

GUIDELINES FOR COLLECTION AND POST-HARVEST MANAGEMENT OF VARIOUS CATEGORIES OF MEDICINAL PLANT PRODUCE

The whole plant is used as a medicinal plant produce only in a few cases. Often it is one or more part like root, bark, stem, leaves, flowers, fruits, seeds of the species, which constitute the officially accepted produce. While the general guidelines for harvesting and post-harvest management are applicable to any collected part, the specific plant parts need additional care,

Ancient science, like Ayurveda, recommends collecting different parts of the plants in different seasons. This was perhaps done keeping in view the optimum activity of herbs when harvested at a specific season. Further, collecting the parts from the plant at a season when it causes the minimum harm to the plant is also important.

It is recommended that a detailed SOP should be written for each category of produce in order to minimize the harm to nature and to optimize the quality of the produce. Some of the important points, which need to be taken care of while harvesting various categories, are given below.

1.Underground parts

- The roots of annual plants must be dug when the plants are well developed and mature.
- Roots of perennials should be harvested late in the fall or early in the spring. Roots of biennial should be collected in either the fall of the first year or spring of the second year.
- The root material that is rich in essential oils should be handled carefully to prevent bruising of the epidermis, where the oils typically reside, which could result in loss of essential oil or its degradation.
- Unless otherwise required for any specific species, underground parts like roots and rhizomes should be collected only after the seed shedding. It also facilitates regeneration of species.
- Where taproot is the desired produce and needs to be uprooted, harm to other plant species in the vicinity should be minimized. Underground parts should be collected with minimum possible digging by using appropriate tools.

- When roots of species that are propagated vegetatively in nature are collected, enough underground part should be left at site to allow regeneration. It must be ensured that underground parts are thoroughly washed and thereafter dried to reduce the moisture content before packing the produce.

2. Annual herbs/ Whole plants

- When collecting whole herbaceous plant, or its aerial parts, the harvesting should be done at flower bud or flowering stage but prior to any visual decline in any of the plant parts.
- Whole population in a given area should never be harvested. Adequate population should be left in nature for regeneration to facilitate future collections.
- Use of mathematical procedures including computer software to estimate collection of individuals from a population may be resorted when target area is large to ensure even harvesting throughout the habitat.
- Annuals, especially small herbs, creepers, grasses are more prone to contamination as well as cross-contamination. It is easier to sort the annuals immediately after the collection rather than after drying.
- Aromatic plants and delicate parts like pistils or stamens of the other plants should not be dried in direct sunlight. If these are collected in wet conditions, they should be shifted to the shade as soon as the external moisture has been removed.

3. Stem Bark

- Stem bark should not be harvested when the tree is under new growth (like spring season)
- As far as possible, the bark should be collected from mature branches of the trees leaving the main trunk intact. Bark from entire branch or trunk should not be taken at one time.
- Girdling of trees or branches by removing the bark all the way around should not be done, unless the tree is to be felled for other purposes like, timber. Bark should be stripped longitudinally (partially along the length of the stem) to allow smooth conduction of water and nutrients.

- Stem bark should not be collected again from same tree unless adequate time has been allowed for it to be reformed completely. It should not be collected from immature trees or branches.
- The rhytidome (outer dead bark) should be removed except where it is the usable part of the produce.
- The bark should be split in pieces of appropriate size to ensure complete drying Unless otherwise required in specific cases, barks should be dried in direct sunlight.

4.Stem or wood

- Only select mature branches of a tree or shrub should be harvested at a time. The branches from the same plant should not be harvested every year. Where the trunk is used as medicinal produce, the main axis should be harvested.
- The produce should be cut in smaller pieces to facilitate faster drying, packaging and storage of the produce. In case of wood, the material can be made into small chips or shavings to facilitate drying and packaging.
- Unless otherwise required in specific cases, stems and woods should be dried in direct sunlight.

5.Leaves

- The leaves of herbaceous plants should be collected before their flowering, as far as possible, leaves should be collected from mature trees. Where bio-active contents in the leaves do not fluctuate with age, the collection could be extended to later stage also.
- The source plant should not be ripped off the leaves completely. Certain percentage of leaves should be left to ensure normal physiological processes of the plant.
- Trees, shrubs or their branches should not be chopped to facilitate the collection of otherwise inaccessible leaves.
- Tender leaves should not be harvested unless they constitute the officially recognized produce. Leaves turned pale, those infected, deficient and unhealthy should be discarded.
- Generally, leaves should not be dried in direct sunlight, unless they have external moisture, in which case they may initially be dried in direct sunlight for some time and be shifted to shade or indirect sunlight as soon as the external moisture is wiped dry. The produce

should be turned periodically while drying to facilitate faster and even drying.

