RESEARCH ARTICLE

COLLECTION OF MEDICINAL PLANTS IN TRADITIONAL AND MODERN PERSPECTIVE

Vinay M. Raole*[1] and Vaidehi V. Raole[2]

[1]*Department of Botany, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India*
[2]*Department of Sharir Kriya, Parul Institute of Ayurveda, Parul University, Limda, Waghodia Vadodara*
Email: vinaysar@rediffmail.com; vraole3@gmail.com

Received-04.04.2020, Revised-25.04.2020

Abstract: In the recent past surveys of medicinal plants and plant products all over the globe is increased. Use of medicinal plants and its products is going on since the beginning of human civilization. Traditional knowledge is very important for sustainability of natural wealth including medicinal plants. Medicinal plants form the major natural resources base of the Indian indigenous health care tradition. Conservation of these plants can be learnt from specific local knowledge and transmission of facts, skills and strategies, concern for well-being of future generations. Due to global popularity of Ayurveda there is enhanced demand of herbal drugs which is exerting enormous pressure on natural assets. Healing plants form the major natural resources base of the Indian indigenous health care system. In the medicinal plants, the secondary metabolites or active principle are made available through biosynthetic pathway and proper harvesting techniques. The science behind ancient Ayurvedic harvesting techniques was narrated in various earlier treaties and commentaries. To achieve good therapeutic result it is mandatory to collect the drug plants in a modern collection procedure and is also proven by modern scientific methods. In Ayurvedic literature, drug collection has been mentioned according to different parts of the plant in respective seasons and basis of therapeutic uses. According to modern botanical and pharmaceutical science, drugs possess highest prospects during its collection period. The soil condition, climatic factors, temperature, rain fall, duration of light exposure, altitude, collection from wild area, and methods of collection, processing and storage have impact on the secondary metabolites of the plant ultimately which affect the therapeutic efficiency of the drug. General guidelines for drug plants, plant parts as per botanical field collection, safety issues and recommendations for collection practices, and future scope of procedure has been given.

Keywords: Ayurvedic, Medicinal plants, Modern, Traditional

INTRODUCTION

Man since time immortal, has constantly struggled to achieve mastery over the very many forces of the nature, and plants has all the time helped us to reach the goal. Nature provided man with all the basic requirements for his existence which is one of the reasons why nature was respected in the form of mother. The early civilizations have always valued nature and nature worship was common in those times. After coming in contact with plants, people began to realize their significance and how they could be of great benefit to them. There are also some evidences relating to nature worship in the Indian subcontinent around 3000 BC as well as admiration for nature as a source of medicine. Conventional therapeutic systems of India employ large numbers of plant species viz., Ayurveda (2000 spp.), Siddha (1121 spp.), Unani (751 spp.) and Tibetan (337 spp.) (Anonymous, 2004 a, b). Aforesaid long-established medical systems are generally based on the exploitation of available natural and local products which are commonly related to the people's perspective on the world and life (Toledo et al., 2009).

India as a nation has different traditional culture, distributed throughout, and follows different custom and systems of medicine. It also harbours a rich variety of floral and faunal diversity. The peninsular region is well known for rich Ethnobotanical wealth in traditional knowledge particularly medicinal plants since ancient time. Furthermore, it might have started with ancient myths, lores and beliefs in addition to other occult practices and developed into folk medicine which advanced into herbal medicinal practices viz. Ayurveda and siddha etc. Ancient Unani manuscripts, Egyptian papyrus and Chinese writings have also described the use of herbs in their medicinal texts. After prolonged time, these traditional systems of green medicine are coming back to centre stage of our health care and hygiene (Balasubramanian, 2000). Moreover, demand for these medicines and systems have started gaining the respectability among the scientific society all over the globe despite the development of synthetic drugs, and demand for plant based medicines is growing. The main rationale for this growing drift is increasing public concerns about the adverse effects of synthetic medicines. Traditional medicine and Ethnobotany are two important subjects that should be noted to achieve effective herbal medicines with considerable therapeutic effects. Conventional medicine is based on experience of citizens over centuries and ethno-botany is based on recognition of the indigenous plants prevailing in the vicinity of the human habitat. Natural products have been the backbone of traditional system of healing

*Corresponding Author

throughout the globe, and have also been an integral part of history and culture ((Shankar *et al*., 2000).

