

**GOOD FIELD COLLECTION PRACTICES (GFCP) FOR MEDICINAL PLANTS****Dr. Vaishali Shripad Balwande<sup>1\*</sup>, Dr. Shreya Avinash Jankar<sup>2</sup>, Dr. Amruta Jagdish Rajenimbalkar<sup>3</sup>**<sup>1</sup>Assistant Professor, Dravyaguna-vidnyan Department, Government Ayurvedic College, Dharashiv, Maharashtra – 413501.<sup>2</sup>Assistant Professor, Rasashastra evam Bhaishajya Kalpana Department, Government Ayurvedic College, Dharashiv, Maharashtra – 413501.<sup>3</sup>Assistant Professor, Sharir Kriya, Department, Government Ayurvedic College, Dharashiv, Maharashtra – 413501.**\*Corresponding Author: Dr. Vaishali Shripad Balwande**

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**ABSTRACT**

In modern medicine many drugs derived from extract and compounds from the plant. This trend is attributed to a growing awareness of the harmful side effects associated with many modern drugs. So now a day's exponential growth in demand of herbal plant for medicinal purpose as well as for their daily needs. The increasing demand for natural herbal products creates a need not only for conserving medicinal plants in-situ, but also for their cultivation outside the forest areas. Acharya Charaka describes an excellent design of drug research and given much importance for season of collection (Sangrahaniya Kala/Rutu) along with place (Prashastha Bhoomi) and method of collection (Sangrahaniya Vidhi). The plant should be authenticated before the actual collection. The collection should be done at the appropriate stage of maturity of the plant part to get optimum level of active ingredients. The workers should be trained to select the healthy plants and to collect the plant parts in conservative manner to avoid spoilage and damage to the plant life. The collected material should be sorted and ensured about the absence of adulteration and toxic materials. The data should be maintained at each level of planning and execution of the collection for traceability.

**KEYWORD:** Medicinal plant collection, Good field collection Practices, harvesting technique, documentation.**INTRODUCTION**

Medicinal plants are naturally found in large quantities in forests and open areas. These species are used in traditional and modern medicinal practices for making medicines. Even though synthetic products have gained popularity due to its quick effects but their safety and efficacy has always remained questionable, resulting in the dependency on the natural products.

According to WHO 80 % of world population still need medicinal plant for medication as their primary health care. Even in modern medicine many drugs derived from extract and compounds from the plant. This trend is attributed to a growing awareness of the harmful side effects associated with many modern drugs. So now a day's exponential growth in demand of herbal plant for medicinal purpose as well as for their daily needs.

The increasing demand for natural herbal products creates a need not only for conserving medicinal plants in-situ, but also for their cultivation outside the forest areas. The World Health Organisation (WHO) has developed Good Agriculture and Collection Practices in 2003. Aim of GACP is to provide guidance about authenticity, quality, safety and sustainability of raw material to be used in medicine.

Acharya Charaka describes an excellent design of drug research and given much importance for season of collection (Sangrahaniya Kala/Rutu) along with place (Prashastha Bhoomi) and method of collection (Sangrahaniya Vidhi). He describes the technical excellence in the field of pharmacognostical, pharmaceutical and pharmatherapeutical sciences.

To procure best qualities of drug, one has to select the proper site for collection of medicine/ herb. The site should have abundant population of the herb which is to be collected. The site should possess all the criteria of the collection site similar to given in Charaka Samhita Kalpasthana. While collecting the factors such as Guna, Desha, Kala, Pakva- apakva avastha, nav-purana avastha, Prayojyanga, karma and Disha should be given importance.

The plant should be authenticated before the actual collection. The collection should be done at the appropriate stage of maturity of the plant part to get optimum level of active ingredients. The environmental conditions also need to be observed and followed to prevent damage to the collected parts.

The workers should be trained to select the healthy plants and to collect the plant parts in conservative manner to avoid spoilage and damage to the plant life. The collected material should be sorted and ensured about the absence of adulteration and toxic materials. The collected plant material should be processed and preserved in such scientific manner to preserve the active ingredients and to increase the shelf life of the medicine. The data should be maintained at each level of planning and execution of the collection for traceability.

## MATERIALS AND METHODS

A thorough review of texts of Ayurveda like Charaka Samhita, Asthang Samgraha, Sushruta Samhita and Bhavaprakash Nighantu is done for references on drug collection. Data thus obtained was analyzed with the information available in text books of Pharmacognosy, research articles and relevant websites to have a comparative understanding and to see the feasibility for current practices.

