JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# AN OVERVIEW OF VARIOUS MEDICINAL PLANTS USED TO ALLEVIATE CONSTIPATION.

**Neha D.Upare *, Chandrashekhar B. Badwaik, Upadesh B.Lade**
Chhatrapati Shivaji College OF Pharmacy Deori Maharashtra-441601,India

## Abstract:

As we see most commonly People are facing the issue of Constipation. Due changes in diet or routine, or due to inadequate intake of dietary fiber, fluids and exercise. Constipation is a common problem faced by every person. Constipation is a burning problem in today's healthcare practices.The three types of constipation that can be distinguished by their pathophysiology are obstructed defecation (OD), normal transit (NT), and slow transit (ST).

Medicinal plant plays an important role in the health development of mankind. The medicinal plant like Haritaki, Amla, Senna, Isapgol, Rhubarb,honey, castor oil , cascara, clove, fennel. Results showed that these plants has various Pharmacological properties including antioxidants, analgesic, digestive, anti-cancer activity, anti-inflammatory,wound healing activity, anti- ulcerogenic activity, anti-bacterial, anti-pyretic, antifungal effects which is probably due to presence of active constituent such as chebulinic acid, chebulic acid , corilagin, ellagic acid , gallic acid, sennoside , aloin, emodin, cascaroside , eugenol , fenchone , anethol. This review will focous on to provide a dtail account of Constipation and various medicinal plant for treatment of Constipation. It gives an enormous information about the herb and their significantjob in medicinal services and cleanliness.

**Keywords:** Medicinal plants, Stimulant, laxative, purgative, Stomachic, chronic constipation, irritable bowel syndrome, bowel, Purification.

## INTODUCTION:

Constipation is considered one of the common conditions. It can be defined as the infrequentpassage of small, hard stools with difficulty. Definitions of constipation vary widely.
Constipation is a common ailment with multiple symptoms and diverse etiology. It is a commoncomplaint among the elderly. Constipation in the elderly is not simply related to aging; it is a major feature of disorders of colorectal motility.[1]

The definition of constipation includes excessive straining, a sense of incomplete evacuation, failed or lengthy attempts to defecate, use of digital maneuvers for evacuation of stool, abdominal bloating, and hard consistency of stools.[2] The highest prevalence of constipation was found in older adults in Africa at 32.3%, and the lowest prevalence was found in Asia at 13.6%.[3] Constipation is a common problem faced by every person. Constipation is a burning problem in today's healthcare practices, difficult to rule out causes and treatment. If patients don't improve with dietary or lifestyle changes, the majority of pharmacologic treatment for prospective long-term therapy is laxatives.

Diagnostic testing is required to comprehend the underlying anorectal and/or colonic pathophysiology following a failed empiric use of laxatives.

Ayurveda is an ancient clinical science. Constipation is not mentioned as a specific disease but as a symptom of multiple diseases. Ayurveda's basic principles are based on the tridosh theory.

When the soul enters the fertilized ovum, life begins, and human prakriti depends on the predominance of mahabhuta. Thus, the five fundamental eternal substances—the soul, Akash, Vayu, Tej, Aapa, and Prithvi—are combined to form all living things and are known as the Panchamahabuta. The brilliance of Ayurveda is found in its analysis of a theory of the preservation of health and the origins of disease. The tridosha theory of Ayurveda justifies the demands of the past while also considering the needs of the present and future. The health of thehuman body is preserved by these three doshas. The maintenance of healthy health depends on the balance of these three fundamental chemicals, similar to how their imbalance might result indeath or the dissolution of the body.[4]

## DEFINATION:

Constipation has long been considered a symptom, rather than a disease.[5] Constipation is often characterized by infrequent bowel movements or hard stool passage, with some defining it as less than three movements per week [6] or difficulty passing stools.[7] Approximately 0.5% of school children have defecation frequency less than 3 per week and 0.3% have fecal incontinence.[8] Furthermore, 20% of children also have at least 1 clinical feature of constipation.[9] Therefore, it is important to use diagnostic criteria based on multiple symptoms to define constipation.

The Rome II criteria were developed in 1999 to diagnose defecation disorders in infants and preschool children. However, they were found restrictive due to not including cardinal constipation features and requiring persistent symptoms for at least 3 months. The Rome process established the pediatric Rome III criteria in 2006, which recognized functional constipation as aseparate clinical entity and reduced symptoms duration to 8 weeks.

Table 1. Pediatric Rome III Criteria for Constipation

| Rome III criteria for neonates and toddlers |
|---|

Must include 1 mo of at least two of the following in infants up to 4 yr of age:

1. Two or fewer defecations per week
2. At least 1 episode per week of incontinence after the acquisition of toileting skills
3. History of excessive stool retentionHistory of painful or hard bowel movements
4. Presence of a large fecal mass in the rectum
5. History of large-diameter stools that may obstruct the toilet

Accompanying symptoms may include irritability, decreased appetite and/or early satiety. The accompanying symptoms disappear immediately following pass-age of a large stool.

| Rome III criteria for children and adolescents |
|---|

Must include two or more of the following in a child with a develop-mental age of at least 4 yr withinsufficient criteria for diagnosis of irritable bowel syndrome:

1. Two or fewer defecations in the toilet per week
2. At least 1 episode of fecal incontinence per week
3. History of retentive posturing or excessive volitional stool reten-tion
4. History of painful or hard bowel movements

5. Presence of a large fecal mass in the rectum
6. History of large diameter stools that may obstruct the toilet

Criteria fulfilled at least once per week for at least 2 mo before diagnosis. entary life style might have contributed to higher prevalence of constipation reported in children living in urban areas.[10]

## Classification of Constipation :

Constipation can be categorized into three classes based on its pathophysiology: obstructed defecation (OD), normal transit (NT), and slow transit (ST). Paré et al. (2007) conducted a study on population revealed that 13%, 25%, and 59% of individuals experienced constipation in the NT, ST, and OD forms, respectively. Furthermore, 3% of individuals exhibited a combined ST/OD syndrome . Similarly, in a demographic survey conducted in Thailand, the frequency of According to reports, NT, ST, and OD situations were 47%, 13%, and 29%, correspondingly, and 11% having a combined ST/OD circumstance [11]. Nonetheless, there are certain over- conversely, constipation may be connected to laps with IBS, or irritable bowel syndrome.
Generally speaking, there is There is almost a 50% overlap between ST constipation and IBS. Fur-thermore, it has been demonstrated that there is a 10%–13% overlap. between constipationtypes OD and ST [12].

## 1. Slow Transit Constipation :

There are a few bits of proof on the likelihood that ST blockage might be because of worldwide engine irregularity. Irregularities in the ST type of blockage are not restricted to the colon and rectum however motility changes in the stomach furthermore, jejunum have likewise been archived. Scott et al. (2003) revealed proof of jejunal motility problems in around one-third of patients with the ST condition [13]. Postponed gastric purging and strange gastric convenience have too been accounted for by different creators [14-16]. A deficiency of coordination between contractile movement in the rectum and sigmoid colon as well as diminished rectal tangible edge have been embroiled in ST obstruction [16-19] . ST constipation, truth be told-tion is more common in young ladies who have less gut development [20]. In these patients, a high-fiber dietmay in-wrinkle stool weight, decline colon-travel time, and event partner alleviate stoppage.
Patients with serious ST conditions show unfortunate reaction to dietary fiber and laxatives [20-25] .

## 2. Normal-Transit Constipation :

Normal-Transit or functional constipation is the most prevalent form of constipation. In patients with thisform of illness, stool transition and frequency are normal [26]. These patients feel difficulty in defecationor hard stools. Further-more, patients may experience bloated and abdominalcramping and pain as well as psychological distress [26], and some of them may have reduced rectal sensation [27] . Die- tary fiber alone or in combination with osmotic laxatives could relieve the symptoms of this type of constipation [25]. Failure to respond to these interventions suggests an im-paired disturbance of evacuation or transit. However, this condition needs further management [28].

## 3. Obstructed Defecation :

This syndrome is relatively common, which is characterized by a difficult and often painful evacuation, a sense of incomplete evacuation, perineal support or finger insertion into the vaginaor anus to defecate, frequent enemas, and laxative abuse. Half of the constipated patients suffer from OD, occurring more frequently in females (II). The pathophysiology of OD is poorly understood. Recent studies have suggested that this syndrome develops because of multiple and/or difficult labors and is the cause of obstruction. It may result from rectoanal intussusception, rectocele, pelvic organ prolapse, enterocele, sigmoidocele, or solitary rectal ulcer syndrome. Furthermore, rectal hyposensitivity (blunted rectum), idiopathic megarectum, hereditary internal sphincter myopathy and nutcracker anus are the rare causes of OD [29,30].
Osmotic agents are useful for patients who suffer from OD and in whom first-line bulk-forming agents or stool softeners do not work. Some recent evidence suggested that low dosage of polyethylene glycol (PEG), lactulose, and sorbitol as osmotic agents enhances stool passage in these patients [31,32].

## Pathophysiology of constipation in Children :

The pathophysiology of constipation in children is multi-factorial and is associated with interactions of many risk factors. Many organic diseases cause constipation (Table 2). However, the majority of constipation patients secondary to organic conditions usually have other clinical features suggestive of the relevant underlying organic disease. Organic diseases presenting as isolated constipation are rather uncommon

Over 90% of children with this condition have functional constipation [33]. Borowitz et al [34]. reported painful defecation as the commonest factor for constipation. If there is pain during defecation, children usually withhold stools. During the withholding, rectal mucosa absorbs water from the fecal mass, which becomes harder and larger as the time passes and ultimately defecation be-comes difficult. Therefore, when the desire to pass stools comes, children adopt retentive posture, hide from parents till the urge pass off. Passage of this fecal mass is painful and sometimes re-sults in anal fissures which further aggravate pain and precipitate stool withholding. This sets up a vicious cycle of stool retention. Accumulation of stools in rectum causes gradual dilatation leading to megarectum resulting in loss of rectal sensation and urge for defecation. It had been shown that children with megarectum have high sensory threshold forrectal sensation [35,36].