Ayurveda is more than the experience with the nature as it is nothing but the knowledge of life. Ayurveda (drug school) a supplement of Atharvaveda (charm school) which we can notice an admixture of drug school and charm school is used in concept of drug. And, the drug concept in Ayurveda is totally different from modern school of medicine. As modern medicine heavily based on principles of physical sciences only, while Ayurveda includes physical, living and conscious phenomenon also. The term drug is derived from the French word 'drogue' i.e. dry/dried herb. It is defined as 'any substance or product used to modify and/or explore the physiological systems or pathological states for the benefit of the recipient'. In terms of Ayurveda drug is a *'bhesaja'* or *'aushadha'* which will overcome the disease or fear of disease. Although, in Ayurveda 3 types of drugs *Audbhida*, *Jangama* and *Parthiva* derived from plants, animals and minerals includes salts respectively (Sinha, 1984; Majumdar, 1989).

The link between available phytodiversity and medicine was appreciated early in India. Caraka Samhita, mentions that the remedies for the diseases prevalent in a given region can be found in the herbs growing naturally in that region. Folk medicines are widely practiced for primary healthcare, underlying factors such as economy, education, religion, culture, and environment. The local society and herbalist primarily use different Barks, Roots, Rhizomes, Leaves, Flowers, Fruits, Seeds, Herbs or other common items available in and around their homestead, collected from their vicinity and even from remote hills/forests, as well as grown through cultivation (Sivarajan and Balalchandran, 1999). In some cases, they also perform rituals based on faiths, and recite holy verses (mantras). Three factors which legitimize the role of the folk healers include: their own beliefs, the beliefs of the community and the success of their actions. Nearly half of rural community members present in this universe have superstitions and strong beliefs on herbs and approximately 15%- 25% treats simple ailments with herbs. They mostly use different plant as a whole in diverse forms and simple extracts or polyherbal formulation for different diseases for cure. These systems are still in place today because of their organizational strengths, and they focus primarily on multicomponent mixtures (Bannerman et al, 1983).

India, seventh largest country of the world covering total area of 32,87,263 square Kilometers, ranks 6 among the 12 mega biodiversity centres of the world and home for 4 main hotspots. The Indian homeland is divided into 10 bio-geographical zones and 25 provinces and also has 15 agroclimatic zones and 17,000–18,000 species of flowering plants of which 6000–7000 are estimated to have medicinal usage in folk and documented systems of medicines. Our nation has a wide range of medical experiences due to historical precedent and diversity of race, religion, ethnicity, language, and climate. The herbal medicines are considered to be of great importance especially, for tribal populations and residents settled in the treacherous part of the land. On the other hand, climatic and environmental variability between regions leads to growth of different types of plant species rather large diversity. In recent years owing to habitat destruction and indefensible harvesting of natural phyto-resources including medicinal plants pose a serious threat not only to biodiversity but, even to native medicinal resources in India because of progressively loss of forest cover in every region (Mukherjee *et al.* 2013)

METHODOLOGY

Ayurveda classical texts and their commentaries, various available compendia and translations, lexicons, literature on collection and cultivation methods as well as on modern plant inventory methods have been referred. Some of the harvesting practices and research publications related to documentation and inventorization of forest wealth for research data also taken into account. Main emphasis has been about these collection techniques and its utility for collecting medicinal plants are considered while compiling the information (Anonymous 1948-1976; Anonymous 2005).

Plant Diversity and Ayurvedic Medicinal Plant Collection

Plants are used as a medicines in the treatment of various diseases in civilised society since times gone by. Most of the medicinal plant species used in trade is always carrying on to be sourced from natural forest and most of these are harvested by destructive means leading to rapidly decreasing in the vicinity. Ongoing dilapidation of ecosystem through ruthless exploitation of natural resources and inconsistent collection practices, collection of the drug plants with high therapeutic activity is declining. This is quite true with respect to medicinal plants whose roots are collected and used for very many herbal formulations. The naturally synthesised phytocompounds are having better patient tolerance and acceptance. Approximately 30,000-70,000 plant species all around the globe have been screened for their medicinal properties and used by aboriginals. Plants have provided us with some of our most effective drugs, including aspirin, made from willow bark. Moreover, at least 7,000 medical compounds in the modern pharmacopoeia are derived from plants. And, these plants in particular those with ethno pharmacological uses have been the major starting place of medicine in the early drug discovery. Fabricant and Farnsworth, (2001) reported that, 80%

of 122 plant derived drugs were related to their original ethno pharmacological purposes used by indigenous people. Current drug discovery from plants mainly relied on bioactivity guided principle as well as fractionation and led to isolation of many important anticancer drugs. Nearly two thirds of traditional medicinal plants are as effective as medical drugs but it is still difficult to get proper sound advice due to variability of quality of these drugs as an individual or in polyherbal formulations. Medical pluralism has led to an intrinsic feature of its medical system in historical and contemporary contexts.

