

**Pharmaceutical standardization, product development and quality control
aspect of vitaamrit syrup a marketed product**

A DISSERTATION REPORT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF

MASTER OF PHARMACY (AYURVEDA)

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Chapter 1

Introduction

Rasayana is not just a drug therapy but it is a specialized procedure practised in the form of revitalisation and rejuvenation therapies, dietary regimen, and special health promoting conduct and behaviour. Scientific studies have proven the efficacious role of Rasayana remedies in the management of chronic life style related diseases and degenerative changes. It has been reported that the 'Rasayanas' are rejuvenators, nutritional supplements, possess strong antioxidant activity and antagonistic actions on the oxidative stressors. Rasayana is the preventive therapy describe in Ayurveda which is helpful to maintain health, retard aging process and promote immune system to fight against infection. The activity of Rasayana on immune system may be due to several chemical compounds present in the drug acting synergistically in the biological system.

Vitamrit syrup is specially formulated to work as a *rasayan* which promotes good health all. Vitamrit is a complete health tonic and a good source of vitamins, mineral and anti-oxidants. It helps people develop good appetite and naturally activates the digestive system. Its main ingredients-Amrita and Ashwagandh are known to correct metabolism and help in proper nutrition to the body. It can also be taken as a daily health energiser tonic.

Problem background

It is increasingly being realized that many of today's diseases are due to "oxidative stress" that results from an imbalance between formation and neutralization of free radicals. Free radicals are produced in the body as by-products of normal metabolism, as a result of exposure to radiation and some environmental pollutants. Because they are highly reactive, they can damage cellular components and are implicated in a variety of diseases. Free radicals are normally neutralized by efficient systems in the body that include the antioxidant enzymes (superoxide dismutase, catalase, and glutathione peroxidase) and the nutrient-derived antioxidant small molecules (vitamin E, vitamin C, carotenes, flavonoids, glutathione, uric acid, and taurine). In healthy individuals, a delicate balance exists between free radicals and antioxidants. In some pathologic conditions such as diabetes and in critically ill patients, oxidative stress causes the level of antioxidants to fall below normal. Antioxidant supplements for such conditions are expected to be of benefit. As a preventive measure

against certain diseases, the best approach for healthy individuals is to regularly consume an adequate amount of antioxidant-rich foods or herbs.

How Rasayana act?

1. Rejuvenates the body after prolonged illness.
2. Detoxifies the body and protects.
3. Regulates the immune system of the body.
4. Take care of stress and strain of the day to day life.

Chapter 2

Rational and scope of the study

Vitamrit syrup is the marketed product which is known for its rasayan property. It is a liquid dosage form; associated with the problems like less stability, accurate dosing, complex to administer and due to presence of water and sugar, are more susceptible to microbial contamination due to multiple exposures with the environment. However, Solid dosage forms, such as tablets are easy to pack and carry and its accurate dosing is possible. Due to onetime exposure with the environment it has least chances of microbial contamination. It also improves drug compliance in patients with respect to its palatability issue so present study is hypothesis for the development of tablet dosage form of vitamrit.

Chapter 3

Objective of the study

1. Procurement and authentication the raw materials.
2. To perform the physicochemical and phytochemical analysis of authenticated raw materials.
3. To develop the tablet dosage form.
4. To perform the physicochemical and phytochemical analysis of prepared tablet dosage form
5. To perform the stability study for the prepared tablet dosage form.

Chapter 4

Literature review of drugs

4.1 AMALAKI

Amalaki consists of fresh fruit pulp of *Embilica officinale* . (Fam. Euphorbiaceae); a small or medium sized tree.

SYNONYMS:-

Sanskrit : Amalaka, Amtaphala, Dhatriphala.

Hindi : Amla, Aonla.

English : Emblic Myrobalan.

Classical categorization:-

Caraka:-jvaraghna,kasaghna,virecanopaga,kusthaghna,vayahsthapana.

Susruta:-Amalakyadi,paruskadi,triphal.

Vagbhata:-Parusakadi.

DESCRIPTION:-

a)Macroscopic:- Fruit, globose, 2.5-3.5 cm in diameter, fleshy, smooth with six prominent lines; greenish when tender, changing to light yellowish or pinkish colour when mature, with a few dark specks: taste, sour and astringent followed by delicately sweet tast

b)Microscopic:- Transverse section of mature fruit shows an epicarp consisting of single layer of epidermis and 2-4 layers of hypodermis; epidermal cell, tabular In shape, covered externally with a thick cuticle and appear in surface view as polygonal; hypodermal cells tangentially elongated, thick-walled, smaller in dimension than epidermal cells; mesocarp forms bulk of fruit, consisting of thin-walled parenchymatous cells with intercellular spaces, peripheral 6-9 layers smaller, ovoid or tangentially elongated while rest of cells larger in size, isodiametric and radially elongated; several collateral fibrovascular bundles scattered throughout mesocarp consisting of xylem and phloem; xylem composed of tracheal elements, fibre tracheids and xylem fibres; tracheal elements show reticulate scalariform and spiral thickenings; xylem fibres elongated with narrow lumen and pointed end; mesocarp contains large aggregates of numerous irregular silica crystals.

PROPERTIES AND ACTION:-

Rasa : Madhura, Amla, Katu, Tikta, Kashaya

Guna : Laghu, Ruksha

Virya : sheeta

Vipaka : Madhura

Karma : Rasayana,

IDENTITY, PURITY AND STRENGTH:-

Foreign matter	Not more than	2	per cent,
Total Ash	Not more than	7	per cent,
Acid-insoluble ash	Not more than	2	per cent,
Alcohol-soluble extractive	Not less than	40	per cent, (On dried basis)
Water-soluble extractive	Not less than	50	per cent,
Moisture content	Not less than	80	per cent,

CONSTITUENTS :- Ascorbic acid and tannins.

THERAPEUTIC USES:- Raktapitta; Amlapitta; Prameha; Daha

DOSE :- 10-20 g of the drug. 5-10 ml of fresh juice.

IMPORTANT FORMULATIONS:- Cyavanaprasa.

4.2 ASHWAGANDA

Ashwaganda consists of dried mature roots of *Withania somnifera* . (Fam. Solanaceae), a perennial shrub.

SYNONYMS:-

Sanskrit : Hayagandha, Vajigandha.

Hindi : Asgandh.

Classical categorization:-

Caraka:-.Balaya,brmhaniy,madhuraskandha.

Susruta:- -

Vagbhata:- -

DESCRIPTION:-

a)Macroscopic:-Roots straight, unbranched, thickness varying with age. roots bear fibre-like secondary roots, outer surface buff to grey-yellow with longitudinal wrinkles, crown consists of 2-6 remains of stem base, stem bases variously thickened, nodes prominent only on the side from where petiole arises, cylindrical, green with longitudinal wrinkles, fracture, short and uneven, odour, characteristic, taste, bitter and acrid.

b)Microscopic:-Transverse section of root shows cork exfoliated or crushed, when present isodiametric and non-lignified, cork cambium of 2-4 diffused rows of cells, secondary cortex about twenty layers of compact parenchymatous cells, phloem consists of sieve tubes, companion cells, phloem parenchyma, cambium 4-5 rows of tangentially elongated cells,

secondary xylem hard forming a closed vascular ring separated by multiseriate medullary rays, a few xylem parenchyma.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than 2 per cent,
Total Ash	Not more than 7 per cent,
Acid-insoluble ash	Not more than 1 per cent,
Alcohol soluble extractive	Not less than 15 per cent,

CONSTITUENTS :- Alkaloids and withanolides.

PROPERTIES AND ACTION:-

Rasa : Tikta, Kashaya

Guna : Laghu

Virya : Ushna

Vipaka : Madhura

Karma : Rasayana, Vatakaphapaha, Balya, Vajikara.

THERAPEUTIC USES :- Kshaya, Daurbalya, Vataroga, Klaibya.

DOSE:- 3-6 g of the drug in powder form.

4.3 BIBHITAKA

Bibhitaki consists of pericarp of dried ripe fruits of *Terntinalia belerica* . (Fam. Combretaceae), a large deciduous tree.

SYNONYMS :-

Sanskrit : Vibhita, Aksha.

Hindi : Bahera

English : Beleric Myrobalan

Classical categorization:-

Caraka:-jvarahara,kasahara,virecanopaga.

Susruta:-Mustadi,tripphala.

Vagbhata:-Mustadi.

DESCRIPTION :-

Macroscopic:-Fruit nearly spherical to ovoid, 2.5-4.0 cm in diameter, fresh ripe fruits slightly silvery or with whitish shiny pubescent surface, mature fruits grey or grayish brown with slightly wrinkled appearance, rind of fruit shows variation in thickness from 3-5 mm, taste, astringent.

Microscopic:- Transverse section of fruit shows an outer epicarp consisting of a layer of epidermis, most of epidermal cells elongate to form hair like protuberance with swollen base, composed of a zone of parenchymatous cells, slightly tangentially elongated and irregularly arranged, intermingled with stone cells of varying shape and size, elongated stone cells found towards periphery and spherical in the inner zone of mesocarp in groups of 3-10, mesocarp traversed in various directions by numerous vascular strands, bundles collateral, endarch, simple starch grains and some stone cells found in most of mesocarp cells, few peripheral layers devoid of starch grains, rosettes of calcium oxalate and stone cells present in parenchymatous cells, endosperm composed of stone cells running longitudinally as well as transversely.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than 2 per cent,
Total Ash	Not more than 7 per cent,
Acid-insoluble ash	Not more than 1 per cent,
Alcohol-soluble extractive	Not less than 8 per cent
Water-soluble extractive	Not less than 35 per cent,

CONSTITUENTS:- Gallic acid, tannic acid and glycosides.

PROPERTIES AND ACTION:-

Rasa : Kashaya

Guna : Laghu, Ruksha

Virya : ushna

Vipaka : Madhura

Karma : Cakshushya, Keshya, Kaphapittajit, Bhedaka.

THERAPEUTIC USES :- Chardi, K_jsa, K_mmiroga, Vibandha, Svarabheda, Netraroga

DOSE :- 3-6 g of the drug in powder form.

4.4 GOKSHURA

Gokshura consists of dried, ripe, entire fruit of *Tribulus terrestris* . (Fam Zygopyllaceae), an annual, rarely pernnial common weed.

SYNONYMS:-

Sanskrit : Gokshuraka, Traika.