## RESULTS AND DISCUSSION

It is necessary that collectors should have detailed knowledge of good field collection practices so that this valuable natural resource can be protected for themselves and future generations.

The concept of good agricultural and collection practices (GACP) is introduced as a set of guidelines aimed at ensuring the sustainable and environmentally friendly cultivation and harvesting of medicinal plants. These guidelines are crucial for maintaining the quality and efficacy of the final herbal products. GACP is presented as a way to meet the increasing demand for medicinal plants while safeguarding their populations and ecosystems.

### Nine Principles of Good Collection practices

1. Sustainability
2. Collection regulations
3. Protection from contamination
4. Active ingredients
5. Documentation/ Traceability

6. Harvesting time
7. Harvesting Places
8. Harvesting techniques
9. Good collection manner and documentation

### 1. Sustainability

It has been observed that unsustainable harvesting practices have resulted in the rapid loss of habitats of many medicinal plant species. Hence, it is essential to train collectors for sustainable harvesting practices, to ensure that the regeneration rate of the medicinal plants being collected is higher than their extraction rate. They should be cultivated and harvested according to their annual, biannual, perennial pattern. This process will ensure that collectors have access to medicinal plants year after year, along with a regular/sustainable source of income.

### 2. Collection Regulation

*"Tatra yani kalajata anyupagata sampurna pramana rasa veerya gandhani  
Kalatapagni salila pavana jantubhih anupahata gandha -varna -rasa-Sparsha-prabhavani  
Pratyagra anyudichyam dishi sthitani; tesham shakha palasham achira praroodham  
Varsha vasantayoh grahyam, grishme mulani shishire va shirna praroodha parnanam,  
Sharadi tvak kanda ksheerani, hemante sarani, yathartu pushpa phalam iti;  
Mangalacharah kalyana vruttah shuchih shukla vasah Sampujya devata ashvinau go brahmanamshcha kritopavasah  
Prangmukho udangmukho va grihneeyat. Cha.K. 1/10).*<sup>[1]</sup>

According to Charaka Samhita, the substances grown in Prashatha bhoomi and having fertile characteristics should be collected with purity, wearing white clothes, doing Mangalacharan, worshipping the God - Ashwini Kumar-cow- Brahmins, with a pure mind, with devotion, facing east or north (Cha.K. 1/10).

Most of the substances have been instructed to be collected in Pushy, Ashwini or Mrigasira constellation because the lord of the east direction is the Sun, who infuses power into the medicines, the lord of the north direction is Dikpal and the lord of Pushy (Cancer) and Mrigasira is the Moon who is the lord of the medicines and he is strong in these constellations.

Collection of medicinal plants is also related to collection of endangered species under national and international rules; hence, collectors should be aware of these rules too.

### ❖ Compliance to regulatory requirement

- a) The collection, processing, storage and sale of medicinal plant produce carried out in accordance with the existing laws. This needs compliance to laws enacted by both Central and local

Governments.

- b) The collection, processing, storage and sale of medicinal plant produce carried out in accordance with the international treaties and conventions signed by India. The various international treaties and conventions related to conservation of biodiversity signed by India must be respected while collecting any medicinal plant produce from the wild.

#### ❖ International regulation and guidelines

- a) The provisions laid down in the CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) CITES regulations must be adhered to while collecting any medicinal plant produce from the wild. The collection managers and collectors should be imparted on the provision of CITES and the regulation copy must be available on site.
- b) The collection managers and collectors of the medicinal plant produce meant for export, honour existing laws of the importing countries? Besides the regulatory authorities in the country of import, local secretariats of CITES, IUCN and TRAFFIC may be consulted for such laws and regulations.

#### ❖ National regulations

The provisions of Indian Forest Act 1927<sup>[2]</sup>, The Wildlife (Protection) Act 1972, The Forest (Conservation) Act 1980, The Biological Diversity Act 2002, The Scheduled Tribes & Other Traditional Forest-Dwellers (Recognition of Forest Rights) Act 2006 should be followed.

