



Review Article

## EXPLORING THE CONCEPTS OF COLLECTION PRACTICES OF BARK - FROM ANCIENT TO MODERN

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### ABSTRACT

Indian indigenous health care tradition plays a vital role in the health sector as it forms the major resource base of the medicinal plants. Precisely, 90% of the plant constituents are yet to be explored while only 10% have been studied. The global popularity of ancient Ayurvedic medicine is creating the persistent increase in demand and supply of Ayurveda medicinal plants. Advantages of these medicinal herbs either in single or many combinations, one part or the whole plant are known in every Indian house hold from the time of our ancestors. Ayurvedic science, the Indian system of medicine is known for the uniqueness of utilising different parts of the medicinal plant such as roots, leaves, flowers, barks etc and even minerals to treat various disorders. Even Ayurveda Acharyas has stressed upon the medicinal values that each part of the plant possess and has described multiple benefits of these drugs. *Dravyaguna* is one among the branches of Ayurvedic science that deals with the studies related to Ayurvedic drugs that includes analytical and physio-chemical studies. In association with the clinical studies, physicochemical and analytical studies are need of the hour to comprehend the beneficial properties of the different parts of the medicinal plants. In this regard, we find many studies but not on the collection of barks. This study is an attempt to explore in depth, the collection practices of barks mentioned in ancient period and modern period.

### INTRODUCTION

Ayurvedic medicine also known as Traditional medicine or Alternative medicine or the Complementary medicine and is gaining popularity worldwide post Covid-19. India is the homeland of this traditional medicine that is being practiced since ages. Traditional medicines of India also include Homeopathy, Siddha, Unani and Yoga apart from Ayurveda. These medicinal systems have its root from ancient *Vedas* and other scriptures. Ayurveda is defined as the “science of life,” as it focuses on the whole of an individual including life and health. Ayurveda is also understood as the “science of

longevity” because it provides a holistic approach for a healthy and a longer lifespan. Apart from this, this ancient science describes about diet and nutrition that rejuvenates the body and also treatment methods and techniques for the management of various disorders. It mainly focuses on prevention of the diseases rather than just cure. According to the statistics 65% of the Indian population uses Ayurvedic system of medicine. [1] Ayurveda is a complete science that believed in using the all the materials available in the *Pancha mahabhutas* to treat the *Panchamahabhuta* components present in the body. This includes materials from different origins such as plants, animal and mineral origin. Plants are one of the most important natural resources of our planet without which we cannot survive. This resource is widely used in various ways by the mankind for various purposes.[2]

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Indian indigenous health care tradition plays a vital role in the health sector as it forms the major resource base of the medicinal plants. Precisely, 90% of the plant constituents are yet to be explored while only 10% are has been studied. The global popularity of ancient Ayurvedic medicine is creating the persistent increase in demand and supply of Ayurveda medicinal plants. Medicinal plants are the treasure of our earth and it depends on how we utilise them. These medicinal plants possess the necessary ingredients and the secondary metabolites or active principles that are studied by an analytical of physio-chemical studies. The quality of these drugs depends upon the method of harvesting and includes various techniques. Conservation of the plant species, management of habitat and ecosystem balance is based on the harvesting method and it plays a very important role in production of the medicinal drugs with best yield and quality. [3]

In *Vedas*, a vast treasure of knowledge is available on the human life and the practices he needs to follow for a healthy and a longer lifespan. With this view, in-depth knowledge of medicinal plants and its collection practices, principles, preservation etc. can also be found. Ayurvedic science is one of the oldest sciences and an *Upaveda* of *Atharva Veda* which mainly describes medicinal plants in detail with its properties and the management of diseases very effectively under the concept of *Dravya Sangrahana* that includes all related to *Dravya* or the drugs.

All *Acharyas* of Ayurveda beginning with *Bruhatrayees* to *Lahutravees* and *Nighantukaras* have given utmost importance to *Dravyas* and hence elaborated it in depth. *Acharya Charaka* has given much importance for the season of collection as the season plays a very important role in augmenting the phytoconstituents present in the drugs and its parts. He also entails the field of pharmacognostical, pharmaceutical, pharmacological and pharmacotherapeutical sciences through the *Pariksha, Prakruti* etc examination methods. [4] Drug collection in Ayurveda include four methods such as *Bhumi Pariksha* (selection of land), *Sangrahaniya Dravyas* (selection of drug), *Sangrahaniya Vidhi* (method of cultivation) and *Sangrahaniya Kala* (time for collection).