Hindi : Gokhru

English : Caltrop's fruit

DESCRIPTION:-

- a) **Macroscopic** :-Fruit stalked, light or greenish yellow, five ribbed or angled, more or less spherical in structure and covered with short stiff or pubescent hairs, 1 cm in diameter with five pairs, of prominent short stiff spines, pointed downwards, about 0.5 cm in length, tips of spines almost meet in pairs whole together forming pentagonal framework around fruit, ripe fruit separates into five segment, of each cocci and each appears as single-fruit, each coccus semi-lunar or plano-convex in structure one chambered, armed with a pair of spines, starting from its middle, containing four or more seeds, taste, slightly astringent.
- b) **Microscopic**:- Transverse section of fruit shows small epidermal cells of each coccus rectangular, unicellular trichomes in abundance, mesocarp 6-10 layers of large parenchymatous cells, rosette of calcium oxalate crystals abundantly present, mesocarp followed by 3-4 compact layers of small cells containing prismatic crystals of calcium oxalate.

IDENTITY, PURITY AND STRENGTH:-

Foreign matter	Not more than	1	per cent
Total Ash	Not more than	15	per cent,
Acid-insoluble ash	Not more than	2	per cent,
Alcohol-soluble extractive	Not less than	6	per cent,
Water-soluble extractive	Not less than	10	per cent,

CONSTITUENTS :- Potassium nitrate, sterols, sapogenin with pyroketone ring (diosgenin), gitogenin and hecogenins.

PROPERTIES AND ACTION :-

Rasa : Madhura

Guna : Guru, Snigdha

Virya : sheeta

Vipaka : Madhura

THERAPEUTIC USES :- , Daurbalya, Hridayaroga, Kasa, Ashmari. Prameha.

DOSE :- 3-6 g of the drug in powder form. 20-30 g of the drug for decoction.

4.5 GUDUCHI

Guduchi consists of dried, matured pieces of stem of *Tinospora cordifolia* (Fam, Menispermaceae), a perennial climber.

SYNONYMS:-

Sanskrit : Amatavallç, Amita, Madhupar, Assamese.

Hindi : Giloe, Gurcha.

DESCRIPTION:-

a) Macroscopic Drug occurs in pieces of varying thickness ranging from 0.6-5 cm in diameter, young stems green with smooth surfaces and swelling at nodes, older ones show a light brown surface marked with warty protuberances due to circular lenticels, transversely smoothed surface shows a radial structure with conspicuous medullary rays traversing porous tissues, taste bitter.

b) Microscopic Transverse section of stem shows outer-most layer of cork, differentiating into outer zone of thick-walled brownish and compressed cells, inner zone of thin walled colourless, tangentially arranged 3-4 rows of cells, cork broken at some places due to opening of lenticels, followed by 5 or more rows of secondary cortex of which the cells of outer rows smaller than the inner one, just within the opening of lenticels, groups of sclereids consisting of 2-10 cells found in secondary cortex region, outer zone of cortex consists of 3--5 rows of irregularly arranged, tangentially elongated chlorenchymatous cells, cortical cells situated towards inner side, polygonal in shape and filled with plenty of starch grains, simple, ovoid, or irregularly ovoid-elliptical, occasionally compound of 2-4 components, several secretory cells, found scattered in the cortex, pericyclic fibres lignified with wide lumen and pointed ends, associated with a large number of crystal fibres containing a single prism in each chamber, vascular zone composed of 10-12 or more wedge-shaped strips of xylem, externally surrounded by semi-circular strips of phloem, alternating, with wide medullary rays, phloem consists of sieve tube, companion cells and phloem parenchyma of polygonal or tangentially elongated cells, some of them contain crystals of calcium oxalate, cambium composed of one to two layers of tangentially elongated cells in each vascular bundle, xylem consists of vessels, tracheids, parenchyma and fibres, in primary xylem, vessels comparatively narrow devoid of tyloses, secondary xylem elements thick-walled, lignified, vessels cylindrical in shape bearing bordered pits on their walls some large vessels possess several tyloses and often contain transverse septa, medullary rays 15-20 or more cells wide containing rounded, hemispherical, oblong, ovoid, with faintly marked concentric striations and central hilum appearing like a point, starch grains of 5.5-11.20 μ in diameter and 6-11.28 μ in length, pith composed of large, thin-walled cells mostly containing starch grains.

IDENTITY, PURITY AND STRENGTH:-

Foreign matter	Not more than	2	per cent
Total ash	Not more than	16	per cent

Acid-insoluble ash	Not more than	3	per cent
Alcohol-soluble extractive	Not less than	3	per cent
Water-soluble extractive	Not less than	11	per cent,
Moisture content	Not more than	75	per cent

CONSTITUENTS :- Terpenoids and alkaloids.

PROPERTIES AND ACTION :

Rasa : Tikta, Kashaya

Guna : Laghu

Virya : Ushna,

Vipaka : Madhura

Karma : Balya, deepana, Rasayana, Raktaroga, Jvaraghna.

THERAPEUTIC USES :- Jvara, Kushtha, , Prameha, Vatarakta, kamala.

DOSE :- 3-6 g of the drug in powder form. 20-30 g of the drug for decoction

4.6 HARITAKI

Haritaki consists of the pericarp of mature fruits of *Terminalia chebula*.(Fam. Combretaceae), a moderate sized or large tree.

SYNONYMS :-

Sanskrit : Abhaya, Pathya, Vijaya.

Hindi : Harre, Harad, Harar

English : Myrobalan

Classical categorization:-

Caraka:-jvaraghna,kasaghna,virecanopaga,kusthaghna,prajasthapana,kuthagba

Susruta:-Amalakyadi,paruskadi,triphal.

Vagbhata:-Parusakadi

DESCRIPTION:-

a) Macroscopic Intact fruit yellowish-brown, ovoid, 20-35 mm long, 13-25 mm wide, wrinkled and ribbed longitudinally, pericarp fibrous, 3-4 mm thick, non-adherent to the seed, taste, astringent.

b) Microscopic Transverse section of pericarp shows epicarp consisting of one layer of epidermal cells inner tangential and upper portions of radial wall thick, mesocarp, 2-3 layers of collenchyma, followed by a broad zone of parenchyma in which fibres and sclereids in group and vascular bundles scattered, fibres with peg like out growth and simple pitted walls, sclereids of various shapes and sizes but mostly elongated, tannins and raphides in

parenchyma, endocarp consists of thick-walled sclereids of various shapes and sizes, mostly elongated, epidermal surface view reveal polygonal cells, uniformly thickwalled, several of them divided into two by a thin septa, starch grains simple rounded or oval in shape, measuring 2-7 μ in diameter, found in plenty in almost all cells of mesocarp.

Powder- Brownish in colour, under microscope shows a few fibres, vessels with simple pits and groups of sclereids.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than	1	per cent
Total Ash	Not more than	5	per cent
Acid-insoluble ash	Not more than	5	per cent
Alcohol-soluble extractive	Not less than	40	per cent,
Water-soluble extractive	Not less than	60	per cent

CONSTITUENTS:- Tannins, anthraquinones and polyphenolic compounds.

PROPERTIES AND ACTION:-

Rasa : Madhura, Amla, Katu, Tikta, Kashya

Guna : Laghu, ruksha

Virya : Ushna

Vipaka : Madhura

Karma : Cakshushiya, Deepana, Hridya, Medhya, Rasayana, Anulomana .

THERAPEUTIC USES-Aruci, Hridroga, Kasa, Pandu, Prameha, Vibandha, Jawarghana, Gulma, Udararoga .

DOSE :- Hridroga, Kasa, Pandu, Prameha, Vibandha, Jawarghana, 3-6 g of the drug in powder form.

4.7 MULETHI

Melethi consists of dried, unpeeled, stolon and root of *Glycyrrhiza glabra* , (Fam. Leguminosae) , a tall perennial herb.

SYNONYMS:-

Sanskrit : Yashatimadhuka, Madhuka, Madhuya.

Hindi : Mulethi, Mulathi, Muleti, Jethimadhu, Jethimadh

English : Liquorice root

DESCRIPTION:-

a) **Macroscopic** Stolon consists of yellowish brown or dark brown outer layer, externally longitudinally wrinkled, with occasional small buds and encircling scale leaves, smoothed

transversely, cut surface shows a cambium ring about one-third of radius from outer surface and a small central pith, root similar without a pith, fracture, coarsely fibrous in bark and splintery in wood, odour, faint and characteristic, taste, sweetish.

b) Microscopic Stolon- transverse section of stolon shows cork of 10-20 or more layers of tabular cells, outer layers with reddish-brown amorphous contents, inner 3 or 4 rows having thicker, colourless walls, secondary cortex usually of 1-3 layers of radially arranged parenchymatous cells containing isolated prisms of calcium oxalate, secondary phloem a broad band, cells of inner part cellulosic and outer lignified, radially arranged groups of about 10-50 fibres, surrounded by a sheath of parenchyma cells, each usually containing a prism of calcium oxalate about 10-35 μ long, cambium form tissue of 3 or more layers of cells, secondary xylem distinctly radiate with medullary rays, 3-5 cells wide, vessels about 80-200 μ in diameter with thick, yellow, pitted, reticulately thickened walls, groups of lignified fibres with crystal sheaths similar to those of phloem, xylem parenchyma of two kinds, those between the vessels having thick pitted walls without inter-cellular spaces, the remaining with thin walls, pith of parenchymatous cells in longitudinal rows, with inter-cellular spaces. Root -transverse section of root shows structure closely resembling that of stolon except that no medulla is present, xylem tetrarch, usually four principal medullary rays at right angles to each other, in peeled drug cork shows phelloderm and sometimes without secondary phloem all parenchymatous tissues containing abundant, simple, oval or rounded starch grains, 2-20 μ in length.

CONSTITUENTS :- Glycyrrhizin, glycyrrhizic acid, glycyrrhetic acid, asparagine, sugars, resin and starch.

IDENTITY,PURITY :-

Total Ash	Not more than	10	per cent,
Acid-insoluble ash	Not more than	2.5	per cent,
Alcohol-soluble extractive	Not less than	10	per cent,
Water-soluble extractive	Not less than	20	per cent,

PROPERTIES AND ACTION:-

Rasa : Madhura

Guna : Guru, Snigdha

Virya : sheeta

Vipaka : Madhura

Karma : Balya, Cakshuya, Varnya, Vatapittajit, Raktaprasadana

THERAPEUTIC USES :- Kasa, Kshaya, Svarabheda, Vatarakta,

DOSE:- 2-4 g of the drug in powder form.

4.8 ARJUNA

Arjuna consists of the stem bark of *Terminalia arjuna* (Fam. Combretaceae); a large deciduous tree.

