International Journal of Applied Ayurved Research ISSN: 2347- 6362

RECOGNITION OF AYURVEDIC HERBS BY VIRTUE OF ORGANOLEPTIC CHARACTERS

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ABSTRACT :

Ayurveda is the ancient science of medicine with number of unique formulations in its armory with one or many ingredients. Those who understand *Ayurveda* deeply state that every material, whether animate or inanimate is potentially medicinal.Understanding *Ayurveda* with scientific rigor requires both deep understanding of human biology and intimate knowledge of external environments. *Ayurveda* is based on the *Pancha Mahabhuta Siddhanta*, the understanding of objects of sense perception in terms of five qualities of objectivity, each one arising from a particular sense. This approach is inclusive of anything with a form occupying space. The perspective can be extrapolated to all things that can be measured, either qualitatively or quantitatively. This is a unique feature of *Ayurveda*. Even though flora, fauna and minerals/metals are all used in *Ayurveda*, this article only considers quality aspects of herbal ingredients used in *Ayurveda* industry. More than 1500 plants were identified and their possible multiple uses are specified in the codified works of *Ayurveda* dating from 2500BC (*Charaka Samhita*) up to to 1900 AD (*Saligrama Nighantu*).These can be categorised into trees, shrubs, herbs (including grass), climbers, creepers, ferns, lichen and orchids. Many were rare, endangered, threatened or extinct even at the time of *Bhava Mishra* (16th Century). Today nearly 200 such medicinal plants are under different levels of threat. Industry obtains them not only from forests, but also from locations including unprotected–wasted lands, roadsides, traditionally used landscapes etc. for purposes of quality; considerations about such plants are of two kinds.

Key words: *Pancha Mahabhuta Siddhanta*, inanimate, flora, fauna, landscapes, endangered.

INTRODUCTION: The foremost step in the *Ayurvedic* herbal preparation is the identification of *Dravya*. Identification primarily involves examination organoleptically e.g.

- *Roop*- Morphology(Appearance)
- *Rasa*- Taste
- *Gandha*- Smell
- *Shabda*- Sound
- *Sparsha*- Texture

Morphology is a branch of bioscience dealing with the study of the form and structure of organisms and their specific structural features.Parts of plants generally examined are:

- *Patra* – Leaves
- *Pushpa* – Flower
- *Phala* – Fruits
- *Moola* – Root
- *Kanda* –Stem
- *Twak* - Bark

***Patra* – Leaves:**The leaves perform two major functions for the tree, Photosynthesis and Transpiration. The tree produces organic molecules by a complex array of chemical pathways called Photosynthesis. Transpiration is important for the water

balance of the tree. Water not used by the metabolism of the tree passes out through the leaves (through special openings called stomata).

There are primarily three types of leaves: Gymnospermanous, Monocotyledonous and Dicotyledonous.Gymnosperms leaf like Coniferophyta or the conifers, are the largest group of gymnosperms (naked-seeded plants) and have various leaf types.

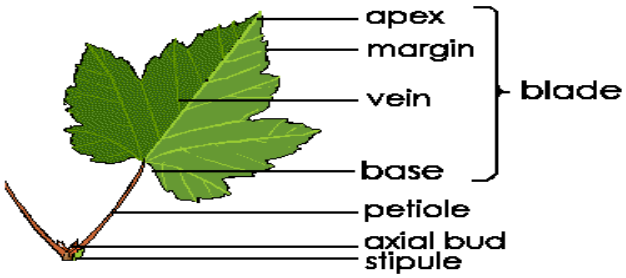
Pine trees (family Pinaceae) have needle like leaves. The cypresses and junipers (family Cupressaceae) have very small scale-like leaves.

The yellowwoods(Podocarpaceae) have small narrow leaves which are borne singly. The leaves of the Ginkgo or Maiden-hair tree (the only surviving species of the group Ginkgophyta) have dichotomous venation, in other words each vein divides into two near the leaf margin.

A Ginkgo leaf showing the dichotomous venation.

The monocotyledonous leaf like bamboo, banana, and palms consist of: sheath and blade. The sheath is often nearly as large as the blade and completely surrounds the stem, sometimes extending over the length of the internodes. The leaf blade is characterized by parallel venation. Some monocotyledonous plants possess the largest leaves in the plant kingdom. The Raffia palm (genus *Raphia*) has the largest leaves with a length of 18m.

The Dicotyledonous leaf consists of two main parts: Blade (the blade is thin and expanded and is supported by a network of veins, have apex, margin, and base) and Petiole (slender connection the leaf to the stem).