Other intestinal pathologies leading to chronic constipation surprisingly have not received much attention. Several studies have demonstrated slow colonic transit in 25%-69% children with constipation [37-39]. Furthermore, those with slow transit constipation had more severe symptoms including night time soiling [37].Laparoscopic biopsies of the colon have shown deficiency of neurotransmitters such as substance P in some children [40,41]. Furthermore it wasshown that number of antegrade pressure waves in the colon was significantly decreased in children with slow transit constipation [42].

## Pathophysiology of Constipation in the Older Adult :

Constipation is often considered a natural part of aging but it is a disorder that is not caused by aging itself. Although changes in the gastrointestinal tract associated with aging may predisposeone to develop constipation, the disorder usually has a multifactoral etiology and may be a lifetime disorder. As shown in Table 2, numerous factors may contribute to the development of constipation [43–46,47,48]. Though bowel transit time and frequency of bowel movements do not change with aging, a number of comorbid conditions may contribute to the development of constipation [47]. Some data suggest that older adults perceive constipation as straining during defecation rather than decreased bowel frequency [49,50]. Another study of elderly individuals who reported constipation demonstrated that straining and hard bowel movements were the mostfrequent complaints[50]. A determination of the most likely etiology for constipation requires identification of the primary complaint [47]. Aging is associated with changes in the structure and function of the colon and defecatory mechanisms. Regional differences in colonic propertiesand in neurotransmitter functions have implications for normal function and dysfunction [51].

Rectal sensation plays a critical role in normal defecation and may change with aging. In one study elderly patients with constipation and a history of fecal impaction had impaired rectal and perineal sensation and required significantly larger volumes of rectal distention to stimulate the normal urge to defecate [52]. A second report described impaired rectal perception of stool in elderly patients with constipation [53], while sensation appeared to remain intact in those patients without constipation.

Disordered defecation can occur as a result of injury to the pudendal nerve. The incidence of increased pudendal nerve terminal motor latency, an indicator of pudendal nerve dysfunction, isincreased in elderly females [54]. Injury to the pudendal nerves can lead to abnormal perineal descent, which can impact rectal emptying by causing partial prolapse of the anal canal by the anterior rectal mucosa [55].

Several types of anorectal abnormalities occur in older people with constipation including dyschezia and pelvic dyssynergia. Dyschezia is characterized by reduced tone, increased compliance, and impaired sensation such that a

greater degree of rectal distention is required toinduce the defecatory mechanism [52]. Seen most commonly in frail elders, these individuals have recurrent rectal impactions, a frequent consequence of which is fecal soiling. Fecal soilingaffects 28% of older people. However, it is a problem that is not assessed by doctors or nurses [56]. Pelvic dyssynergia, also termed anismus, involves a failure to relax the pelvic floor andexternal anal sphincter muscles during defecation.

## Etiology :

Historically, symptoms were thought to suggest the presence of disordered defecation (eg, the need for support or pressure to the perineum and/or vagina or digitations of the rectum to facilitate rectal emptying). Patients with primary constipation may have a combination of these subtypes. In an evaluation 33 of 1000 patients referred to a tertiary care center due to intractableconstipation, 59% were identified as having normal-transit constipation, 28% with pelvic floor dysfunction (with or without slow transit), and 13% with slow-transit constipation. Because pelvic floor dysfunction and slow-transit constipation are less common (as stated), it is not generally recommended to begin diagnostic workup for these constipation subtypes initially in most patients. It may be warranted to proceed with more definitive diagnostic workup in patients who have not responded satisfactorily to trials of normally recommended laxatives, because appropriate treatment of constipation due to slow transit or disordered defecation may differ.

Secondary constipation may be due to medications, disease conditions or abnormalities, lifestyle factors, or psychogenic conditions. It was previously believed that lifestyle factors linked to the development of constipation included lack of adequate fiber, fluids, and exercise.

Recommendations addressing these lifestyle interventions have remained part of the management strategy for preventing and treating constipation despite a lack of evidence to support their efficacy. Other secondary causes of constipation include underlying diseases or drug therapy. Drug-related causes of constipation are important to identify, especially in patientstaking numerous daily medications, which may often be the case for older individuals [57].

Common secondary causes of constipation and Medications associated with constipation in olderpersons are listed in Table No. 1

## Table 1:Causes of Constipation

| NO | Condition | Possible Cause |
|---|---|---|
| 1. | Gastrointestinal cause | Irritable bowel syndrome<br>Upper gastrointestional disorder Anal and rectal disorders Hemorrhoids and anal fissure Ulcerative proctitis<br>TumorsHernia<br>Volulus of the bowel Syphilis Tuberculosis Helminthic infection<br>Lymphogranuloma venereum<br>Hirschsprnugs disease |
| 2. | Metabolite and endocrine disorder | Diabetes mellitus with neuropathy Hypothyroidism Panhypopituitarism Pheochromocytoma Hypercalcemia<br>Enteric glucagon excess |
| 3. | Pregnancy | Depressed gut motility<br>Increase fluid absorption from colon Decreased physical activity<br>Dietary changes Inadequate fluid intake Low dietary fiber<br>Use of iron salt |
| 4. | Neurogenic causes | Disease of central nervous system Trauma of brain specially medullaSpinal cord injury<br>Tumors of central nervous system Cerebrovascualr accidents Parkinson's disease |
| 5. | Psychogenic causes | Ignoring or postponing urge of defection Psychiatric condition |

| | | |
|---|---|---|
| 6. | Medication | Inhibitors of PG Analgesic Opiate drug Anticholinergic<br>Antihistaminic drug<br>Antiparkinsonian agents (Benzatropine) Phenothiazines<br>Tricyclic antidepressant Antacids containing calciumBarium sulfate<br>Calcium channel blockersClonidine<br>Diuretics (Non potassium sparing )Ganglionic blockers<br>Iron preparations<br>Muscle blockers (d -tuberculin)<br>Non-steroidal anti-inflammatory agents Polystyrene sodium sulfonate |

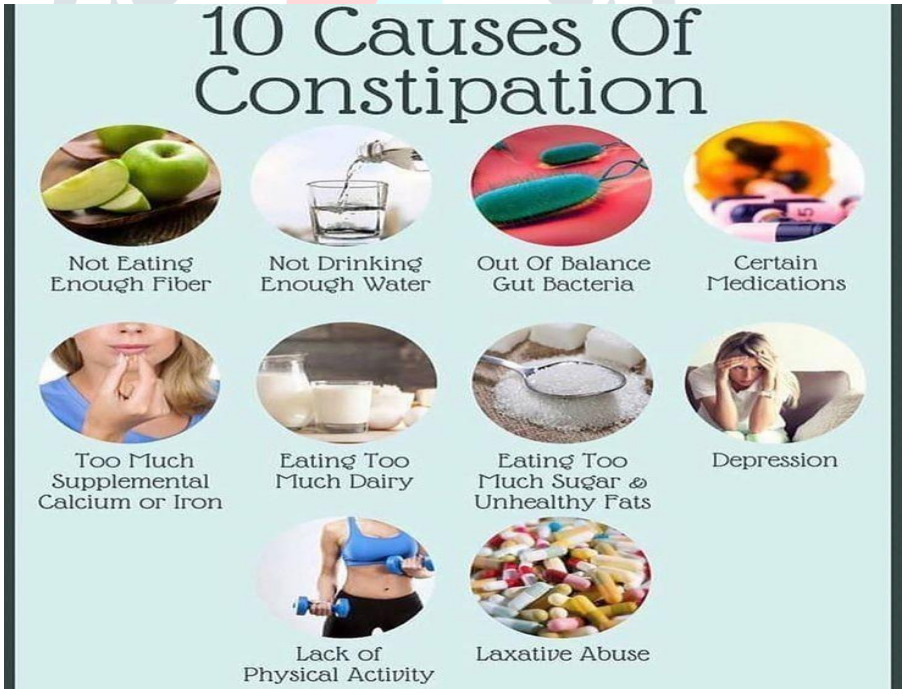


Table 2

| Etiology of constipation in the older adult |
|---|
| Endocrine and metabolic disease |
| Diabetes mellitus |
| Hypothyroidism |
| Neurologic disease |
| Autonomic neuropathy |
| Cerebrovascular disease |
| Multiple sclerosis |
| Parkinson's disease |
| Spinal cord injury |
| Psychological conditions |
| Anxiety |
| Depression |
| Structural abnormalities |
| Anorectal conditions: fissures, hemorrhoids, rectal prolapse or rectocele |
| Obstructive colonic lesions |
| Lifestyle |
| Dehydration |
| Low calorie diet |
| Low fiber diet |
| Immobility |
| Iatrogenic |
| Medications |

## Common Symptom : [58]

- Infrequent stools
- Hard stools
- Difficulty passing stool
- Symptoms necessitating the use of laxatives
- Incomplete bowel movements
- Anal or rectal blockage
- Bloating or distension

**Herbal Medication for constipation** :

**Haritaki:**

Haritaki consists of the dried pericarp of mature fruits of Terminalia chebula belongs to the family Combretaceae. It is moderate large-sized trees found throughout India, chiefly in deciduous forests and areas with light rain fall, but occasionally found in moist forest up to an altitude of 1500 meters. It is moderate-sized to large. deciduous tree attaining a height of 25–30
m. with a cylindrical bole, rounded and spreading branches. Leaf buds, branches, and youngest Leaves are covered with soft, shining rust-colored hairs [59,60]. The Fruits ripen from Novemberto March, depending upon the locality. and fall soon after ripening. The germinative capacity of the seeds is low because of the hard cover, and the seed requires pre-treatment.Fermentation of the seeds gives the best germinative results. Soaking of seeds in boiling water is preferable to untreated seeds. The tree can be successfully raised in the field by direct sowing of seeds,transplanting the seedlings, and planting root and shoot cuttings. The wood shows 4–12 rings per 2.5 cm of radius; the annual girth is increment being 1–4 cm [61,62]. The dried fruits constitute one of the most important vegetable tanning materials and have been used in India for a long time. The mature fruits are collected in January. April by shaking the trees, which are then dried in thin layers, preferably in shade, and graded for marketing. The raw myrobalans graded under different trade names, selection being based upon their solidity, color, and freedom from insect attack [63].

