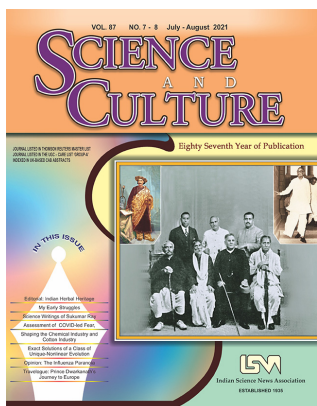


SCIENCE AND CULTURE

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EDITORIAL

HERBAL HERITAGE OF INDIA



The issue July and August 2021 (Vol. 87 Nos. 7-8, 2021) of Science and Culture is being released for our readers. July and August months are most significant not only for the advancement of science and technology but also equally important culturally at the national and international level. July-August reflects

the birth of so many intellectuals of Indian Renaissance. Dr. Bidhan Chandra Roy (1 July 1882–1 July 1962) was an Indian physician, educationist, philanthropist, freedom fighter and statesman who served as the Chief Minister of West Bengal for 14 years from 1948 until his death in 1962. Dr. Roy is one of the few people in history to have obtained F.R.C.S. and M.R.C.P. degrees simultaneously. In India, the *National Doctors' Day* is celebrated in his memory every year on 1 July. The nation honoured Dr. Roy with the Bharat Ratna on 4 February 1961, India's highest civilian honour. The following other celebrated personalities were borne in July-August months playing significant role for the greater development of the academic scenario of India: Acharya Prafulla Chandra Ray – Father of Chemical Science and the founder President of ISNA (2 August 1861–16 June 1944), Dr. Syama Prasad Mookerjee –Academician, Barrister, politician and the youngest Vice-Chancellor of the University of Calcutta, founder Vice-President of ISNA (6 July 1901–23 June 1953), Sri Aurobindo – Indian nationalist, freedom fighter, philosopher and poet (15 August 1872 – 5 December 1950), **14th Dalai Lama** (Tenzin Gyatso) - spiritual leader of Tibet, famous Buddhist teacher, awarded **Nobel Peace Prize in 1989** for his non-violent struggle for the liberation of Tibet

(6 July 1935), Bal Gangadhar Tilak - Indian independence activist (23 July 1856 - 1 August 1920), J.R.D. Tata - Indian businessman (29 July 1904 - 29 November 1993), Munshi Premchand - Hindi writer (31 July 1880 - 8 October 1936), Jayant Narlikar- Scientist-Astrophysicist (19 July 1938-), Dwijendralal Ray - Bengali poet, playwright and musician (16 July 1864 - 17 May 1913), Prof. Ashoke Sen - Theoretical Physicist and distinguished Professor, Recipient of Breakthrough Prize in Fundamental Physics (15 July 1956), Tarasankar Bandyopadhyay - Writer (23 July 1898 - 14 September 1971), M.S. Swaminathan - Scientist - Agriculturist (7 August, 1925), Abanindranath Tagore - the principal artist and creator of the "Indian Society of Oriental Art" (7 August 1871 - 5 December 1951), Vikram A. Sarabhai -Father of Indian Space Programme (12 August 1919 - 30 December 1971), S.R. Ranganathan -Father of Library and Information Science (12 August 1892 - 27 September 1972), his birthday is celebrated as National Librarian Day in India.

India attained independence on 15th August following the Independence Movement and the Day is celebrated annually as a national holiday in India commemorating the nation's independence (75th anniversary year) .from the United Kingdom on 15 August 1947, the day when the provisions of the 1947 Indian Independence Act, which transferred legislative sovereignty to the Indian Constituent Assembly, came into effect. It is also noteworthy to mention that July and August reflects the birth of 136 celebrated personalities/ scientist won the Nobel Prize for their significant contributions in their field of specialization. The special mention to Mother Teresa who worked in Kolkata for her entire life. **Mother Teresa** - Roman Catholic saint working in Kolkata and awarded **Nobel prize in Peace in 1979**, **Bharat Ratna**, Order of the Smile, Golden Honour of the Nation, etc. (26 August, 1910 – 5 September 1997), During her lifetime Mother Teresa

became famous as the Catholic nun who dedicated her life to caring the destitute and dying in the slums of Kolkata. The WWW (World Wide Web) Day is celebrated on 1st August every year. It is a global celebration dedicated to internet web browsing, the online activities that bring the world at our fingertips and a wealth of information.