In modern pharmaceuticals, we hardly find any sources particular to drug collection, but in Ayurveda, along with the description of these drugs it also has a branch known as *Dravyaguna*, the department that entirely deals with the *Dravyas* its collection, practices, application and also inclusive of many ancient practices that can enhance the properties of the drugs. Ayurveda believes that each part of the plant is very important and possesses potential benefits in it. To

procure best qualities of these drugs and its parts, it requires a systematic examination of the place of collection, part to be used, method and time for collection.

During the procedure of collection of the drugs and its parts, it is very important to keep in mind some of the factors like *Desha, Kala, Disha, Guna, Karma, Pakva-Apakva Avastha, Navpurana Avastha, Prayojyanga* etc. [3] Although, many studies are available regarding the collection practices of medicinal plants but not exclusively on the bark. This study is an attempt to study in depth the collection practices of barks mentioned both in ancient period and modern period.

### An Insight into Bark

In many villages the barks of trees are used widely for medicinal purposes due to their abundant properties. [5] And as a result the use of bark has become the basis of many traditional health care services across the countries. [6] These barks include two sections as outer bark and inner bark and wherein the outer bark is called the rhytidome which is separated from the inner tissues by cork layers, restrict the free passage of pathogens, insects and any other form of destruction. On the other hand, the live tissue called the phloem constitutes the inner bark. [7] The inner bark is also called as the connecting organ between the leaf and root. Bark thickness is shown to increase with organ maturation and bark structure shows axial changes. The combination of functional solutions, developmental constraints, and evolutionary history reflects the enormous differences in bark structure and morphology between the young and the mature barks. [8]

In general, bark tissues weigh between 10 and 20% of woody vascular plants. It consists of lignin, suberin, tannins and polysaccharides etc and up to 40% of the bark tissue is made of lignin, which forms an important part of a plant that provides the structural support by cellulose like polysaccharides. [9]

### MATERIALS AND METHODS

#### Vedic Period

In *Atharva Veda*, the eminent *Vedic* scholars have opined that the plant should be collected in their fully-grown stage if it is used either as food or the medicine. [10] Ayurveda, an *Upaveda* of *Atharva Veda* has a vast description of medicinal plants, its different parts, preparations and its indications for various health disorders and also its collection methods and its usage in depth.

#### Collection Practices

*Ayurveda* gives in detail description of the collection practices of medicinal plants such as place of drug collection (*Dravya Sangraha*), different seasons

and its effects, type of soil and also the rituals to be performed before the collection of the medicinal plants.

### Selection of Place

Ayurveda has described certain guidelines regarding the place of collection and are as follows;

- To collect the plants in a very clean area without any presence of burrows (*Shwabra*), pot shed (*Sharkara*), stones (*Ashma*), uneven (*Vishama*), anthill (*Valmika*), sand dunes (*Sikata*).
- Temples (*Devatayana*) and Places of cremation and slaughtering (*Shmashana*, *Ghaatana*) should be avoided.
- Place should be either dry land forest (*Jangala*) or a land with common characteristics features of dry and marshy land forest (*Sadharana Desha*).
- Plants grown near sacred tomb (*Chaitya*) assembly place of people (*Sabha*).
- Plants should be collected from land that is non-alkaline (*Anushara*), non-fragile (*Bhangura*), with unctuous sprouts of plants (*Paroha*).
- Plants grown on plains (*Sama*), clean (*Shuchi*) and surrounded by water reservoirs (*Pradakshima Udaka*) should be collected.
- Soil being soft (*Mrudu*), stable (*Sthira*), even (*Sama*).
- Plants should have been exposed appropriate seasonal cold, sun, wind, and rain (*Yathaa Kaala Shishira Atapa Pavana Sevita*).
- The land should not have any other big trees in the vicinity over shadowing the medicinal plants, the land that have not been ploughed and also the land having enormous growth of grass like plants. [11]

### Soil

The properties of soil of the medicinal plants to be collected are as follows; the soil should be red colour (*Lohita*), black in colour (*Krishna*) or golden (*Gouri*) in colour and unctuous (*Snigdha*). [11]