#### ❖ Local regulations

- a) The collectors/collection managers should be aware of the local regulations governing the collection, transit and sale of the medicinal plant produce in specific areas and abide by them.
- b) ROR of local regulations enacted by states such as The Madhya Pradesh Sustainable Harvesting Act 2005, The Andhra Pradesh Red Sanders Wood Possession Rules 1989, The HP Forest Produce Transit (Land Routes) Rules, 1977, The Tamil Nadu Sandalwood Transit Rules, 1967, and The Maharashtra Forest Produce (Regulation of Trade) Act, 1969. etc.

#### ❖ Permission for collections

- a) The collectors/collection managers must have taken prior written permission from the

authorized agency for collection, possession, transit and sale of the medicinal plant produce, when required under law.

- b) The documentary proof of such permissions must be kept in safe custody. Such medicinal plant produce, when traded, must be accompanied by appropriate documentation in accordance with the laws and regulations.

### 3. Protection from Contamination, fall and loss in collected medicinal product

According to Ashtanghruday Samhita,<sup>[3]</sup> the medicinal plant to be collected should not be rotten, poisoned, cut by a weapon, scorched by the sun, burnt by fire, broken by strong wind or rotted by water, and should not have grown in impure and unclean places like crematoriums. The roots of these plants should be thick, juicy, plump, and have a pleasant aroma. This plant should have grown in a favourable season and should have grown in the east direction. Such a plant is suitable for collection.

To eliminate the possibility of any kind of adulteration in the collected medicinal plant, it is necessary that the collected material is cleaned and packed properly before sending it to the storage market or processing site so that any kind of adulteration, loss or reduction in quality does not occur.

### 4. Excess of active ingredient

While collecting medicinal plants/products to be mixed, the three main factors that should be kept in mind are **place of collection, time and maturity of the crop**, to maintain maximum potency of the active ingredient in any suitable part. Type of soil, climate, age of the plant etc. affect the active ingredients of the plant. Also, plant collection, different months/seasons of the year affect the medicinal properties and maturity of the plant at different levels. According to Charaka, in Vimanastana Adhyaya 1,<sup>[1]</sup>

*“Deshah punah sthanam; sa dravyanam utpatti pracharau desha-satmyam cha ahashte || (5 | 22)”*

In the context of Dravyagun, Dhesha (Geographical area), means the habitat of the medicine. The properties of a medicine depend on the Desha in which it is produced, hence it is very important to have knowledge of the Desha and properties of medicines. This gives knowledge about the place of species (Uttapati stana), distribution and Desha - Satmya of the medicine. According to ayurveda there are 3 types Desha, Anupa Desha, Jangama Desha and Sadharan Desha.

Different opinion regarding Desha and Dosha given in below chart. Table no 1. Ref. Charaka Vimanastana 3 – 42 to 48.<sup>[1]</sup>

Desha	Adhikya	Dosha - Dushya	Shreshthata	Example	According to Vagbhata
Aanupa Desha	Jaladhikya	Vata – Kapha Bahula Rogadhikya	Ahitatam Desha	Kadali	Vata Pradhan

Jangal Desha	Vayu Adhikya, Ushantadhikya	Vatapitta Bahula, Minimum number of diseases	Uttam Desha	Dhava, Khadir	Pitta Pradhan
Sadharan Desha	Jala and Vayu Adhikya	Vata – Pitta – kapha		Amra, Amalaki	Moderate Dosha

Characteristics of different types of *Desha* is explained in *charaka kalpasthana*.<sup>[1]</sup>

*Charaka* when describing Para and Apari guna, says that jaangala is favourable when compared to Anooa.<sup>[1]</sup>

In *vrikshaayurveda*, *vanavargasootreeya adhyaaya*, there is reference to forests and their division in the country.<sup>[4]</sup>

### Bhoomi

Food and medicines are Panchabhoutika. They are nourished by the minerals in the soil in which they grow.

### Prashastha Bhoomi



Fig. 1 Prashastha Bhoomi.

“Tatra deshe sadharane jangale va yathakalam shishiratapa-pavana-salila-sevite same shuchau pradakshinodake shmashana-chaitya-devayajana-agara-sabha-shvabhra-arama-valmika-ushara-virahite kusha-rohisha-astirne snigdha-krishna-madhura-mrittike suvarna-varna-madhura-mrittike va mridau aphala-krishte anupahate anyair balavattaraih drumaih aushadhani jatani prashasyante||  
Dhanve sadharane deshe same sanmrittike shuchau, Shmashana-chaitya-ayatana-shvabhra-valmika-varjite. Mridau pradakshina-jale kusha-rohisha-samsrite, Akalakrishte anakrante padapaih balavattaraih, Shasyate bheshajam jatam yuktam varna-rasadibhih.|| ”  
(— A.H. Su. 6/1–3)

Ayurveda mention certain guidelines for drug collection as follows.