Nature has bestowed man with flowers of multitude colours, shapes and sizes and with sweet scents. Flowers preceded man, may be millions of years. Apart from the few edible ones, they added a new dimension to his life – quality. Its freshness in the morning, the dew covered petals, roused new hopes and fresh inspiration to begin the day. It's beauty, tenderness and fragrance filled him with warmth in his heart and a pleasant feeling overall. No surprise, man adopted the flowers as a constant companion in every walk of his life, and we see flowers dominating the social life, traditions and culture in every country.

India is fortunate to have a wide variety of climatic conditions, from extreme hot to extreme cold. Thus a wide variety of flowers bloom on this land, and we have adopted them for every occasion from birth to death. It is considered auspicious to have flowers on any occasion. They bring cheer and a message of good will. The religion of majority of the land requires flowers in religious worship. Thus the **Vaishnavas** use mainly white flowers and a select coloured ones (mainly cultivated) for adorning the deity and tulsi leaves for conducting puja, while the **Shivas** want wild flowers with

bilwa leaves in their rituals. **Kali** worship demands red jawa (*Hibiscus*), while **Durga**, the mother goddess prefers a wide variety. Besides durva grass, Ganesh puja accepts a variety of flowers. Every **puja** (adoration) during the day requiring fresh flowers, the used ones are distributed amongst the devotees as sacred offering (prasada) which

the latter touch to their heads as a blessing of the divine.

Men too adorn their dress with single flower and on occasions like marriages or any other festive gathering it is customary to offer flowers to tuck in the dress of participants. **Jawaharlal Nehru's** red rose has become legendary. Thus flowers have their own way to convey a message suiting the occasion. Presentation of bouquets to guests at any gathering, or garlanding them is considered as a great honour, and gives aesthetic satisfaction; it also adds solemnity to the occasion. Flowers have not only played a major role in all human activities, but it has also occupied the minds of people. Poets and writers have written much in praise of flowers. It is a favourite topic with them from time immemorial. All our literature is full of mention of flowers, seasons and moods. In the writings of **Rabindranath** one can find the mention of every

flower that every bloom in Bengal. Poet's imagination is so vast and deep that they try to give emotions to the flowers too and thus a well known Hindi poet writes about the "*desire of a flower*", linking it with our own social activities.

The utility of the wild plants for various purposes was not recognised in one day or in one century, this was achieved as a result of the progressive development of human cultures. Man after his ascent from Ape-man about 250,000 years ago continued for a fairly long time as a hunter, gatherer and fisher. It was several thousands of years, later that he became a sedentary agriculturist but his old traits continued along side. In the earlier stages he manufactured stone tools replaced by copper – ultimately by iron. In the course of this cultural and material evolution, he moved from rock shelters to self-made huts. A revolutionary change took place with the innovation of Agriculture. The society now consisted of several socioeconomic professions. Many of them depended directly or indirectly upon the wild plant life. It was during this time that many more wild plants were brought into use.

The floristic heritage of India is as diverse as its cultural heritage. India is one of the richest countries of the world in its floristic natural resources. Our country is connected by land with European, Chinese and other Asiatic regions which exercise a powerful influence on the natural characteristics of the physical landscape, biospheres and the human life. India has about 17,000 species of flowering plants and altogether about 55,000 plant species. This vast number of plant species which we have received as natural heritage, comprises of diversified elements, and is an assemblage of main floristic constituents of the world. However, more than 60% of the Indian flowering plants are unique and endemic and have their distribution restricted to small regions.

The Indian forest resources is dwindling from the prehistoric time. Destruction and degradation of ecosystem in wide areas were common due to human settlement. The progressive destruction of forests and the establishment of human settlements by our forefathers seems to have been far more in India than anywhere else although our ancestors developed a great love for the nature at the Vedic ages. The topography and habitat had become gradually senile and decaying and ecologically suboptimal. The process is still continuing endangering the biosphere and threatening the existence of a large number of plant species.

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Plants are companion of man since his appearance on the earth. Glancing through the history of civilization one finds that forests were closely related to human being in one way or other in meeting some of the basic needs. The forest constitutes an important natural heritage for the people, more so to the tribals who live amidst the forests. Besides serving as a complimentary source of

food, fodder, medicine, religious rite and other material requirement to tribals, forests are in culture of these people and make this system more than a mere physical entity and register its indispensibility for the maintenance of equilibrium of ecology and economy. Forests are characterised by pure stand of “Sal” or forests of mixed and miscellaneous types. Besides Sal (*Shorea robusta*), other major tree components of forests are Trop (*Buchanania lanzan*), Murga (*Pterocarpus marsupium*), Bhelwa (*Semecarpus anacardium*), Asan (*Terminalia alata*), Kumbhi (*Cayrea arborea*), and species of *Bauhinia*, *Bridelia*, *Butea*, *Diospyrus* and *Ziziphus*. Beneath these tree covers are found different types of herbs, shrubs, twinners and climbers which are characteristics of particular locality.

India with her 55,000 plant species and 550 tribal communities belonging to 160 linguistic groups inhabited in varied geographic and climatic zones with diversified plant species, varied culture, rich traditional knowledge system and wisdom possess an Ethnobotanical emporia. Living close to the nature, the tribal communities are custodian of unique traditional knowledge system and wisdom about ambient flora and fauna and rich heritage of Phytomedicine-Ethnomedicine. Therefore, Profesor R.E. Schultes of the Harvard University, USA, opined that “*India with her many living groups of people, having diversified ethnic culture, history of rituals and performance, who are more or less isolated from modern world and are closely associated with their ambient vegetation is the emporia of ethnobotanical research*”.

Ethnobotany is a field where relationship between plants and humans are studied. Selection of plant species used by the tribals with special emphasis on medicinal plants will definitely be ideal for ethnobiologists, conservation ecologists, anthropologists, herbal drug industry, tribal development boards and other organisations. Besides, the ability to use the plants and its by-product for making agricultural and musical equipments, mats, baskets, etc. and food, *their uncanny knowledge of selective plants claimed to treat effectively chronic diseases like arthritis, diabetes, tuberculosis as well as common ailments is something which should be tested scientifically and clinically*.

Plants are utilised in preparation of herbal drugs used in traditional systems of medicine such as Ayurveda, Unani, Siddha and Tantra therapy. Many of these plant species like *Asparagus racemosus*, *Bacopa monnieri*, *Emblica officinalis*, *Phyllanthus amarus*, *Strychnos nux-vomica*, *Rauvolfia serpentina*, etc. are also used in modern Allopathic and Homeopathic Systems of medicine.

According to Kapoor & Mitra (1979) nearly 450 plant species are utilized in India for different formulation of herbal drugs. In India, at present, there are about 160,000 registered medical practitioners of Ayurvedic System, 140,000 are conventional doctors as compared to ca.700,000 doctors of modern systems including Homeopathic system. There are about 8000 licensed pharmacies of Indian traditional systems. For economical viability, the cultivation of herbals may be the source of supplement income to the rural women and tribal communities.

India inherit a rich herbal heritage. It has a vast natural resources including herbs and other plants having curative properties. The history of medicine in India can be traced back to the oldest repository of human knowledge – The Rigveda (4500 B.C. – 1600 B.C.) where mention has been made of 67 medicinal plants. But in the Atharvaveda (2000 B.C.-1500 B.C.) mention has been made about 290 plants used as charms for curing the diseases. Lord Dhanvantari, one of the disciples of emergence Lord Asvini is the originator of Ayurveda (2500 B.C. – 900 B.C.) who established the real foundation of earliest medical science where the properties of various drugs have been given in details. Of the eight divisions of Ayurveda, two Samhitas (Charak –1000 B.C.) and Sushruta (800 B.C.) which exclusively deal with medicine and surgery respectively are probably the parts of Agnivesa Samhita.

About 700 plant species have been mentioned here as medicinal plants. In Charak Samhita the materia medica, administration of purgatives, emetics and other drugs resemble almost with that of present day system. In

Sushruta samhita, earlier than Lord Buddha (c.550 B.C.-470 B.C.) and Hippocrates (460 B.C.), the application of the anaesthesia was not uncommon, before the surgical operation. But anaesthetic as Sammohini, i.e., inhalation of medicaments for the purpose was probably introduced during Buddhist period by Jivaka – the Physician of Lord Buddha. Sushruta possessed armamentarium of 20 types of sharp and 101 types of blunt surgical instruments alongwith the dressing material and other equipments.

The most enduring legacy of the science of the classical era is the Indian system of medicine, namely Ayurveda, which is in daily use even today. The two greatest theses of the Ayurveda, the Charaka and Sushruta Samhitas, were composed during this time. There are more than 600 medicines of plant, animal or mineral origin prescribed in the Charaka and Sushruta Samhitas. Extensive methods of medicinal preparations, therapeutic processes and disease diagnostics are mentioned. Herbal products are being used as drug from time

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The systematic study of Indian vegetable drugs started in early nineteenth century. Probably the *Botanical observations of Select Plants (1798)* by Sir William Jones is the first step in such a direction. *The Catalogue of Indian Medicinal Plants and Drugs* by John Fleming (1810) was followed by *The Bengal Dispensatory and Pharmacopoeia* of O'Shanghnessy (1841) where in the properties and uses of the medicinal plants have been mentioned. Waring (1886) published the *Pharmacopoeia of India* for more understanding about the indigenous medicinal plants. Some important drugs of India from this work were incorporated in *British Pharmacopoeia*. *The Translation of Sanskrit Materia Medica* of U.C. Dutt (1877) and *the Materia Medica of Madras* by Hooper (1891) brought a good account of drugs used by the then Hindu

Physicians. Hooper's work was mainly based on the work of *Mohidden Sherif*. Fliickiger and Handbury's (1879) *Pharmacographia of India* is another good contribution to indigenous drugs. *The Vegetables Materia Medica* of western India by Dymock (1883) was another contribution to indigenous drugs. Dymock, Warden, warden and

Hoper's works (1890-93) as *Pharmacographia India* were practically the compandium of indigenous medicinal plants. Sir George Watt (1889-96) completed the encyclopaedic work *The Economic Products of India* where he catered a mine of information on vegetable drugs. *The Indigenous Drugs of India* (1896) by Kanailal Das; *Indian Medicinal Plants* (1958) by R.N. Chopra et al.; *Indian Meteria Medica* by Nadkarni (1954); *Glossary of Indian Medicinal Plants* (1958); *Medicinal Plants* (1968) by S.K. Jain; *The Wealth of India – A dictionary of Indian Raw Materials and Natural Products* by CSIR (1948-74, 1994); *Tribal Medicine* (1998) by D.C. Pal & S.K. Jain and *Ethnobotany of Santhal Pargana* (1999) by S.K. Varma et al., are the noteworthy publications in this field of study.

From the study of Tribal Medicine (Ethnomedicine) /folk medicine, it can be said now that about 1600 species are newly identified as drug yielding plants and are well known for their use about 4000 drug industries of various Indian systems of medicine like Ayurveda, Unani, Siddha (South Indian System) and Homoeopathy. It is about 12% of present Indian flora. About 80% of the raw materials of medicinal plants are still now collected mainly from 75 milion hectares of forest coverage. Some forest species like Mamira (*Coptis*

teeta), Sarpagandha (*Rauvolfia serpentina*), Brahamakamal (*Saussurea lappa*), etc. are endangered or threatened species. A good numbar of plant species and their plant products such as *Plantago*, *Acacia*, *Asparagus*, *Seena*, *Myrobalan*, etc., are of export value.

At present, a large number of Indian plants are endangered due to either over-exploitation or due to technological or agricultural pollution and extension of human settlement. Medicinal plants like different species of Lycopodium, Rauvolfia, Podophyllum, Dioscorea, Colchicum, Gloriosa are over-exploited for their medicinal value. Santalum album, Pterocarpus santalinus are over-exploited for their scented and coloured timber. Some of them are over exploited as they are botanical curios as Nepenthes khasiana, Helwingia himalaica, etc., some for their beautiful flowers as Primulas, Orchids, etc. A large number of plants are endangered due to agricultural pollution as Drosera, Utricularia (aquatic insectivores) and due to agricultural extension as Nipa fruticans in the Sunderbans. These are irreplaceable resources which we have inherited through generations.

Plants have influenced the development of the cultural and spiritual life in India from the very ancient times.. They are being used as writing material, as beauty aid, as incense and perfumes and in religious rituals and social ceremonies. Certain trees like peepul (*Ficus religiosa*), banyan (*Ficus benghalensis*), tulsi (*Ocimum sanctum*), plantain (*Musa sapientum*), bel (*Aegle marmelos*), etc. find prominent place in the religious festivals. In certain places both Hindus and Muslims offer the same flowers and fruits in temples as well as in Mosques. Emperor Akbar used to go to temples with betel and areca nuts. The plants of plantains and mango leaves are indispensable in the cultural and religious life in Bengal, both in West and in Bangladesh. This is an interaction between environment and culture, being quite independent of the religion. In Hindu religion distinct plants are attributed to appease different Gods, e.g. Lotus (*Nelumbium speciosum*) for Goddess Durga, Jaba (*Hibiscus rosa-sinensis*) for Goddess Kali, Palas (*Butea monosperma*) for Goddess Saraswati, Dhutura (*Datura metel*) and Akanda (*Calotropis procera*) for Lord Shiva and so on. In North India Dhutura is offered to Vishnu.

A number of references of plants are also found in our folk tales. According to such tales Amlaki (*Phyllanthus emblica*) is the tear of Joy of Brahma, Champa (*Michelia champaca*) – the seven brothers and the sister, Parul (*Stemodia suaveolens*) is perhaps one of the best known folk tale in Indian languages. According to tale of Malwa, Sonabai took refuge in Sandal wood (*Santalum album*) tree to save her chastity, in Bengal the Princess got shelter inside a Mango tree (*Mangifera indica*) – thus narrating the help rendered by the dear plants to the dear ones.

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The drugs so far developed have been arrived at from chemical processing of 35,000 plants and screening of bioactivity of 25,000 extracts. A serious problem has emerged out due to over exploitation of medicinal herbs. An example can be cited for the plant *Taxus brevifolia*, for the marketed drug taxol used for refractory ovarian cancer, isolated from this plant. 24 kg of taxol is required per year in the United States alone (1 gm of taxol is produced from approximately 13 kg of dried bark equivalent to about 1.5 mature trees). The trees can be grown for the production of active components but there are certain practical difficulties. The big trees are slow growing and such harvesting can not be sustained indefinitely. The other way to obtain extracts for the preparation of medicines from plants is to obtain it through micropropagation and culture of plant cell, tissue organ. These alternative sources will definitely offer a number of benefits including uniformity of products, freedom from climatic factors, seasonal variations, disease and other restraints. Nowadays, the biotechnological procedures involving genetic engineering are also being developed for production of the useful plant drugs to avoid over-exploitation of bioreserve.

In view of the so many destructive forces working together on the biosphere, it will be our prime duty to save our floristic heritage at any cost. This editorial presents an attempt to provide the genesis of India's floristic inheritance with reference to herbal medicines and to cite how plants have influenced the cultural heritage of India. □

Sudhendu Mandal
Editor-in Chief, Science and Culture
Indian Science News Association, Kolkata
E-mail: chiefeditorscienceandculture@gmail.com