## Macroscopy : [64,65]

These are 30m tall, bark grayish black to gray , coarsely split and thick. Branchlets are conspicuously white or yellowish-long. lenticellate, glabrous, tomentose, or appressed villous, at least when young, hair tawny, rarely silvery. Leaves are ovate, elliptic, or obovate, alternate or subopposite, spaced along branchlets; petioles 1-3cm, moderately stout, with 2 (-4) glands 1–5 mm below the apex; leaf blade elliptic, both surfaces glabrous, or appressed (and rarely silvery) at least when young, base obtuse- rounded or cuneate, oblique, apex mucronate; lateral veins in 6–12 pairs.Inflorescences are axillary or terminal, simple spikes, 5–10 cm, numerous flowered, sometimes grouped at branchlet apex and forming a panicle; axis glabrous or sparsely hairy, with denser hairs near the base of flowers. Flowers are yellowish-white in terminal, simple and spikes or short panicles have an offensive odor and are slightly fragrant.bisexual. Calyx tube distally cupular, 2.5–3.5 mm, abaxially glabrous, adaxially tawny tomentose; lobes 5, apex mucronate to aristate. Stamens 10, exserted, 3–4 mm. Fruits are oblong, ovoid, or club-shaped. with a wrinkled surface of greenish yellow or golden brown color with five ribs running from the apex to the base. Fruit contains a single stony seed of a light yellow color. Fruits are not stipitated; they are blackish.brown when ripe, having 5-ridged, 2-4.5 × 1.2-2.5 cm, rigid, becoming deeply wrinkled when dry.

# Microscopic character : [66,67,68]

## Fruit :

The TS of the drug shows epicarp and mesocarp. Epicarp is composed of epidermis with a single row of cubical cells and hypodermis comprising of one or two rows of thick-walled cells intermingled with stone cells followed by layers of thin-walled parenchymatous cells filled with starch grains. Tannins are present in most of the cells. Stone cells present in mesocarp region areof two types, horizontally elongated ones present in the peripheral region and round ones in interior part, vascular bundles present in the mesocarp.

## Stem :

Growth ring boundaries distinct, indistinct, or absent Growth ring limits, when microscopically distinct, are demarcated by zoning of thick-walled, radially flattened fibers (latewood).
Heartwood is bascally brown. Sapwood color is distinct from heartwood color. Odour indistinctor absent. Density: 0.7–1 g/cm2. of commercial potential.

## Vessels:

Wood is semi-ring-porous and diffuse-porous. Vessels arranged in no specific pattern, in multiples, commonly short (2–3 vessels) radial rows. Perforation plates are simple. Intervessel pits alternate, average diameter (vertical): 6–10 µm. Fibres are very thin-walled. medium wall thickness. Average fiber length is 1200–1400 µm. Fibre pits mainly restricted to radial walls, simple to minutely bordered. Helical thickenings absent. Fibers are exclusively non-septate.

## Axial parenchyma:

Axial parenchyma present, not banded (banded parenchyma) observed in some specimens of T. arjuna and T. bellirica). Axial parenchyma bands not marginal (or seemingly marginal), fine, up to three cells wide and coarse, more than three cells wide. Axial parenchyma paratracheal.
Paratracheal axial parenchyma is vasicentric, aliform, and confluent. Aliform parenchyma winged. axil parenchyma as strands. Average number of cells per axial parenchyma strand: 4–7.Unlignified parenchyma absent.

## Rays

Rays present, 9–15 per tangential mm, exclusively uniseriate (with very few 2-seriates). Aggregate rays are absent. Rays of one size The height of large rays is up to 500 µm. Rays composed of a single cell type (homocellular) and two or more cell types (heterocellular); homocellular ray cells procumbent. Heterocellular rays with square and upright cells restricted to marginal rows, mostly 1 marginal row of upright or square cells. Tile cells are absent. Perforatedray cells are absent. Disjunctive ray parenchyma end walls indistinct or absent.

## Powder:

Yellowish brown, bitter and astringent, with a sweet after taste, fibers, polygonal epidermal cells, stone cells, and parenchyma containing starch grains.

## 1. Taxonomical Description: [69,70,71,72,73,74].

❖ First Botanical name : Terminalia Chebula retz.

## ❖ Botanical Classification :

- Family : Combretaceae.
- Kingdom : Plantae.
- Subkingdom : Tracheobionta.
- Division : Mangnoliophyta.
- class : Monocotyledons.
- Subclass : Epigynae.
- Order : Myrtales.
- Genus: Terminalia.

## 2. Common Names : [75,76,70,71,73,74,77,78].

Haritaki is distributed in a wide landscape of the earth and thus has got various namesthroughout the world.

Table showing Vernacular Names Used In India :

| LANGUAGE | NAME |
|---|---|
| Sanskrit | Kayastha , Abhaya, Shiva, pathya, Vijaya (Not Bhanga) |
| Asamese | Shilikha. |
| Bengali | Haritaki. |
| English | Myrobalan. |
| Gujarati | Hirdo, Himaja, Pulo-harda. |
| Hindi | Harre, Harad, Harar. |
| Kannada | Alalekai. |
| Kashmiri | Halela. |
| Malayalam | Katukka. |
| Marathi | Hirda, Haritaki, harda, Hireda. |
| Punjabi | Halela, Harar. |
| Tamil | Ammai, Amutam, Aritaki, Pethiyam, Varikkai. |
| Telugu | Karakkaya, Karaka. |

❖ Table Showing Vernacular Names Used By Different Countries-

| COUNTRY | NAME |
|---|---|
| Filippines | Chebulic myrabolan. |
| Franch | My robolan noir. |
| Tibet | Somz moox kh'ook. |
| China | Zhang-Qin-Ge, Tlezi. |
| Malaysia | Manja puteri. |
| Germany | Myrobalane. |
| Arab | Aheelalj, Harar. |
| Thailand | Samo thai. |
| Persian | Halela. |
| Vietnam | Chieu lieu xanh. |
| India | Haritaki , harad , harada. |
| Cambodia | Sa mao tchet. |

## 3. GEOGRAPHICAL DISTRIBUTION:

It is a moderate to enormously dispersed tree. through tropical and subtropical Asia, includingChina and Tibet [71]. The favorable conditions for the growth of this plant are sunny, thickets,and moist forests with light rainfall [69,74]. This tree is found all through most of India, from Ravi eastwards to West Bengal and Assam, Indo-Burma district, climbing to an elevation of 1500 meters in the Himalayas [73,74].

It grows in the deciduous backwoods of Himachal. Pradesh, Tamil Nadu, Kerala, Karnataka, Bihar, Orissa, Maharashtra, Uttar Pradesh, Madhya Pradesh, and West Bengal [74, 79].

## 4. PROPAGATION AND CULTIVATION [69, 72,73,74] :

It develops on an assortment of soils, however. flourishes in mud and sandy soil. The organic products mature from November to March contingent on the area. Fallen natural products are gathered. For the most part, in the first 50% of January, seeds are dried and It can be preservedfor more than one year. Seed germination is low because of the hard spread, and seed requires pre-planting. treatment. The best germination happens when the seeds are chipped at their wideend without harming the incipient. organism, and afterward absorbed water for 36 h, before

planting in nursery beds. Following 15 days of planting, Germination starts and proceeds for 3–4weeks. The tree can be effectively raised by stem cuttings or by transplanting the seedlings or bystraightforwardly planting the seed. It is seen that transplanting a 1-year-old seedling develops better than direct seed planting or cutting plants. The young plant requires a water system duringthe first sweltering climate. Sanctuary is alluring in the beginning phases of the nursery and furthermore in the wake of transplanting. The general development pace of plant is moderate.

## 5. BOTANICAL DESCRIPTION :

The Haritaki plant is a medium-sized deciduous tree with variable appearance, up to 25 m tall, with a generally short barrel-shaped bole of 5–10 m length, at bosom tallness of 60-80 cm in breadth, crown adjusted, with broadening branches,bark dim earthy colored, for the most part longitudinally split with woody scales, branchlets corroded villous or glabrescent [69]. Leaves of haritaki are exchange or inverse, ovate or elliptic-obovate, thin-coriaceous, 7–12 cm long and 4–
6.5 cmwide, inhumane to subacute at the summit, adjusted at the base, pubescent underneath, petiole up to 2 cm since quite a while ago, given two organs at the base of the leaf cutting edge [70,71]. The Haritaki plant blossoms in axillary, 5-7 cm-long spikes.straightforward or, at some point, spread, around 4 mm over, yellowish-white and disagreeably scented, calyx 5-lobed, stamens 10, corolla missing, ovary sub-par, exserted, 1-celled [73]. Natural fruit: an obovoid or oval ellipsoid drupe, 2.5-5 cm long, faintly 5-rakish fit as a fiddle, yellow to orange earthy-colored when ready, glabrous [74].

## 6. CLASSIFICATION OF HARITAKI [80,75,81,76, 71,82,72,73,83]:

### A. AS DETERMINED BY THE SIZE OF THE FRUIT [71]-

**(i) Survari harade:** This kind of harade is thick,overwhelming and huge, around 2 inches in length,yellowish-earthy colored; when cut, it contains yellowish or darkish earthy-colored mash and stone, and the mash is astringent in taste.

**(ii) Rangari harade:** This sort is less wrinkled, smaller,littler andless wrinkled than the above assortment; long about aninch; the epidermis is yellow; when cut, it presents ayellow dried mash and a stone. The mash is lessastringent in taste than that of survari harade.