### Ideal land area for drug collection (*Dravya sangraha*)<sup>[3]</sup>

Plants growing in the soil of a common or forested area should be collected. Plants grown in good, clean, fertile and unbroken soil that is adequately exposed to heat, wind, and rain, and that is away from Plants growing in the soil of a common or forested area should be collected. Plants grown in good, clean, and fertile soil that is adequately exposed to heat, wind, and rain, and that is away from cemeteries, slaughterhouses, and temples, and that is free from holes. There should be no sandy areas, rocky, or sandy soil. If the soil has excessive

Since living beings such as humans, animals and birds also depend on the soil for their sustenance, they are also indirectly dependent on the soil for their sustenance. Minerals are actually produced in the soil. Thus, since the soil from which minerals, animal and vegetable substances are produced is related to the Panchabhoutika of the soil, that's why it is necessary to know about the soil types.

Kshar, plants will not grow properly. The land should be close to a reservoir, which means there is plenty of water supply. If there are other large trees other than medicinal plants in this soil, then the plants will not be nourished and will not grow due to the shade.

### 5. Documentation and Traceability

During the collection of medicinal plant material for sustainable exploitation, it is very important to keep information about the source for documentation and identification. It is also necessary that the quantity and place of the material being collected is ascertained, so that it can be known whether regeneration has increased after the previous collection or not.

To maintain the yield of medicinal plants and the level of active ingredients, the rules related to high quality production and collection practices, prevention of contamination, the following 'do' and 'don't' points should be strictly followed.

#### Do's

1. When going for collection, keep clean tools and collection containers with you.
2. If necessary, obtain permission for collection from the concerned officer / landowner.
3. Before collection, roam the area and assess the species so that the amount of sustainable harvesting

can be decided.

#### Don't

1. Do not collect endangered species.

2. If there is any doubt in the identity of the plant, do not collect it.
3. In sustainable harvesting, do not collect more than the estimated quantity.



Fig. 2 Format for labelling while collection.

#### 6. Harvesting Time

While collecting medicinal plants/products, special care should be taken to do and not do the following things.

#### Do

1. Collect only when the possibility of reproduction is very high.
2. Collect plant material at the right time of the year when the amount of active ingredients of the plants is maximum.
3. The collection period of every species is fixed, so collect according to its time period.

#### Do not do

1. Do not collect before the plants mature. If the plants reproduce through seeds, do not collect before the seeds are ready.
2. If there is no arrangement for drying during rainy days, then it would be inappropriate to collect.

#### Specific period of collection of plant

While collecting the plant, its useful parts should also be given due importance. Generally, the part or the specific portion which is considered for use, must grow full – maturity.

According to – Rajagnighantu, Tuber – Hemant, Root – Shishir, Flower – Vasant, Leaves – Greeshma & Panchang Sharad.<sup>[5]</sup>

Table no. 2<sup>[1, 6]</sup>

Charaka		Sushrut	
Part of Plant	Sangrahan Kala	Part of Plant	Sangrahan Kala
Shakha	Varsha, Vasant		
Patra	Varsha, Vasant	Patra	Varsha
Mula	Grishma, Shishira	Mula	Pravrut
Twak	Shard	Twak	Shrada
Kanda	Shard		
Ksheera	Shard	Ksheera	Hemant
Sar	Hemant	Sar	Vasant
Pushpa, Phala	Yatha Rutu	Phala	Grishma

#### Veerya in drug procurement

Above mentioned seasonal view may not be useful while considering Veerya. Instead of considering specific parts in specific season for drug collection due importance should be given to its Veerya.

Sheeta Veerya drugs which possess Madhur Snigdha & Sheeta gunas should be collected during Visargakala (Saumya Rutu) While Ushna Veerya drug which possess Tikta, Ruksha & Ushna, properties must be collected in Adana kala (Aagneya Rutu).