- Packing of the leaves should be done after ensuring the complete drying. Even a small amount of moisture present in some leaves, may invite fungal contamination and spoilage of whole lot.
- Leaf material rich in essential oil must be handled carefully to avoid bruising of the leaves that could result in loss of essential oil or its degradation.
- The leaves should be harvested during the season when growth and leaf production is the highest.
- When environmental conditions are stressful for the plants leaf harvesting should be postponed or should be harvested in less quantity.
- If the leaf size is decreasing the rate of harvest should be lowered as it indicates stressful condition.
- If the plant size in a population appears to be decreasing, even if vegetative sprouting is increasing (i.e. the population is becoming dense), the rate of harvest should be lowered.
- The rate of harvest should be decreased if there is heavy pressure from grazing, fire or other incidents that may negatively affect the plants.

6. Flower and floral parts

- As per the need of the produce, fruits may be split or cut into small pieces to facilitate drying and packaging
- Complete drying of fruits should be ensured before they are packed. Randomly selected individuals fruits should be dissected to ensure that there is no inherent moisture left.

7. Gums and resins

- Collectors/collection managers should ensure minimum harm to the mother plant while collecting the exudates. Only a few small longitudinal incisions should be made to collect the exudates and the exposed parts should be treated appropriately to avoid any fungal or bacterial infestation after the exudates has been collected.
- Incisions, too close to the ground, easily approachable by the cattle and wild animals, should be avoided. The collection container should

be designed in a way to prevent rain, bird droppings and any other such possible contaminations.

- Where there is a likelihood of some foreign matter being mixed with the collect gums and resins, it should be carefully removed.
- Source tree or shrub should be allowed appropriate recovery period before collecting the exudates again from them
- Most of the gums and resins, being inflammable, should be packed in appropriate containers and stored at isolated places. The containers of resins like Damar (*Shorea robusta*) and Saral (*Pinus longifolia*) should be labeled as “Inflammable Material”, while on transit and storage.
- No fire should be ignited near the base of the tree to increase gum/resin flow.
- Younger trees should not be tapped. The girth of the trees has to be decided below which tapping of gum/resin will not be allowed.
- Flow of gum is more in hot weather. Therefore, tapping in such species, should be done between June-October.
- Long sharp cut blazes are best as they give pure resin/gum and the bark heals faster. Irregular cuts add impurities to the resin. Long cuts are better as they provide more area for exudation and heal faster. Square and round cuts take longer time to heal as the distance between the two walls is more.
- Sharp knives or chisels can be used to make blazes.
- Instead of letting the gum or resin solidify on the bark, it is better to fix a collection trough e.g. coconut shell, hollow bamboo etc.
- On the same tree more than one blaze is made, these should be staggered for optimum exudation. After 3 years of tapping, sufficient rest should be given to the tree to rejuvenate from the injury.

8.Others (Galls, Lac etc.)

- Galls should be collected only from stipulated species (Karkatshringi from *Pistacia intergerrima*).
- Collectors must ensure that no live insects are present inside the galls
Post harvest management of galls should be done at an isolated place and the content should be packed and stored appropriately so as to avoid possible infestation of other produce

RECOMMENDED PACKAGING FOR
MEDICINAL PRODUCE

Type of the Produce	Packaging Options
Woody in nature – roots, stem, wood, woody bark etc.	<ol style="list-style-type: none"> 1. Gunny Bags 2. Jute Bags 3. Woven Sacks
Annual whole herbs, creepers, twiners, leaves, etc.	<ol style="list-style-type: none"> 1. Woven sacks with low density liner 2. Jute bags
Fleshy materials-fleshy rhizomes (e.g. Shatavari), fruit rinds (Kokum butter) of flowers (Mahua)	<ol style="list-style-type: none"> 1. Jute bags with high gauge polyethylene liners 2. Woven sacks with high gauge polyethylene liners
Delicate flowers and floral parts – Anthers, Stigma, Petals etc.	<ol style="list-style-type: none"> 1. Corrugated box with polyethylene liners 2. Card-board box with woven sacks
Gums and resins	<ol style="list-style-type: none"> 1. Air-tight Plastic drums 2. Corrugated box with polyethylene liners
Aromatic plant produces	<ol style="list-style-type: none"> 1. Air tight High Density Polyethylene (HDPE) containers 2. Fiber board drums with polyethylene liners