Morphology of a typical Dicotyledonous Leaf

Tip / Apex

- *Acuminate:* Long-pointed, prolonged, tapering point in a concave manner.
- *Acute:* Ending in a sharp, but not pro-longed point.
- *Cuspidate:* With a sharp, elongated, rigid tip; tipped with a cusp.
- *Emarginate:* Indented, with a shallow notch at the tip.
- *Mucronate:* Abruptly tipped with a small short point, as a continuation of the midrib; tipped with a mucro.
- *Mucronulate:* Mucronate, but with a smaller spine.
- *Obcordate:* Inversely heart-shaped, deeply notched at the top.
- *Obtuse:* Rounded or blunt.
- *Truncate:* Ending abruptly with a flat end, that looks cut off.

Leaf Edges/Margins

- *Entire:* Even line, without teeth, notches, or lobes.
- *Serrate:* Cut into sharp, saw-like teeth pointing forward.
- *Dentate:* Toothed teeth point outward instead of forward and are large.
- *Crenate:* Teeth are short and rounded; also called scalloped.
- *Undulate:* Margin of the leaf forms a wavy line, bending slightly inward and outward in succession.
- *Sinuate:* Like undulate, margin is very wavy (sinuous).
- *Incised:* Cut into sharp, deep, and irregu-lar teeth or incisions.
- *Lobed:* Incisions do not extend deeper than halfway between the margin and the center of the blade and are rounded.
- *Cleft:* Incisions extend more than half-way between the margin and the center of the blade, and are sharper.
- *Deeply Lobed:* Incisions are even deeper, but not quite to the midrib or base of the blade.

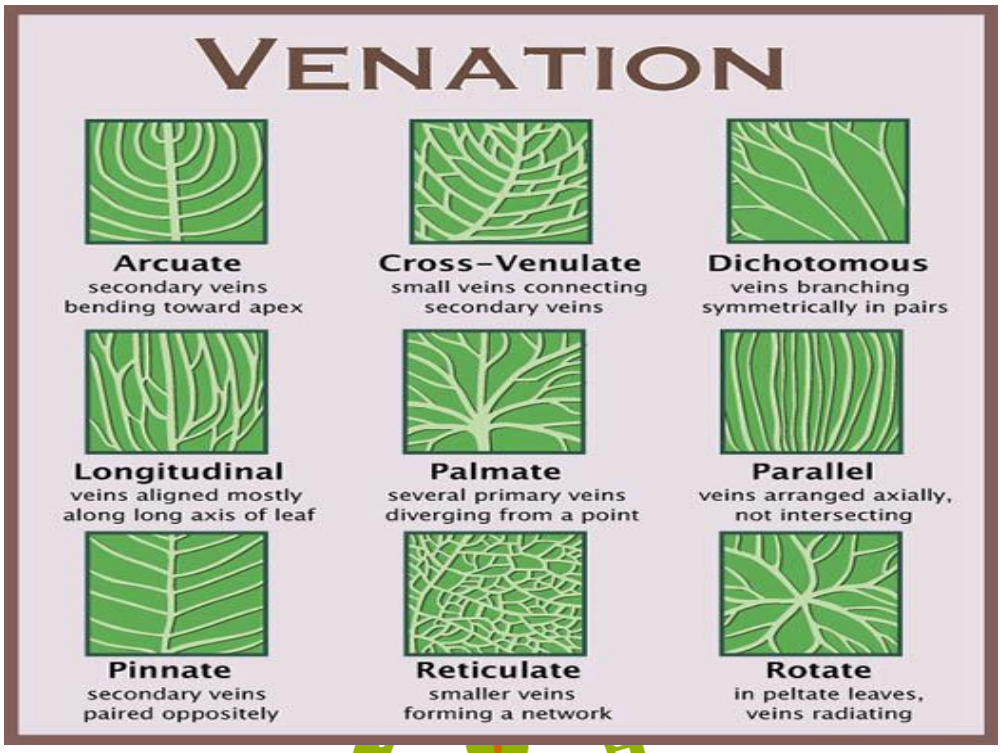
Venation

- *Arcuate:* Secondary veins curve to-wards the apex (tip).
- *Cross-Venulate:* Small veins connect-ing secondary veins.
- *Dichotomous:* With veins branching or forking symmetrically in pairs equally.
- *Longitudinal:* Veins aligned mostly along axis of the leaf running the length of the leaf.
- *Palmate:* Several primary veins di-verging from a point.
- *Parallel:* The veins run parallel to each other and are connected by smaller veins.