#### Collection of dietary items

As per the useful parts of plants, collection guidelines are as follows<sup>[6]</sup>

**Fruit** – Only ripe (not raw or over ripe), fruit are collected. The exception is Aegle marmelos which is collected in a raw form which is very effective fruits which are diseased, insect affected, untimely grown, affected by fire or cold or artificially ripened are not to be collected.<sup>[6]</sup>



**Fig. 3: Collection of Haritaki [*Terminalia Chebula*].**

**Tender leaves and branches** to be collected in June to September and spring season (March, April and May). Pharmacognostic review reveals following points for leaf collection. Leaves to be collected when the flowers are just beginning to expand or the flowering is just arriving at its height. At this time, it is reasonable to assume that the whole plant has arrived at its condition of maximum vigor and that leaves are the most healthy state and contain an optimum of the products of the plant

metabolism and therefore should be at this period of their development suited to exert the most desirable therapeutic action. Leaves to be collected preferably during dry weather since those collected in wet deteriorate in quality and are apt to become discolored during drying. Apart from consideration to these general points, leaves in particular will have specific time of collection. Example: Aloes should be sufficiently thick leaf.<sup>[7]</sup>



**Fig. 4: Collection of Vasa leaves [*Adhatoda justicia*].**

**Root** of trees to be collected in summer and June to September. Tubers should be collected in October and November. The same is substantiated by present texts as Roots and Rhizomes tissues are fully stored with reserve foods, it being assumed that medicinal constituents will be also most abundant at September, October and

November. As the roots are major parts of plant anatomically and physiologically non-destructive system of collection to be adopted. Ex: to collect root of a tree, lateral roots to be taken and thus main tap root will be retained.



**Fig. 5 Collection of Shatavari Root [*Asperagus recemosus*]**

#### **Collection of bark**

Bark collection is advised during October and November. For collection of bark, tree should be allowed to grow to an age varying from one and half year to eight years. Bark collection is preferred in March, April and May, when the sap is rising in the stem and the cambium is active and therefore more easily torn than at other

seasons. Exceptionally few barks are collected during other season if they are found to have good amount active constituents during particular season. Ex: For the removal of *Arjuna* bark, longitudinal incisions are made at intervals round the circumference of the stem and only these strips are removed thus saving the tree from destruction.<sup>[7]</sup>



**Fig. 6 Collection of *Cinnamomum zeylanicum* Nees Bark.**

**Pushapa** should be collected as per season of flowering because flowers when collected in fine dry weather as the petals which are damp when gathered become badly discolored during drying. Since the flowers must be obtained in good condition, they must be gathered at precisely the correct time and consequently the process of collection may extend over several days or weeks. The collection is usually made by picking or cutting the flowers by hand. Cutting the branch to ease collection of its bearings (fruits, leaves, flowers etc.) should not be attempted. Example: Saffron collection is done in October, November morning during sunrise. Clove bud collected before the white corolla expands and the crimson buds are picked by hand. Chamomile collection is done during rainy season, only capitula is picked which are just fully expanded.<sup>[7]</sup>

**Phala** as per season or during summer. Fruits are to be collected during its season either fully ripe or nearly ripe depending on the fruit. Ex: Specific collection method has been highlighted in classical text to obtain fruit pulp from the pod of *Aragvadha*. It has been advised that ripe fruit should be collected during appropriate season of fruiting. Fruits endowed with good qualities should be taken in large quantity and kept covered with sand for seven days. Thereafter, these fruits should be taken out of the sand and pulp of these fruits should be collected and preserved for use. *Cassia fistula* fruit pulp should be buried under sand for easy removal of its pulp. A marked difference in the physicochemical parameters and

quantitative estimation of total and reducing sugar were observed in buried and non-buried samples of *Cassia fistula* fruit pulp. It is concluded that only fully ripen pods should be collected and seven days are sufficient for the burring process.<sup>[8]</sup>

**Sara** should be collected in winter or spring. Wood must be seasoned (dried) before it will burn properly. It seasons most quickly during the hot, dry days of summer, and only after it has been cut from the stump. The wood that you plan to use in late fall should therefore be cut no later than the previous spring.<sup>[18]</sup>

**Ksheera**: October, November and early winter is ideal season for collection of **Ksheera**. Unorganised plant parts like gum, resin, oleo resin, oleo gum resin and latex are to be collected during dry season and when they ooze out of the tree. Ex: Research standardization of gum collection method of *Salai guggul*, *Boswellia serrata* revealed that the gum can be extracted throughout the year but April-May is the most ideal period of the year when the gum yield is at its maximum. The study also revealed that a wound made up to a depth of  $\frac{1}{2}$  the thickness of the bark of size 20 A-30 cm as recommended by Shiva (2008) is the most appropriate for extraction of gum. The Apart from this it was observed that gum production starts in *Salai Boswellia serrata* when it attains a girth size of 38 cm. The gum producing ability gets stabilized when the plants of *Salai Boswellia serrata* attains a girth of 86cm.<sup>[9]</sup>



**Fig 7 Collection of *Commiphora wightii* Nirryasa.**

Their branches and leaves should be collected in rainy and spring season, roots in summer or late winter when the leaves have fallen down or are fully matured; bark, tubers and latex in autumn; heartwood in early winter and flowers and fruits according to their season.<sup>[10]</sup>

*Susruthaachaarya* quotes opinion of some scholars like-Root, leaf, bark, latex, heartwood and fruit should be collected in early rains, rainy season, autumn, early winter, spring and summer respectively.<sup>[11]</sup>

The bulbous roots in winter season, other roots in cold season and flowers during spring season are supposed to contain better properties. The new leaves or shoots in summer and the drugs which grow in mud like *lotus* should be used in October and November.<sup>[12]</sup>

### Collection of animal origin drugs

Similar consideration must be given to the collection of drugs of animal origin. Animals from whom blood, hair or nails are to be collected, must be fully grown. (These animals mature at ¼ th the age of the total life span of the species. This span varies with different species.) Similarly, milk, urine, etc. of animals is collected after complete digestion of their food.

### 7. Harvesting Places

Special attention should be paid to the following dos and don'ts at the collection sites of medicinal plants / products.

#### Do

1. Collect plants from a clean place where the possibility of contamination is minimal or not.
2. Respect local customs, traditions and regional beliefs.
3. Collect only from areas where the species is abundant.
4. Keep a record of the places where the plants have been collected, so that it can be known whether the plants have reproduced after collection or not.

#### Do not do

1. Do not collect from places where you do not have rights and without the permission of the owner.

2. Do not collect from places where there is a high chance of contamination.

### 8. Harvesting Techniques

#### Do's

1. Harvest plants in dry weather.
2. Collect at appropriate time to ensure maximum amount of active ingredients.
3. Make sure that your collection method is as per records and does not have any negative impact on the environment. Store the collected material in a clean container or bag.
4. Keep green herbaceous plant material in shade after collection to protect it from damage caused by sunlight.
5. If there is doubt about reproduction, do not collect more than 70% of the medicinal plant.

#### Don'ts

1. Do not collect medicinal plants by a method that affects future reproduction.
2. green herbaceous plants in direct sunlight after collection.
3. Do not collect medicinal plants during rainy season or in the morning when there is dew on the plants.
4. Do not collect diseased or weak plants.
5. Do not store more than one species in the same bag or container.

### 9. Good collection manner and Documentation

While doing good collection manner and documentation of medicinal plants, special attention should be paid to the following "do's" and "don'ts".

Genus/Species:	
Family:	Habitat:
Growth:	Flower Color:
Where Collected:	
Collected by:	
Identified by:	
Common Names:	
Date Collected:	Collection #:

Fig 8.

#### Do's

1. Keep all the information related to collection in the collector diary.
2. Write the name of the species, name of the place (from where collected), date etc. on the collection tag.

#### Do not do

1. Do not prepare for collection without label. Because, it is important that anyone should know where the collected plant has come from.

### Processing after collection

Generally, the collection/processing process after harvesting plays the most important role in determining the final quality of medicinal plant material. Once the plants are harvested, there are many potential risks involved, such as being collected by different people, being placed on different surfaces, being transported through polluted roads, being stored in people's homes for a few days or weeks, which can lead to a high chance of loss, deterioration or contamination of the collected material. The best way to prevent this is to take preventive measures against all potential risks so that

problems can be dealt with before they occur.

The key principles of post collection processing under high quality production and storage practices are

### 1. Protection from contamination

Contamination is the biggest risk during processing after harvest. These hazards may vary from location to location. Each manufacturer should know the processing process at each stage and plan to avoid potential hazards in his production process. Contamination may be caused by smoke and Odors, dust, animals, birds, other species, soil, bacteria, fungi or anything else that may adversely affect the purity of medicinal plant material. The type of contamination that is likely to occur at different locations should be determined.

### 2. Protection from fall, loss and colourless

The most important objective of post-harvest processing activities is to convert fresh plant material into a stable form so that its medicinal properties can be preserved for future use. This is usually achieved through drying. While extracts, tinctures and essential oils can be obtained from it and preserved.