HARVESTING TIME OF SELECTED MEDICINAL PLANTS

Name of the herb	Local Name	Part Used	Season for Collection			
			February to April	May to July	August to October	November to January
<i>Abies webbiana</i>	Talishpatra	Leaves		✓	✓	
<i>Acacia chundra</i>	Khadir	Wood				✓
<i>Acacia nilotica</i>	Babool	Bark			✓	
<i>Achyranthes aspera</i>	Apamarga	Whole Plant	✓			
<i>Aconitum ferox</i>	Ativisha	Rhizome			✓	
<i>Aconitum heterophyllum</i>	Atish	Rhizome			✓	
<i>Acorus calamus</i>	Vacha	Rhizome		✓		
<i>Adhatoda vasica</i>	Adusa	Leaves	✓			
<i>Aegle marmelos</i>	Belgiri	Fruit	-	✓		
	Belchhal	Bark	✓	-		
<i>Alpinia galanga</i>	Kulinjana	Rhizome			✓	
<i>Alstonia scholaris</i>	Saptaparni	Bark		✓		
<i>Andrographis paniculata</i>	Kalmegh	Aerial Parts	✓			✓
<i>Aquilaria agallocha</i>	Agaru	Stem		✓		
<i>Argyreia speciosa</i>	Vidhara	Root		✓		
<i>Asparagus adscendens</i>	Safed Musli	Root			✓	
<i>Asparagus racemosus</i>	Shatawari	Root			✓	
<i>Azadirachta indica</i>	Neem	Leaves		✓		-
		Bark		-		✓
<i>Barringtonia acutangula</i>	Hizzal	Seeds			✓	

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<i>Berberis aristata</i>	Daruhaldi	Roots/Stem			✓	
<i>Blepharis edulis</i>	Utigan Beej	Seeds	✓	✓		
<i>Boerhaavia diffusa</i>	Punarnava	Aerial		✓		
		Parts		✓	✓	
		Root				
<i>Boswellia serrata</i>	Sallaki	Gum-resin	✓			✓
<i>Butea monosperma</i>	Palash	Seeds	✓			
<i>Calotropis procera</i>	Arka/Aak	Leaves	✓			
<i>Calotropis gigantea</i>	Arka/Aak	Leaves	✓			
<i>Carthamus tinctorius</i>	Kusum Phol	Floral parts	✓			
<i>Cassia angustifolia</i>	Senna	Leaves	✓		✓	
		Pods	✓		✓	
<i>Cassia fistula</i>	Amaltas	Fruit		✓		
<i>Cedrus deodara</i>	Devdar	Wood		✓	✓	
<i>Celastrus paniculata</i>	Malkagini	Seed		✓		
<i>Centella asiatica</i>	Mandookparni	Leaves			✓	
<i>Cichorium intybus</i>	Kashni	Root	✓			✓
		Seeds				✓
<i>Cinnamomum tamala</i>	Tejpatra	Leaves	✓			✓
<i>Cinnamomum verum</i>	Dalchini	Bark		✓	✓	
<i>Cissus quadrangularis</i>	HarhJORH	Stem			✓	
<i>Clerodendrum serratum</i>	Bharangi	Bark			✓	
<i>Commiphora wightii</i>	Guggulu	Gum-resin				✓
<i>Crataeva nurvala</i>	Varun	Bark			✓	✓

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<i>Crocus sativus</i>	Keshar	Stigma				✓
<i>Curculigo orchioides</i>	Kali Mushli	Rhizome	✓	✓		
<i>Cyperus rotundus</i>	Mustaka	Rhizome			✓	
<i>Desmodium gangeticum</i>	Shalparni	Aerial parts			✓	
<i>Dioscorea bulbifera</i>	Varahikand	Tuber		✓		
<i>Eclipta prostrata</i>	Bhringraj	Whole Plant		✓		
<i>Embelia ribes</i>	Vidanga	Fruit				✓
<i>Ferula asfoetida</i>	Heeng	Gum-resin	✓	✓		
<i>Ficus benghalensis</i>	Vata/Bargad	Bark			✓	✓
<i>Ficus carica</i>	Anjeer	Fruit		✓		
<i>Ficus racemosa</i>	Udumbar	Bark			✓	✓
<i>Ficus religiosa</i>	Peepal	Bark			✓	✓
<i>Gmelina arborea</i>	Gambhar	Bark			✓	✓
<i>Gymnema sylvestre</i>	Gurmar	Leaves			✓	
<i>Hedychium spicatum</i>	Karpoorkachri	Rhizome	✓			
<i>Hemidesmus indicus</i>	Anantmool	Root	✓			
<i>Holarrhena antidysenterica</i>	Kutaz Indarajava	Bark				✓
		Seed	✓			
<i>Martynia diandra</i>	Kakanasha	Fruits			✓	
<i>Mesua ferrea</i>	Nagkeshar	Stamen	✓			
<i>Mimosa pudica</i>	Lajwanti	Whole Plant	✓			
<i>Mimusops elengi</i>	Vakula	Bark			✓	
<i>Moringa oleifera</i>	Sahajana	Fruit	✓			
<i>Mucuna pruriens</i>	Kaunch Beej	Seed	✓			
<i>Myrica esculenta</i>	Kaiphali	Bark		✓	✓	