**(iii) Bala harade:** This sort is smaller than the other two.assortments. Profoundly earthy-colored or dark in shading;exceptionally wrinkled, dull, or earthy-colored epidermisand theirmash is dim and homogenous; there is no stone.

**(iv) Java harade:** These are the littlest of all and different.characters are like Bala harade.

### B. CLASSIFICATION AS PER SHAPE [1, 3, 6, 8, 9, 10, 11,16]-

**(i) Vijaya:** This sort, having an alabu shape, is utilized in all infections, and living space in the Vindahya Mountains.

**(ii) Rohini:** It is round-fitted as a fiddle, utilized in vrana, natural surroundings in Zansi anddifferent conditions ofIndia.

**(iii) Pootana :** It is small in size, with a small mesocarp and a small seed. greater, remotely utilized habitat in Sind.

**(iv) Amirtha:** Mesocarp of this sort is often utilized for shodhanakarma habituate.

**(v) Abhya:** This kind of fruit having five ribbed segments is utilized in eye infections, habitate champaranya,

Himalaya.

**(vi) Jeevantee:** This sort of organic product is brilliant yellow. in shading, utilized in all infections, habitat Himalaya.

**(vii) Chetaki:** This kind of fruit, having three ribs, is utilized as laxative.

## C. CLASSIFICATION AS INDICATED BY THE DEVELOPMENT OFFRUIT [71]-

**(i) Halileh-Zira**: At the point when the size is that big, cumin seed.

**(ii) Halileh-Javi:** At the point when the size is that big, scarcely corn.

**(iii) Halileh-Zangi:** At the point when the size resembles a raisin.

**(iv) Halileh- Chini:** At the point when organic products are greenish-yellow in shading and, to some degree, hard.

**(v) Halileh-Asfer:** At the point when it is practically full grown organic product.

**(vi) Halileh-Kabul:** It is completely natural product.

## D. ACCORDING TO VARIOUS PHASES OF DEVELOPMENT OF NATURAL PRODUCTS [71] -

Chattopadhyay and Bhattacharyya grouped the Haritaki into three kinds as per various phases ofthe development of natural products-

**(a) Small Myrobalan:** The juvenile fruit

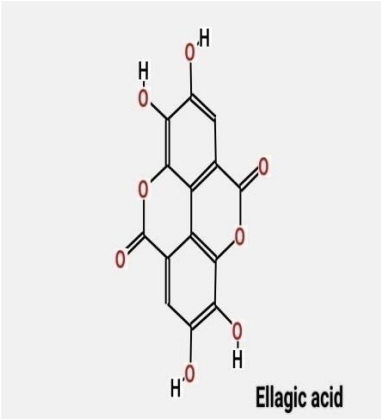
**(b) Yellow Myrobalan:** After improvement of the seed, this is the experienced phase of thenatural product.

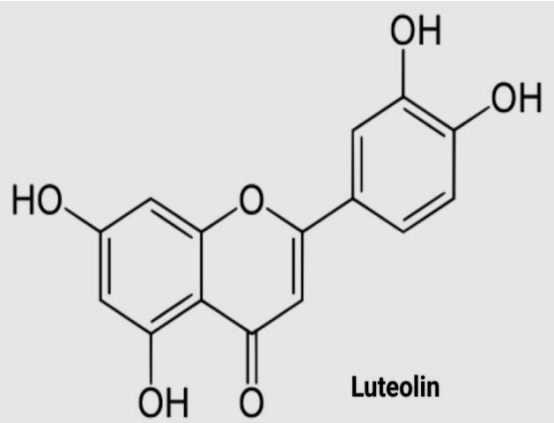
**(c) Large Myrobalan:** The completely developed organic product.

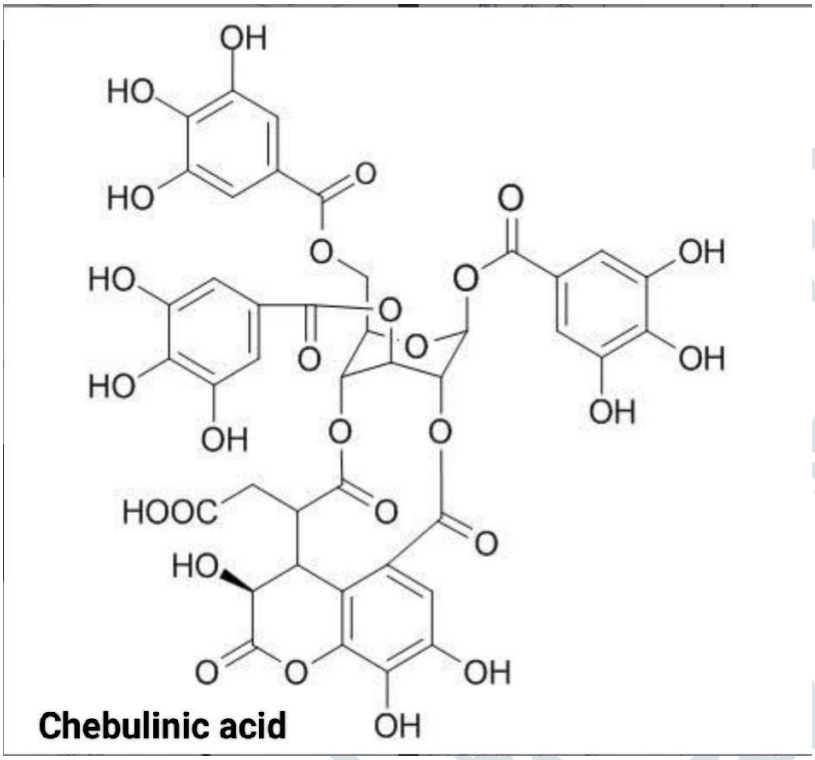
## PHYTOCHEMICALS:

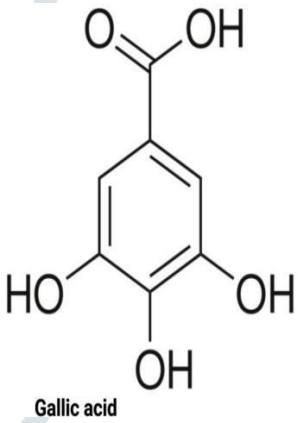
The dried flesh surrounding the seed is rich in tannin (av.,30-32%), whose content considerably varies with the different grades of myrobalans from different areas. The important grades recognized for export include Bhimlies (from Madras), Jubbulpores (from Jabalpur), Madhya Pradesh), Rajpores (from Kolhapar, Maharashtra), Vingorlas (from Bombay forests), and Madras Coast. Myrobalans from Salem district (Tamil Nadu) are considered the best because of their high tent of tannin, pale color, and the paleness of the extract from them. Analysis of several samples of the fruits of Indian myrobalans showed the following percentages of tannin. [61] The tannins in myrobalan belong to the pyrogallol type. They also considerably differ in their susceptibilities. ity to hydrolytic

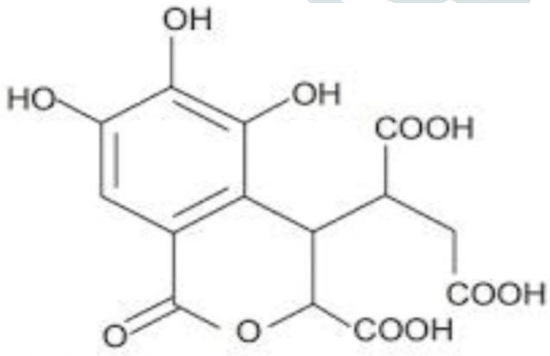
breakdown. The hydrolysable tannins, chebulagic acid (C41 H30O27' 10H2O; m.p. >2400 [84,85,61,86,87,88,89,90,91,92]. chebulinic acid (C41H32O27)
(84,85,61,87,89,90,91 , 92] and corilagin [61,92] are the major tannin constituents present in myrobalans; these are long to ellagitannin class. They are accompanied by varying proportions ofthe following products of their complete and incomplete histories: Drolysis: chebulic acid (C14H12O11) [84, 85, 61, 92], 3, 6-digalloylglycose (C20H20O14) [84, 61], ellagic acid [84, 61,
86], gallic acid [84, 61, 86], and B-D-glucogallin [84, 61]; the presence of terchebin, 1, 3, and 6-trigalloylglucose and 1,2,3,4,6-pentagalloylglucose have also been reported. Some of these constituents are reported in the extract but not in the fresh, ripe fruits [61]. The carbohydrates present in myrobalan are glucose and sorbitol (major constituents), about one percent each of fructose and sucrose, a smaller amount of gentiobiose, and traces of arabinose, maltose, and rhamnose, and xylose. Eighteen typical amino acids of plants (all possibly occurring free in the living trees) are also present besides small quantities of phosphoric, succinic, quinic, shikimic, and dihydro- and dehydroshikimic acids. During the maturation of the fruits, the amount of tannin decreases, whereas acidity increases [61].

