is more that 50 percent. In rural areas, 34.4 percent of SCs, 30.4 of STs and 24.3 percent OBCs fall under this category against 20.9 percent for all classes. (Table No. 3)

The behaviour of various measures of poverty and inequality in India are given in Table -4. The poverty Head Count Ratio, however, makes no distinction whether the broad category of the poor depending upon their actual levels of consumption and deprivation. As a result the poverty ratio fails to capture the depth and severity of poverty in an adequate manner. A measure of capturing the depth of poverty is the poverty gap (PG) index, which adjusts the poverty ratio with difference between the per capita consummation of the poor and poverty line expressed
as a percentage of the poverty line. This is therefore a measure of the magnitude of the effort that would be requiring shifting.

Table 4
Indices of Poverty and Inequality in India

<table>
<thead>
<tr>
<th>Year</th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
<th>Squared Poverty Gap</th>
<th>Lorenz Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973-74</td>
<td>6.4</td>
<td>9.0</td>
<td>4.9</td>
<td>6.56</td>
<td>3.64</td>
<td>5.95</td>
<td>.81</td>
<td>.26</td>
</tr>
<tr>
<td>1977-78</td>
<td>3.1</td>
<td>5.2</td>
<td>1.3</td>
<td>5.73</td>
<td>3.13</td>
<td>5.15</td>
<td>.48</td>
<td>.25</td>
</tr>
<tr>
<td>1983-84</td>
<td>5.7</td>
<td>0.8</td>
<td>4.5</td>
<td>2.32</td>
<td>0.61</td>
<td>1.96</td>
<td>.78</td>
<td>.07</td>
</tr>
<tr>
<td>1987-88</td>
<td>9.1</td>
<td>8.2</td>
<td>8.9</td>
<td>.11</td>
<td>.94</td>
<td>.32</td>
<td>.15</td>
<td>.60</td>
</tr>
<tr>
<td>1993-94</td>
<td>7.3</td>
<td>2.4</td>
<td>6.0</td>
<td>.45</td>
<td>.88</td>
<td>.30</td>
<td>.78</td>
<td>.82</td>
</tr>
</tbody>
</table>


Rising inequality in both rural and urban India is reflected in consumer expenditure. During the period 1993-94 to 2004-05 there was an increase in consumptive income in both rural and urban areas both in terms of uniform (URB) as well as the mixed reference period (MRP). (Table No. 4) The difference in the consumption expenditure between the house hold concentrated at the top and these located at the bottom increased in both Rural & Urban areas. Vakula Bharnam (2010) found in an study that in rural
area the gap between the rural elite (money lenders and absentee landlord and rural poor (marginal formers or agricultural labourers) has increased in 2004-05 as compared to 1993-1994 likewise in urban India, the distance between the elite (represented by the owners, Manager & pro percent) and the poor had in increased in several year.³

<table>
<thead>
<tr>
<th></th>
<th>Gini Coefficient Based on URP</th>
<th>Gini Coefficient Based on MRP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>1993-94</td>
<td>0.28</td>
<td>0.34</td>
</tr>
<tr>
<td>2004-05</td>
<td>0.30</td>
<td>0.37</td>
</tr>
</tbody>
</table>


As per NSS 66th data a compassion of MPCE across states during 1993-94 and 2004-05 reveals that average MPCEs (by URP) in Bihar, Orissa, and M.P have been the lowest as compared to other states, while Kerala and Punjab have consistently been on the higher end. (Table No. 4) In 2004-05, Kerala had highest MPCE for rural areas, which was 2.5 times higher than that of Odisha which had the lowest MPCE In urban areas, among the major states, Punjab had the highest average MPCE which was 1.9 times the average MPCE for Bihar (the state with the lowest average MPCE in 2004-05). Table-5 reveals that inequalities in monthly per capita expenditure based on URP and MRP have increased between 1993-94 to 2004-05.⁷

5. Conclusion

[97]
It can be said that there was a sharp increase in regional inequality in India during the 1990s. In 2002-03 the per capita Net State Domestic Product (NSDP) of the richest state, Punjab was about 4.7 times that of Bihar the poorest state. This ratio has increased from 4.2 in 1993 – 1994. A time series graph of this ratio shows that the disparity between the richest and poorest state shot up. This has been highlighted by Ghosh and Chandrashekhar, who showed that inter state inequality increased sharply in India during the reform period. It seems Marxian concept of capitalist society is true in the context of our society also. Rich are becoming richer and poor are becoming poorer that leads to a revolution. Government organized several schemes for removing poverty after that it remains, so much more has to be done to bring prosperity in the lives of people of rural areas.

References


(5) National Account Statistics Data. CS02008-09.