There are many reasons why freshly stored plant material may spoil. Excessive heat, humidity or moisture

immediately after harvesting can cause all sorts of potential damage. In such a situation, the most important principle is usually to move the crop immediately to a cool and dry place. Spread it on a sheet of cloth to avoid loss of yield. If drying of plant material is necessary, then specific parts of the species should be dried as per the requirement in a suitable manner.

### 3. Documentation/Traceability

There should be continuity in the documentation of post-harvest processing activities and the documentation started during cultivation or wild collection. Records of activities at each stage should be recorded in such a way that the final product can be traced back to the initial activities from batch number.

The „Do“s and „Don“ts are briefly described to ensure the source of the final product right from collection to processing, from medicinal plants leaving the harvest site for sorting, washing, drying, grading, packing and storage for high quality production and processing.

#### (A) Primary Cutting & Sorting

While doing primary cutting and sorting of medicinal plants/products, special care should be taken of the following do's and don'ts.



fig. 9 Primary Cutting & Sorting of plant.

#### Do's

Use a clean place. If possible, use cemented land or tarpaulin sheet for spreading the material and ensure that it is clean. Remove weeds and unwanted external parts by pruning. Separate unwanted plant parts. Make a path to walk through the plant material.

#### Don'ts

Do not handle medicinal material if the worker is suffering from contagious disease or wound.  
Do not walk on the medicinal plant material.

#### (B) Washing

While washing medicinal plants/products, special care should be taken of the following do's and don'ts

#### Do

Wash medicinal plant parts with clean water.

Use separate tubs for second washing after initial washing.

Before drying, remove the plant material from water and keep it on a sieve or clean high place to drain out excess water.

Use of high-pressure spray machine for cleaning soil from roots and tubers will give good results.

#### Don't

Do not wash highly sensitive seeds and flowers.

Do not keep the material on an unwashed place after washing. Do not use water contaminated with chemicals or bacteria.

#### (C) Drying

While drying medicinal plants/products, pay special attention to the following points.



**Fig. 10 Drying of medicinal plant.**

#### **Do**

Construct suitable system for drying stored crops. Dry the stored material as soon as possible.

Keep the harvested medicinal plants on open and clean ground. Create air flow for drying the plant material.

Protect the plant material from insects, dust, animals and birds. Spread the plant material in a thin layer in an open space.

Dry the plant parts at the right temperature and for the right time only.

Label the plant material so that it can be known where the material came from and when the drying was started.

#### **(D) Processing Place**

##### **Do's**

Select a work place which is clean and where direct sunlight does not fall. If the work place is exposed to strong sunlight, then make a shed for shade.

There should be proper arrangement for protection from rain at the work place. There should be easy access road from the work place to transportation.

##### **Don't**

Do not choose a place where there are sources of potential contamination. Do not choose a processing place which is far from the collection place.

#### **(E) Transportation to Processing Unit**

##### **Do's**

Send the collected plant material for processing as soon as possible.

Keep the plant material of different species separate during transportation. Protect the material from strong sunlight and rain during transportation.

##### **Don't**

Do not delay transportation.

During transportation, keep away from highly contaminated sources such as pesticides or chemical fertilizers.

#### **Guideline for drying the various parts of medicinal plants 1] Aerial parts**

Leaves are generally the softest parts of the plants. They easily turn black when scratched. Therefore, it is important that there is minimum damage to the leaves

while drying them. Green herbaceous plants lose their real colour due to sunlight, so they should be dried in the shade. Eg. Tulasi, Guduchi.

#### **2] Stem and Pedicle**

Stem and Pedicle should be dried until they crack. If it bends instead of breaking, it means that it needs to be dried further. While drying it, the bark should be scratched with a nail, if the bark comes off easily and is green in colour, it means that it needs to be dried. Eg. Vasa, Kumari.

#### **3] Flowers**

Flowers should be dried immediately after collection, because the micro elements present in them can be stable in a vibrating state. It should not be dried too much or else it is likely to be crushed during storage. If it is kept too hot or cold or given too much air flow, then there is a possibility of loss of colour and medicinal properties. Eg. Japa, Gambhari, Dhataki.

#### **4] Fruits**

Large fruits should be cut into small pieces to ensure that they are dried parallelly, while small berry fruits can be dried whole normally. Sticky fruit pieces can attract insects. Therefore, cover the fruits with mosquito net or cloth and protect them from dust caused by sweeping. Eg. Madanphal, Bibhitaki, Amala.