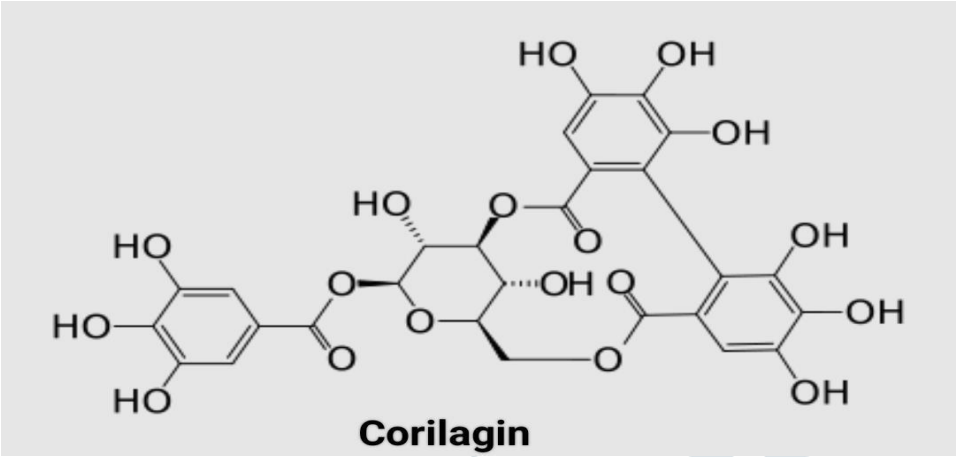

Ellagic acid


Luteolin


Chebulinic acid


Gallic acid


Chebulic acid



Corilagin

## TRADITIONAL USES:

In Traditional Haritaki means "carries away " (all diseases). Is an important Ayurvedic medicine, which often promotes health through successive steps of purification and detoxification. It is known to have strong anti-mutagenic activity. Because of its very rich content of vitamin C. Haritaki is a safe and effective purgative mild laxative, stomachic, tonic, alterative, adaptogen, hepatoprotective, febrifuge, antispasmodic, astringent, expectorant, anti- asthmatic, antiviral, and hypoglycemic. It is useful in ophthalmia, hemorrhoids, dental caries, bleeding gums, ulcerated oral cavity and in many other diseases, according to Ayurveda [93,94].

## AMLA:

Emblica officinalis (EO), or Indian gooseberry,also known as the king of all medicinal crops. It is the most important drug in the Indian ordinary approach, primarily Ayurveda. It has occupied an important location in ayurvedic drugs. EO has long been and remains greatly preferred in India, and the extractis consumed as a nutraceutical in more than a few meals . Not most effective is EO largely consumed in India, but it surely has been famous to be used in over 20 nations of the world for health advantages [95]. EO (amla) is a deciduous tree belonging to the family Euphorbiaceae [96]. It also reward on the hill slopes up to 200 m. It is commercially cultivated. within the state of Uttar Pradesh in India. It is also grown in Tamil Nadu. Rajasthan, and Madhya Pradesh. Dried fruits, contemporary fruits, seed, leaves, root bark, and plant life of EO (amla) are regularly used in drug treatments. EO (amla) is a medium-sized deciduous plant. It grows to a peak of 8–18 m with thin, gentle gray bark. Its flower is yellow-greenish in color. The fruit is spherical, faded yellow, with six vertical furrows enclosing six trigonous seeds in two-seeded crustaceous cocci. The traditional weight of the fruit is 20–25 g. It has a gray bark and reddish wood. Its leaves are feathery, linear, and rectangular .In form, and scent-like lemon. Its wood is difficult to texture. EO (amla) is particularly nutritious and is among the richest sources. of diet C, amino acids, and minerals [97]. It is an especially rich supply. of diet C containing 30 times the quantity discovered in oranges. The suitable for eating EO (amla) fruit tissue has three occasions: protein concentration and 160 instances of ascorbic acid awareness ofan apple. The fruit additionally includes a higher awareness of most minerals and amino acids

than apples. EO (amla) fruit ash includes chromium, zinc, and copper. It is considered adaptogenic because improves immunity. It contains a number of chemical ingredients. such as tannins, alkaloids, phenols, and plenty more [98]. Among all hydrolysable tannins, emblicanin Aand B, gallic acid, and ellagic acid are reported to be their own biological endeavor.Just about allcomponents possess medicinal properties, notably fruit, which has been used in Ayurveda as a strong rasayana and in customary treatment within the therapy of diarrhea, jaundice, inflammation, and a number of other illnesses [99]. EO (amla) fruit is generally used in the Indian system of medicine, as on my own or in mixture with different crops Fresh fruit is refrigerant, diuretic, and laxative. Fruit can be carminative and stomachic. Dried fruit is sour and astringent. Bark acts as an astringent and contains leukodelphinidin, tannin, and proanthocyanidin. The herb is also aphrodisiac, hemostatic, nutritive tonic, and rejuvenative. It raises the red blood cell count [96]. The fruits are valuable invitiated stipulations of tridosah, diabetes, cough, bronchial asthma, bronchitis, cephalalgia, ophthalmopathy, dyspepsia, colic, flatulence, hyperacidity, peptic ulcers, erysipelas, skin diseases, leprosy, hematogenesis, inflammation, anemia, emaciation, hepatopathy, jaundice, strangury, diarrhea, dysentery, hemorrhages, leukorrhea, menorrhagia, cardiac problems, intermittent fevers, and grayness of hair or hair loss [100-102]. The fermented liquor from the fruits isused in dyspepsia, jaundice, and cough. Exudation from an incision on The fruit is used as an external utility for the infectionof the eye. Because of the wealthy diet C, EO (amla) is used in the healing of humans. scurvy. It is also precious for neutralizing snake venom and acting as an antimicrobial agent [103].

## TAXANOMICAL CLASSIFICATION:

- Class : Dicotyledonae
- Division : Angiospermae
- Family : Euphorbiaceae
- Genus : Emblica
- Kingdom :Plantae
- Order : Geraniales
- Species : Officinalis Geartn.
- Synonym : *Phyllanthus emblica Linn.*

## VERNACULAR NAMES OF EO :

- Assam : Amlaku , amalaki , amalakhu.
- Bengali : Dhatri.
- Chinese : An mole.
- English : Emblic myrobalan , Indian goose berry .
- French : Phyllanthe emblica.
- German : Amla.
- Gujarati : Ambla.
- Hindi : Amla.

- Italian : Mirabolano emblica.
- Kannada : Nellikayi.
- Karnataka : Nellikayi , bela nelli.
- Kashmir : Aonla.
- Malayalam : Nelli kayi.
- Malaysian : Popok melaka.
- Marathi : Amla.
- Orissa : Anala , Ainla.
- Punjabi : Anula , Amla.
- Sanskrit : Dhatriphala, amla, amaliki , amalakan , sriphalam , vayastha .
- Tamil :Nelli.
- Telugu : Usirikaya.

## PLANT MORPHOLOGICAL DESTRIBUTION :

EO (amla) is a small- to medium-sized tree with greenish-gray or red bark, growing to a height of about 8–18 m [104]. Flowering in March toMay, and fruiting from September to November.

**Bark :** Thin, light gray bark exfoliates in small, thin, irregular flakes [105].

## Flowers:

Small, inconspicuous, greenish-yellow flowers are borne in compact clusters in the axils of the lower leaves. Male flowers are unisexual and numerous on short, slender pedicels,females few, subsessile, ovary three-celled [105].

## Fruit :

Pale yellow, depressed, fleshy, globose, about 2 cm in diameter with six obscure vertical furrows enclosing six trigonous seeds in 2 seeded 3 crustaceous cocci [105].

## Fresh fruit :

It consists of fresh fruit pulp of EO (amla): (a) macroscopic, (b) microscopic,
(c) identity, purity, and strength, and (d) dose [106].

a. macroscopic: fruit, globose, 2.5–3.5 cm in diameter, fleshy, smoothwith six prominent lines, greenish when tender, changing to lightyellowish or pinkish when mature, with a few dark specks: Taste, sour and astringent, followed by a delicately sweet taste [106].

b. Microscopic: The transverse portion of mature fruit shows an epicarp.such as a single layer of skin and a pair of four layers of hypodermis,epidermal mobile, tabular. In shape, included externally with athick cuticle and show up in floor view as polygonal, hypodermalcells that are tangentially elongated, thick-walled, and smaller in dimension.than epidermal cells, mesocarp varieties bulk of fruit, consistingof skinny-walled parenchymatous cells with intercellular spaces,peripheral, 6–9 layers smaller, ovoid, or tangentially elongatedeven as the rest of the cells are better in dimension, isodiametric, and radiallyelongated, a couple of collateral fibrovascular bundles scattered forthe period of mesocarp, which includes xylem and phloem, xylemcomposed of tracheal factors, fiber tracheids, and xylem fibers,

Tracheal factors show reticulate, scalariform, and spiral thickenings. xylem fibers elongated withslender lumen and pointed end, Mesocarp comprises large aggregates of numerous irregular silica crystals [106].

c. Identity, purity, and strength [106]:

- Acid-insoluble ash: not more than 2%
- Alcohol-soluble extractive: not <40%
- Foreign matter: not more than 2%
- Moisture content: not <80%
- Total ash: not more than 7%
- Water-soluble extractive: not <50%.

d. Dose: 20 g of the drug, 5–10 ml of fresh juice.

**Dried fruit:**

It consists of pericarp of dried mature fruits of EO (amla):

(a) Macroscopic, (b) microscopic, (c) identity, purity, and strength, and

(d) dose [106].

a. Macroscopic: Drug contains curled pieces of pericarp of dried fruit taking place both as separated single segment, 1-2 cm lengthy or united as three or four segments, bulk color gray to black, portions displaying, a large, particularly shriveled and wrinkled outside convex surface to moderately concave, transversely wrinkled lateral floor, external surface shows a couple of whitish specks, every so often some portions exhibit a portion of stony testa (which must be removed earlier than processing), texture rough, cartilaginous, tough, style, bitter, and astringent[106]

b. Microscopic: Transverse portion of fruit indicates epicarp including a single layered epidermis, telephone appearing tabular and polygonal in 6loor view, cuticle present, mesocarp cells tangentially elongated parenchymatous and crushed, differentiated roughly into peripheral eight or nine layers of tangentially elongated smaller cells, leisure consisting of regularly is diametric larger cells with partitions showing irregular thickenings, rami6ied vascular factors on occasion present, stone cells present either remoted or in small companies closer to endocarp, pitted vascular 6iber, walls appearing serrated due to the pit canals, leading into lumen [106]

c. Identity, purity, and strength [106]:

- Acid-insoluble ash: Not more than 2.0%
- Alcohol-soluble extractive: Not <40.0%
- Foreign matter: Not more than 3.0%
- Total ash: Not more than 7.0%
- Water-soluble extractive: Not <50.0%.