Acharya Charaka described the technical excellence in the field of medicinal plants pharmacognostical, pharmaceutical and therapeutic sciences as "Tasyapium pariksha idam evam Prakruti" etc. Here "evam rutu" the season for collection of drug plays an important role in the field of drug research. Shankar et al., (2000) explained about both siddha and unani systems were enriched by and in turn contributed to the enrichment of Ayurveda. While the Vedic texts written between c. 1500-1000 B.C. list only 289 medicinal plants, this number increased to around 650 in Caraka and Susruta Samhitas composed around 500 A.D., and further to about 1800 in various „Nighantus" (ayurveda texts) that were compiled between 500 and 1900 A.D. (Shankar *et al.,* 2000). In Ayurvedic classics, *Charak samhita, sushrut samhita, bhavaprakasha, Raj nighantu* etc. drug collection has been described in four major steps i.e. ((Table 1 & 2)

Bhumi pariksha (Selection of land), Medicinal plant materials should be collected from the appropriate place, and during the appropriate season or time period to ensure the best possible quality of both source materials and finished products. The soil which is unctuous, smooth, blackish-white or reddish in colour, nearer to water sources ,tight(non fragile), devoid of big stones, ditch, excessive water, gravels, sand particles, valmika (ant hills) is recommended best for finding best quality medicinal herb as a whole and for the collection of raw materials in the part of medicinal shrubs or trees.

Therefore, one should have the basic knowledge of the soil types from which drug plant is going to be collected. This soil texture is also based on the availability of water at that particular region. Three main types of soil classes have been given; Jangal desha, Aanoop desha and Sadharan desha repectively. Over and above, on the basis of five fundmental elements (Panchmahabhootas) soil is further sub divided into *parthiv, jaliya, aagneya, vayaneeya and aakashiya.* Furthermore, on the basis of other characters it is termed as prashasta and aprahsasta bhoomi i e. Nonpolluted and polluted soil. (Table 3)

Sangrahaniya dravyas (Selection of drug), It is well known that the quantitative concentration of biologically active constituent's i.e. veerya of a drug, varies with the stage of plant growth, its stage of development and place of its occurrence this includes *sheetveerdravya* and *ushanveerdravya* which varies according to phytoconstituetns. The best time for collection should be determined according to the quality and quantity of biologically active constituents rather than the total vegetative yield of the targeted medicinal plant parts. For herbs we should look into some of the following characteristics (Charak and Sushruta samhita).

- It should not be affected by smoke, rain, air or water.
- It should be collected in respective seasons, from prasastabhumi which should be free from pests, poisonous weapon, severe sunlight, high breeze, fire, excessive moisture and any kind of disease.
- It should not be collected from road sides, should be well developed and deeply rooted in the soil, must have a single predominant taste in it with its natural odor, color and taste.
- It should be new and must be used within one year of its collection from field and must be collected from eastern and northern side for therapeutic utility.

Sangrahaniya Vidhi (Method of collection) to procure best qualities of drug the proper place of collection, part, method and time for collection are most important. Charaka prescribes certain instructions regarding mode of collection. They include performance of auspicious rituals and practices, taking of sacred bath to become mentally and physically clean, wearing sacred dress, worshipping of gods including Ashwinikumar's and the sacred cow, performance of religious fast overnight etc. In addition to the collector should collect the raw material plant or plant part mainly from east or north direction according to part-used, season of collection and its potency, in a specific manner.

Sangrahaniya Kala (Time for collection). Sangrahakala of various medicinal plants and plant organs in different seasons give you an idea about a systematic scientific reason of transportation of synthesised secondary metabolites from one part to another part of the plant to live fit in that particular ecological condition. While, collecting the medicinal plants in nature certain factors such as Guna, Desha, Kala, Pakva-apakva avastha, Navpurana avastha, Prayojyanga, Karma and Disha should also be given importance.