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<i>Myristica fragrans</i>	Jaiphal	Fruit		✓	✓	
<i>Nardostachys jatamansi</i>	Jatamanshi	Rhizome				✓
<i>Operculina turpethum</i>	Nishoth	Root			✓	
<i>Oroxylum indicum</i>	Syonaka	Barks				✓
<i>Parnelia perlata</i>	Chharila	Ascolichen		✓	✓	
<i>Phyllanthus emblica</i>	Amla	Fruit/Seed				✓
<i>Picrorrhiza kurroa</i>	Kutki	Rhizome			✓	
<i>Piper longum</i>	Pippali	Fruit	✓			
<i>Plumbago indica</i>	Chitrakmool	Root	✓			✓
<i>Plantago ovata</i>	Isabgol	Seed	✓			
<i>Podophyllum hexandrum</i>	Bankakri	Rhizome		✓		
<i>Premna integrifolia</i>	Agnimantha	Stem			✓	✓
<i>Psoralea corylifolia</i>	Bakuchi/Somraji	Seeds				✓
<i>Pterocarpus marsupium</i>	Vijayshal	Heart wood			✓	
<i>Rauwolfia serpentina</i>	Sarpgandha	Root		✓	✓	
<i>Rheum australe</i>	Rewandchini	root			✓	
<i>Rubia cordifolia</i>	Manjishtha	Stem			✓	✓
<i>Santalum album</i>	Chandan	Wood			✓	✓
<i>Sapindus mukorossi</i>	Reetha	Seed			✓	✓
<i>Saraca asoca</i>	Ashoka	Bark			✓	
<i>Saussurea costus</i>	Kutha	Root			✓	
<i>Sida cordifolia</i>	Bala	Leaves	✓			✓
<i>Solanum anguivi</i>	Vrihati	Root & Stem	✓	✓		
<i>Solanum nigrum</i>	Makoy	Fruit	✓			
		Whole Plant	✓			
<i>Solanum virginianum</i>	Kantkari	Whole Plant	✓			

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<i>Spheranthus indicus</i>	Mundi	Fruits	✓	✓		
<i>Swertia chirayita</i>	Chirata	Whole Plant			✓	
<i>Syzygium cumini</i>	Jamun	Seed		✓		
		Bark			✓	
<i>Syzygium aromaticum</i>	Lavanga	Floral buds				✓
<i>Taxus baccata</i>	Thuner	Leaves			✓	
<i>Tephrosia purpurea</i>	Sarpaunkha	Whole Plant			✓	
<i>Teramnus labialis</i>	Mashparni	Aerial parts			✓	
<i>Terminalia arjuna</i>	Arjuna	Bark	✓			✓
<i>Terminalia bellirica</i>	Vibheetaki	Fruit	✓			
<i>Terminalia chebula</i>	Hareetaki	Fruit	✓			
<i>Tinospora cordifolia</i>	Guduchi	Stem	✓			
<i>Tribulus terrestris</i>	Gokharu	Fruit				✓
<i>Uraria picta</i>	Prishniparni	Aerial Parts			✓	
<i>Valeriana jatamansi</i>	Tagar	Root			✓	
<i>Vetiveria zizanioides</i>	Khash/Ushir	Root			✓	
<i>Vigna triloba</i>	Mudgaparni	Aerial parts			✓	
<i>Viola odorata / V.serpens</i>	Vanafsha	Flower				✓
<i>Withania somnifera</i>	Ashwagandha	Roots	✓			
<i>Woodfordia fruticosa</i>	Dhataki	Flowers	✓			
<i>Zanthoxylum armatum</i>	Timru/Tejbal	Fruits			✓	✓
<i>Zingiber officinalis</i>	Sunthi/Adrak	Rhizome				✓
<i>Zizyphus fruticosa</i>	Vadari/Ber	Fruits	✓			