Study of Military System During Gupta Period

Manish Prakash  
Research Scholar  
Department of History,  
Dr. B.R. Ambedkar University, Agra

The Gupta rulers developed strong military setup in order to cope with the requirement of the time. During this period geographical boundaries of the Gupta empire extended up to beyond central India. The Gupta Empire (320 to 550 CE) is considered a golden age of Indian and Hindu history. This was a time when Indian culture flourished in all areas but like all empires it was made possible by a powerful military, clad and equipped by Kushans. However, despite the use of horse archers by their enemies such as the Scythian, Parthian, and Hepthalite (White Huns or Huna) they never developed their own. The Gupta favored armored cavalry forces that attacked with lances or swords.

The Gupta military continued to rely heavily on infantry archers, which was an effective counter to mounted archers. One advancement the Gupta military made they made in archery was creating the steel bow; this weapon could match the power of the composite bow while not being subject to the problem of warping due to humidity. This incredibly powerful bow was capable of excellent range and could penetrate thick armor. However, steel bows would have only been used by elite or noble class warriors while common archers continued to use
the highly regarded bamboo longbow. Iron shafts were substituted for the long bamboo cane arrows when armor penetration was needed, particularly against armored elephants and cavalry. Fire arrows also were employed by the Gupta, their long bamboo cane arrows being particularly well suited for use in these operations.

Gupta archers were protected by infantry units equipped with shields, javelins and swords. They had no particular uniforms and dressed in accordance to their indigenous customs. Some warriors wore a type of tunic spotted with black aloe wood paste, which could be a type of tie-dye (or bandhni) that may have functioned as an early type of camouflage. Indian Gupta era infantry rarely wore pants, instead going into battle with bare legs. Skullcaps (more common) or thickly wrapped turbans were worn around the head to give some protection. Shields were generally curved or rectangular and featured intricate designs, sometimes decorated with a dragon’s head. The swords could be long swords, curved swords or daggers.

Elite troops and nobles would have had access to armor, such as chainmail, although the hot Indian climate can make heavy armor unbearable. Use of a breast plant and simple helmet would have been more common. They had access to better steel weapons as well, such as bradswrds, axes and the Khanda, a uniquely Indian sword with a broad double blade and blunt point. The Khanda was a slashing weapon and considered very prestigious. Steel was developed in the Tamil
region of Southern India between 300 BC and the start of the common era. Steal weapons were highly prized and traded throughout the Near east and ancient Europe. Indian steel was legendary for its tensile strength and knowledge of it fueled a quest for improved metallurgy across the Near east and Europe. By the time of the Gupta’s steel weapons would have been more common in Indian warfare, but still only used by elite warriors.

War elephants continued to be used and pacaderm armor was advanced throughout this period. Elephants remained a component of the combined arms tactics employed by Gupta generals. The use of war elephants coordinated with armored cavalry and infantry supported foot archers is likely the reason for the Gupta Empires success in war against both Hindu kingdoms and foreign armies invading from the Northwest. Another reason may have been a higher level of discipline compared to their tribal rivals. At its height the Gupta Empire had ¾ million soldiers.

The Gupta empire also maintained a navy to control water ways and their coasts. They also had a high level of understanding of siege warfare, employing catapults and other sophisticated war machines.

The Gupta Empire eventually collapsed in the face of a Hepthalite (Huna or White Huns) on slaughter. This was another of the Asiatic hordes and was probably a confederation of nomadic tribes. Their origins are obscure, although their language is likely of East Iranian origin. They may have gone by
the name of White Huns in order to associate themselves with the feared Huns of Turkic origins. The Hepthalite were initially defeated by Skandagupta which has been seen to mean that militarily the Indian armies could defeat them and that the fall of the Gupta Empire was due to internal dissolution. However, the collapse of the Roman and Chinese empires at the same time and to branches of the same invaders seems to point to something more.

Reference
Biochemical Studies of *Tinospora cordifolia* Plants in Agra, Mathura, Etah and Firozabad Districts

Dr. Yugal Pratap Singh

Abstract

The Biochemical investigation was carried out in four accession of *Tinospora cordifolia* which were from four districts of Uttar Pradesh (Agra, Mathura, Firozabad and Etah) indicates that the aqueous and methanol leaf and stem extracts showed that the presence of biochemical compounds viz., alkaloids, flavonoids, fixed oils, fats, phenols, proteins and carbohydrates. It is inferred that the biochemical compounds in these accessions were more or less similar in nature.

**Keywords**: Alkaloids, Flavonoids, Tannins, Phenols, Fats, Fixed Oils, Amino acids.

Introduction

The observation on biochemcials in different solvent of leaf extracts in four accessions of Tinospora cordifolia were collected from four districts of U.P. Agra, Mathura, Firozabad and Etah respectively, which are described separately in the following paragraphs.