### Rituals

This is the most important method before the collection of the drugs. It includes taking bath, wearing white clothes, fasting and keeping sanctity of both body and mind. Then one should offer prayers to God, *Ashwini Devathas*, cows and brahmins. Regarding the *Disha*, one should face either north or south directions quoted in the science. [12,13]

Ayurveda expounds six *Rutus* or the seasons such as *Shishira* (winter), *Vasanta* (spring), *Grishma* (summer), *Varsha* (monsoon), *Sharada* (autumn) and *Hemanta* (early winter). [14] Both *Sushruta* and *Charaka Samhita* has opined that the stem bark of medicinal plants should be collected in *Sharada Ritu* that includes both *Ashwini* and *Kartika Masa* [15,16] as the collection of specific part and *Ritu* (season)

specific collection of plant capitulate gives maximum efficacy and potency (*Veeryavan*) and also will have enhanced phytoconstituents. [17] *Shastras* also refer to the *Sharad Rutu* as the best time for collection of the medicinal plants due to its highest therapeutic potency and maturity. [5]

### Sangraha Kala

Time of the *Kala* is considered as one among the nine *Karana Dravya* and its significance specifically explained and understood as *Kalachakra* in *Sushruta Samhita*. *Dravya* is defined as a substance that possesses *Guna* and *Karma*. *Kala* exhibits properties such as *Samkhyā* (number), *Pruthaktva* (separateness), *Samyoga* (combination), *Parimana* (measurement) and *Vibhaga* (disjunction). It is said as *Amoorta Dravya* or the one that has no shape or form and the *Nityadravya*, which cannot be destroyed. [18]

### Bheshaja Pariksha of Bark

Generally, the safety and quality of the medicinal plants is critically reviewed in the pharmaceutical industry and undergoes the stringent regulations before getting into the market as a product. In Ayurveda, these factors are based on *Desha*, the habitat or the geographical distribution, *Dik* (Direction) and *Kala* or the time factor that can be understood in terms of season, lunar period and day-night cycle etc. *Acharyas* explain that these factors have a significant role in enhancing the phytochemical, pharmacotherapeutic properties and potency of the medicinal plants pharmaco-therapeutically. Regarding the time factor or the *Kala*, all the *Acharyas* have been specified particular time for the collection of different parts of the plants such as root, leaf, bark, latex, heartwood and fruit as early rains, rainy season, autumn, early winter, spring and summer respectively. For the collection of barks, *Sharad Rutu* or the autumn has been indicated in Ayurveda and many scientific studies have been carried out on the same. [19]

### Modern Period

One of the research study quotes that the cambium is very active and due to thin cell wall bark gets easily separated and therefore the barks are collected in spring or early summer. Some cases show that the barks are also collected in other seasons. According to a study, wild cherry bark collected in autumn season showed the maximum percentage of active constituents compared to the *Cinchona* bark collected in rainy season. Botanical research has shown that the temperature dramatically changes the fluidity of the membrane, nucleic acid, protein structures, osmolyte and metabolite concentrations. Heat aid in altering the multiple aspects of cellular physiology and thereby thousands of transcriptional changes are observed in seeds, leaves, roots, and

pollen as plants get reprogrammed by the cellular processes to adapt temperature variations at the molecular level. [3]

It is also observed that the radiation and especially the sun irradiation has allowed to propose the mode of hormonal regulation of bark structure and the combination of anatomical, morphological and developmental factors, bark responses to the environmental factors. Earlier anatomical evidences [20,21] show that long time before, the role of plant hormones in bark differentiation was considered and a strong correlation between the ray structure and ray size with the type of lenticels in the stems of woody dicotyledon species were studied. It was reported that the orientation of lenticels- transverse versus longitudinal was based on the type of rays. [20,21] Woody plants comprised of many unicellular rays and plants with regular short rays had transverse lenticels. According to a study, longitudinal or the axial lenticels are associated with tall rays, aggregate rays that have multiseriate subunits, and with aggregate rays that have uniseriate subunits complete their aggregation within the first three years and ethylene is the hormone suggested to be the main inducer of cork formation. [22]