Table 1. Season and collection period According to 3 main Ayurveda samhitas

Part used	**Season**		
	Charaka	**Sushruta**	**Raj nighantu**
Whole plant	-	-	Late autumn
Roots	Summers and winter	Summer and monsoon	Late winter
Tubers and rhizomes		-	Early winter
Branches and Leaves Tender Leaves	Autumn and spring	Monsoon and early Winter	Late winter late summer
Stem bark and latex	Autumn and winter	Late autumn and early Winter	-
Heart wood and sap wood	Early winter	Spring	-
Flowers and inflorescence	According to season	-	Spring
Fruits and seeds (mature)	According to season	Summer	-

Modern Collection Technique

On the subject of huge diversity and distribution of medicinal plants in India, botanical research and collection of data obtained from other researches can provides a good recognition of this great treasure for us and future generation. Botanical studies of a neighbouring region not only are of an educational value, but they are also the source of information for students on diversity of nature and a necessity for protection of the province they reside in. Going outdoors, visiting nearby and farther surroundings, pupils together with their teachers, can observe the morphological properties record and collect plants including medicinal plants. It gives an input for analyzing and describing plant species present in the community and vegetation of the nearby region which always forms basic source of number of medicinal plants.

Table 2. Collection schedule of medicinal plant and plant parts according to Rutus (Seasons)

Part used	**Rutus (Season)**		
	Charaka	**Sushruta**	**Raj nighantu**
Whole plant	-	-	Sharad
Roots	Grishama, Shishira	-	Shishira
Tubers and rhizomes	Sharad	-	Hemant
Branches	Varsha, vasant	-	-
Leaves	Varsha, vasant	Varsha	Shishira
Tender Leaves	Varsha, vasant		Grishama,
Stem bark	Sharad	Sharad	-
Latex	Sharad	Hemant	-
Heart wood and sap wood	Hemant	Vansnat	-
Flowers and inflorescence	As per rutu	-	Vasant
Fruits	As per rutu		
Seeds	-	-	-

Table 3. Collection of medicinal plant and vegetation based on traditional soil types

Mahabhuta (Elemental composition)	Soil nature	Colour	Vegetation
Prithvi	Pebbly	Dark blue or black	Rich vegetation
Jala	Unctous, cool	White	Grass
Agni	Stony	Multicolour	Small sized tree
Vayu	Rough	Grey	Small trees
Akash	Soft	No colour	Trees of no value

In order to gain proper knowledge of medicinal plants we should have the information on the flora and the vegetation of a particular or certain region. It is necessary to carry both, field and laboratory studies. Field studies encompass, first of all, listing/registering and collecting of the plant material, as well as, identification and description of plant communities that are made of that plant material. The collected material is prepared in laboratories for preservation and a further utilization for stereoscopic and microscopic analyses if any for proper identification. The field investigations can also include different microclimatic measurements (solar radiation, solar light, air and soil temperatures, air humidity, evaporation, etc.) that provide data on a habitat conditions under which living creatures live i e. abiotic and biotic factors prevailing in the area. By and large, considerable importance is given for the season during collection of different parts of economical plants as it governs not only the total quantity of active constituents produced but also the relative proportions of the components of the active mixture.

Presently plant collections methods always suggest looking for the morphologically best specimen from that particular habitat and ecological niche. Mostly we have to select vigorous, typical specimens for identification and after confirmation of particular medicinal species we can go for bulk collection. By and large, non destructive system of the plant collection should be employed. Specimens should be representative of the population, but should include the range of morpho-variation of the plant species. Dioecious plant species should be represented by both sexes in the collection. Roots, bulbs, and other underground parts should be carefully dug up, and the soil removed with care if it is useful for proper identification such as Cyperaceae and Araceae members. In collecting large herbs, shrubs and trees, different types of foliage, flowers and fruits should be collected from the same plant. Collect sufficient material to prepare the herbarium sheet and still leave enough room for the labelling and field notes. This will be useful for authentification of the plant species and will require during the use as well as research purpose. Moreover, if we are going to collect the whole population then avoid insect or pathogen damaged plants and plant parts of pharmacological interest. These will vary widely from species to species and the area from which we are going to collect the raw material according to necessity. While, collecting whole plant we have to follow above procedure. Leafy drug plants which are discoloured or attacked by insects or strike must be rejected as it has the main quality of the medicinally important phytochemicals. At the same time, we have to keep away the leaves covered with rain or dew drops (Annonymous, 2005).

Season of collection: The season and time at which each drug is collected is usually a matter of consideration, since the amount and sometimes nature of active constituents varies throughout the year. There is increasing evidence that composition of number of secondary plant metabolites varies appreciably throughout day and night. e.g., Rhubarb (*Rheum emodi*) has maximum Anthraquinone in summer season which is an active constituent of this plant while same constituent is minimum or absent if one collect the drug in winter. Likewise, the amount of glycoside present in the leaves of *Digitalis purpurea* remains at its highest level only in the day time, it breaks down in the night. So, the leaves of *Digitalis* should be collected in the day time and rhubarb should be collected in summer for desired action.

Collection period: The best period for collection of herbaceous species is during September -November, but in August-October in the area above 3000m., as, snowfall starts from November. In evergreen forest the best period for collection of trees and shrubs is March-May, as most of the species are in flowering condition during this period, while in deciduous forest the collection should be avoided in winter season because falling of leaves is common during this season.

Stage of plant: It is also observed that the quality and quantity of chemical constituents varies according to stage/growth of plant. Therefore, it is very essential to know the optimum stage of the plant parts/plant for collection of right material for getting best therapeutic effects. It is generally suggested to collect the leaves just before flowering, flowers when fully opened, and rhizome and root when aerial parts are matured.

Herbage: The aerial or top parts of the plant are collected with flower or fruit bearing stem. In case of herbage, seasonal studies must be conducted to pinpoint the period when optimum active principles are present in the plant. The care should be taken during the collection that the mature branches of the stem must be harvested and never remove all the branches of the plant. Care should be taken to exclude vegetable debris as far as possible.

Roots: Roots of annuals are usually not collected but in case where the whole plant is used, the roots of an annual plant along with aerial part of the plant are collected. At the same time, while collecting roots of trees and bushes, the main roots should not be cut or dug up, and moreover, severing the tap root of trees and bushes should be avoided. Only some of the lateral roots should be located and collected. The biennials and perennials are generally collected in autumn of the first year growth or in spring before the beginning of the second year growth. This is because the roots are storage organ for the plant and accumulate active principles during the summer. However, there are some exceptions also viz. the root of *Withania somnifera* are normally collected when the plants are 6-8 months old. Likewise the roots of *Saussurea lappa, Innula racemosa, Glycirrhizia glabra* should be collected when the plants are of 3-5

years old. Moreover, seasonal variation is recorded in overall various active biomolecules content, as well as variation among different phytochemicals present their in. This is an exceedingly valuable finding if roots are being grown for individual compounds or if manufactured products are harvested at different times and standardized to a specific compound that varies from month to month, week to week, or even day to day.

Stem and bark: It is collected either in spring when the trees and shrubs begin to bud or in autumn after they have shed their leaves. This is the time of year when the flow of sap is at its maximum and bark radially detach from the wood. However, the collection time of every individual plant or part of the plant differs depending upon the climate and altitude. The bark should be collected from the branches instead of main trunk and do not peel whole bark of the plant. It is also important to strip the bark longitudinally and not all over the circumference to the trunk/ branches. Bark and wood samples are often desirable additions when collecting woody plants. There are special requirements for the identification of some plants; e.g. *Eucalyptus* specimen, should must include mature leaves, juvenile leaves, buds, fruits, and bark wherever possible.

When collecting species whose bark is the main material to be used, the tree should not be girdled or completely stripped of its bark, it will result into death of that plant. So longitudinal strips of stem bark along one side of the tree should be cut and collected. Bark is usually collected after a period of damp weather. Collection of gums, gum resins etc. should be made in dry weather.

Leaves: They are collected throughout the whole growing period. The leaves show that loss on drying is minimum when they are fully grown. When majority of leaves dries up and new leaves are coming. Young leaves, however, contain highest quality of active principle, but they must be free from diseases, insect etc. This indicates that new leaves have more tendencies to absorb more moisture helping in proper storage of the drug. Leaves, flowers and fruits should not be collected when covered with dew or rain. Care should be taken to exclude vegetable debris as far as possible.

Tubers/bulb: These should be collected during flowering period because this aid in identification of the species. It is notable that the deep digging is avoided during the collection of underground parts. Underground parts must be freed from soil to minimise the microbial contamination.