Leaves of 'Monocot plants'e.g., Banana, Wheat.

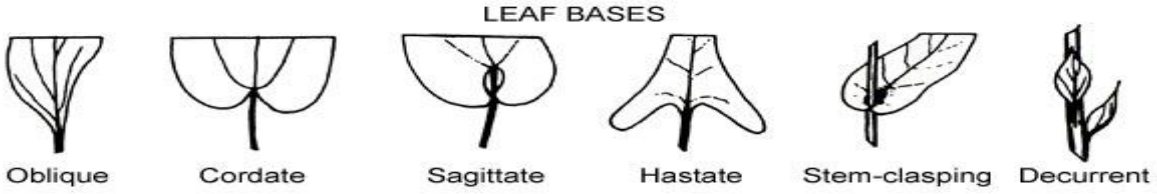
- *Pinnate:* With secondary veins arising from midrib or mid vein and paired oppo-sitely.
- *Reticulate:* The veins branch and unite forming a complicated network. All the veins are interconnected, like the strands of the net.e.g., Hibiscus, Redgram.

- *Rotate:* Arrangement where major veins project out from center like the spokes of a wheel.



Base

- *Oblique:* Slanting.
- *Cordate:* Heart-shaped with the notch towards the stalk.
- *Sagittate:* Shaped like an arrowhead and with the acute basal lobes pointing downward.
- *Hastate:* Shaped like a halberd and with the basal lobes pointing outward.
- *Stem Clasping:* Leaf partially encircles the stem, as in *Calendul officinalis* (calendula)
- *Decurrent:* Leaf base extends downward to form a wing or ridge along the stem, as in *Psidium guajava* (Guava).



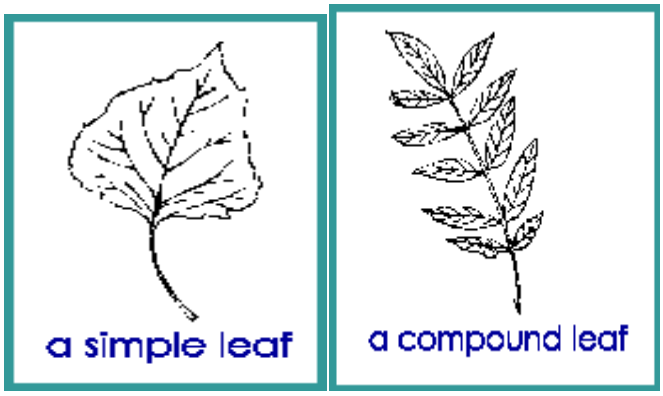
Leaf Divisions

Simple: Blade is of one piece, as in *Camellia japonica.* It may still be simple and be lobed or cleft, as in *Hibiscus rosa-sinensis* (Hibiscus).

Compound: Blade is made up of a number of separate leaflets. The two principal types of compound leaves are pinnate and palmate.

Pinnate: Leaflets or pinnae are arranged on the sides of the main leaf stalk.e.g. *Nephrolepsis exaltata.*

Palmate: The leaflets are attached directly to the end of the petiole and extend outward much like fingers in a palm. e.g. *Carica papaya* Types of configuration of leaf blade.

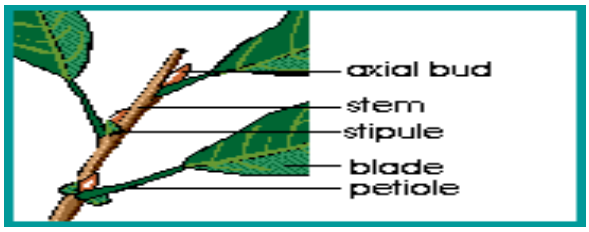


Note: The distinction between simple and compound leaf can be made by the fact that a leaf (simple or compound) has an axial bud between the petiole and the stem.

Petiole: The petiole of a leaf connects the blade of the leaf to the stem. It may be long, short, rounded or flat.

Sessile leaf: Some leaves have no petioles in which case they are said to be sessile.

Stipules: At the base of the petiole, these are small leaf-like structures called stipules e.g. in peas, beans and roses. Between the petiole and the stem is a bud of a potential branch (an axial bud).



Phyllotaxis or Phyllotaxy: Leaf Arrangements on Stem

Node is the place on the stem from where the leaves grow. Internodes are the part between the nodes.

*Alternate: O*ne leaf at each node, as in *Hibiscus rosa-sinensis* (hibiscus).

*Opposite: T*wo leaves at each node, always on opposite sides of the stem.