Sample TC – 1 (Agra)

Table 1 Biochemical compounds in aqueous leaves extract of *Tinospora cordifolia*

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
(i) Aqueous leaves extract:

The observation on biochemical’s in aqueous leaves and stem extracts of *Tinospora cordifolia* collected from Agra district is summarized in Table 1.

It is evident from Table 1 that the aqueous leaves and stem extract performed for the presence of biochemical compounds like alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoids, and carbohydrates.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 2 Biochemical compounds in methanol leaves extract of *T. cordifolia*
7. Saponins - + +
8. Fats Libermann test + +
9. Carbonhydrates Benedict’s test + +
10. Fixed oils - + +
11. Phytosterols - + +

(ii) **Methanolic leaves extract**

The observation on biochemical in methanol leaves and stem extract of *Tinospora cordifolia* is summarized in Table 1.

It is evident from Table 1 that the methanol leaves and stem extract performed for the presence of biochemical compounds viz., alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoides, and carbohydrates.

**Sample TC-2 (Mathura)**

(i) **Aqueous leaves extract**

The observation on biochemical in aqueous leaves and stem extract of *Tinospora cordifolia* collected from Mathura district is summarized in Table 2. It is evident from Table 3 that the aqueous leaves and stem extract performed for the presence of biochemical compounds like alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoides, and carbohydrates.

(ii) **Methanolic leaves extract**

The observations on biochemical in methanol leaves and stem extract of *Tinospora cordifolia* is summarized in Table 4. It is evident from table 4 that the methanol leaves and stem extract performed for the presence of biochemical compounds viz., alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoides, and carbohydrates.
Table 3 Biochemical compounds in aqueous leaves extract of
*Tinospora cordifolia*

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Fats</td>
<td>Libermann test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Carbonhydrates</td>
<td>Benedicts test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Fixed oils</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Phytosterols</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td>Amino acids</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 4 Biochemical compounds in methanol leaves extract of
*T. cordifolia*

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
7. Saponins              -  +  +
8. Fats                 Libermann test  +  +
9. Carbonhydrates      Benedicts test  +  +
10. Fixed oils          -  +  +
11. Phytosterols        -  +  +

Sample TC-3 (Firozabad)

(i) **Aqueous leaves extract**:

The observation on biochemical’s in aqueous leaves and stem extract of *Tinospora cordifolia* collected from Firozabad district is summarized in Table 5.

**Table 5 Biochemical compounds in aqueous leaves extract of Tinospora cordifolia**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Fats</td>
<td>Libermann test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Carbonhydrates</td>
<td>Benedicts test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Fixed oils</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Phytosterols</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td>Amino acids</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
It is evident from table 5 that the aqueous leaves and stem extract performed for the presence of biochemical compounds like alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoids, and carbohydrates.

(ii) Methanoilic leaves extract:

The observation on biochemical in methanol leaves and stem extract of *Tinospora cordifolia* is summarized in Table 6.

**Table 6 Biochemical compounds in methanol leaves extract of T. cordifolia**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Fats</td>
<td>Libermann test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Carbonhydrates</td>
<td>Benedict's test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Fixed oils</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Phytosterols</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

It is evident from table 6 that the methanol leaves and stem extract performed for the presence of biochemical compounds like alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoids, and carbohydrates.

**Sample TC-4 (Etah)**

(i) Aqueous leaves extract:
The observation on biochemical’s in aqueous leaves and stem extract of *Tinospora cordifolia* collected from Etah district is summarized in Table 7.

**Table 7 Biochemical compounds in aqueous leaves extract of *Tinospora cordifolia***

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Fats</td>
<td>Libermann test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Carbonhydrates</td>
<td>Benedicts test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Fixed oils</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Phytosterols</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td>Amino acids</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

It is evident from table 7 that the aqueous leaves and stem extract performed for the presence of biochemical compounds like alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoids, and carbohydrates.

(ii) **Methanoilic leaves extract:**

The observation on biochemical in methanol leaves and stem extract of *Tinospora cordifolia* is summarized in Table 8.

**Table 8 Biochemical compounds in methanol leaves extract of *T. cordifolia***

[110]
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Biochemical compounds</th>
<th>Name of the test</th>
<th>Leaf</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>Mayer test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Glycosides</td>
<td>Legal test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Tannins</td>
<td>Gelatin test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>Biuret test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Fats</td>
<td>Libermann test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Carbonhydrates</td>
<td>Benedicts test</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Fixed oils</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Phytosterols</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

It is evident from table 8 that the methanol leaves and stem extract performed for the presence of biochemical compounds like alkaloids, flavonoids, fixed oils, fats, phytosterols, amino acids, glycosides, tannins, phenols, proteins, terpenoids, and carbohydrates.

References: