

Observations of ethno-botanical studies in India

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ABSTRACT

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While going through the ethno-botanical information so far available in the various literature from India, it has been found that there is a wealth of information on wild plants in Indian ancient literature. However, they have yet not received the due attention concerning the data on the useful plants of India as has been accumulated since over 100 years by now. It is pity that the recent publications on ethno botany have shown utter ignorance on the literature published since 1840s to 1950, which has documented substantial information on the useful wild plants of India. Unmindful of the past work, these have been redocumented by the ethno biologists during last 40 years. In the present communication the author has stressed the need for careful scrutiny of literature published earlier while documenting ethnobotanical information. Besides, the methodology involved in the preparation of each product should also be essentially recorded not only for the benefit of the society but also for the adaptation of suitable measures for their sustainable utilization towards the socio-economic upliftment of the tribal and rural people. It is hoped that the observations given in this paper are made for the betterment of the entire nation including that of tribal communities.

Key-words—Observation, Ethnobotany, India, Documentation, Methodology, Socio-economic development.

भारत में मानव जाति-वानस्पतिक अध्ययनों के प्रेक्षण

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सारांश

भारत में अब तक विविध साहित्यों में उपलब्ध मानव-जाति वानस्पतिक जानकारी का अध्ययन करते समय यह पाया गया है कि भारतीय प्राचीन साहित्य में वन्य वनस्पतियों पर जानकारी बहुतायत में है। फिर भी, भारत की उपयोगी वनस्पतियों से संबंधित आँकड़ों पर जैसा कि अब तक 100 वर्षों से ज्यादा संचित है इन पर उचित ध्यान नहीं दिया गया है। खेद का विषय है कि 1840 से 1950 तक प्रकाशित साहित्य पर मानव-जाति वनस्पतिविज्ञान ने नवीन प्रकाशनों पर परम अभाव दर्शाया है, जिसमें भारत की उपयोगी वन्य वनस्पतियों पर प्रचुर जानकारी प्रलेखित की है। गत शोध-कार्य की लापरवाही, ये पिछले 40 वर्षों के दौरान मानव-जाति जीव-विज्ञानियों द्वारा पुनर्प्रलेखित किए गए हैं। वर्तमान संप्रेषण में लेखक ने पहले प्रकाशित किए गए साहित्य को मानव-जाति वानस्पतिक जानकारी प्रलेखन के समय सावधानीपूर्वक जाँच हेतु जोर दिया है। इसके अलावा, प्रत्येक उत्पाद की तैयारी में प्रयुक्त कार्यप्रणाली को केवल समाज के लिए ही नहीं अपितु आदिवासी ग्रामीण लोगों के सामाजिक-आर्थिक उत्थान हेतु इनके समर्थन योग्य उपयोग उचित उपायों के अनुकूलन हेतु भी अभिलिखित करने चाहिए। आशा की जाती है कि इस शोध-पत्र में दी गई टिप्पणियाँ आदिवासी संप्रदाय को सन्निहित करके समूचे राष्ट्र के उन्नयन हेतु की गई हैं।

संकेत-शब्द—प्रेक्षण, मानव जाति-वानस्पतिक, भारत, प्रलेख, विधि, सामाजिक-आर्थिक विकास।

INTRODUCTION

BEFORE the advent of life, the Earth was bleak place, a rocky globe with shallow sea, thin band of gases and water vapours. It was hostile and barren planet. This strictly inorganic state of the Earth is called the geosphere. With the generation of first life in this thin outer layer of geosphere, it

has converted into biosphere, "Zone of Life". Plants were the earliest form of life on this planet earth, much before the primitive man made an appearance. When man appeared, the biosphere became more and more influenced by his presence and was transformed into the anthrosphere by his activities. For perhaps 3,000,000 years or more, man has been living in reasonable balance with the organisms around him. His

heightened capacity for reasoning, his memory, his ingenuity led him to discover the limitless resources in the forests. Consequently, the primitive men have acquired unique knowledge about the various uses of wild plants over the years of observations, analysis, trial, error and experience. This natural and traditional interrelationship between man and plants (wild and domesticated), and man's domesticated animals is defined as Ethnobotany.

The culture and economies of various tribal communities and forest-dwellers scattered in the forests of various geographic zones in India, vary with the ecosystems. Some are dependent entirely upon hunted and gathered food and other on the agriculture for their subsistence. Utilizing the plant resources in forest, the tribal people developed their own cultures, customs, taboos, folk-tales, food, medicines, etc. and they have discovered a large number of plants for multifarious uses. This vast repository of knowledge related to plants has been cared and nourished by the tribal communities as a common property since thousands of years and it is also being freely transmitted from generation to generation by means of oral communication. Many plants used today by us were originally identified and developed through indigenous knowledge. The utility of wild plants for diverse purposes has not recognized in one day or in one century; it is a result of the progressive development of human culture. The cereals, vegetables and root crops that we have cultivated as source of food, fiber and oil for our subsistence, are all gifts of Tribal to our modern civilized society. Infact, the civilized society should be indebted to primitive people for they had during the last several thousands years, screened the wild plant life and determined its usefulness. Recently, ethnobotanical research in India has enriched our knowledge of numerous plant species, and a large number of ethnobotanical literatures have been appeared rapidly over the last hundred years. It is pity that the recent publications on ethnobotany have shown utter ignorance on the literature like books on regional flora (Duthie, 1960; Hooker, 1872-1897, forest working plans, survey of tribal by Anthropologists (Gnanambal, 1952a, 1952b) reports in tribal development projects, ethnographies, archaeological accounts, travelogue, district gazetteers, herbals, material-medica, etc. published since 1840s to 1950. The oldest record about herbal medicines written on palm leaves about 1710 A.D. was discovered from south Batar in Madhya Pradesh (Maheshwari, 1996). These document record 93 types of herbal medicines used in the district. Unmindful of the past work, these have been redocumented by the ethnobotanists during the last 40 years. If these trends continue some one ask "what worth is ethnobotanical research". In view of the above facts, the present author has scrutinized old literature and identified 11 major and about 20 minor or miscellaneous aspects for future prospecting of wild plants for multifarious uses.

OBSERVATIONS

Edible Plants

There is an incredible variety and abundance of edible plants available to us. Carbohydrates, proteins, minerals, vitamins, fats and condiments are all provided by plant foods. However, of the 18,000 known species, over the centuries, fewer than 20 species of the plants now supply about 90% of our food requirements. It is all the more necessary to relieve pressure on the traditional crops by adopting the other improved varieties of some of the wild plants which have been domesticated by the tribal people on which the tribal community subsists. Out of several hundred examples of the edible fruits, seeds, shoots, flowers, etc. some are given as follows.

Food Plants

Food is the primary need of all life forms as it provides energy to work and sustain life. During the quest of food, the earliest people might have experimented on various edible plants and discovered a wide variety of food as wild roots and tubers, fruits, berries, grains and seeds, flowers, foliage and stems (Jain, 1964; Jawahar, 1996; Joshi & Tewari, 2000; Nayar *et al.*, 1989; Negi, 1996; Nizauddin *et al.*, 1996; Rajlakshami, 1991; Verma, 1955). Nutritional evaluation of these wild food plants will be very promising by bringing them into modern food.

Grains—Many tribals and orthodox cultivators have not adopted all new or improved varieties of crops and have continued to grow the traditional (even less productive) land races or wild relatives of commonly cultivated crops, thereby maintaining their genetic material or germplasm (Arora, 1996, 1997). Specific characters of hardiness, disease resistance and adaptability to special conditions like waterlogging, extreme drought or cold, etc. in the land races. They may be utilized by the plant breeders for improvement of crop varieties. Several wild grains occurring in rain fed areas are used as staple energy foods such as *Avena sativa*, *Coix lachryma-jobi*, *Dactyloctenium aegyptium*, *Dinochloa scandens*, *Echinochloa colonum*, *Echinochloa crus-galli*, *Eleusine coracana*, *Oryza rufipogon*, *Panicum miliare*, *Panicum atrosanguineum*, *Panicum hippothrix*, *Panicum paludosum*, *Panicum trypheron*, *Panicum turgidum*, *Paspalum scrobiculatum*, *Paspalum distichum*, *Nymphaea nauchali*, *Nymphaea stellata*, *Pennisetum alopecuroides*, *Paspalidium flavidum*, *Setaria glauca*, *Setaria italica* and *Sorghum halepense*. These have excellent nutritive value with high protein content and are known as the "poor man's protein".

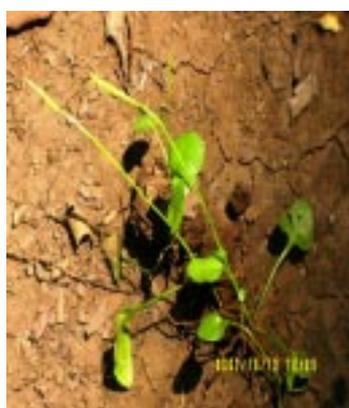
Seeds—Ripe seeds of several wild plants are very nutritious and rich in protein value. They are also planted with other crops specially to improve nitrogen content in the soil through root nodules. These seeds are eaten raw or cooked.



Eriobotrya japonica (Thunb.) Lindl. *Syzygium jambos* (Linn.) Alston
(Fruits are edible)



Celosia argentea Linn. *Tetrastigma lanceolarium* (Roxb.) Planch.
(Tender stem & leaves are used as vegetable)



Ophioglossum reticulatum Linn. *Moghania macrophylla* Kuntze
(Plant is used as vegetable) (Leaves are used as vegetable)



Dioscorea alata Linn. *Dioscorea bulbifera* Linn.
(Tubers are used as vegetable) (Bulbils and Tubers are used as vegetable)



Perilla frutescens (Linn.)Britt. *Ventilago maderaspatana* Gaertn.
(Edible oil obtained from seeds)



Alpinia zerumbet Burtt et. Sm.
(Rhizomes used to flavour food)



Trachyspermum roxburghianum (DC.) Craib
(Leaves used to flavour food)



Erythrina blakei Parker
(Fibres obtained from bark)



Agave sisalana Perr.
(Fibres obtained from leaves)



Pennisetum hohenackeri Hochst
(Fibres obtained from leaves and culms)



Garcinia sp.
(Gum used for preparing Varnish)



Mat made of fibres obtained from leaves of *Agave sisalana* Perr.



Hat made of fibres obtained from leaves and culms of *Pennisetum hohenackeri* Hochst.



Broom made of floral stalk of *Vetiveria zizanioides*. Nash



Wall of hut made by floral stalk of *Saccharum begalensis* Retz.



Pulcetilla sp.
(Leaves are used in cold & cough)



Rauwolfia serpentina Benth. ex Kurz.
(Roots are use in mental diseases)



Piper sp.
(Fruits are used in Throat infection)



Cleome spinosa Linn.
(Extract of leaves are used in ear-ache)



Semicarpus anacardium Linn. f.
(Black dye obtained from fruit)

Rubia cordifolia Linn.
(Red dye obtained from root)

Santalum album Linn.
(Wood oil used as perfume)

Zingiber zerumbet Rosc. ex Sm.
(Flowers & rhizomes used as perfume)



Euphoria longan (Lour.) Steud.
(Fruits edible and wood used for making tool handles, toys, tea boxes & canoes).

Duabanga grandiflora Walp.
(Fruits edible and wood used for making tool handles, toys, tea boxes & canoes).

i. Eaten raw—*Buchanania lanzan*, *Euryale ferox*, *Nelumbo nucifera*, *Trapa bispinosa*, etc.

ii. Eaten cooked—*Artocarpus heterophyllus*, *Bauhinia purpurea*, *Bauhinia variegata*, *Bauhinia vahlii*, *Cicer soongaricum*, *Mucuna prurita*, *Mucuna corymbosa*, *Vigna vexillata*, *Vigna aconitifolia*, *Vigna trilobata*, *Vigna pilosa*.

The seeds of above plants are very rich in protein content and very much similar to Almond. The seeds of *Bauhinia vahlii* may eventually become as popular as seeds of *Buchanania lanzan*, which were once uncared in the forest, but adopted later for human exploitation. Similarly, large numbers of seeds go waste in the forests and can be utilized by urban population.

iii. Made into coarse flour—*Polygonum glabrum*, *Fagopyrum esculentum*, *Fagopyrum tataricum*.

Fruit-Plants

Vegetables and fruits are the source of vitamins and minerals, necessary for good health and growth. Even before their intrinsic value was realized, Stone Age men were using several vegetables cultivated today. Fruits are the most delicious, naturally sweet and nutritive plant food eaten as such or after cooking. Over hundreds of the wild fruits such as *Aglaia edulis*, *Aporosa dioica*, *Baccaurea courtallensis*, *Crataegus oxycantha*, *Feronia limonia*, *Myrica esculenta*, *Docynia hookeriana*, *Elaegnus latifolia*, *Elaegnus angustifolia*, *Emblica officinalis*, *Euodia fraxinifolia*, *Dillenia aurea*, *Dillenia indica*, *Hovenia dulcis*, *Madhuca latifolia*, *Olex nana*, *Syzygium jambos*, *Eiobotrya japonica*, *Pinanga dicksonii*, *Rubus niveus*, *Phoenix sylvestris*, *Borssus flabellifer*, *Zizyphus jujube*, *Zizyphus xylopyrus*, *Zizyphus oenoplea*, etc. are used in various ways by local people and

tribal communities throughout the India for sweet drinks, pickles, seasoning material, jellies and jams, brewing local beer, and chutneys.

Vegetable Plants

Large number of wild plants, of which aerial and underground parts are used as vegetable:

Aerial parts used as vegetable—The aerial parts of the number of wild plants are being used by various tribal communities and other people in the forests, rural and urban areas of the country which may be exploited for better and larger uses. Manilal *et al.* (2000) has enumerated some wild plants, used by two tribal groups of Attappady, Palkkad District, Kerala. Some examples are given as : Young foliar buds of *Ficus infectoria*, *Cassia tora*; young foliages with tender stems of *Amaranthus blitum*, *Basella alba*, *Ipomoea aquatica*, *Celosia argentea*, *Chenopodium album*, *Chenopodium murale*, *Digera muricata*, *Fagopyrum esculantum*, *Lathyrus sativa*, *Lathyrus sphaericus*, *Lathyrus aphaca*, *Moghania macrophylla*, *Ophioglossum reticulatum*, *Tetrastigma lanceolarium*, *Vicia sativa*, *Vicia hirsuta*, etc.; fruits and seeds of *Madhuca indica*, *Ipomoea alba*, *Artocarpus heterophylla*, *Artocarpus lakoocha*, *Cordia dichotoma*, *Xeromphis spinosa*, *Xeromphis uliginosa*; floral buds of *Bauhinia variegata*, *Bauhinia purpurea*, *Crotalaria juncea*, *Luffa cylindrical*, *Luffa acutangula*, etc.

Underground parts used as vegetable—Underground parts of a large number of plant species are known for vegetable of which roots, tubers, bulbs and rhizomes are used in various ways, and they may be eaten raw or cooked. The tubers of *Aponogeton natans*, *Aponogeton crispum*, *Potamogeton natans*, *Scirpus grossus*, *Scirpus tuberosus*; Rhizomes of *Nymphaea pubescens*, *Nelumbo nucifera* and roots of *Phaseolus adenanthus* and *Pueraria tuberosa* are eaten after boiling. The giant taros and *Manihot esculenta* are eaten raw or cooked after repeated washing to get rid of the bitterness and pungency. Tuberos roots and aerial bulbils of *Dioscorea alata*, *Dioscorea bulbifera*, *Dioscorea esculenta*, *Dioscorea hispida*, *Dioscorea aculeate*, *Dioscorea pentaphylla*, *Dioscorea versicolor*, etc., are eaten cooked. The fusiform roots of *Phoenix acaulis* and *Borassus flabellifer* are consumed raw or cooked. Likewise, hundred of plants are still left uncared in the forests of which underground parts are consumed by wild animals. They may be exploited for human use.

Oils and Fats

The saturated fats and the animal fats consumed today are believed to be one of the causes for heart attacks. It is usually advised by doctors to the heart patients to consume less animal fat (saturated oil) exclusively. The unsaturated fat, which occurs in oil derived from plants should be used by heart patients. We have traditional oil plants, the seeds of

which are rich in oil, used widely in cooking food such as mustard, coconut, groundnut, etc. Ethno botanical studies bring to light that oils for cooking medium can be derived from forest trees and shrubs such as *Derris indica*, *Schleichera oleosa*, *Calophyllum inophyllum*, *Prinseppia utilis*, *Aleurites moluccana*, *Caralia brachiata*, etc. The oil extracted from seeds of wild plant- *Perilla frutescens* and *Ventilago maderaspatana* are largely used by Baiga tribes in the forest of Amarkantak as cooking medium. Apart from vegetable oils, even butter as cooking medium can also be extracted from some other trees such as *Diploknima butyracea*, *Garcinia morella*, *Moringa oleifera*, *Mimusops elengi*, *Shorea robusta* (Roy, 1998).

Thus, the popularization of vegetable oil through establishment of cottage industry in rural and tribal areas can be beneficial for socio-economic development of ethnic communities as well as to civilized people for medical point of view. Wild plants like *Guizotia abyssinica* and *Carthamus tinctorious* have recently brought under cultivation for its oil, which is used as cooking medium. Thus, to get away from several diseases related to heart caused by animal fats, it would be good to make use of the tribal expertise for vegetable oil and butter.

Spices and Condiments

Spices are aromatic flavourings made from different parts of the variety of plants. Archaeologists estimate that by 50,000 B.C., primitive man had discovered certain aromatic plants, which help him to make their food in better taste. With few exceptions, the spices and condiments known today were used early in human history. Fragrant leaves of *Allium hooker*, *Allium wallichii*, *Ocimum basilicum*, wild coriander, *Trachyspermum roxburghianum*, *Mentha piperata* and *Eryngium foetidum*; ripe fruits and seeds of *Garcinia cambogia*, *Zanthoxylum rhetsa*, *Piper scmidtii* and *Piper mullesua*; roots of *Allium stracheyi* and barks of cinnamon. Vanilla, the essence of which is drawn in ice cream, chocolates and cakes, comes from an orchid. The rhizomes of *Alpinia zerumbet* and flowers of *Zinziber zerumbet* and *Acacia farnesiana* are used as spice for flavouring food.

Non-alcoholic beverages

Tea from Asia, coffee from Africa and cocoa from South America are the world's favourite beverages. They all contain caffeine, a stimulant. Tea is the world's most popular beverage after water. China was the main source of tea, whose cultivation spread through trade to other parts of the world. *Camellia assamica*, a wild tea plant, growing in Assam, was later discovered by Britishers. Tribal communities inhabiting in forest areas use the leaves of *Cymbopogon citratus* and *Basella alba* for preparation of tea like drink. Cooling drink is made from hairy seeds of *Lepidagathis bandraensis* and *Ocimum basilicum*. The fruits and plant of *Tricopus zeylanicus*

is used by Kani tribes of Agasthyar Hill as “ginseng” for evergreen health and vitality (Pushpangadan *et al.*, 1988). The juice of various fruits, vegetables and the clear water of the tender coconut are used as naturally sweet and refreshing drinks. Toddy or palm liquor obtained from *Borassus flabellifer*, *Caryota urens*, *Phoenix dactylifer* and *Phoenix sylvestris* is commonly used in India.

Alcoholic drinks

Tribal uses the fleshy petals of *Madhuca latifolia*, rhizomes of *Imperata cylindrica*, fruits of *Syzygium cumini* and rhizome of *Cissampelos pareira* in the fermentation of rice beer. The flowers of *Madhuca latifolia* are also used to prepare country liquor by all tribes.

Plants for Fibres, Cordages and Basket

Plants are the source of many natural fibres. The fibres can be spun into yarn and woven into fabrics. The fibres are also twisted into ropes which have been used to lift and move the heavy objects since prehistoric times. Cotton, flax, jute and sisal are the chief plant fibres. The main vegetable fibres are structurally of following kinds:

Surface fibres—The soft and silky floss (hairs) that surround the seeds of certain plants such as *Calotropis gigantea*, *Calotropis procera*, *Bombax ceiba*, *Ceiba pentandra* are used to stuff pillow and in preparation of life saving equipments and insulators of fridges.

Bast fibres—The tough fibres which occur in the outer part of stem as cortical fibres, pericyclic fibres or phloem fibres between the bark and stem, e.g. *Boehmeria nivea*, *Linum usitissimum*, *Cannabis sativa*, *Corchorus capsulais*, *Corchorus olitorius*, *Corchorus fascicularis*, *Crotalaria juncea*, *Crotalaria pallida*, *Crotalaria sirisia*, *Crotalaria retusa*, *Crotalaria mysorensis*, *Marsdenia tenacissima*, etc.

Vascular fibres—The tough fibres made up of sclerenchyma cells associated with the vascular-bundle strands in leaves and stems and entire stem of grasses, e.g. *Mussa paradisiaca*, *Agave* sp., *Sansevieria* sp., *Annanas comosus*, *Bromus* sp., *Pandanus odoratissimus* and *Pandanus fascicularis*.

The fibres obtained from the bark of *Cannabis sativa*, *Careya arborea* and *Caryota urens* are very strong and used for tethering elephants; ropes made from leaves and stems of *Corypha unbraclifera*, *Imperata cylindrica*, *Saccharum bengalensis*, *Saccharum spontaneum*; bark of *Marsdenia tenacissima*, *Cordia wallichii*, *Dillenia pentagyna*, *Erythrina suberosa*, *Erythrina variegata*, *Erythrina blakei*, *Ficus benghalensis*, *Ficus religiosa*, *Hardwickia binata*, *Gerardinia palmata*, *Grewia subinequalis*, *Grewia elastica*, *Helicteres isora*, *Grewia cannabinus*, *Grewia tilliaceous* and *Kydia calycina* are used to drag elephants and several other tying purposes. The strength and flexibility of grass and even

some reeds finds application in weaving mats and baskets can be made from them. Bamboo, *Phragmites karka*, and other giant grass regenerate quickly and the hard stems are cheap and convenient resource for making baskets and screens.

Cordage, garments sacks, mats, coarse clothes and ropes used for tying raft and dragging animal, etc. are made from fibres derived from several wild plants such as: bark of *Abelmoschus moschatus* and *Abroma augusta*; stem of *Abutilon theophrastii*, *Acacia senegal*. Leaves of *Agave americana* and *Agave sisalana* that yield a valuable fibre. It is used in making ropes, twines, mats and brushes.

The raw materials used for coarsely woven articles are obtained from the stem of reeds, rushes, grasses, willows, bamboos and leaves and roots of many other plants like *Eulaliopsis binata*, *Pennisetum hohenackeri*, *Vetiveria zizanioides*, *Thysanolenia maxima*, *Typha angustata*, *Typha elephantina*, *Sparganium ramosum*, *Cyperus corymbosus*, *Cyperus elleusinoides*, *Scirpus squarrosus*, *Scirpus maritimus*, *Scirpus articulatus*, *Scirpus tuberosus*, *Phragmites karka*, *Arundinacea* sp., *Arundo donax*, *Bambusa* sp., *Dendrocalmus strictus*, *Calamus* sp., *Phoenix acaulis*, *Phoenix sylvestris*, *Phoenix dactylifer*, *Borassus flabellifer*, *Caryota urens*, *Ventilago maderaspatana*, *Marsdenia tenacissima*, *Hemidesmus indicus*, *Ichnocarpus frutescens*, etc. These materials are used entirely or split. They are woven or twisted together in the simplest manner and made up into hat, mat and matting, screens, chairs, seats, baskets, etc.

Thousands of plants used for extraction of fibres by several tribal communities and rural people are still unknown to civilized people. Inventorisation and documentation of these less known plants for future fibre source is very necessary. The establishment of cottage industries on fibre yielding plants may help in socio-economic development of tribal communities and rural people.

Plants for Health

With the varied climatic conditions and topography, India is endowed with rich biological diversity and large number of ethnic groups. There are about 550 tribal communities belonging to 227 ethnic groups from 6 different racial stocks (Sinha & Sinha, 2001). Over 9500 wild plants species have been discovered and are being used by Indian tribal communities for meeting their multifarious requirements since dawn of civilization. Many a cure for illness and disease lies locked within plants. Forest dwellers discovered the uses of different plants in the treatment of various ailments and diseases, some of which have been used as medicine for hundreds of years. Ayurveda (5000 B.C.), Sidha and Unani are all indigenous system or alternative system of medicine, founded on natural medicine extracted from plants. Parts of 7500 wild plant species used by tribal for medicine to cure their ailments (Anonymous, 1976a, b; Anonymous, 1948-76;

Anonymous, 1987; Chopra *et al.*, 1956; Dastur, 1950; Duke, 1996; Jain, 1968, 1979, 1996; Kirtikar & Basu, 2001; Rastogi & Mehrotra, 1998; Said Hakim Mohammad, 1983; Singh, 2000; Singh & Vishwanathan, 1996; Verma, 1955). There is a great potential in some of them, which can be exploited to cure several kinds of diseases. Many unknown compounds of promising biological activity have been isolated after the chemical investigations and biological screening of about 300 plant species, based on ethnobotanical reports on tribes' knowledge (Atal, 1987; Asolkar *et al.*, 1992; Bhakuni, 1990; Bhakuni *et al.*, 1971; Chakarborty, 1988; Dhar *et al.*, 1968). There has been an upsurge in the use of herbal based drugs because of their miraculous effect. Some instances these plant drugs are such as *Rauwolfia serpentina* for the treatment of hypertension and mental diseases; *Podophyllum* for the treatment of cancerous tumor and *Catharanthus roseus* for leukemia; *Digitalis purpurea* for heart diseases; fugiform roots of *Euphorbia acaulis* for rheumatism; seeds of *Crataeva nurvala* and *Cucurbita maxima* for prostrate cancer; *Aloe barbadensis* for protection from radiation and treatment of burs; Species of *Piper* for throat infections; *Taxus buccata* for breast and uterine cancer; *Phyllanthus fraternus* for jaundice and other liver ailments; *Gymnema sylvestri* for diabetes; Rhizome of *Helminthostachys zeylanica* for liver diseases; *Cleome spinosa* for earache; *Convolvulus microphyllus*, *Centella asiatica* and *Bacopa monniera* for improving the intelligence and memory power among children and also they are used to remove mental tension; *Commiphora mucul* for reducing serum lipid and cholesterol; *Cordia macleodii* for reducing high blood pressure.

However, still several plants effectively utilized by various ethnic groups are yet to be investigated for their biological activity and it is hoped that some new and powerful medicines could be evolved from them for future *materia medica* of the world.

Natural Dyes stuff and Mordents

There is no dearth of wild plants from which dyes have been extracted and used by the tribes to dye yarn and cloths made of both cotton and silk. Most of the natural dyes come from bark, berries flowers, leaves and roots of the plants. Being of natural origin, many of these colours are safe to colour food as well. They have ingenious methods of extraction of dye. To make the colour permanent they prepare alkaline solution from the ash of dried burnt leaf-sheath of *Musa bulbiseana*. The leaves of plants from which dye is to be extracted are crushed in water kept for 2-3 days and then sieved. To the residue is added the alkaline solution. The yarn of cloth is repeatedly dipped into the alkaline solution for 2-3 hours and dried thereafter. For Kalamkari and Madhubani styles of painting done in Andhra Pradesh and Orissa respectively, the natural vegetable dyes are used. Natural indigo, a dark blue

dye comes from roots of *Aleurites moluccana*, *Pterocarpus sanalinus*; leaves of *Marsdenia tenacissima*, *Wrightia tinctoria* and indigo plant (*Indigofera tinctoria*), which grow chiefly in eastern India. It is still used on denim fabrics. Permanent black colour is obtained from the leaves of *Aporosa dioica*, *Garuga pinnata*; bark of *Oroxylum indicum*, *Jatropha curcas* and seeds of *Turpinia nepalensis*. Henna, an orange-brown dye made from leaves of *Lawsonia alba* is used to colour leather. It is also used to dye human hair and colour the palms and feet. The paste of equal amount of the leaves of Henna and Indigo are used as black hair dye. Saffron is brilliant yellow dye produced by drying the stigmas and parts of the style of the purple autumn *Crocus* species. Black dye obtained from fruit of *Semicarpus anacardium* and Red dye obtained from root of *Rubia cordifolia*. It is also used in colouring and flavouring food, especially sweets. Turmeric, a yellowish powder obtained by grinding the rhizomes of *Curcuma longa* has been used for hundreds of years as a dyestuff and as a spice. 'Abir' or 'Gulal' is the finely powdered rhizomes of *Curcuma zedoaria* mixed with powder of *Caesalpinia sappan*. The powdered rhizomes of *Hedychium umbellata* is also used as 'Abir'. Root barks of *Wendlandia tinctoria* is used as mordent in dyeing.

It is suggested that a large-scale cultivation of these dye-yielding plants should be encouraged in order to obtain natural dye in place of synthetic dyes.

Plant for Perfumes, Fragrance and Cosmetics

Fragrant flowers of jasmine, lavender, frangipani, rose, lilies, vetiver, etc. have always been used for making sacred offerings, adoring hair, floral arrangements, garlands, bouquets and floral decoration industry. Being fragrant, Sandal (*Santalum album*) and sal (*Shorea robusta*) wood is burnt in temples. Oil extracted from the seeds of *Abelmoschus moschatus* are largely employed in perfumery and cosmetics industries. Oleoresin from *Boswellia serrata* and from distillation of flowers of *Canarium odoratum* is used as incense. The leaves of *Eyngium foetidum*, *Murraya koenigii* and *Premna latifolia* are provide flavour to curries. Flowers of *Acacia farnesiana*; rhizomes of *Vetiveria zizanioides* and *Zingiber zerumbet*, *Acorus calamus* and leaves of *Cymbopogon citratus*, *Poghostemone perilloides*, etc. are used as perfumes.

It has been observed that the tribal women possess considerable knowledge about cosmetic utility of plants, especially for hair and skin care and for this purpose the seeds of *Abelmoschus moschatus*, fruits of *Embllica officinalis*, *Terminalia bellirica* and *Acacia concinna* are used.

It is suggested that an attempt should be made to authenticate the efficacy and cosmetic value of those plants and products used by the tribes for their large scale production and socio-economic development of tribal and rural communities.

Plant Secretions

Tribal and urban people use secretions from large number of wild plants for several purposes. Natural resins secreted by many plants, are sticky, liquid, organic substances that usually harden, on exposure to air. They are used as glue and incenses. Incense is aromatic resin or plant secretions from woody surface. When burnt, they produce a pleasant aroma. The practice of burning incense at religious ceremonies to produce a pleasant smell was known even in ancient time. The aromatic resin exudates from bark of *Aquilaria agallocha* is used to make burning sticks (Agarbatti). Incense sticks are made by applying a combination of perfumes onto thin sticks. Rasin, extracted from pine is used in sizing papers, adhesives, soap making, varnishes and paints, even as a friction producing coating for bows of stringed instruments. Amber is a fossil resin obtained from the now-extinct *Hymeneae protera* tree. A gum is a water-soluble resin. Gum Arabic, obtained from *Acacia nilotica* subsp. *indica* tree is the best-known natural gum. Gum obtained from trunk and branches of *Garcinia cowa* is used for preparing yellow varnish.

Plants in Culture, Tradition and Worship

Forests are the home of many tribal communities, as they provide everything for everyday living, and are also spiritual and cultural home. Plants occupy pride of place in our religious customs and traditions. Only natural products of plant origin are offered or utilized on such occasions. Flowers and incense are necessary at any auspicious occasion, as also burning Camphor (*Cinnamomum camphora*) and Guggul (*Commiphora wightii*); breaking Coconuts (*Cocos nucifera*); offering leaves of Bael (*Aegle marmelos*), Betel (*Piper betel*); fruits of Supari (*Areca nut*); rhizome of Turmeric (*Curcuma longa*). Kolams or decoration of the floor with rice flour (*Oryza sativa*) and door with leaves of mango (*Mangifera indica*). The Tulasi (*Ocimum tenuiflorum*) plant is extremely revered and finds a place in every home. The Dharbai grass (*Cynodon dactylon*) and Kusha (*Desmostachya bipinnata*) are important for any auspicious occasion. Nature worship is a tribal belief. In India, there is an ancient tradition of designating patches of forestland on the fringes of villages as sacred groves (the forests of God and Goddesses). As the grove is considered to bring to the presiding deity, indiscriminate removal of plants is forbidden. These forests are usually dedicated to a deity or to a Mother Goddess, who is supposed to protect and preside over it and see to it that intruders are punished. Many tribal societies have reverence for particular trees such as *Madhuca latifolia* and *Anthocephalus chinensis* are sacred to Munda and Santhal of Bihar; the Bhuiyas and the Gonds of Madhya Pradesh regard *Butea monosperma* as sacred; the tribal of Rajasthan worship *Prosopis cineraria*; the tribals of Orissa and Bihar worship *Tamarindus indica* and *Mangifera indica*.

Dried flowers of *Achyranthes aspera* is used in sacred pyres in Rajasthan desert. Individual trees were also designated as sacred and worshipped, due to an ancient lore or myth associated with their origin. An event is that takes place in their vicinity or because of an idol or deity resting in their shade, e.g. *Ficus benghalensis* for Brahma; *F. religiosa* for Shani Devata; *Azadirachta indica* for Shitala Devi.

Miraculous Plants

Living with close association of plants and nature the ancient people have observed several healing and divine power in plants. By touching, bearing, offering to Gods and placing or planting on a specialized place in the houses, they have encountered many miraculous properties. Hindu epics are full of miraculous and sacred events related to several plants. Based on their belief and observations these plants are categorized as under:

Plants in Astrology

People, plants, planets and constellations are made of the same elements (fire, earth, air and water) and the same energy (hot/dry, hot/moist, cold/dry, cold/mist). This commonality facilitates people's connection with nature and universe. The human body is a miniature replica of our solar system with each body part and system symbolically representing a sign and planet. Nature often has a way to tell us what specific plant is good for specific planet. How does this affect the character of man? What flowers suit the star sign and what are the astrological colour and plants? All these were keenly observed by our ancestors since remote past and a large number of plants have been discovered that heal us on a mental and spiritual level as well as on physical plane. The jurisdictions of planets over the plants are: The Sun- *Borassus flabellifer*, *Heliotropium indicum*, *Helianthus annuus*, *Crocus sativus* and all aromatic plants. The Moon- All cucumber, *Lactuca sativa* and all ripen fruits, plants with white and pale yellow flowers, plants growing around water (*Mentha piperata*, *Ottelia alismoides*, etc.). Large numbers of plants are used to remove evil spirit and negative effect of planets in their horoscopes since ancient time. People take bath under some trees and wear a small piece of root or stem around neck, hand, or wrist in place of stones and they get benefit by them. Some examples are given here:

If a person take bath under the tree of Sita asok (*Saraca asoka*) it is believed that the negative effect of mercury planet in their horoscope and the effect of all bad radiation of the different planets are removed. The Leo-person should plant one shrub of white flowered 'Madar', some milk along with turmeric powder is also offered to Madar (*Calotropis gigantea*) on every Sunday to protect from ill effect of Mercury planet. A piece of banana root is tied around the arm to overcome the bad effects of Jupiter. To nullify the problems due to sun in

the horoscope, one should take bath with water to which some cardamom, rice, khas (*Vetiveria zizanioides*), honey, amaltas (*Cassia fistula*), lotus (*Nelumbo nucifera*), kumkum, mensal and deodar (*Cedrus deodara*) on every Sunday for about 11 Sunday. To get relief from the troubles of Moon Planet the flowers of Mogra (*Jasminum sambac*) is offered to Moon, a bath should be taken with the water in which few flowers of Jasmine, white Nerium and the shell of unio are kept, offering of Jasmine flowers daily to Lord Shiva keep away from ghost troubles; to nullify the problem due to 'Sun' in the horoscope, a bath is taken with water to which some fruits of Choti-elachi (*Elettaria cardamomum*), grains of rice, roots of Khas (*Vetiveria zizanioides*), honey, flowers of Amaltas (*Cassia fistula*) and Kamal (*Nelumbo nucifera*) are added; Bargad (*Ficus benghalensis*) is believed that it is capable to remove bad effect due to 'Rahu'; the Gemini person should keep the root of Latjeera (*Achyranthes aspera*) in their pocket for overcome the bad effect of different planets.

Likewise, several plants are used for this purposes and it is suggested that they should be scientifically analyzed.

Plants in Tantra, Mantra and Yantra

The Tantra is composed of two words, i.e. tan and tra which implies that through sadhana and pooja one can mould nature and God according to one's desires. Tantras are deeply associated with mantras. Without mantra tantra cannot be successful. Tantra is not a religion but is a sadhana, a shastra, consisting of religion's treatise compiled by Lord Shiva containing mystical formulae for the attainment of supernatural powers. It is evident from ancient literature that a number of plants were used by ancient Tantrik to vanish worries, to get respect and to get rid of various deadly and chronic diseases. To have a daughter- if the root of *Citrus medica* is taken by a lady with water who is blessed with son and wants daughters, she will give birth of girl. Aam Tari a shrub of about 4- 5 feet in height with small leaves, found in Dehra Dun and Lal Tiba area of Mussorie. Leaves of the plant shine during night. The leaves dipped in water for three days and then ground to a paste, if applied on the face, hands and body all wrinkles will go and one will look young. The black turmeric (*Curcuma caesia*) found around the Narmada River in Madhya Pradesh is used in Tantrik Sadhana. The leaves of Danwantri (about three feet high found in Jammu-Kashmir area and being called as Dhanuri by local people) shines and twinkles like a fire during night. If only one leaf is eaten, one does not feel hunger and thirst for 24 hours. The root of this plant mixed with vegetable and taken after cooking to remove blackish hues from the body and face. It is believed that a person who just keeps a single leaf of *Ocimum basilicum* in the feet of Lord Ganesh along with a plant of *Cynodon dactylon* (Doob ghas) for 40 days, his ambitions is fulfilled. The bark and thin wood over the root of white flowered *Calotropis gigantea* is peeled off, one will see an image of Ganpati below it. This is called

Swetarak Ganpati. The shastras say that in any house, which has white Ganpati, remains free from all evil and possessor is blessed with immense wealth. A piece of root when kept tied to the arm does not have any fear of carnivorous animals. Importance of beads of Tulsi (*Ocimum tenuiflorum*), Chandan (*Santalum album*), Rudraksha (*Elaeocarpus sphaericus*) and Putranjiva (*Drypetes roxburghii*) is well known today.

Plants in Vastu

Vastu shastra unifies the science, art astronomy and astrology; it can be also said as an ancient mystic science for designing and building. Vastu is a part of Vedas, which are believed to be 4000-5000 thousand years old. Vastu is also the science of directions that combines all the five elements of nature and balances them with the man and the materials. Vastu is a composite whole or professional blend of five elements - Earth, Water, Ether, Air and Fire. Their equitable proportions create bioelectric, magnetic energy, which bestows health, wealth and prosperity. Our ancient sages have applied their vastu knowledge for plantation of the various trees, shrubs and herbs on appropriate places and directions in and around the houses to mitigate the negative functioning of our environment and increase the advantageous effect that it can have on our life. It is always good to grow a Tulsi plant on one's property. Tulsi should be planted on the north, northeast or east sides of the house, or in front of the house. Trees should not be planted directly in front of the house's main entrance as they block the sunlight. Thorny plants other than rose should not be planted near or in the house because they produce negative energy.

It is true that plantation of trees in the wrong direction in and around house may block the sunlight, positive rays and energy; they can damage the foundation of walls. Thus, the plantation of trees in correct direction in accordance with scientific visionary of vastu, harnesses positive energies and vibrations within homes which leads to an atmosphere and environment of absolute harmony, peace, good health and success.

Plants for Paper

Paper gets its name from *Papyrus*, a reed that the Ancient Egyptians used for making a writing material. Paper as we know it was invented in China more than 2,000 years ago. The material used was probably the bark of the paper mulberry tree. In ancient India, palm leaf manuscripts were used for writing. Today, wood is the major source of paper making fibres. Fibres of bamboo (*Dendrocalamus strictus*), Cotton (*Gossypium arboretum*), Esparto grass, Hemp, Jute, Sugarcane, wheat and Rice straws and various woods can be used for making paper. Paper made from *Daphne papyracea* is used for genealogical records and deeds. Many early books have been written on leaf blades of *Corypha umbraculifera* and papyry bark of *Betula utilis*.

Wood

Wood is soft and can be sawn, chopped or crafted into different shapes. It has hence been adopted in a number of ways to help man in his pursuit of progress. It has been found that much ingenuity in design, choice of timber or other materials and in art of making and decorating these articles in huts or houses of the tribals. Woods from large number of trees species are used for construction of buildings, boats and vehicles; making tool handles, axles, shafts, pounders, mortars, wheels, carts, ploughs, yokes, sugar and oil crushers, musical instruments, toys, furniture and artifacts. Some commonly used trees are Teak (*Tectona grandis*), Rose wood (*Dalbergia sissoo* and *Dalbergia latifolia*), Cedar (*Cedrus deodara*), Sal (*Shorea robusta*), Bamboo (*Dendrocalamus strictus* and *Bambusa arundinacea*), Nim (*Azadirachta indica*), Aam (*Mangifera indica*), Siris (*Albizia procera*, *Albizia chinensis* and *Albizia odoratissima*), *Euphoria longan*, *Duabanga grandiflora*, etc.

Miscellaneous Uses

Besides the above, numerous minor/miscellaneous uses of thousands of the plant species are encountered, such as *Helicteres isora* used for fire production by friction; stem of *Aeschynomene aspera* and *Aeschynomene indica* used for fishing floats and various decorative items for marriage ceremonies; several plants used for making bows for hunting; seeds of *Adansonia digitata* used to smooth earthenwares before firing and leaves of *Adhatoda zeylanica* used to wash and paint unglazed pottery before firing to give it a black colour; crushed fruits of *Xeromphis spinosa* are mixed with stored grain to protect it from insects and leaves of *Trigonella foenum-graecum*, *Azadirachta indica* and pieces of root of *Saussurea lappa* are put with clothes to protect them from insects; seeds of *Canna indica*, *Elaeocarpus sphaericus*, *Adenanthera pavonia*, *Caryota urens*, *Coix lachryma-jobi*, *Drypetes roxburghii*, *Abrus precatorious* are used as beads in necklaces; wood of *Buxus wallichiana*, *Carissa carandas*, *Morinda citrifolia*, *Premna tomentosa*, *Xeromphis spinosa* and *Xeromphis uliginosa* are used for the manufacture of combs; powdered seeds of *Annona squamosa*, *Annona reticulate* and *Annona muricata* with gram flour are used to kill lice; to wash hair the dried fruit-rind of *Sapindus mukorossi* in combination with fruits of *Emblics officinalis* and *Acacia concinna* are used; wood ash obtained from burning *Avicennia officinalis*, *Haloxylon recurvum* and soda ash of *Salsola maritime* is used as detergent for washing clothes; woolen clothes are washed with powdered roots of *Dioscorea deltoidea* and dried fruit-rind of *Sapindus mukorossi*; seeds of *Strychnos potatorum* are used to clean water; to increase the milk and to meet the nutritive fodder to the domestic animals large number of grass species and other plant species are used by rural and tribal people.

DISCUSSION AND CONCLUSION

It appears from recent literature that there are certain aspects of ethno-botanical research that have not received attention as it they should have required. During present time, most of the ethno-botanical studies have largely been pursued for academic point of view rather than from utilitarian viewpoint. Presently, the major focus of ethno-botanical study has involved the identification and inventorisation of plants used by tribal and rural people. These have been concerned mainly with the cataloguing the plants used by Indigenous people. If the present and future attempts continue in the same direction then the recording of the useful plants would remain preserved in scientific literature rather than their wider use. The chief objective of ethno-botanical research would never be realized. If these trends continue some one, ask, "What worth is ethno-botanical research". It is all the more important now that the purely academic research should be channalized to meet the growing requirements and developmental projects for the betterment of the society (Jain, 1979; Maheshwari, 1983, 1996). The ethno-botanical research is privileged to meet this requirement and its channalization into applied aspects is must now.

Finding that the informations on utility of plants have not been recorded, as they must be, what worth would be the information of names and uses of the plants to future generation if they did not know how to prepare the useful product? With all the efforts being directed today by the Government towards the socioeconomic development of the tribal, it is most likely that the methods of preparation of useful products and techniques for many articles from wild plant life would eventually be lost to posterity. Besides, recording the useful plants along with their uses from academic, economic and conservational viewpoint, it is equally important that the process of the preparations of the useful products from the wild plant along with combinations and proportions of other plants must also be recorded. Howsoever, crude the tribal methods of preparation for the useful products they may have distinct advantages and they could be sophisticated and improved up on with the present day technical know-how.

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