Whorled: More than two leaves at a node as in *Nerium oleander* (oleander).

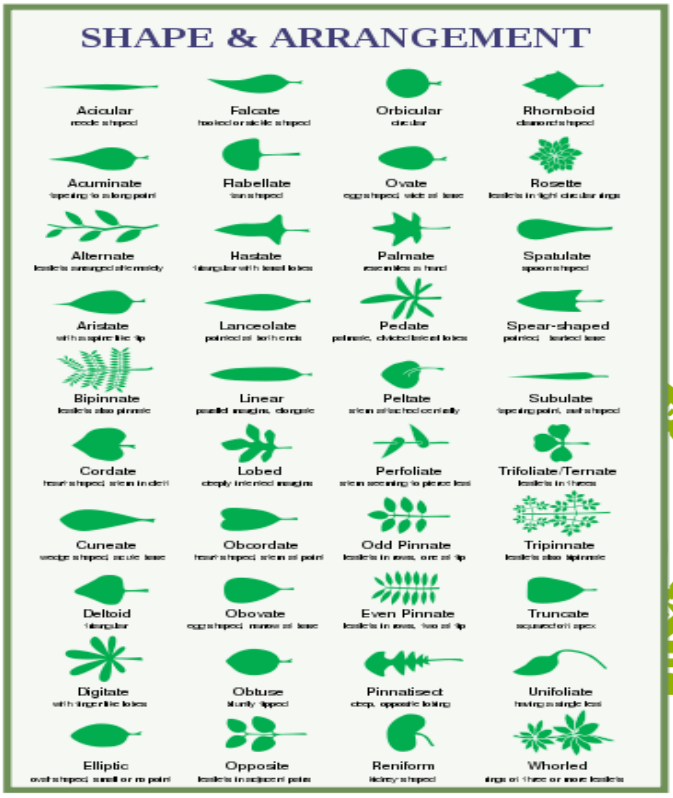
Decussate: Successive leaf pairs are perpendicular as in *Calotropis procera.*

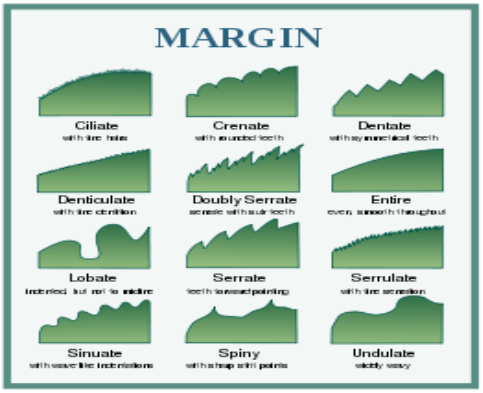
Distichous "two-ranked leaf arrangement": Is a special case of either opposite or alternate leaf arrangement where the leaves on a stem are arranged in two vertical columns on opposite sides of the stem as in sunflower.

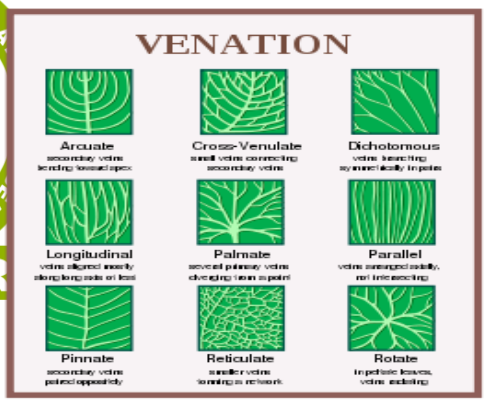
Alternate Pattern *Opposite Pattern*

Whorled Pattern

Decussate Pattern







Rasa / *Anurasa* (Taste)

Taste of the herbs plays important role in the classification as *Madhur*, *Amla*, *Lawana*, *Katu*, *Tikta* and *Kashaya*.

Gandha (Smell)

Most of the herbs have specific smell e.g.

- Sarpagandha
- Ashwagandha
- Gandha Prasarini (foul smell)
- Haritaki

***Sparsh* (Texture):** The texture of the plant helps in Identification. The leaf surface is also host to a large variety of microorganisms; in this context it is referred to as the phyllosphere. Trichomes, "Hairs" on plants, leaves can show several degrees of hairiness. Commonest types of textures are:

- *Farinose:* Bearing farina; mealy, covered with a waxy, whitish powder.
- *Glabrous:* Smooth, not hairy.
- *Glaucous:* Aucous with a whitish bloom; covered with a very fine, bluish-white powder.
- *Glutinous:* Sticky, viscid.
- *Papillate* or *papillose:* Bearing papillae (minute, nipple-shaped protuberances).
- *Pubescent:* Covered with erect hairs (especially soft and short ones).