A strong correlation between ray size, structure and the type of lenticels has been observed and shown that ethylene regulates the differentiation of both structures as ethylene is found to be the inducer of ray formation. [23,24] In a study, the storage season and temperature was influenced by degradation rate of bark extractives and the chemical

composition in which the winter-stored saw log bark retained 22% more hydrophilic extractives than the summer-stored bark after a storage period of 24 weeks. [25]

### Phyto constituents in Bark

Larger scientific evidences on the barks indicates the sumptuous presence of phytochemicals in it. They are endowed with tannins, suberin, lignin along with other phytochemicals such as saponins, terpenes, phenolic acids, glycosides, alkaloids, flavonoids, vitamins, steroids etc. in different concentrations based on the plant species. Like the carbohydrate present in foods, cellulose is the principal carbohydrate present in barks. Flavonoids are some of which have economic importance as known phytochemicals viz., quercetin, taxifolin, anthocyanins and leuco-anthocyanins. Studies on the bark have shown that the phytochemical content present in it helps in prevention of several diseases. [26]

### Age wise development of Bark

Several studies observed that the bark morphology changes with age in which older trees have a balding pattern on their lower bole and some species have great bark pattern variability, which requires careful interpretation when interpreting age from bark. For instance, *Q. alba* (L.) bark ranges from tightly ridged to peeling and flaky bark in young trees and patchy and balding bark to entirely smooth lower boles in older trees. In *Magnolia acuminata* (L.) balding can be an indicator of greater age and oval areas of smooth bark on young trees. [27]

### Plants of Root Bark as useful part

S.No	Drug Name	Useful part	Phytochemical Constituents	Veerya	Indications
1.	<i>Bilva Aegle marmelos</i> Carr.	Root bark	Marmelosin, tannic acids, fatty acids, essential oils, rutin, aegeline, marmesinin	Ushna	Shotahara, Arshogna, Asthapanopaga, Shoolagna, Tridoshagna
2.	<i>Agnimantha Clerodendrum phlomidis</i> Linn.	Root bark	Apigenin, pectolinarigenin, cerolic acid, luteolin	Ushna	Shothahara, Sheetaprashamana, Anuvasanopaya, Agnimandya, Pandu, Arsha
3.	<i>Shyonaka Oroxyllum indicum</i> Vent.	Root bark	Tetuin, oroxindin, baicalein, chrysin	Ushna	Amavata, Atisara, Deepana, Grahi, Kasa, Sannipata jwara
4.	<i>Gambhari Gmelina arborea</i> Roxb	Root bark	Oils, resin, benzoic acid, tartaric acid, tannin, luteolin	Ushna	Shothahara, Dahaprashamana, Virechanopaga
5.	<i>Patala Stereospermum suaveolens</i> DC.	Root bark	Flavone, Glycoside, Scutellarenin, Dinatin	Ushna	Arshas, Hikka, Shwasa, Arochaka, Trushna

**Plants of Stem Bark as useful part**

S. No	Drug Name	Useful part	Phytochemical Constituents	Veerya	Indications
1.	<i>Vata</i>	<i>Ficus Bengalensis</i> Linn	Phytosterols, triterpin, friedelin, beta sitosterol, glucoside, flavonoid, liglic acid	<i>Sheeta</i>	<i>Stambhaka, Shotahara, Meha, Varnya, Visarpa</i>
2.	<i>Udumbara</i>	<i>Ficus glomerata</i> Roxb	Beta sitosterol, lupeol, friedelin	<i>Sheeta</i>	<i>Granthi, Arbuda, Pittagna, Atisara</i>
3.	<i>Ashvattha</i>	<i>Ficus religiosa</i> Linn	n-octacosanol, methyl oleanolate, lanosterol, stigmasterol	<i>Sheeta</i>	<i>Kaphagna, Pittagna</i>
4.	<i>Shirisha</i>	<i>Albezzia Lebeck</i>	Myricitrin, Kempferol, Reyoutrin, Albigenin	<i>Ishad Ushna</i>	<i>Tridosahara, Vishagna, Visarpa, Vranahara, Kasa</i>
5.	<i>Plaksha</i>	<i>Ficus lacor</i> Buch-Ham.	Methylricinolate, lanosterol, caffeic acid	<i>Sheeta</i>	<i>Kaphagna, Pittagna</i>