SYNONYMS :-

Sanskrit : Kakubha, Partha,

Hindi : Arjuna

DESCRIPTION:-

a) Macroscopic Bark available in pieces, flat, curved, recurved, channelled to half quilled, 0.2-1.5 cm thick, market samples upto 10 cm in length and upto 7 cm in width, outer surface somewhat smooth and grey, inner surface somewhat fibrous and pinkish, transversely cut smoothed bark shows pinkish surface, fracture, short in inner and laminated in outer part; taste, bitter and astringent.

b) Microscopic Stem Bark -Mature bark shows cork consisting of 9-10 layers of tangentially elongated cells, a few outer layers filled with brown colouring matter; cork cambium and secondary cortex not distinct and medullary rays observed traversing almost upto outer bark; secondary phloem occupies a wide zone, consisting of sieve tubes, companion cells, phloem parenchyma and phloem fibres, traversed by phloem rays, usually uniseriate but biseriate rays also occasionally seen; in the middle and outer phloem region, sieve tubes get collapsed and form ceratenchyma; phloem fibres distributed in rows and present in groups of 2-10; rosette crystals of calcium oxalate measuring 80-180 μ in dia., present in most of the phloem parenchyma, alternating with fibres; idioblasts consisting of large cells having aggregates of prismatic and rhomboidal crystals of calcium oxalate in row throughout the zone, measuring 260-600 μ in dia., starch grains, mostly simple, compound of 2-3 components, sometimes upto 5 components, round to oval, elliptical, measuring 5-13 μ in dia., distributed throughout the tissue (absent in *T. alata*); in a tangential section the uniseriate phloem rays 2-10 cells high and biseriate, 4-12 cells high; in longitudinal section rosette crystals of calcium oxalate found in the form of strands in phloem parenchyma.

Powder - Reddish-brown; shows fragments of cork cells, uniseriate phloem rays, fibres, a number of rosette crystals of calcium oxalate, a few rhomboidal crystals, starch grains simple and compound, round to oval, elliptic, having 2-3 components with concentric striations and small narrow hilum, measuring 5-13 μ in diameter.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than 2 per cent,
Total Ash	Not more than 25 per cent
Acid-insoluble ash	Not more than 1 per cent
Alcohol-soluble extractive	Not less than 20 per cent,
Water-soluble extractive	Not less than 20 per cent,

CONSTITUENTS :- Tannins.

PROPERTIES AND ACTION:-

Rasa : Kashya

Guna : Ruksha

Virya : sheeta

Vipaka : Katu

Karma : Bhagnasandhanakara, Hridya, Kaphahara, Pittahara,

THERAPEUTIC USES :- Medoroga, Vrana, Hridroga, Prameha.

DOSE :- 3-6 g. of the drug in powder form.

4.9 BRAHMI

Brahmi consists of dried whole plant of *Bacopa monnieri*. (Fam. Scrophulariaceae); a glabrous, succulent, small, prostrate or creeping annual herb.

SYNONYMS:-

Sanskrit : Sarasvata, Kapotavaka.

English : Thyme Leaved Gratiola .

Hindi : Manduka Parni

DESCRIPTION

a) Macroscopic Root - Thin, wiry, small, branched creamish-yellow. **Stem** - Thin, green or purplish green, about 1-2 mm thick, soft, nodes and internodes prominent, glabrous; taste, slightly bitter. **Leaf** - Simple, opposite, decussate, green, sessile, 1-2 cm long, obovate-oblong; taste, slightly bitter. **Flower** - Small, axillary and solitary, pedicels 6-30 mm long, bracteoles shorter than pedicels. **Fruit** - Capsules upto 5 mm long, ovoid and glabrous.

b) Microscopic Root - Shows a single layer of epidermis, cortex having large air cavities; endodermis single layered; pericycle not distinct; stele consists of a thin layer of phloem with a few sieve elements and isolated material from xylem shows vessels with reticulate thickenings. **Stem** - Shows single layer of epidermis followed by a wide cortex of thin-walled cells with very large intercellular spaces; endodermis single layered; pericycle 3 consisting of

1-2 layers; vascular ring continuous, composed of a narrow zone of phloem towards periphery and a wide ring of xylem towards centre; centre occupied by a small pith with distinct intercellular spaces; starch grains simple, round to oval, present in a few cells of cortex and endodermis, measuring 4-14 μ in dia., and 8.0-14.0 x 2.5-9.0 μ in dia. respectively. **Leaf** -Shows a single layer of upper and lower epidermis covered with thin cuticle; glandular hairs sessile, subsidiary cells present on both surfaces; a few prismatic crystals of calcium oxalate occasionally found distributed in mesophyll cells; mesophyll traversed by small veins surrounded by bundle sheath; no distinct midrib present.

Powder - Yellowish-brown; shows xylem vessels with reticulate thickening, glandular hairs, simple, round and oval starch grains, measuring 4-14 μ in diameter.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than 2 per cent,
Total Ash	Not more than 18 per cent,
Acid-insoluble ash	Not more than 6 per cent,
Alcohol-soluble extractive	Not less than 6 per cent,
Water-soluble extractive	Not less than 15 per cent

CONSTITUENTS :- Alkaloids.

PROPERTIES AND ACTION:-

Rasa : Madhura, Tikta, Kashya

Guna : Laghu, Sara

Virya : sheeta

Vipaka : Madhura

Karma : Kaphahara, Medhya, Rasayana, Svarya, Matiprada, Prajishipana, Mohahara.

THERAPEUTIC USES:- Jvara, , Pandu, Prameha.

DOSE :- 1-3 g in powder form.

4.10 SHATAVARI

Shatavari consists of tuberous roots of *Asparagus recemosus* (Fam. Liliaceae), an ascending, spinous much branched, perennial climber.

SYNONYMS:-

Sanskrit : Abheru, Atirasa

Hindi : Satavar, Satamul

English : Asparagus

DESCRIPTION:-

a) Macroscopic :-Root tuberous, 10 to 30 cm in length and 0.1 to 0.5 cm thick, tapering at both ends with longitudinal wrinkles; colour cream; taste, sweetish.

b) Microscopic :-Shows an outer layer of piliferous cells, ruptured at places, composed of small, thin-walled, rectangular asymmetrical cells, a number of cells elongated to form unicellular root hairs; cortex comprises of 25 to 29 layers, distinct in two zones, outer and inner cortex; outer cortex consists of 6 or 7 layers, compactly arranged, irregular to polygonal, thick walled, lignified cells; inner cortex comprise of 21 to 23 layers, oval to polygonal, thin-walled, tangentially elongated cells with intercellular spaces; stone cells, either singly or in groups, form a discontinuous to continuous ring in the upper part of this region; raphides of calcium oxalate also present in this region; 2 or 3 layers of stone cells encircle the endodermis; endodermis composed of thin-walled parenchymatous cells; pericycle present below endodermis; stele ex arch and radial in position; xylem consist of vessels, tracheids and parenchyma; xylem vessels have pitted thickening; phloem patches consists of usual element; pith composed of circular to oval parenchymatous cells, a few cells slightly lignified.

Powder - Yellowish-cream; fragments of lignified, thick-walled cells; vessels with simple pits, pieces of raphides, numerous, lignified, rectangular elongated' stone cells having clear striations with wide as well as narrow lumen and groups of parenchyma.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than 1 per cent,
Total Ash	Not more than 5 per cent,
Acid-insoluble ash	Not more than 0.5 per cent,
Alcohol-soluble extractive	Not less than 10 per cent,
Water-soluble extractive	Not less than 45 per cent,

CONSTITUENTS :-Sugar, Glycosides, Saponin and Sitosterol.

PROPERTIES AND ACTION :-

Rasa : Madhura, Tikta

Guna : Guru, Snigdha

Virya : sheeta

Vipaka : Madhura

Karma : Balya, Hridya, Medhya, Pittahara, Rasayana,,Kaphavataghna, Stanyakara, Natrya.

THERAPEUTIC USES :- Amlapitta, Arsha, Gulma, Kshaya, , Raktapitta, Raktavikara, Mutrarakta, Stanya Kshaya.

DOSE:- 3-6 gm of the drug.

4.11 PUNARNAVA

Punarnava consists of dried, matured whole plant of *Boerhaavia diffusa* . (Fam Nyctaginaceae), trailing herb.

SYNONYMS:-

Sanskrit : Kahtilla, sophaghni, sothaghni, Vashabhu.

Hindi : Gadapurna, Lalpunarnava

English : Horse Purslane, Hog Weed

DESCRIPTION:-

a) Macroscopic:- **Stem** greenishpurple, stiff, slender, cylindrical, swollen at nodes, minutely pubescent or nearly glabrous, prostrate divericately branched, branches from common stalk, often more than a metre long. **Root** - well developed, fairly long, somewhat tortuous, cylindrical, 0.2-1.5 cm in diameter, yellowish brown to brown coloured, surface soft to touch but rough due to minute longitudinal striations and root scars, fracture, short, no distinct odour, taste, slightly bitter. **Leaves** opposite in unequal pairs, larger ones 25-37 mm long and smaller ones 12-18 mm long ovate-oblong or suborbicular, apex rounded or slightly pointed, base subcordate or rounded, green and glabrous above, whitish below, margin entire or subundulate, dorsal side pinkish in certain cases, thick in texture, petioles nearly as long as the blade, slender. **Flowers** very small, pink coloured, nearly sessile or shortly stalked, 10-25 cm, in small umbells, arranged on slender long stalks, 4-10 corymb, axillary and in terminal panicles, bracteoles, small, acute, perianth tube constricted above the ovary, lower part greenish, ovoid, ribbed, upper part pink, funnel-shaped, 3 mm long, tube 5 lobed, stamen 2-3. **Fruit** one seeded nut, 6 mm long clavate, rounded, broadly and bluntly 5 ribbed, viscidly glandular.

b) Microscopic :-**Stem** Transverse section of stem shows epidermal layer containing multi cellular, uniseriate glandular trichome consisting of 9-12 stalked cells and an ellipsoidal head, 150-220 μ long, cortex consists of 1-2 layers of parenchyma, endodermis indistinct, pericycle 1-2 layered, thick-walled often containing scattered isolated fibres, stele consisting of many small vascular bundles often joined together in a ring and many big vascular bundles scattered in the ground tissue, intra fascicular cambium present. **Root**-transverse section of mature root shows a cork composed of thin-walled tangentially elongated cells with brown walls in the outer few layers, cork cambium of 1-2 layers of thin walled cells secondary cortex consists of 2-3 layers of parenchymatous cells followed by cortex composed of 5-12

layers of thin-walled, oval to polygonal cells, several concentric bands of xylem tissue alternating with wide zone of parenchymatous tissue present below cortical regions, number of bands vary according to thickness of root and composed of vessels, tracheids and fibres, vessels mostly found in groups of 2-8 in radial rows, having simple pits and reticulate thickening, tracheids, small, thickwalled with simple pits, fibres aseptate, elongated, thick-walled, spindle shaped with pointed ends, phloem occurs as hemispherical or crescentic patches outside each group of xylem vessels and composed of sieve elements and parenchyma, broad zone of parenchymatous tissue, in between two successive rings of xylem elements composed of thin-walled more or less rectangular cells arranged in radial rows, central regions of root occupied by primary vascular bundles, numerous raphides of calcium oxalate, in single or in group present in cortical region and parenchymatous tissue in between xylem tissue, starch grains simple and compound having 2-4 components found in abundance in most of cells of cortex, xylem elements in parenchymatous tissue between xylem elements, simple starch grains mostly rounded in shape and measure 2.75-11 μ in diameter. **Leaves** Transverse section of leaf shows anomocytic stomata on both sides, numerous, a few short hairs, 3-4 celled, present on the margin and on veins, palisade one layered, spongy parenchyma 2-4 layered with small air spaces, idioblasts containing raphides, occasionally cluster crystal of calcium oxalate and orange-red resinous matter present in mesophyll. Palisade ratio 3.5-6.5, stomatal index 11-16, vein islet number 9-15.