- *Punctate:* Marked with dots; dotted with depressions or with translucent glands or colored dots.
- *Rugose:* Deeply wrinkled; with veins clearly visible.
- *Scurfy:* Covered with tiny, broad scale like particles.
- *Tuberculate:* Covered with tubercles; covered with warty prominences.
- *Verrucose:* Warted, with warty out-growths.
- *Viscid* or *viscous:* Covered with thick, sticky secretions.

Scanning electron microscope image of trichomes.

Shabda (Sound)

- On breaking e.g. *pilu*
- On fire e.g. *tinduka*

There need not necessarily be a one to one relationship between *Dravyaguna* and western identifications of a given 'plant' i.e. Sanskrit and botanical names are not necessarily in one-to-one correspondence. As a result, there can be more than one botanical source for a given plant component of an *Ayurvedic* formulation e.g. *Bala* can mean either *Sida retusa* or *Sida cordifolia*; *Centella asiatica* and *Bacopa monerri* are both accepted as *Brahmi*. Similarly, *Vishnukranta* also has more than two botanical sources. Correspondingly, morphological properties determining botanical identification of a plant may seem a reasonable starting point for quality control, but quality control cannot end there, for specific *Ayurvedic Dravyaguna* properties do not necessarily depend on particulars of plant morphology.

The concepts of *Rasa* (taste), *Guna* (qualitative attributes), *Veerya* and *Vipaka* (overall post-digestive effect of a medicine) are qualitative. When the approach to drug action based on the above principles does not work, *Ayurveda* proposes the principle of *Prabhava*, meaning unpredictable action of a drug i.e. not based on a plant or substance's morphology or internal attributes.

Such materials were meticulously studied by the ancient sages, based on the *Prakriti Sama Samavayarabdha* principle. Those not falling into this category are classified under *Vikriti Vishama Samavayarabdha*, meaning unpredictable action, not consistent with *Guna* or *Rasa*.(2)

Secondary aspects of plant Quality Control: There are further considerations of great importance in determining quality of plant ingredients in herbal formulations, including place of origin, method of cultivation (mono-culture or multi-culture crop

etc.), time, season, methods of collection and storage. Each of these should be studied for individual plants. This is an area requiring careful explanation. Many plants, though grown with great care and nourishment, are not found to be effective, because they lack the necessary *Veerya*. For example, relatively smaller specimens of Haridra (Haldi, Turmeric), grown under demanding, dry conditions in Tamil Nadu are far more potent, with greater concentration of curcumin, than the same variety grown in damp conditions.

Certain plants, especially root tubers, have to remain underground for a specified period before they are collected. Certain plant material loses its activity merely from exposure to sunlight e.g. Haridra. Some plants need to be processed in particular materials to obtain their full efficacy e.g. *Piper longum* in milk. Some are synergistic and become more effective when used together e.g. *Salaparni* and *Prushniparni.* Four basic attributes are given to an ideal *aushadham* (medicine) pertaining to both an ingredient of a whole preparation, as well as a poly constituent formulation. These are 1. *Bahu kalpam*, which can be used in varieties of dosage forms like decoction and oils. 2. *Bahu gunam* means having more than one attribute like *Tinospora cordifolia*, which has many uses. 3. *Sampannam*, which refers to natural attributes and is critical for quality control. To ensure that the sampannatha is present in herbal ingredients, many attributes must be assessed. 4. *Yogyata* means suitability of a medicine in a given context.[3]

Even in today's world the following words of *Charaka* are relevant to its being fulfilled. "*Thadeva yuktam bhaishajyam yadarogyaya kalpathe*" broadly meaning medicine is that which restores health and brings longevity.[4] "*Suddhastu Shamayet nacha kopayet*" meaning, a pure medicine is, one which when eliminating a disease, should not give rise to even the slightest cause for another disease.[5]

CONCLUSION: Identification of Ayurvedic herbs is a meticulous process. Ayurvedic herbs can be recognised by various organoleptic characters mentioned in text. Many of the drugs are even named by virtue of its organoleptic properties viz. *durgandha*, *sukhasparsha*, *sinhasya* etc. Even other properties viz. Synergism, refinement etc of drugs can be very well corroborated by the properties mentioned in texts.

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Source of support: Nil
Conflict of interest:None Declared