Flower: Flowers or whole inflorescences are gathered at the start of the flowering period and leave some floral parts on the plants to facilitate natural regeneration.

Fruits and the seeds: Fruits and the seeds are collected when they are fully matured. In the case of cultivated crops which are harvested by machine, this is done just before they are fully ripe so that fruits do not crumble or the seeds fallout in the field.

Medicinal Property of the Plants

The beneficial medicinal effects of plant materials typically result from the combinations of secondary products present in the plant. That the medicinal actions of plants are unique to particular plant species or groups is consistent with this concept as the combinations of secondary products in a particular plant are often taxonomically distinct (Wink, 1999). These secondary products defined as biochemicals which do not have any vital biochemical role in maintaining plant cells. But, these chemicals play an important role in ecophysiology of plants such as defensive role against herbivory, pathogen attack, and inter-plant competition. In addition they play attractant role toward beneficial organisms such as pollinators or symbionts (Kaufman et al., 1999; Wink and Schimmer, 1999). Plant secondary products also have protective actions in relation to abiotic stresses exerted on the plants. Secondary metabolites involved in plant defense toward microbial pathogens proved useful as antimicrobial medicines in humans. Likewise, defence against herbivores through neurotoxin activity may have beneficial effects in humans through their action on the central nervous system. To promote the ecological survival of plants, secondary products can be affecting the physiological functions in competing microorganisms, plants, and animals (Wink and Schimmer, 1999). Over and above, some plant metabolites may have beneficial medicinal effects on humans due to similarities in their potential target sites (e.g. central nervous system, endocrine system, etc.) (Kaufman *et al*., 1999). Many phytomedicines exert their beneficial effects through the additive or synergistic action of several chemical compounds acting at single or multiple target sites associated with a physiological process (Briskin, 2000).

Secondary metabolites also contribute to the specific odours, tastes and colours in plants (Bennett and Wallsgrove, 1994). Plant secondary metabolites are only one of its kind as a source for number of food additives, flavors, pharmaceuticals and industrially important pharmaceuticals (Ravishankar and Venkataraman, 1990; Ravishankar and Rao, 2002). Chemicals include calcium, abscisic acid (ABA), salicylic acid (SA), polyamines and Jasmonates (JA), nitric oxide are involved in stress responses in plants (Tuteja and Sopory, 2008). Accumulation of metabolites often occurs in plants subjected to stresses including various elicitors or signal molecules. Secondary metabolites have significant practical applications in medicinal, nutritive and cosmetic purposes, besides, importance in plant stress physiology for adaptation.The production of these compounds is often low (less than 1% dry weight) and depends greatly on the physiological and developmental stage of the plant. Some of the plant derived natural products include drugs such as

morphine, codeine, cocaine, quinine etc. *Catharanthus* alkaloids, *Belladonna* alkaloids, colchicines, phytostigminine, pilocarpine, reserpine and steroids like diosgenin, digoxin and digitoxin, flavonoids, phenolics etc. (Rao and Ravishankar, 2002).

General guidelines for collection

In the course of collection, efforts should be made to remove parts of the selected plants that are not required. In addition to above, foreign material in any form natural or artificial such as particular toxic weeds or the anthropogenic waste also should be taken away. Decomposed and decayed medicinal plant parts as a raw material should be discarded. Medicinal plants should not be collected in or around areas of heavily pollution. Local sites having high levels of pesticides, herbicides, insecticides, chemical fertilizer or other possible contaminants are always neglected. Even, road sides, drainage, ditches, mines tailing, garbage dumps and industrial surroundings which may produce toxic emissions should not be considered. In addition, the collection of medicinal plants in and around active pastures, including riverbanks downstream from pastures, should be avoided in order to avoid microbial contamination from any type of waste as it has the capacity to have numerous microorganisms. In general, the collected medicinal plant and raw materials of any plant part should not come into direct contact with the soil. If underground parts are used, any adhering soil should always be removed from the plants and plant part as soon as they are collected. Collected material must be placed in clean containers, basket, mesh bags, other well aerated containers or drape clothes that are free from any foreign matter, including plant remnants from previous collecting activities. This concern is of extreme importance to present day society that has been over exploiting the drugs for commercial gains without much reciprocal social gains as a result many commonly used medicinal plants are on the verge of extinction (Annonymus, 2005).

Safety issues and recommendations

Lack of side effects of herbals does not mean taking a conventional medicine without any expert's recommendations. With traditional medicine, there is always risk of counterfeits or adulterations or admixture of unwanted material. And, while their effectiveness varies from place, method and season of collection of plant material and also person to person. Such traditional medicinal systems are often the last resort for people, especially when the western medical treatments fail them to cure. Definitely we get energized with a number of active herbal ingredients posing on the package but a little but relevant question rise how all these ingredients are altogether found at a time as plant constituents varies in different seasons. Moreover, some plants should not be found anytime and every time. And if we are convinced with the fact that they collected and stored for selling year-round, where's the guaranty that they were stored in a prescribed manner after following standard operating procedure for plant collection. Rapidly increasing of local healer's or quack shops clearly visible with their unusual claim of complete recovery from any complications. A growing number of people are looking for guidance on the Internet while others believe dishonest ads. It is strictly recommended that plant drugs are miraculous, better avoid plant drugs only as food supplements, they can't be always safe as they are natural and taking expert's advice before use.

Conclusion and future scope

Thus, on the one hand, habitat destruction and unsustainable harvesting of medicinal plants pose a serious threat to biodiversity, as well as the native medicinal resources in India, where many states and regions are progressively losing their forest cover (FSI, 1999). Therefore, collection of these resourceful plants in most appropriate manner is essential. Vedic, Ayurvedic literature on medicinal plants has furthermore described the collection practices in well documented manner and its utility is also corroborated by modern chemical tools. Therapeutic efficiency is presumed to depend on the quality and quantity of the secondary metabolites which are major active principles. The quantity and quality are influenced by the method of collection. For our ancient Ayurvedacharya's medicinal plants were not just resources for exploitation of natural resources for man's need/greed. They were the auspicious fellow inhabitants of the sacred planet 'Mother Earth' which is being exploited only to protect and promote the health of living being during the time of natural or life style problems. In fact they believed that the drug will be blessed with optimum medicinal value if and only if their purpose is genuine and proper collection of the plants or plant parts with due respect in a proper season.

This communication highlights the importance of collection practices to achieve desired beneficial effect, as herbs without good effectiveness become useless to physician as well as pharmaceuticals industries. Traditional plants have vast opportunities to explore and conducting extensive research is necessary for their rational use. In order to expedite medicinal plant breeding and transform them into living factories of medicinal compounds proper collection of important medicinal plants is essential. And, even use of the emerging high-end modern technologies can be expanded to traditional medicinal plants to understand and extract newer phyto-molecules for very many health problems of the human being.

REFERENCES

Anonymous (1948-1976). *Pharmacognosy of Ayurvedic drugs*. Trivandrum Vol. 1 and 2.

Anonymous (1948-1976). *Wealth of India*, New Delhi.

Anonymous (2005). How to Collect Plants. Royal Botanic Gardens, Sydney.

Ashtanga Hrudya of Vagbhata (2018). Choukhmbha Surbharati Prakashana.

Balasubramanian, A.V. (2000). The relevance of a vibrant tradition. In: Indian Health Traditions, pp. 6-8. The Hindu, October, Chennai, India.

Bannerman, R.H.O., Burton, J. and Chen, W.C. (1983). Traditional Medicine and Health Care Coverage: A Reader for Health Administrators and Practitioners. Geneva: World Health Organization.

Bennett, R.N. and Wallsgrove, R.M. (1994). Secondary metabolites in plant defence mechanisms. New Phytol. 127:617-33.

Bhavaprakash Nighantu Commentary by Dr. Krushnachand Chunekar, Oriental Publishers and Distributors, Varanasi.

Charaka, Samhita (1981). PV Sharma Translator, Chaukhamba Orientalia, Varanasi, India.

Chopra, A. and Doiphode, V.V. (2002). Ayurvedic medicine: core concept, therapeutic principles, and current relevance. Med Clin North Am. 86:75-89.

Fabricant, D.S. and Farnsworth, N.R. (2001). The Value of Plants Used in Traditional Medicine for Drug Discovery. Envir. Health Perspectives, 109, 1. 69-75.

Forest Survey of India (FSI). (1999). State of Forest Report 1999. Forest Survey of India (Ministry of Environment and Forests), Dehra Dun, India.

Hankey, A. (2001). Ayurvedic physiology and etiology: Ayurvedo Amritanaam. The doshas and their functioning in terms of contemporary biology and physical chemistry. J Altern Complement Med. 7:567-574.

Karnick, C.R. (1977). Effects of phases of moon on the growth and active principles of *Acorus calamus* (Bach.) Nagarjun journal.

Kaufman, P.B., Cseke, L.J., Warber, S., Duke, J.A. and Brielmann, H.L. (1999). Natural Products from Plants. CRC Press, Boca Raton, FL.

Madhava, Nidanam (1993). Shri Kanta Murthy translator, Chaukhamba Orientalia, Varanasi, India, *Bhava Prakasha* 1998, Shri Kanta Murthy translator, Chaukhamba Orientalia, Varanasi, India.

Majumdar, A.K. (1989). Ayurveda and modern medicine Anc. Sci. Life 8(3): 117-190.

Mukherjee, P.K., Bahadur, S. and Harwansh, R.K. (2013). Development of traditional medicines: Globalizing local knowledge or localizing global technologies. Pharma, 45(9).

Parasuraman, S., Thing, G.S. and Dhanaraj, S.A. (2014). Polyherbal formulation: concept of Ayurveda. Pharmacogn Rev.;8(16):73-80. Rajnighantu with Dravyagunaprakashika hindi vyakhya by Indradev Tripathi,Choukhamba krushnadas academy,Varanasi.

Rao, S.R. and Ravishankar, G.A. (2002). Plant cell cultures: chemical factories of secondary metabolites. Biotechnol Adv 20:101-53; PMID:14538059; DOI:10.1016/ S0734-9750(02)00007-1.

Ravishankar, G.A. and Rao, S.R. (2000) Biotechnological production of phytopharmaceuticals. J Biochem Mol Biol Biophys 4:73-102.

Ravishankar, G.A. and Venkataraman, L.V. (1990). Food applications of plant cell cultures. Curr Sci 57:381-3.

Reid, W.V. 1993. World Resources Institute, Instituto Nacional de Biodiversidad (Costa Rica), Rainforest Alliance, African Centre for Technology Studies. Biodiversity Prospecting: Using Genetic Resources for Sustainable Development. New York:World Resources Institute.

Sabnis, M. (2006). Chemistry and Pharmacology of Ayurvedic Medicinal Plants. Varanasi, India: Chaukhamba Amarabharativ Prakashan; Sastri H, ed. Ashtanga Hridayam. Varanasi, India: Chaukhambha Orientalia; 2002.

Shankar, D. (1999). Bioresources and biotechnology policy issues: the case of medicinal plants. In: Bioresources and Biotechnology: Policy Concerns for the Asian Region (Ed. Sahai, S.), pp. 45-51. Gene Campaign, New Delhi, India.

Shankar, D., Ved, D.K. and Geetha, U.G. (2000). A green pharmacy. In: Indian Health Traditions, pp. 14-17. The Hindu, October, Chennai, India

Sharangdhara Samhita, Dipika Hindi Vyakhya, by Brahmananda Tripathi, Choukhamba Surbharati prakashana, Vasranasi.

Sharngadhara, Samhita (1984). Shri Kanta Murthy Translator, Chaukhamba Orientalia, Varanasi, India,

Sinha, A.K. (1984). Philosophical presuppositions of Ayurveda and Modern medicine. Anc. Sci. Life 3(3): 123-128.

Sivarajan, V.V. and Balalchandran, I. (1999). Ayurvedic drugs and their plant sources. Oxford & IBH publishing comp. New Delhi.

Sushruta, Samhita (1991). KL Bhishagratna Translator, Chaukhamba Orientalia, Varanasi, India, *Ashtanga Hridaya* 1991 Shri Kanta Murthy Translator, Chaukhamba Orientalia, Varanasi, India.

Toledo, B.A., Galetto, L. and Colantonio, S. (2009). Ethnobotanical knowledge in rural communities of Cordoba (Argentina): the importance of cultural and biogeographical factors. J. Ethnobiol. Ethnomed. 5:40.

Tuteja, N. and Sopory, S.K. (2008). Chemical signaling under abiotic stress environment in plants. Plant Signal Behav; 3:525-36.

Wink, M. and Schimmer, O. (1999). Modes of action of defensive secondary metabolites. In MWink, ed, Functions of Plant Secondary Metabolites and Their Exploitation in Biotechnology. CRC Press, Boca Raton, FL, pp 17–112.