IDENTITY, PURITY AND STRENGTH:-

Foreign matter	Not more than 2 per cent
Total Ash	Not more than 15 per cent
Acid-insoluble ash	Not more than 6 per cent
Alcohol-soluble extractive	Not less than 1 per cent
Water-soluble extractive	Not less than 4 per cent

CONSTITUENTS:- Alkaloid (Punarnavine).

PROPERTIES AND ACTION:-

Rasa : Madhura, Tikta, Kashya

Guna : Ruksha

Virya : Ushna

Vipaka : Madhura

Karma : Anulomana, shothahara, Mutrala,

THERAPEUTIC USES:- shotha, Pandu

DOSE :- 20-30 g of the drug for decoction.

4.12 VIDARÌ

Vidari consists of sliced and dried pieces of tuberous root of *Pueraria tuberosa* (Fam. Fabaceae); a perennial climber.

SYNONYMS:-

Sanskrit : Vidari, Vidarika, Bhumikusmanda.

Hindi : Vidarikanda

DESCRIPTION

a) Macroscopic :- Drug available in the form of longitudinally sliced pieces of variable size; outer surface reddish-brown, smooth except for protuberances at some places; cut surface creamish-brown, starchy and somewhat porous; usually does not break, but pliable; taste, sweetish.

b) Microscopic:- Tuberous Root - Mature tuber shows 20-30 layers of cork consisting of rectangular, thinwalled, tangentially elongated and radially arranged cells filled with dark reddish-brown content except in a few inner layers; secondary cortex consists of 6-15 layers of circular, oval to rectangular and tangentially elongated, thin-walled cells, yellow band of 2-6 layers of compactly arranged stone cells present towards inner side of cortex; stone cells moderately thick-walled, varying in shape and size and having well marked striations and pits; a number of prismatic crystals of calcium oxalate found in parenchymatous cells, and also rarely in stone cells; secondary phloem consists of sieve elements and phloem parenchyma having a number of strands of phloem fibres and a few stone cells; sieve elements somewhat collapsed in outer region forming tangential bands; phloem fibres much elongated, highly thickened, lignified with narrow lumen; a number of tanniferous ducts filled with brown content, distributed throughout this region; xylem forms whole of inner white spongy zone, consisting of several concentric rings of one or a few xylem vessels associated with a few xylem elements; vessels mostly drum-shaped having reticulate thickening; xylem rays multi seriate and well marked consisting of thin walled, radially elongated cells, a few latex duct also present; plenty of starch grains mostly simple, somewhat round, angular to oval, having central hilum and striations, measuring 5.5 - 13.75 μ in dia. present in all parenchymatous cells.

Powder - Buff coloured; shows plenty of starch grains with central hilum and striations measuring 5.5 - 13.75 μ in dia., fragments of cork, prismatic crystals of calcium oxalate, a few xylem vessels with reticulate thickening and phloem fibres.

IDENTITY, PURITY AND STRENGTH :-

Foreign matter	Not more than 2 per cent
Total Ash	Not more than 17 per cent
Acid-insoluble ash	Not more than 4.5 per cent
Alcohol-soluble extractive	Not less than 4 per cent
Water-soluble extractive	Not less than 24 per cent

CONSTITUENTS:- Gluconic and Malic acids.

PROPERTIES AND ACTION:-

Rasa : Madhura

Guna : Guru, Snigdha

Virya : sheeta

Vipaka : Madhura

Karma : shukrala, Balya, Mutrala, Pittahara, Rasayana, Svarya, Vatahara.

THERAPEUTIC USES:- Daha, Raktapitta, Angmarda, Daurbalya.

DOSE :-3-6 g. of the drug in powder form.

4.13 SUNTHI

Sunthi consists of dried rhizome of *Zingiber officinale* (Fam. Zingiberaceae), widely cultivated in India, rhizomes dug in January-February, buds and roots removed, soaked overnight-in water, decorticated, and some times treated with lime and dried.

SYNONYMS :-

Sanskrit : Aushadha, Muhaushadha, Nḷgara, Visva.

Hindi : Sonth

English : Ginger root, Ginger.

DESCRIPTION

a) Macroscopic:-Rhizome, laterally compressed bearing short, flattish, ovate, oblique, branches on upper side each having at its apex a depressed scar, pieces about 5-15 cm long, 1.5-6.5cm wide (usually 3-4 cm) and 1-1.5 cm thick, externally buff coloured showing longitudinal striations and occasional loose fibres, fracture short, smooth, transverse surface exhibiting narrow cortex (about one-third of radius), a well-marked endodermis and a wide stele showing numerous scattered fibro-vascular bundles and yellow secreting cells, odour agreeable and aromatic, taste, agreeable and pungent.

b) Microscopic:-Transverse section of rhizome shows cortex. of isodiametric thin-walled parenchyma with scattered vascular strands and numerous isodiametric idioblasts, about

40-80 μ In diameter containing a yellowish to reddish-brown oleo-resin, endodermis slightly thick walled, free from starch immediately inside endodermis a row of nearly continuous collateral bundles usually without fibres stele of thin-walled, parenchyma cells, arranged radially around numerous scattered, collateral vascular bundles, each consisting of a few unligified, reticulate or spiral vessels upto about 70 μ in diameter, a group of phloem cells, unligified, thin-walled, septate fibres upto about 30 μ wide and 600 μ long with small oblique slit, like pits, present, numerous scattered idioblasts, similar those of cortex, and associated with vascular bundles, also present, idioblasts about 8-20 μ wide and up to 130 μ long with dark reddish-brown contents: in single or in axial rows, adjacent to vessels, present, parenchyma of cortex and stele packed with flattened, rectangular, ovate, starch grains, mostly 5-15 μ - 30-60 μ long about 25 μ wide and 7 μ thick, marked by five transverse striations.

IDENTITY, PURITY AND STRENGTH

Foreign matter Not more than 1 per cent

Total Ash Not more than 6 per cent

Acid-insoluble ash Not more than 1.5 per cent

Alcohol-soluble extractive Not less than 3 per cent, Appendix 2.2.6.

Water-soluble extractive Not less than 10 per cent

CONSTITUENTS :- Essential oil, pungent constituents (gingerol and shogaol), resinous matter and starch.

PROPERTIES AND ACTION:-

Rasa : Katu

Guna : Laghu, Snigdha

Virya : ushna

Vipaka : Madhura

Karma : Anulomana, Deepana, Hridya,

THERAPEUTIC USES :- Agnimandya, svasa, Pandu, Udararoga.

DOSE :- 1-2 g of the drug in powder form.

4.14 PIPPALI

Pippali consists of the dried, immature, catkin-like fruits with bracts of *Piper longum* (Fam. Piperaceae), a slender, aromatic climber.

SYNONYMS:-

Sanskrit : Magadhi, Granthika, Pippalika.

English : Piper root

Hindi : Pipar

DESCRIPTION

a) Macroscopic:-Drug available in cut pieces, having distinct internodes and swollen nodes with a number of small rootlets and root scars; stout, cylindrical, 0.2-0.6 cm thick, reddish brown to grey; odour, aromatic; taste, pungent.

b) Microscopic:-Stem - Shows a single layered epidermis followed by a continuous ring of collenchymatous and round to oval thin-walled, parenchymatous cells; vascular bundles show peripheral and medullary arrangement, separated from each other by a wavy strip of sclerenchyma forming a ring, enclosing pith; bundles collateral and arranged in rings, having sclerenchymatous sheath of pericyclic cap over phloem; xylem wedge-shaped; starch grains simple and compound having 2-7 components, round to oval, measuring 3-14 μ in dia., present abundantly throughout the section.

Powder - Reddish-brown to creamish-grey; under microscope shows scalariform vessels, aseptate fibres, simple and compound starch grains measuring 3-14 μ in diameter.

IDENTITY, PURITY AND STRENGTH

Foreign matter Not more than 2 per cent

Total Ash Not more than 5.5 per cent

Acid-insoluble ash Not more than 0.2 per cent

Alcohol-soluble extractive Not less than 4.0 per cent

Water-soluble extractive Not less than 12 per cent

T.L.C.

T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using Toluene:Ethylacetate (9:1) shows under U.V. light eight spots at Rf. 0.04 (yellow), 0.12 (light green), 0.25 (green), 0.31 (light green), 0.36 (light green), 0.53 (light green), 0.65 (green) and 0.97 (blue). On exposure to Iodine vapour five spots appear at Rf. 0.13, 0.25, 0.40, 0.89, 0.93 (all yellow). On spraying with Dragendorff reagent two orange coloured spots appear at Rf. 0.13 & 0.25.

CONSTITUENTS:- Essential Oil and Alkaloids.

PROPERTIES AND ACTION:-

Rasa : Madhura, Katu, Tikta

Guna : Laghu, Snigdha

Virya : Anusna

Vipaka : Madhura

Karma : Deepana, Hridya, Kaphahara, Rucya, Tridosahara, Vatahara, Rasayana, Rasan.

THERAPEUTIC USES :- Gulma, Hikka, Kasa, Krimi, Ksaya, Pleha Roga, Prameha,
DOSE :- 1-3 gm.