Since centuries, the utilization of natural raw materials is on practice. Amongst all the raw materials, wood and its bark have shown significant changes because of their special chemical components and unique structure. In Europe the bark or the leaf of *Chondrodendron tomentosum* is used in operations to hinder the smooth muscles and the bark of *Cinchona* was used as the only medicine for malaria. *Aesculus hippocastanum* was used in cases of diarrhoea, haemorrhoids and skin problems. The bark of *Frangula alnus* is used as a laxative and is antifungal and antiviral. The decoction of *Quercus robur* and *Q. petraea* is used to cure inflammations of the mucous membrane and skin. The bark and leaf of the African *Warburgia salutaris* is traditionally used to cure cold symptoms and coughs. [28]

**Right method of Bark Extraction****Bark Harvesting**

According to one of the sources, bark should be collected when the sap is running particularly in spring or autumn after they have shed their leaves. It is said that traditionally, bark is harvested with an axe or bush knife. If a particular species is in high demand and intensively used, the plant can become endangered

by this technique. The most common safe and unsustainable practice is ring barking where entire rings of the bark are removed around the tree, inevitably leading to death of the tree. In order to ensure sustainable harvest of bark material, the following techniques should be practiced such as

- The bark should be collected from mature branches of the trees leaving the main trunk intact.
- Peel the bark from the tree in small pieces leaving most of it intact on the trunk on the East and West side of the tree.
- Remove the bark in long vertical strips using a thin flexible blade or bush knife.
- Do not practice ring barking which is the cut off entire rings around the tree.
- Remove the bark in small sections and leave some inner bark to protect the wood.
- Do not cut the edges of the strip with an axe. [29]

**DISCUSSION**

Standardization of the crude drug and the end product is the objective of every Ayurveda pharmaceuticals. Ayurvedic ancient texts have elucidated in detail the time and place of collection including methodology of the medicinal plants. According to the *Shastras*, all these modus-operandi is for utilizing the maximum potency of the medicine. [27] and regarding the potency of the bark, scholars opine that its potency, corresponding to its action will be high during *Sharad Ritu*. Few studies have also quoted that that the phenolic compounds are said to be maximum during the summer season. [30,31]

Environmental changes are said to be the most important factor responsible for accumulating the compounds at a specific season. [32] This is called as the biological activity which is dependent on the chemical composition of the barks subject to variation depending on the environmental factors.[33] With the phytochemical group of substances like taxons, the

chemical group includes the stage of plant development and specific genotype.<sup>[34]</sup> Genetic responses are observed with climatic and edaphic factors in the formation of secondary metabolites which is due to the variation in the secondary metabolites among plants chemotype.<sup>[35,36]</sup>

Currently good collection practises have been provided by the National Medicinal Plant Board based on different criteria. Regarding the collection and selection of places, National Medicinal Plant Board has explained same as that mentioned in Ayurvedic classics. Medicinal plant should be collected from places that are clean and free from chemicals, toxic gases, sewage, exposure to insects, automobiles etc. Places such as crematoria, hospitals, mining sites, public utilities, anthills, industrial areas, sewage lines, automobile workshops and any other places should be avoided as they contaminate the medicinal plant. Plants grown in industrial areas or should be avoided as these plants may be toxic gases and they should be checked for the usage of pesticides if found, should not be considered for medicine preparation. Plants found around drainage or waste dump should also be avoided because of microbial contamination.<sup>[37]</sup>

Though there are limited studies and the evidence regarding the collection of bark and their importance, there is a need to explore the complete concept of the collection practices mentioned in Vedas and ancient period and make it available to the researchers to extract its medicinal values and to conduct more and more physicochemical studies to extract its chemical constituents and for the application of the same in clinical studies to benefit the mankind.

## CONCLUSION

Different medicinal preparations in the form of *Vatis*, *Kashayas*, *Lepas*, *Phantas* and *Himas* are the specialities of Ayurveda pharmaceutical industries. As these preparations have its own unique properties and indications, even today it is advised to consume in the same form for its maximum benefit. For the manufacturing of these preparations, the whole plant or its leaves, barks or fruits are used. Bark is one of the parts of the plant used in the preparation of *Kashayas* which has shown its high efficacy in the management of wounds and gynaecological disorders and others. To prepare these *Kashayas* to make it more effective, the practices that are elaborated in the Ayurveda *Shastras* are to be advocated. Hence this study focuses on the collection practices followed both in *Vedic* and modern period.

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