#### **5] Root & Root bark**

Most roots and barks can be dried in direct sunlight as these are soluble oils with fragrance. Eg. Sariva, Shatawari, Ashwagandha.

#### **Drying Temperature**

The optimum temperature for drying most of the medicinal plants is between 45-50°C. If the humidity in the air is high, then the humidity can be reduced by increasing the temperature by 10 degrees. Aromatic plants, which contain soluble oil, should be dried at a temperature of 30-35°C.

##### **Don't**

If the drying machine is wet, do not keep the plant material in the machine.

The management of plant material should be such that it does not absorb moisture again after drying.

Special attention should be paid to the complete drying

of rhizomes, fleshy roots, stems, leaves, flowers, pulpy fruits, woody parts, leaves etc.

**The main points to be kept in mind for proper drying and better processing of medicinal plants / parts are as follows**

- 1) If the collected part is thick, fleshy and large in size, then it should be cut into small pieces and dried.
- 2) Products should be dried in open air or in a special type of frame (made for drying) by spreading them in the form of a thin layer in the sun.
- 3) Keep stirring the products from time to time so that they can dry well.
- 4) It is very important to take care of the safety and quality of the products while drying them in the sun. Along with preserving the quality of the products, they should also be protected from the contamination of the excretory substances of living organisms.
- 5) Artificial methods such as oven, hot air etc. can also be used to dry the products. It is necessary to check the authenticity of these equipment's and the entire process before use so that the quality of the products is not affected. During the drying process.

**Storage**

**Do's**

Store medicinal plant material in a clean and dry room. Clearly label bags.

Store different species separately.

**Documentation after processing of plant material**

**Do's**

All processing activities should be documented in a diary. All processing activities should be documented, labelled or stored tagged and affixed on each bag.

The batch number given at the time of storage should be used to access all the information whenever required. The format of storage tag and batch tag is being given separately.<sup>[13]</sup>

**DISCUSSION**

Good Field Collection Practices (GFCP) play a vital role in ensuring the quality, safety, and sustainability of medicinal plant resources. Medicinal plants are the backbone of traditional medicine systems such as Ayurveda, Siddha, and Unani, and their global demand continues to rise. However, unscientific and unregulated collection practices have led to overexploitation, habitat degradation, and the extinction of several valuable species.

GFCP guidelines aim to establish standardized procedures for the identification, collection, handling, and documentation of medicinal plants in the wild. These practices ensure that plant materials collected are of consistent quality and free from contaminants such as pesticides, heavy metals, and microbial loads.

Additionally, adherence to GFCP contributes to the conservation of biodiversity and promotes sustainable use of natural resources.

Proper identification and authentication of the plant material are crucial steps in GFCP. Collectors must be trained in botanical identification to avoid substitution or adulteration, which can compromise the therapeutic efficacy of herbal products. Seasonal and phenological considerations are also essential, as the concentration of bioactive compounds can vary with the growth stage and harvesting time.

Moreover, GFCP emphasizes the importance of maintaining accurate records of collection sites, quantities harvested, and environmental conditions. Such documentation supports traceability and accountability throughout the supply chain, which is increasingly demanded by the herbal drug industry and regulatory authorities.

Sustainability is a key component of GFCP. Methods such as rotational harvesting, minimal damage to parent plants, and preservation of the ecosystem ensure that the natural populations of medicinal plants are not depleted. Community participation and benefit-sharing mechanisms further strengthen the implementation of GFCP, especially in rural and tribal areas where traditional knowledge of plant exists.

**Research needs**

Research is greatly needed to improve the agronomy of cultivated medicinal plants, promote the exchange of information on agricultural production and investigate the social and environmental impact of medicinal plant cultivation and collection. Data sheets and monographs should be developed on medicinal plants that take into account the particular situation of regions and countries. Such information materials can be useful instruments for promoting technical advancement. General as well as specific education and training materials should be developed for local growers and collectors of medicinal plants

**CONCLUSION**

Adoption of Good Field Collection Practices is essential for protecting medicinal plant diversity, ensuring the quality of raw materials, and promoting ethical and sustainable harvesting. It bridges the gap between traditional practices and modern quality standards, ultimately contributing to public health and environmental conservation, methods mentioned in ancient texts and new techniques together can find way towards healthy habitat of medicinal plants.

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