4.15 MARICH

Marich consist of the dried, immature fruits with bracts of *Piper nigrum* (Family:- Piperaceae.) a , aromatic climbing perennial shrub.

SYNONYMS:-

Sanskrit : Usna, Krsna, Sakanga.

English : Black paper

Hindi : Kali mirch

DESCRIPTION -

a) Macroscopic: Fruits greyish-black to black, hard, wrinkled, 0.4-0.5 cm in dia.; odour, aromatic; taste, pungent.

b) Microscopic: Fruit consists of a thick pericarp for about one third of fruit and an inner mass of perisperm, enclosing a small embryo; pericarp consists of epicarp, mesocarp and endocarp; epicarp composed of single layered, slightly sinuous, tabular cells forming epidermis, below which, are present 1 or 2 layers of radially elongated, lignified stone cells adjacent to group of cells of parenchyma; mesocarp wide, composed of band of tangentially elongated parenchymatous cells having a few isolated, tangentially elongated oil cells present in outer region and a few fibro-vascular bundles, a single row of oil cells in the inner region of mesocarp; endocarp composed of a row of beaker shaped stone cells; testa single layered, yellow coloured, thick-walled sclerenchymatous cells; perisperm contains parenchymatous cells having a few oil globules and packed with abundant, oval to round, simple and compound starch grains measuring 5.5-11.0 μ in dia.; having 2-3 components and a few minute aleurone grains.

Powder - Blackish-grey; shows debris with a characteristic, in groups, more or less isodiametric or slightly elongated stone cells, interspersed with thin-walled, polygonal hypodermal cells; beaker-shaped stone cells from endocarp and abundant polyhedral, elongated cells from perisperm, packed tightly with masses of minute compound and single, oval to round, starch grains measuring 5.5-11.0 μ in dia.; having 2-3 component and a few aleurone grains and oil globules.

IDENTITY, PURITY AND STRENGTH -

Foreign matter Not more than 2 Per cent

Total ash Not more than 5 Per cent

Acid-insoluble ash Not more than 0.5 Per cent

Alcohol-soluble extractive Not less than 6 Per cent

Water-soluble extractive Not less than 6 Per cent

CONSTITUENTS:-Piperene,piperolein,criptone,pipercide.

PROPERTIES AND ACTION:-

Rasa : Katu

Guna : Laghu, Tikсна

Virya : usna

Vipaka : katu

Karma : Vatahara,Rasayana, Avrsya,pramathi.

THERAPEUTIC USES :- Kasa,Hridayaroga,krmi,svasa,sula

DOSE :-0.5 to 1gm.

4.16 BALA

Bala consists of the *Sida cordifolia* (Family:- Malvaceae) a small downy erect herb or shrub.

SYNONYMS:-

Sanskrit : Vatya,Vatyalika,Bhadroudani.

Hindi : Khirainti,Bariyara.

English :Country mallow

DESCRIPTION:-

- a) **Macroscopic:-**Root cream yellow or pale yellowish-brown, thin, irregularly and shallowly ridged due to formation of longitudinal and transverse lenticels, surface ruptured, peeling off in layers, internal surface cream to light yellow; fracture, short; taste, sweet.
- b) **Microscopic:-**Root shows lignified and stratified cork consisting of 3 or 4 alternating bands of 4-14 layers of smaller cells and a few layers of larger cells having golden yellow contents; secondary cortex, a wide zone, consisting of large, polyhedral, parenchymatous cells and stone cells of varying shapes and sizes, thick-walled, lignified, scattered throughout region; secondary phloem consists of sieve elements, fibres, parenchyma and crystals fibres traversed by phloem rays; some sieve elements compressed, forming tangential bands of ceratenchyma alternating with bands of

lignified phloem fibres in outer phloem region, but intact in inner phloem region; phloem parenchyma radially and transversely elongated; phloem fibre groups arranged in concentric rings, fibre groups in inner phloem region extend tangentially from one medullary ray to another, each group consisting of 2-35 or more cells; fibres long, generally with tapering ends but occasionally forked, lignified, some others have wavy walls; crystal fibres numerous, long, about 9-30 chambered, each containing a prismatic crystal of calcium oxalate; medullary rays uni to triseriate in inner region while bi to pentaseriate in outer region of phloem; cambium consists of 3-7 rows of tangentially elongated to squarish cells; secondary xylem consists of vessels tracheids, fibres and xylem parenchyma; vessels scattered throughout xylem region, in groups of 2-5, single vessels also found, varying in shape and size, mostly drum-shaped, with bordered pits some having a pointed, tail-like process at one end; fibres thick-walled with blunt or pointed tips; xylem parenchyma rectangular in shape; medullary rays uni to triseriate, bi and triseriate rays more common, triseriate rays 12-40 cells high, uniseriate rays 4-10 cells high; prismatic crystals of calcium oxalate present; starch grains simple, 5-19 μ in dia., mostly round to oval with centric hilum; compound starch grains having 2-3 components present in inner few layers of cork cells, secondary cortex, phloem and xylem rays. Powder - Grey to greyish-brown; shows thick-walled, angular cells of cork, numerous prismatic crystal of calcium oxalate, crystal fibres, starch grains simple, 5-19 μ in dia., mostly round to oval with centric hilum; compound starch grains having 2-3 components, fragments of xylem vessels with bordered pits and thick-walled xylem fibres.

IDENTITY, PURITY AND STRENGTH:-

Foreign matter	Not more than 1 per cent,
Total ash	Not more than 6 per cent,
Acid-insoluble ash	Not more than 1 per cent,
Alcohol-soluble extractive	Not less than 7 per cent,
Water-soluble extractive	Not less than 7 per cent,

CONSTITUENTS:- Ephedrine, Hypaphorine, Vasicinone, Betaine.

PROPERTIES AND ACTION:-

Rasa : Madhura

Guna : Laghu, Snigdha, Picchila.

Virya : Sheeta

Vipaka :Madhura

Karma : Vata pitta hara,Balya,Prameha.

THERAPEUTIC USES:- Raktapitta,Vatavyadhi,vrsya.

DOSE :3-6gm powder,50-100 ml Decoction.

4.17 JIVANTI

Jivanti consist of *Leptadenia reticulata*(Family:-Asclepiadaceae) a Perennial climber.

SYNONYMS:-

Sanskrit : Saka,Sresta

Hindi : Dodisak

CONSTITUENTS:- Hentriacontanol, α - and β -amyrin, stigmasterol, β -sitosterol

DESCRIPTION:-

a) Macroscopic:- Roots cylindrical, 5 to 7 cm in length and 1 to 3 cm in thickness, surface light brown to greyish brown with longitudinal wrinkles; fracture, tough; fractured surface creamish and horny; odour and taste indistinct.

b) Microscopic:-Root shows cork consisting of rectangular and tangentially elongated cells, phellogen 1 to 2 layered; phelloderm consists of thin walled parenchyma cells with groups of stone cells and fibres scattered in the central and lower regions; phloem made up of sieve tubes, companion cells, parenchyma, fibres and stone cells being transversed by uni to multiseriate medullary rays, groups of fibres and stone cells present in outer phloem region, stone cells are about 60 μ in length and 20 μ in width, fibres are upto 1300 μ in length; xylem represented by vessels, tracheids, fibres, parenchyma, interxylary phloem and uni to multi seriate medullary rays, all xylem elements except interxylary phloem thick walled and lignified; vessels drum shaped or elongated with bordered pits or scalariform thickenings, bordered pitted tracheids, fibres elongated with tapering or bifurcated ends present; xylem parenchyma simple pitted; rosettes of calcium oxalate crystals present in some of the parenchyma cells of phloem and phelloderm.

Powder - Powder shows rectangular to polygonal stone cells, vessels with bordered pits or scalariform thickenings, border pitted tracheids, fibres with tapering or bifurcated ends, thick walled parenchyma cells with simple pits and thin walled parenchyma cells with rosettes of calcium oxalate crystals.

IDENTITY, PURITY AND STRENGTH –

Foreign matter - Not more than 2 per cent,

Total ash - Not more than 14 per cent,

Acid-insoluble ash - Not more than 1.5 per cent,

Alcohol-soluble extractive - Not less than 5 per cent,

Water-soluble extractive - Not less than 3 per cent,

PROPERTIES AND ACTION:-

Rasa : Madhura

Guna : Laghu, Snigdha

Virya : Sheeta

Vipaka : Madhura

Karma : Caksusya, Balya, Rasayana, Grahi.

THERAPEUTIC USES:- Sathanya, Ksaya, Rakta, Grahi.

DOSE :- powder 3-6 gm. Decoction 50-100 m

4.18 KALAMEGHA

Kalmegh Consist of *Andrographis paniculata* (Family:-Acanthaceae) a annual erect herb.

SYNONYMS:-

Sanskrit : Bhunimba, Yavakara-phala, Yavatika.

Hindi : Kalmegh

DESCRIPTION

a) Macroscopic:- Drug consists of whole plant, a peculiar shining yellowish tinge all over the herb in fresh sample, stem upto 1 m long and 6 mm in diameter, glabrous, yellowish-brown to purplish, slightly quadrangular above and cylindrical below, large, continuous, easily separable yellow pith, leaf, opposite, cauline, broad at base, ovate or lanceolate, entire, acuminate, glabrous, usually with 5-7 prominent lateral veins, branching from the axils of the leaves which ramify further into paniculate inflorescence, flower, tetramerous, 2-3 mm wide, ovoid, with two glandular depressions near the base of each of corolla lobes, ovary, superior, bicarpellary, unilocular, ovoid and pointed, fruit. a capsule with numerous, minute reticulated seed, 0.25-0.55 mm long, 0.16-0.45 mm broad irregularly ovoid.