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

**Powder :**

Fine powder shows hexagonal, thick, straight-walled epidermal cells. In surface view, embedded with small prismatic crystals of silica, isolated or groups of thin-walled pitted stone cells, fragments of thick walled fibers and sclereids, fragments of pitted vessels, tracheids, and parenchyma, crystals of silica, and simple oval to spherical starch grains scattered as such or embedded in the parenchymatous cells of the mesocarp, (a) identity, purity, and strength, and (b)dose [106].

a. Identity, purity, and strength [14]:

- Acid-insoluble ash: not more than 2%

- Alcohol-soluble extractive: not <40%
- Foreign matter (including seed and seed coat): Not more than 3%
- Total ash: not more than 7%
- Water-soluble extractive: not <50%.

b. Dose: 3-6 g of the drug in powder form. Leaves are 3 mm wide and 1.25-2 cm long, alternate, bifarious, pinnate, Leaflets are numerous, alternate, linear-obtuse, and entire; petioles are striated. round [105].

**Seeds :**

Obovate-triangular, three-celled, with two seeds in each cell [105].

## ORGANOLEPTIC CHARACTERS OF EO:

Qualitative evaluation based on the sensory profile by observation of color, odor, taste, andconsistency were done (Table 3).

# PHYSICO-CHEMICAL PROPERTIES OF EO (TABLE 2) [106] :

Physicochemical constants were studied in order to evaluate purity. parameters of the drug as perpharmacopoeial standards and the percentage of total ash, acid-insoluble ash, water-soluble ash, and extractive values (water-soluble, alcohol-soluble, and organic solvents)soluble), pH of extracts, powder microscopy, and loss on drying (LOD),etc. were calculated as per the Indian Pharmacopoeia and Ayruvedic Pharmacopoeia.

## Inorganic components present in EO :

Prepared ash of the drug material was added with 50% v/v HCl. The filtrate was then subjectedto analysis of the inorganic elements.(Table 5) [106].

## Phytoconstituent screening:

Qualitative chemical examination of an aqueous extract of EO (AEO) (amla) revealed the presence or absence of various plant constituents.(Table 6) [107].

## Nutritive value :

EO (amla) has been called the first-rate of the ayurvedic rejuvenating herb, considering the usual stability of tastes (sweet, sour,pungent, bitter, and astringent) multifunction fruit and is well identified. for its dietary characteristics. EO (amla) fruit is regularly the richest. recognized normal source of vitamin C (200–900 mg per 100 g)of a safe-to-eat component). The fruit juice involves close to 30 instances. as much vitamin C as orange juice, and a single fruit is the same as antiscorbutic value to at least one or two oranges. It also involves minerals and amino acids akin to calcium, phosphorus, iron, niacin,carotene, thiamine, riboflavin, and nicotinic acid [108, 109].

Table 3: Organoleptic Characters of EO (amla)

| S. No | Parameters | Observations |
|---|---|---|
| 1. | Color | Yellowish green |
| 2. | Consistency | Hard |
| 3. | Order | Aromatic |
| 4. | Taste | Sour |

Table 4 : Physico-chemical properties of EO (amla)

| S. No | Parameters | Observations |
|---|---|---|
| 1. | Acid-insoluble ash (w/w %) | 1.90 % |
| 2. | Alcohol-soluble extractive (w/w %) | 15.5% |
| 3. | Disintegration time | 39 minutes |
| 4. | Hardness test | 6.9 $kg/m^2$ |
| 5. | Loss on drying at $110^0$c (w/w % | 3.4 % |
| 6. | pH of 5% aqueous solution | 3.37 |
| 7. | Powder microscopic | 15-20 µ |
| 8. | Total ash (w/w %) | 5.33 % |
| 9. | Water-soluble extractive (w/w %) | 41.30 % |

Table 5 : Inorganic components present in EO (amla)

| S. No | Parameters | Observations |
|---|---|---|
| 1. | Calcium | + |
| 2. | Carbonate | - |
| 3. | Chloride | + |
| 4. | Iron | + |
| 5. | Magnesium | - |
| 6. | Nitrate | - |
| 7. | Potassium | + |
| 8. | Sodium | + |
| 9. | Sulfate | - |
| 10. | Zinc | + |

Table 6 : Phytochemical screening of EO (amla)

| S. No | Plant constituent | Reagent used | Observations |
|---|---|---|---|
| 1. | Alkaloids | Hager's reagent | + |
| | | Wagner's reagent | + |
| | | Mayer's reagent | + |
| | | Dragendorff's reagent | + |
| 2. | Amino acids | Ninhydrin test | - |
| 3. | Carbohydrates | Benedict's reagent | + |
| | | Fehling solution | + |
| | | Iodine test | + |
| | | Legal's test | + |

Libermann-Burchard's test + Molisch's reagent +

4. Fixed oils and fats Spot test -

Saponification test -

5. Flavonoid +

6. Glycosides Cardiac glycosides -Coumarin -

Anthraquinone -

7. Hexose Seliwanoff's reagent -

8. Monosaccharide Barfords Barfords -

9. Non-reducing sugar Benedicts +

10. Pentose Bails -

11. Phenolic +

12. Polysaccharide Iodine test -

13. Proteins Millon's reagent -

Ninhydrin reagent -

14. Reducing sugar Benedicts -

15. Saponins Foam test -

16. Steroids -

17. Tannins Ferric chloride solution + Lead acetate solution +

18. Test for organic acid +

Citric acid -

Oxalic acid -

Tartaric acid

19. Test for vitamins

Vitamin A -

| | |
|---|---|
| Vitamin B | - |
| Vitamin C | + |

## Botanical Description :

| | |
|---|---|
| Appearance | Medium Sized deciduous tree , 8-18 meters height with thin light grey bark exfoliating in small thin irregular flakes [110]. |
| Leaves | Simple , sub sessile, closely set along the branches, light green having the appearance of pinnate leaves [110]. |
| Fruits | 15-20 mm long 18-25 mm wide, nearly spherical or globular wider than long and with a small and slight conic depression on both apexes. Mesocarp is yellow and endocarp is yellowish brown in ripened condition. Fresh fruits are light green and ripe fruits turn light brown in color. The average weight of the fruit is 60-70 g [111]. |
| Seeds | Four-Six, smooth, dark brown [111]. |
| Barks | Thick to 12 mm, shining grayish brown or grayish [111]. |

## Geographical Distribution :

It is commonly found in tropical, sub-tropical, and seacoast districts and on hills. slopes up to 200 meters, also cultivated in plains and in heights of Kashmir, and also found in Burma, it is abundant in the deciduous forests of Madhya Pradesh (Chaudhuri,2004; Sai et al., 2002; Bhattacharya et al., 1999) [112].

## Chemical constituents :

The amla is one of the most extensively studied plants. Reports suggest that it contains tannins, alkaloids, and phenols [113]. Fruits have 28% of the total tannins distributed. in the whole plant. The fruit contains two hydrolysable tannins Emblicanin A and B [114], which have antioxidant properties; one on hydrolysis gives gallic acid, ellagic acid and glucose, wherein the other gives ellagic acid and glucose respectively. The fruit also contains phyllemblin [115]. Activity-directed fractionation revealed the presence of several phytochemicals like gallic acid, corilagin, and furosin and geraniin [116]. flavonoids like quercetin and alkaloids like Phyllantine and

phyllantidine are found. Along with these, It primarily contains amino acids, carbohydrates, and other compounds given in Table 7. Its fruit juice contains the highest concentration of vitamin C.(478.56mg/ 100mL). Vitamin C levels are higher than those in oranges, tangerines, and lemons [117,118]. The composition of fruit pulp of Emblica officinalis are given in Figure 1.

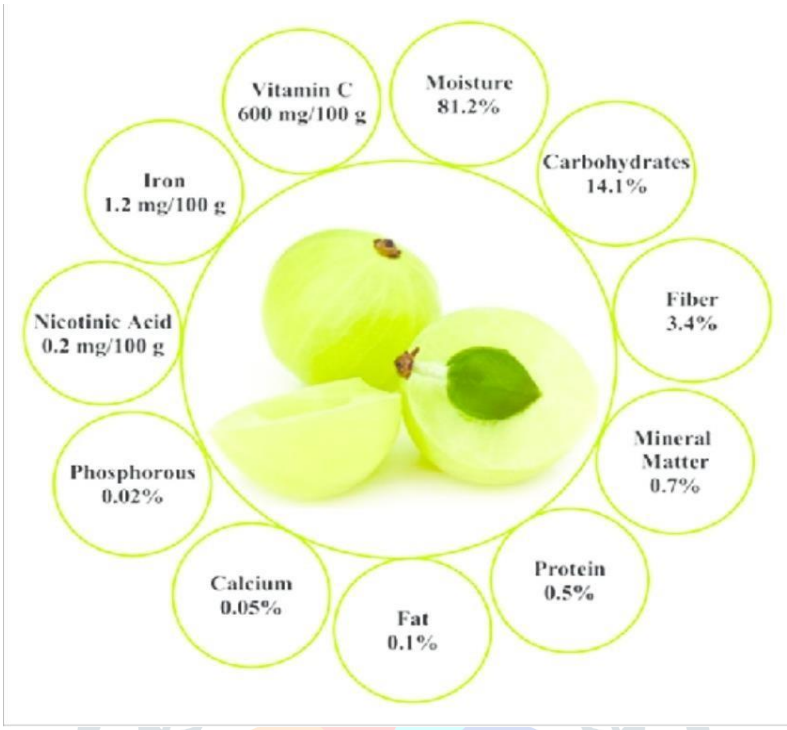


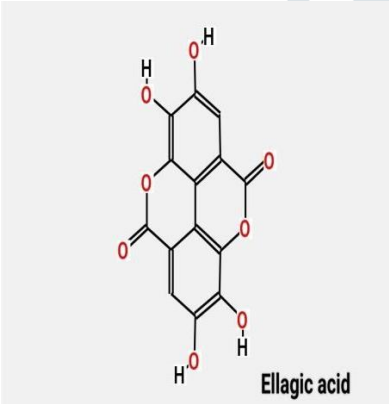

Figure 1 : Amla Fruit pulp : Composition.

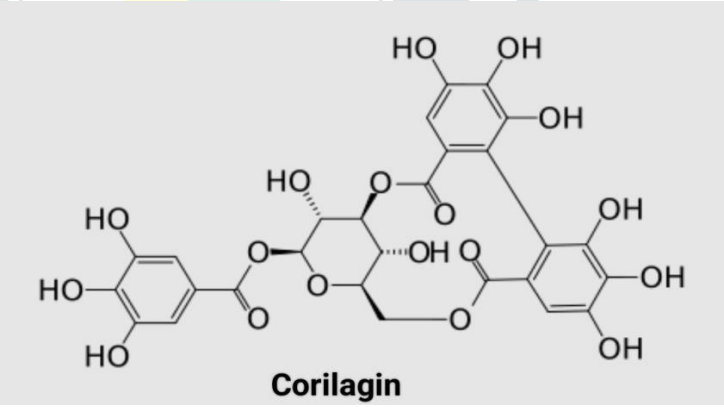
Table 1 : Amla fruit : Chemical constituents.

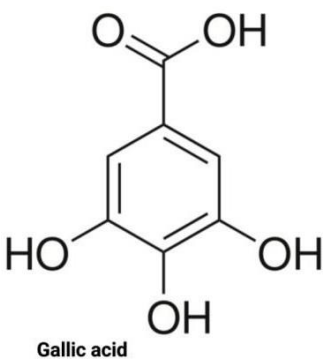
| Type | Chemical Constituents |
|---|---|
| Hydrolysable Tannins | Emblicanin A and B, Punigluconin, Pedunculagin, Chebulinic acid (Ellagitannin), Chebulagic acid (Benzopyran tannin), Corilagin (Ellagitannin), Geraniin (Dehydroellagitannin), Ellagotannin |
| Alkaloids | Phyllantine, Phyllembein, Phyllantidine |
| Phenolic compounds | Gallic acid, Methyl gallate, Ellagic acid, Trigallayl glucose |
| Amino acids | Glutamic acid, Proline, Aspartic acid, Alanine, Cystine, Lysine |
| Carbohydrates | Pectin |
| Vitamins | Ascorbic acid |
| Flavonoids | Quercetin, Kaempferol |
| Organic acids | Citric acid |

In comparison with apples, the edible fruit tissue is rich. with proteins 3-fold and ascorbic acid 160-fold and contains a considerably higher concentration of most minerals and amino acids. Glutamic acid, proline, and aspartic Acid, alanine, and lysine are 29.6%, 14.6%, 8.1%, and 5.4%, respectively. 5.3%, respectively, of the total amino acids. Some of the phytochemicals are shownin Figure 2 [119].

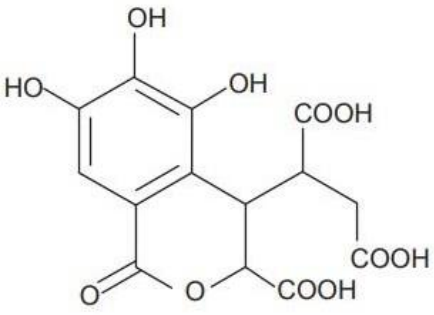
The pulpy portion of fruit, after drying, was found to contain: gallic acid 1.32%; tannin, gum 13.75%; albumin 13.08%; crude cellulose 17.08%; mineral matter 4.12%; and moisture3.83%. Amla fruit ash contains chromium. 2.5 ppm, zinc 4 ppm, and copper 3 ppm. Compounds isolated from amla fruit are gallic acid, ellagic acid, and 1-O-galloyl-beta-D-glucose, 3,6-di-O-galloyl-D- glucose, chebulinic acid, quercetin, chebulagic acid, corilagin, 1,6-di-O-galloyl beta-D-glucose, 3-Ethylgallic Acid (3-Ethoxy)4,5-dihydroxybenzoic acid) and isostrictinin [120]. Amla fruit also contains flavonoids, kaempferol-3-O-alpha L-(6"-methyl) rhamnopyranoside and kaempferol-3- O-alpha L(6"-ethyl) rhamnopyranoside [121].



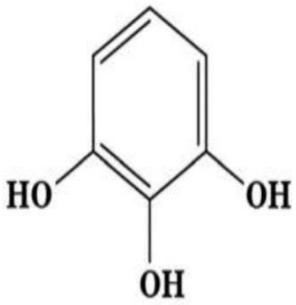





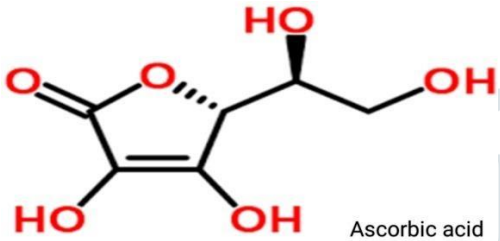
Gallic acid



Chebulic acid

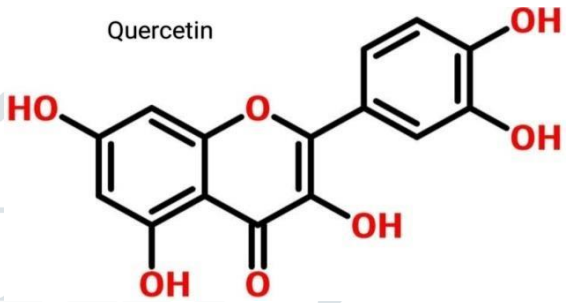


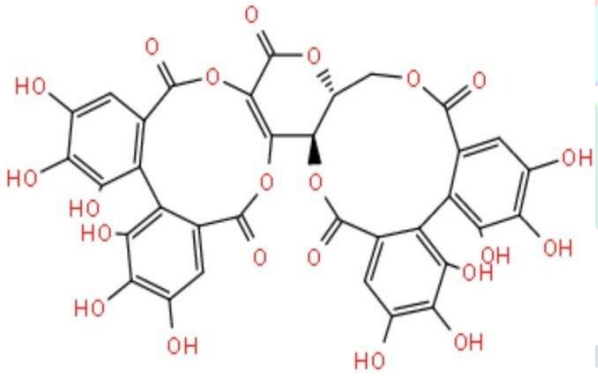
Pyrogallol



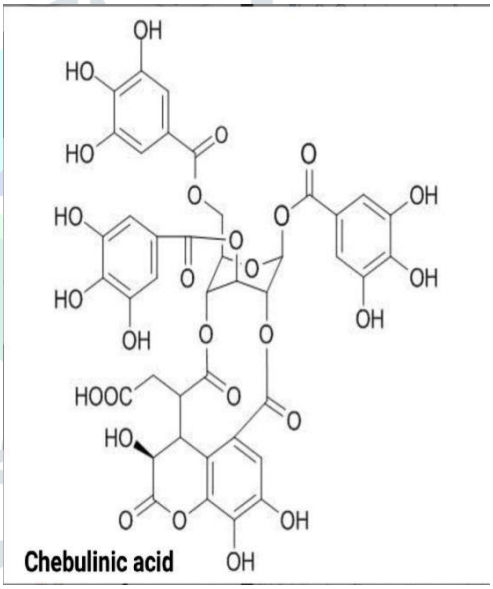
Ascorbic acid

Quercetin

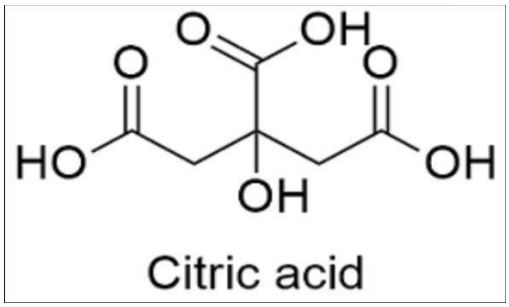


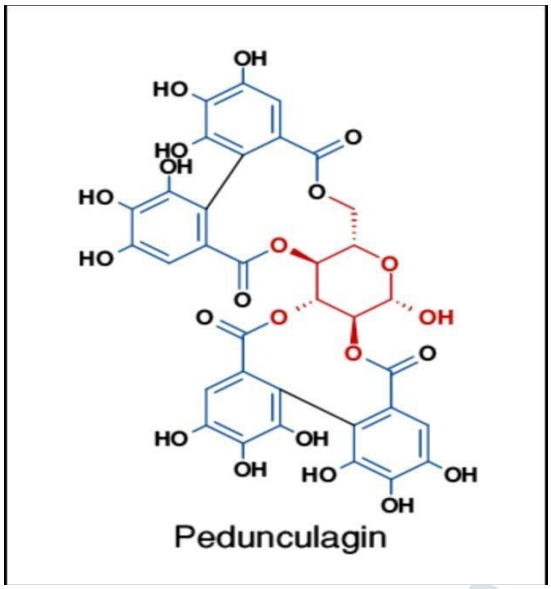
Emblicanin B



Chebulinic acid



Citric acid



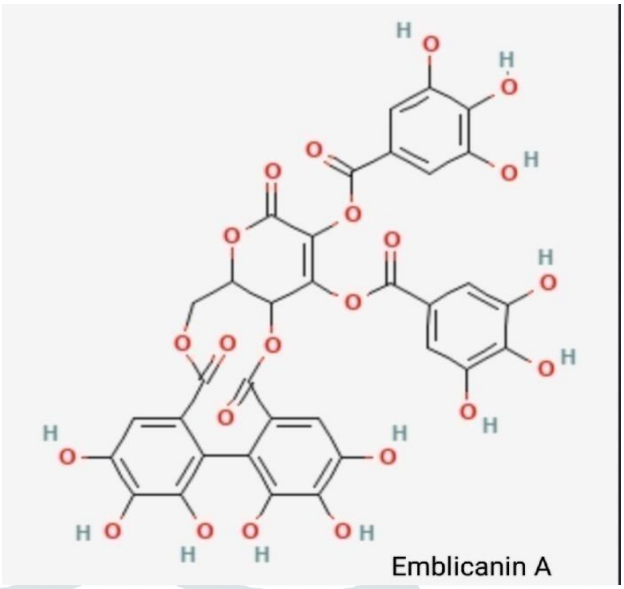




Figure 2 : Amla fruit : Structure of chemical constituents.