b) Microscopic:- Root-transverse section of root shows, 2-4 layers of cork, secondary cortex representee by 4-12 layers of thick-walled, parenchymatous cells, some showing radial wall formation, tangentially elongated with sinuous walls, secondary phloem composed of thin-walled strands of sieve tubes, companion cells and phloem parenchyma, secondary xylem composed of vessels, tracheids parenchyma and xylem fibres, all elements lignified and thick-walled, in older roots, centre of wood more or less spongy and hollow in most cases, outer woody ring remaining strongly lignified, vessels show scalariform thickening and also

simple and bordered pits, tracheids similar in thickening as the vessels, fibres have simple pits, mucilage present in secondary cortical cells, minute acicular crystals present in abundance in secondary cortex and phloem region, resin also present as dark brown mass in secondary cortex cells. Stem-transverse section of stem shows single layered epidermis, externally covered with a thick striated cuticle present in young stem, in older epidermis remains intact but cells flattened and tangentially elongated, four ribs also consists of an epidermis and parenchymatous cortical cells, endodermis distinct, showing anticlinal or periclinal walls, followed by single layered pericycle consisting of thin walled cells, stem possesses an amphiphloic siphonostele, external phloem represented by usual elements, cambium between external phloem and xylem composed of a thin strip of tangentially elongated cells, internal phloem similar in structure as that of external phloem excepting that sieve tube strand is more widely separated, xylem continuous and composed mostly of tracheids, a few xylem vessels present singly or rarely in groups of two while tracheids and fibres present in abundance, vessels and fibre tracheids have mostly simple and bordered pits and fibres with simple pits on the walls, medullary rays absent, central part of the stem occupied by a pith consisting of rounded and isodiametric cells with prominent intercellular spaces mucilage present in cortical cells, minute acicular crystals also present in abundance, cortical cells, in resin present as dark brown mass in some cortical cells along with oil droplets. Leaf-transverse section of leaf shows very little differentiation of mesophyll tissues, epidermis single layered covered with a thick, striated cuticle, more strongly developed on the upper surface than the lower, stomata of anisocytic type, palisade tissue single layered, cells at places become wider and less elongated particularly in bigger veins, spongy mesophyll represented by 4-7 layers of somewhat loosely arranged, tangentially elongated cells, some epidermal cells prominently arched outside at the margin, mucilage present in epidermal and mesophyll cell while minute acicular crystal also present in abundance in mesophyll cells, in leaf parenchymas oil droplets also present.

IDENTITY, PURITY AND STRENGTH

Foreign matter Not more than 2 per cent

Total Ash Not more than 6 per cent

Acid-insoluble ash Not more than 1 per cent

Alcohol soluble extractive Not less than 10 per cent

Water-soluble extractive Not less than 10 per cent

CONSTITUENTS:- Andrographolides, Andrographoside, Oroxylin A.

PROPERTIES AND ACTION:-

Rasa : Tikta

Guna : Laghu, Ruksha

Virya : Sheeta

Vipaka : Katu

Karma : Kapha-pitta hara, Dipana.

THERAPEUTIC USES:- Kamala, pandu, sotha, javara, krmi, kustha

DOSE :- powder 1-2 gm. Decoction 20-40 ml.

4.19 BHUMYAMALAKI

Bhumyamalaki consist of *Phyllanthus nirun* (family: Euphorbiaceae) a small herb.

SYNONYMS:-

Sanskrit : Tamalaki, Bahuphala, Bahupatra.

Hindi : Bhuyiavla

DESCRIPTION

a) Macroscopic:- Root-small, 2.5-11 .0 cm long. nearly straight, gradually tapering, with a number of fibrous secondary and tertiary roots, external surface light brown, fracture, short. Stem-Slender, gabrous, light brown, cylindrical, 20-75 cm long, branching profuse towards upper region bearing 5-10 pairs of leaves, internode, 1-3.5 cm long, odour, indistinct, taste, slightly bitter. Leaf-compound and leaf-let arranged in two rows with a rachis, alternate, opposite and decussate almost sessile, stipulate, oblong, entire, upto 1.5 cm long and 0.5 cm wide, greenish-brown in colour, odour, indistinct, taste, slightly bitter

b) Microscopic:-

Root-transverse section shows, 4-6 layers of cork consisting of thin-walled, rectangular, tangentially elongated and radially arranged cells, filled With reddish-brown content, secondary cortex consists of 8-10 layers of thin-walled, tangentially elongated parenchymatous cells, secondary phloem narrow consisting of sieve elements, phloem parenchyma and traversed by narrow phloem rays, secondary xylem represented by a broad zone of tissues, composed of vessels, tracheids, fibres and parenchyma, all elements being thick-walled and lignified having simple pits, xylem rays uniseriate. Stem-transverse section shows, a single layered epidermis composed of thick-walled, flattened, tangentially elongated cells, older stem shows 4-5 layers of cork, composed of thin-walled, tabular, tangentially elongated and radially arranged cells, filled With reddish-brown content, cortex composed of

4-6 layers of oval, tangentially elongated, thin-walled, parenchymatous cells, some cortical cells filled with yellowish-brown content, endodermis quite distinct, pericycle represented by a discontinuous ring, composed of several tangentially elongated strands of lignified fibres with thick walls and narrow lumen, secondary phloem narrow, composed of sieve elements, dispersed in mass of phloem parenchyma, secondary xylem composed of vessels, fibres, parenchyma and traversed by numerous uniseriate rays, vessels mostly simple pitted, a few show spiral thickenings, fibres narrow elongated, with narrow or sometimes blunt ends with simple pits, centre, occupied by a pith composed of thin-walled, circular to oval parenchymatous cells, occasionally cluster crystals of calcium oxalate present in parenchymatous cells of ground tissue.

Leaf-transverse section of leaf shows, a biconvex outline, epidermis on either side, single layered covered externally by a thick cuticle, a palisade layer present beneath upper epidermis, intercepted by a few parenchymatous cells in the middle, meristele composed of small strands of xylem towards upper surface and phloem towards lower surface, rest of tissue of leaf composed of thin-walled, parenchymatous cells some having cluster crystals of calcium oxalate, lamina shows a dorsiventral structure, mesophyll differentiated into palisade and spongy parenchyma, epidermis on either side composed of thin-walled, tangentially elongated cells, covered externally by a thick cuticle, anisocytic type stomata present on both epidermises, palisade single layered, mesophyll composed of 3-5 layers of loosely arranged cells having a number of veins traversed in this region, a few cluster crystals of calcium oxalate present in spongy parenchyma. Powder-Powder of the drug, brown coloured, under microscope shows, fragments of cork cells, vessels and fibres.

IDENTITY, PURITY AND STRENGTH

Foreign matter Not more than 2 per cent

Total Ash Not more than 16 per cent

Acid-insoluble ash Not more than 7 per cent

Alcohol-soluble extractive Not less than 3 per cent

Water-soluble extractive Not less than 13 per cent

CONSTITUENTS:- Phyllanthin, Nirtetralin, Lintetralin.

PROPERTIES AND ACTION:-

Rasa : Tikta, Kasaya, Madhura

Guna : Laghu, Ruksha

Virya : Sheeta

Vipaka : Madhura

Karma :Rocana,kasa-svasa hara.

THERAPEUTIC USES:- Kasa svasa,prameha,raktapitta,kamala.

DOSE :-powder 3-5 gm.Paste 5-10 g.

4.20 MUSALI

Musali consist of *Asparagus beberica*(Family:-Liliaceae) a perennial thorny climber.

SYNONYMS:-

Sanskrit : Tala patri,Talamuli,Sveta musali.

Hindi : Saphed musali

DESCRIPTION

a)Macroscopic:-Drug occurs in transversely cut pieces of 2.5 to 5 cm long, cylindrical, straight to slightly curved, cut surface 1.0 to 4.5 cm in dia.; external surface blackish-brown, cut surface cream coloured; surface with numerous shallow wrinkles and transverse cracks;with a few rootlets and root scars; nodes and internodes prominent; taste, mucilaginous and slightly bitter.

b) Microscopic:-Shows a narrow strip of cork, consisting of 5 to 7 rows of light brown cubical to rectangular cells; secondary cortex consists of thin-walled, parenchymatous cells, densely filled with starch grains and acicular crystals of calcium oxalate, either isolated or in bundles, in a few cells; a few small, round to tangentially elongated, lysigenous cavities also found scattered in this region; a few vascular bundles found embedded in cortical region with phloem towards outer side, and consisting of a few xylem elements; ground tissue consists of parenchymatous cells, some of which contain acicular crystals of calcium oxalate; numerous fibro-vascular bundles found scattered throughout the region, mostly towards peripheral region having phloem, almost encircled by xylem vessels having annular and spiral thickenings; starch grains simple, rounded to oval and also compound of 2 to 4 components, measuring 4 to 21 μ in dia., present in cortical and central region, a number of deep red, resin canals found throughout the region, mucilage in the form of colourless mass found in a few cortical parenchymatous cells.

Powder - Greyish; vessels with annular and spiral thickenings; simple, round to oval, starch grains measuring 4 to 21 μ in dia., and compound starch grains having 2 to 4 components and a few acicular crystals of calcium oxalate; mucilage in the form of colourless mass found in a few cortical parenchymatous cells

IDENTITY, PURITY AND STRENGTH

Foreign matter Not more than 2 per cent,

Total Ash Not more than 9 per cent,

Acid-insoluble ash Not more than 2 per cent,

Alcohol-soluble extractive Not less than 3 per cent,

Water-soluble extractive Not less than 17 per cent

CONSTITUENTS - Tannin, Resin, Sapogenin and Alkaloid

PROPERTIES AND ACTION:-

Rasa : Madhura, Tikta

Guna : Guru, Picchila

Virya : Ushna

Vipaka : Madhura

Karma : sáramahara, Dahahara, Pittahara, Rasayana,

IMPORTANT FORMULATIONS - Gandharvahast;di Kv;tha Cur,a, Candan;di Cur,a.

THERAPEUTIC USES - Arsa, Vataroga, Karsya.

DOSE - 3-6 gm of the drug in powder form.

Chapter 5

Equipment, Material, and Experimental setup

5.1 List of equipment used:-

S. No.	Equipment
1.	Digital pH meter
2.	Digital balance
3.	Water bath
4.	Muffle furnace
5.	Hot Plate
6.	Hot Air oven
7.	UV spectrophotometry
8.	Disintegration apparatus
9.	Dissolution apparatus
10.	Roche Friabilator apparatus
11.	Monsanto hardness tester
12.	Compound microscope
13.	Humidity chamber
14.	Uv cabinet
15.	Electron Microscope
16.	Abbe's refractometer
17.	Mechanical stirrer

5.2 List of chemical used:-

Ethanol	Sudan 3	Ethyl Acetate	Fehling A
Hydrochloric acid	Ferric Chloride	Sulphuric acid	Fehling B
Mayer Solution	Gelatin	Pyrimidin	Biuret reagent
Dragondroff	Sodium Chloride	Sodium	Bendict reagent

Reagent		nitropurisode	
Wagnor Reagent	Lead Acetate solution	Alpha naphthol	Iodine
Lead Acetate	Copper sulphate	Acetic acid	Methenol
Pottasium hydroxide	n butanol	Chlorofom	Glacial acetic acid
Toluene	Formic acid	Silica gel G	

5.3 List of herbal drug used:-

S.no	Common name	Botanical name	Family name
1	Ashwaganda	<i>Withania somnifera</i>	Solanaceae
2	Amlaki	<i>Embilica officinale</i>	Euphorbiacear
3	Bibhitaki	<i>Terminalia bellerica</i>	Combretaceae
4	Gokhru	<i>Tribulus terristris</i>	Zygophyllaceae
5	Haritaki	<i>Terminalia chebulla</i>	Combretaceae
6	Guduchi	<i>Tinospora cordifolia</i>	Menispermaceae
7	Mulethi	<i>Glycyrrhiza glabra</i>	Leguminosae
8	Vidharikand	<i>Pueraria tuberosa</i>	Fabaceae
9	Bala panchang	<i>Sida cordifolia</i>	Malvaceae
10	Punamava	<i>Boerhaavia diffusa</i>	Nyctaginaceae
11	Shatavari	<i>Asparagus recemosus</i>	Liliaceae
12	Musli	<i>Asparagus beberica</i>	Liliaceae
13	Ark of-Brahmi	<i>Bacopa monnieri.</i>	Scrophulariaceae
14	Kalmegha	<i>Andrographis paniculata</i>	Acanthaceae
15	Jivanti	<i>Leptadenia reticulate</i>	Asclepiadaceae
16	Arjun	<i>Terminalia arjuna</i>	Combretaceae
17	Trikatu	<i>Zingiber officinale</i> <i>Piper nigrum</i> <i>Piper longum</i>	Zingiberaceae Piperaceae Piperaceae
18	Bhumiamlaki	<i>Phyllanthus nirun</i>	Euphorbiaceae

Chapter 6

Research Methodology

1. Collection of the ingredients of formulation
2. Authentication of ingredients of formulation
3. Pharmacognostic and phytochemical study of the ingredients
4. Macroscopic and microscopic study
5. Physicochemical analysis of Herbal material
 - Foreign matter
 - Loss on drying at 110⁰C
 - Total Ash at 450⁰C
 - Acid insoluble Ash
 - Water soluble extractive value
 - Bulk and tapped density of powder Herbal material.
 - Compressibility index of powder Herbal material
6. Preparation of different dosage form of Vitamrit syrup.
7. Physicochemical parameters of formulations.

S.N	Vitamrit Syrup	Vitamrit tablet
1	Total ash (% w/w)	Total ash (% w/w)
2	Acid insoluble ash (% w/w)	Acid insoluble ash (% w/w)
3	pH meter	pH meter
4	Total sugar content (% v/v)	Total sugar content (% v/v)
5	Viscosity	Refractive index on room temperature
6	Wt/ml (g)	Total acidity (%v/v) titrimetric method
7	Specific gravity at 25 ⁰ C (g/ml)	Reducing sugar (%v/v) titrimetric method
8	Total solid content (%w/v)	Non Reducing sugar (%v/v) titrimetric method
9	Refractive index on room temperature	Shape and appearance

10	Total acidity (%v/v) titrimetric method	Hardness
11	Reducing sugar (%v/v) titrimetric method	Thickness and diameter
12	Non Reducing sugar (%v/v) titrimetric method	Friability
		Weight variation test
		Assay
		Disintegration on time
		Dissolution test(% drug release)

6.1 Collection of ingredients

Raw herbs collect from the shree Dhanvantari herbals Amritsar, Punjab, India

6.2 Pharmacognostic study

6.2.1 Macroscopic study

Morphological characters are observed by the organoleptic characters. Organoleptic characters included the color, odour, size, taste, fracture etc.

6.2.1.1 Methodology

- 6 Color is observed by naked eye or magnified lance
- 7 Odour is determined by smell
- 8 Scale is used for determined the size
- 9 Taste is observed by putting drug in mouth

6.2.2 Microscopic study

Microscopes are used for the determination of different characters of the sample or identification of the sample.

6.2.2.1 Methodology

- Take the fresh or dried sample
- Cut into transverse or longitudinal section
- Prepare the glass slide followed by covering with cover slip
- Observed by using lenses of 10x and 45x

6.3 Analytical study

6.3.1 Determination of foreign matter

Weigh 100 –500 g of the drug sample to be examined or the minimum quantity prescribed in the monograph, and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of a lens (6x). Separate and weigh it and calculate the percentage present.

Initial weight – final weight

Percentage of foreign matter = $\frac{\text{Initial weight – final weight}}{\text{Weight of sample}} \times 100$

Weight of sample

6.3.2. Determination of moisture content (Loss on Drying at 105°C)^[17]

Place around 5-10g drug in the evaporating dish dry at 105°C for 5 hours, and weigh. Continue the drying and weighing at one hour interval until difference between two successive weighing corresponds to not more than 0.25 per cent. Constant weight is reached when two consecutive weighing after drying for 30 minutes and cooling for 30 minutes in a desiccator, show not more than 0.01 g difference.

Initial weight – final weight

Percentage of moisture content = $\frac{\text{Initial weight – final weight}}{\text{Weight of sample}} \times 100$

Weight of sample

6.3.3. Determination of Total ash^[17]

Incinerate about 2 to 3 g accurately weighed, of the ground drug in a tarred platinum or silica dish at a temperature not exceeding 450°C until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450°C. Calculate the percentage of ash with reference to the air-dried drug.

Initial weight – final weight

Percentage of Total ash = $\frac{\text{Initial weight – final weight}}{\text{Weight of sample}} \times 100$

Weight of sample

6.3.4 Determination of acid insoluble ash^[17]

Boil the ash for 5 minutes with 25 ml of dilute hydrochloric acid; collect the insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water and ignite to constant weight. Calculate the percentage of acid-insoluble ash with reference to the air dried drug.

Weight of insoluble ash

Percentage of Total ash = $\frac{\text{Weight of insoluble ash}}{\text{Weight of sample}} \times 100$

Weight of sample

6.3.5 Determination of Alcohol Soluble Extractive^[17]

Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of Alcohol of the specified strength in a closed flask for twenty-four hours, shaking frequently during six hours and allowing stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105°, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

Weight of residue × volume made

Percentage of Alcohol Soluble Extractive = $\frac{\text{Weight of residue} \times \text{volume made}}{\text{Weight of sample} \times \text{volume taken}} \times 100$

Weight of sample × volume taken

6.3.6 Determination of Water Soluble Extractive^[17]

Proceed as directed for the determination of Alcohol-soluble extractive, using chloroform water instead of ethanol.

Weight of residue × volume made

Percentage of Water Soluble Extractive = $\frac{\text{Weight of residue} \times \text{volume made}}{\text{Weight of sample} \times \text{volume taken}} \times 100$

Weight of sample × volume taken

6.4 Phytochemical investigation

6.4.1 Alkaloid test

A) Mayer reagent: Filtrates were treated with Mayer's reagent (Potassium Mercuric Iodide). Formation of a yellow colored precipitate indicates the presence of alkaloids.

B) Wagner's Test: Filtrates were treated with Wagner's reagent (Iodine in Potassium Iodide). Formation of brown/reddish precipitate indicates the presence of alkaloids.

C) Dragendroff's Test: Filtrates were treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). Formation of red precipitate indicates the presence of alkaloids.

D) Hager's Test: Filtrates were treated with Hager's reagent (saturated picric acid solution). Presence of alkaloids confirmed by the formation of yellow colored precipitate.

6.4.2 Detection of carbohydrates

Extracts were dissolved individually in 5 ml distilled water and filtered. The filtrates were used to test for the presence of carbohydrates.

- A) Molisch's Test:** Filtrates were treated with 2 drops of alcoholic α -naphthol solution in a test tube. Formation of the violet ring at the junction indicates the presence of Carbohydrates.
- B) Benedict's test:** Filtrates were treated with Benedict's reagent and heated gently. Orange red precipitate indicates the presence of reducing sugars.
- C) Fehling's Test:** Filtrates were hydrolyzed with dil. HCl, neutralized with alkali and heated with Fehling's A & B solutions. Formation of red precipitate indicates the presence of reducing sugars.

6.4.3 Detection of glycosides: Extracts were hydrolyzed with dil. HCl, and then subjected to test for glycosides.

- A) Modified Borntrager's Test:** Extracts were treated with Ferric Chloride solution and immersed in boiling water for about 5 minutes. The mixture was cooled and extracted with equal volumes of benzene. The benzene layer was separated and treated with ammonia solution. Formation of rose-pink color in the ammonical layer indicates the presence of anthranol glycosides.
- B) Legal's Test:** Extracts were treated with sodium nitropruside in pyridine and sodium hydroxide. Formation of pink to blood red color indicates the presence of cardiac glycosides.

6.4.4 Detection of flavonoids

- A) Alkaline Reagent Test:** Extracts were treated with few drops of sodium hydroxide solution. Formation of intense yellow color, which becomes colorless on addition of dilute acid, indicates the presence of flavonoids.
- B) Lead acetate Test:** Extracts were treated with few drops of lead acetate solution. Formation of yellow color precipitate indicates the presence of flavonoids.

6.4.5 Test for Tannins

A) Ferric chloride test

Extract are treated with ferric solution, gives blue color in the presence of hydrolyzed tannins and green color if condensed tannins are present.

B) Lead acetate test

In 10ml of extract add 0.5 ml of 15 lead acetate solution gives the precipitate.

Chapter- 7

EXPECTED RESEARCH OUTCOMES

Rasayana is one of the eight major clinical disciplines of *Astanga Ayurveda*. It is a multi-angled approach to taking care of the mankind, *Rasayana* therapy affords a comprehensive physiologic and metabolic restoration as is evident from the fundamental statement of *Acharya Charaka* i.e. “*Labhopayo hi sastanam rasadinam rasaynam*”. Ca, Ci:1. *Rasayana cikitsa* is mainly used for maintaining the health of healthy individuals although it can be also used for disease conditions. *Rasayana* stands as an answer to solve the problem of healthful longevity including mental development and resistance against disease. It is a specialized type of treatment influencing the fundamental aspect of the body viz. *Dhatu*, *Agni* and *Srotas* and helps in the prevention of aging.

Chapter- 8

WORK PLAN

PURPOSED WORK PLAN AND TIME LINES																			
		Month List																	
Sr. no	Work List	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Indentification of topic	■	■	■															
2	Review	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3	Authantication of raw drugs				■	■	■												
4	Procurement of raw material						■	■											
5	pharmacognostic & phytochemical study							■	■	■									
6	Phsicochemical study									■	■								
7	Perpration of formulation											■	■	■					
8	Evaluation of prepared formulation														■				
9	Stability study of prepared dosage form															■	■	■	
10	Data interpetation & report writing				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Chapter- 9

RESULT AND DISCUSSION

6.3 Pharmacognostic and physiochemical study of ingredients

6.3.4 Morphology of Amalaki



- Part use :-Dried fruit
- colour :-Dark brown to blackish
- Odour :-Characteristic
- Taste :- Astringent
- Shape :-Round
- Surface :-Rough
- Size :-2.5 to 3 cm in diameter

9.1.2 Ashwaganda



- Part use :- Dried root
- colour :- yellowish
- Odour :- characteristic
- Taste :-bitter
- Shape :-cylindrical unbranched

- Surface :-Fiber like secondary root
- Size :- 0.1 to 2 cm
- Fracture :-Short

9.1.3 Bibhitaki



- Part use :- Dried fruit
- colour :-Internally yellow outer brown
- Odour :- characteristic
- Taste :-Astringent
- Shape :-oval
- Surface :-Wrinkled
- Size :- 2.5 to 4 cm

9.1.4 Gokshura



- Part use :- Dried fruit
- colour :-Greenish yellow
- Odour :- characteristic
- Taste :-Astringent
- Shape :-Five ribbed or angled spherical in structure
- Surface :-Spines present outer surface
- Size :- 0.5 cm

9.1.5 Guduchi



- Part use :- Dried stem
- colour :-Internally yellowish outer light brown
- Odour :- characteristic
- Taste :-Bitter
- Shape :-Cylindrical
- Surface :-Wrinkled node present
- Size :- 3.5 to 5 cm
- Fracture :-Hard

9.1.6 Haritaki



- Part use :- Dried fruit
- colour :- yellowish brown
- Odour :- characteristic
- Taste :-Astringent
- Shape :-ovate
- Surface :-Wrinkled
- Size 20-30 mm long 13-25mm wide

9.1.7 Mulethi



- Part use :- Dried root
- colour :-Internally yellow outer light brown
- Odour :- characteristic
- Taste :-Sweetish
- Shape :-cylindrical
- Surface :-Wrinkled
- Size :- 0.1 to 2.5 cm
- Fracture :-Fibrous

9.1.8 Arjuna



- Part use :- Dried Bark
- colour :-Reddish brown
- Odour :- characteristic
- Taste :- Bitter Astringent
- Shape :-Flat,curved,half quilled
- Surface :-Smooth outer surface, inner fibrous
- Size :- 0.2 to 1.5 cm thick
- Fracture :-Short

9.1.9 Brahmi



- Part use :- Dried panchang
- colour :-Leaf: light green ,Stem: Light brown, Root: Brown
- Odour :- characteristic
- Taste :-Astringent
- Shape :-Leaf: Compound, Stem: Thin cylindrical, Root: Irregular
- Surface :-Rough
- Size :- Leaf: 0.3 cm. Stem: 1.2 cm, Root: 1.1 cm.
- Fracture :-Stem: Short.

9.1.10 Shatavari



- Part use :- Dried root
- colour :-Light brown
- Odour :- characteristic
- Taste :-Sweetish
- Shape :-Tuberous tapering both ends.
- Surface :-Longitudinal wrinkles

- Size :-0.5cm thick.
- Fracture :-Short

9.1.11 Punanava



- Part use :- Dried root
- colour :-Yellowish brown
- Odour :- characteristic
- Taste :-Slightly bitter
- Shape :-Cylindrical
- Surface :-Rough
- Size :-0.2 to 1.5 cm
- Fracture :-Short

9.1.12 Vidari kand



- Part use :- Dried kand
- colour :-Yellow
- Odour :- Characteristic
- Taste :- Sweetish
- Shape :-Longitudinally sliced pieces

- Surface :-Rough
- Size :-Variable size
- Fracture :-Hard

9.1.13 Bala



- Part use :- Dried panchang
- colour :- Root: Creamish yellow
- Odour :- characteristic
- Taste :-Sweet
- Shape :-Irregular
- Surface :-Ruptured
- Size :-0.1 to 0.5cm
- Fracture :-Short

9.1.14 Kalamegha



- Part use :- Dried Leaves
- colour :-Dull green to yellowish
- Odour :- characteristic
- Taste :-Bitter

- Shape :- Irregular
- Surface :-Rough
- Size :- 0.1 to 0.5 cm

9.1.15 Bhumi amalaki



- Part use :- Dried panchang
- colour :-Leaf: light green ,Stem: Light brown, Root: Brown
- Odour :- characteristic
- Taste :-Bitter
- Shape :-Leaf: Compound, Stem: Thin cylindrical, Root: Irregular
- Surface :-Rough
- Size :- Leaf: 0.3 cm. Stem: 1.2 cm, Root: 1.1 cm
- Fracture :-Stem: Short, Root: Short

9.1.16 Musali



- Part use :- Dried root
- colour :-Yellowish light brown
- Odour :- characteristic
- Taste :-Bitter

- Shape :-Cylindrical
- Surface :-Smooth
- Size :- 0.5 to 1 cm
- Fracture :- Short

9.1.17 Kali marich



- Part use :- Dried fruit
- colour :-Dark brown to black
- Odour :- characteristic
- Taste :-Bitter
- Shape :- Round
- Surface :-Rough, Wrinkles
- Size :- 0.2 to .0.5 cm

9.1.18 Pipali



- Part use :- Dried fruit
- colour :-Black
- Odour :- characteristic
- Taste :-Bitter

- Shape :- Cylindrical
- Surface :-Rough, spots present
- Size :- 1 to 2.5 cm thick
- Fracture :- Short.

9.1.19 Sunthi



- Part use :- Dried Rhizome
- colour :-yellow
- Odour :- characteristic
- Taste :-Bitter
- Shape :- Irregular
- Surface :-Rough
- Size :- 5 to 6.5 cm
- Fracture :-Hard

6.4.Physiological parameter study:-

9.2.1 LOD

S. No	Drug name	Sample 1	Sample 2	Sample 3	Mean	API
1	Ashwaganda	10.4%	10%	6.4%	8.9%	-
2	Amlaki	5.8%	8%	11.6%	8.4%	Not more than 80%
3	Bibhitaki	8.4%	15.8%	15.8%	13.3%	-
4	Gokhru	7.2%	9%	11.4%	9.2%	-
	Haritaki	5.2%	12.2%	10.4%	9.2%	-
6	Guduchi	9.6%	7.8%	9.8%	9.0%	75%
7	Mulethi	9.8%	14.4%	8%	10.7%	-

8	Vidharikand	8.8%	7.4%	10%	8.7%	-
9	Bala panchang	12.6%	7.2%	5.2%	8.3%	-
10	Punamava	10.4%	8.2%	9%	9.2%	-
11	Shatavari	9.8%	7.8%	10%	9.2%	-
12	Musli	9.8%	12.8%	8.8%	9.8%	-
13	Brahmi	15.2%	6.6%	10.6%	10.8%	-
14	Kalmegha	8%	15.6%	11.8%	11.8%	-
15	Kali marich	15.8%	6.2%	11.4%	11.13%	-
16	Arjun	8.2%	14.2%	11%	11.13%	-
17	Sunthi	12.2%	9.6%	10.8%	10.8%	-
18	Bhumiamlaki	4.2%	4%	4.4%	4.2%	-
19	Pipali	15.8%	6.2%	11.4%	11.13%	-
20	Jivanti					-

9.2.2 Total ash

S. No	Drug name	Sample 1	Sample 2	Sample 3	Mean	API
1	Ashwaganda	6.5%	6.5%	7.5%	6.8%	Not more than 7%
2	Amlaki	8%	6.5%	6.5%	7%	7%
3	Bibhitaki	7.5%	4.5%	7.5%	6.5%	7%
4	Gokhru	18.4%	19.2%	18.1%	18.56%	15%
5	Haritaki	3.5%	4%	3.5%	3.6%	5%
6	Guduchi	16.8%	15.2%	14.9%	15.6%	16%
7	Mulethi	9.6%	9.6%	10.4%	9.8%	10%
8	Vidharikand	12.8%	9.6%	9.6%	10.6%	17%
9	Bala panchang	5%	5.5%	5.2%	5.33%	6%
10	Punamava	12.8%	9.6%	9.6%	10.6%	15%
11	Shatavari	2.5%	5%	7.9%	3.8%	5%
12	Musli	8%	6.5%	7.5%	7.3%	9%
13	Brahmi	15.2%	13.6%	12%	13.6%	18%

14	Kalmegha	8.5%	14.5%	13%	12%	16%
15	Kali marich	3.6%	4.2%	5.4%	4.4%	5%
16	Arjun	16.8%	15.2%	14.9%	15.6%	25%
17	Sunthi	7.5%	8%	8%	7.8%	6%
18	Bhumiamlaki	8.5%	8.5%	8%	8.33%	16%
19	Pipali	4.2%	4%	4.4%	4.2%	5.5%
20	Jivanti					14%

9.2.3 Water-soluble extractive

S. No	Drug name	Sample 1	Sample 2	Sample 3	Mean	API
1	Ashwaganda	20.8%	31.2%	24%	25.33%	Notless than15%
2	Amlaki	49.6%	53.6%	51.2%	51.46%	50%
3	Bibhitaki	49.6%	41.7%	45.6%	53.33%	35%
4	Gokhru	12%	11.2%	14.4%	12.53%	10%
5	Haritaki	56%	56%	54.4%	55.46%	60%
6	Guduchi	23.2%	28%	28.8%	26.6%	11%
7	Mulethi	23.2%	24.8%	26.4%	24.8%	20%
8	Vidharikand	9.6%	8%	6.4%	10.6%	24%
9	Bala panchang	8.2%	14.2%	11%	11.13%	7%
10	Punamava	10.4%	8.2%	9%	9.2%	4%
11	Shatavari	49.6%	53.6%	51.2%	51.46%	45%
12	Musli	23.2%	24.8%	26.4%	24.8%	17%
13	Brahmi	15.8%	6.2%	11.4%	11.13%	15%
14	Kalmegha	28%	23.2%	24.81%	28,33%	10%
15	Kali marich	13.6%	8.8%	7.2%	9.86%	6%
16	Arjun	28%	18.4%	26.4%	24.26%	20%
17	Sunthi	18.4%	19.2%	21.6%	19.73%	10%
18	Bhumiamlaki	15.2%	16%	16%	15.72%	13%
19	Pipali	8.2%	14.2%	11%	11.13%	12%
20	Jivanti					3%

Chapter 10

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