## Benefits of Amla :

## Traditional Uses :

EO (amla) enhances the production of red blood cells and strengthens the teeth, hair [100, 102, 122], and nails, as well as regulating blood sugar. In addition, It is used in bleeding, hemorrhoids, anemia, diabetes, gout, vertigo, obesity, diabetes of all varieties, hyperacidity, eczema, psoriasis, and hoarseness voice, sore throat, infection, hiccoughs, hepatitis B, non- specific urethritis, sterility, anemia, gingivitis, glaucoma, diarrhea, constipation, active fistula, hair loss [100, 101, 123], a couple of voices, and eyes. Seeds used for bronchial asthma, bronchitis, and biliousness. Dried fruit is used for hemorrhage. diarrhea, dysentery, anemia (withiron), jaundice, and dyspepsia. For acute bacillary dysentery taken as syrup with lemon juice. Astriphala just right for laxatives, headaches, biliousness, dyspepsia, constipation, piles, enlarged liver, and ascites. Juice of bark mixed with honey and turmeric for gonorrhea gastritis, hepatitis, osteoporosis, constipation, biliousness, weak point of liver and spleen, untimely graying or hair loss [101,124], basic debility, tissue loss, palpitation. Amla is also mentioned to have hepato, cardio, nephrology, and neuroprotective results, antioxidant, anti-inflammatory, analgesic, antipyretic, and restorative house.

## Senna :

Cassia angustifolia is an ayurvedic herb more commonly known as senna. It is also known as swarnapatri in Sanskrit. It is mainly used as a blood purifier and laxative for relieving constipation.and to treat skin diseases. It contains a powerful natural laxative called anthraquinone and is approved by the World Health Organization (WHO). It is an FDA- approved nonprescription laxative. Due to its laxative property, it is used to clear the bowel before diagnostic tests such as colonoscopy. Senna is an Arabian name, but it is native to Sudan.It was brought into use by Arabian physicians for removing capillary congestion. It is a small herb, growing to a height of 2-3 feet. In India, it is cultivated in Tamil Nadu, Andhra Pradesh, and Karnataka. Its Commercial cultivation has recently come up in Kutch (Gujrat) and Jodhpur

(Rajasthan). It can grow over sand dunes after the rainy season and can be maintained as a perennial crop for 2–3 years. Senna consists of the dried leaflets of Cassia angustifolia Vahl. belonging to the family Leguminosae. The leaves are golden brown in color after drying. The pod and root of the plant is also used. The first systematic examination of the leaves was carriedout by Tschirch and Hiepe.

## Taxanomical Classification of Senna :

| **Botanical Name** | **Cassia anugstifolia** |
|---|---|
| Kingdom | Plantae |
| Sub division | Tracheobionata |
| Division | Magnoliophyta |
| Class | Mabnoliopsida |
| Subclass | Rosidae |
| Order | Fabales |
| Family | Caesalpinaceae |
| Genus | Cassia |
| Species | angustifilia |

## Types of Senna :

The genus Senna comprises 500 species, of which 26 species of the genus Cassia have been reported to contain anthracene derivatives, either in their free form or as glycosides. Out of these,Cassia angustifolia (Indian senna) and Cassia acutifolia (Alexandrian senna) are official in different pharmacopoeias, because of laxative activity and also because they are available in large quantities. The other species with known laxative activity are Cassia fistula, Cassia Obovata, Cassia dentate, Cassia sofara, Cassia sieberiana, Cassia podocarpa, and Cassia alata.

## Chemical constituents :

**Anthraquinone glycosides:** Senna contains two active crystalline glycosides, Sennosides Aand B. They could both be degraded by acid hydrolysis to give rise to two molecules of glucose and the aglycones Sennidin A and B. Sennidin A. is dextrorotatory, and B has no rotation, being the meso form. formed by the intramolecular compensation. It also contains: Sennosides C and D, which are the hetero-dianthrones with the respective aglycones rhein and aloe emodin.

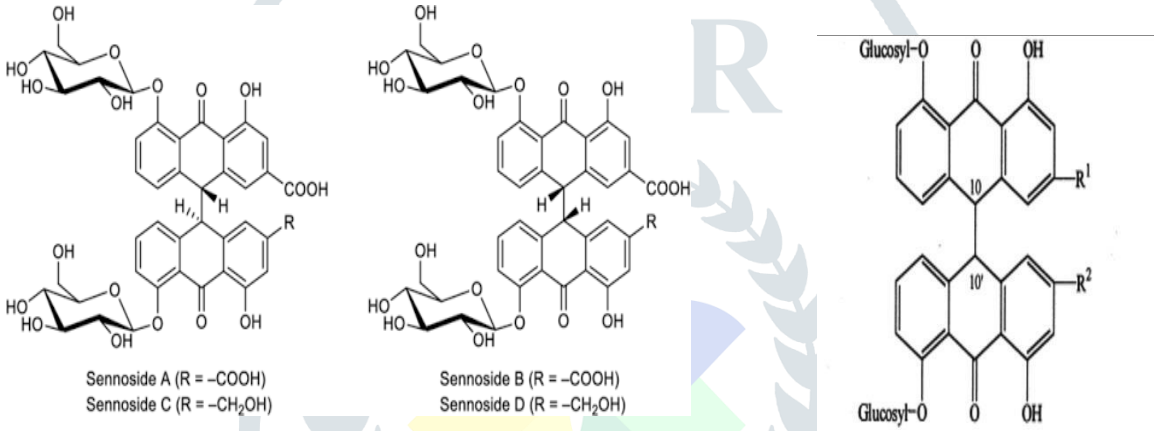
Furthermore a A series of monoanthrones was shown to be present in smaller amounts such as aloe emodin mono- and diglucosides (aloe-emodin-dianthrone diglycoside, aloe-emodin-8- glucoside, aloe-emodin-anthrone-diglucoside) and, further, rhein mono-and diglucosides (rhein-anthrone-8-glycoside, rhein-8-diglucoside).

**Naphthalene glycosides:** It also contains a naphthalene glycoside known as tinnevellinglycoside (0.3%).

**Miscellaneous:** In the fraction of the flavanoid family Senna contains the yellow flavanol coloring matter kaempferol (3,4', 5, 7-trihydroxyflavone), its glucoside (kaempferin), and isorhamnetin, β-sitosterol, calcium oxalate, mucilage, resin, Saponins and polysaccharide hydrocolloids are also present.

## The basic chemical structure of sennosides:

| R1 | R2 | 10-10' | Glycosides |
|---|---|---|---|
| COOH | COOH | Trans | Sennoside A |
| COOH | COOH | Meso | Sennoside B |
| CH2OH | COOH | Trans | Sennoside C |
| CH2OH | COOH | Meso | Sennoside D |




## Medicinal properties of Senna :

The taste of senna is pungent, bitter, and sweet, with a high potency. It is light to digest and dry in nature. After digestion, it undergoes a pungent taste. It acts as a mild purgative. This The herb is pitta shodhaka, and vata anulomaka means to remove the pitta from the body and remove the vata through the anal route. It is used as a laxative for the treatment of constipation and for the evacuation of the bowel prior to the diagnostic tests of the gastrointestinal and colorectal areas. The leaves and pods are administered in the Ayurveda and Unani systems of medicine as infusion for their purgative properties, combined with carminatives and aromatics. Among Ayurveda compounds, Panch Sakaara Churna is available over-the-counter. Other compounds are Shtshakaar Churna and Yashtyaadi Churna. Among Unani compounds, Safoof-e-Mulaiyia and Majoon-e-Senaai are the well-known ones. All these compounds are prescribed as a mild

laxative for constipation and abdominal bloating, indigestion, and colic. Cassia angustifolia is an ingredient in Nilaavarrai Choornam of Siddha medicine, prescribed as a mild laxative in constipation, distention of the stomach and biliousness.

## Uses of Indian Senna :

- The dried leaf of Indian Senna is used as a purgative. The powder of the leaf is taken in adosage of 1-2 g with hot water in conditions of constipation or abdominal distention.
- In skin diseases, the paste of the leaf of Cassia Angustifolia is applied along with vinegarto the affected part of the body.
- In cases of abdominal worm infestation, rheumatoid arthritis, gout, the powder of Senna leaf is given in a dosage of 1-2 g to induce purgation.
- Ayurveda has advised Virechana (purgation therapy) in the conditions of hepatomegaly, splenomegaly, and Jaundice to relive excessive Pitta from the body using the dried leafor pod of the Senna plant.
- Senna leaf or pod, in dried form, stimulates the liver for production of Pitta.
- The leaf of Senna is a blood purifier. It is given daily in a dosage of 500 mg.
- It is used for irritable bowel syndrome, hemorrhoids, and weight loss.
- The anthraquinones of this herb can inhibit a variety of bacteria (staphylococci and Bacillus coli) and dermatomyces (Microsporum audouinii), etc. [125]

## Isapgol: [126]

**Synonyms:** Ispaghula, Isabgul, Indian Psyllium, Isabgol.

The origin of the word isapgol is form the Persian words ISAP (the horse) and GHOL (the ear). Thus, the literal meaning of word isapgol is the ear of the horse. The seeds and the husk of the seeds are used in medicine since eighteenth-century. About 10 species of the drugs are availablein India. Seeds are very small in size. One thousand seeds weigh about 01.5 g. Isapgol has high export potential.

## Biological Source:

Isapgol consists of dried seeds of the plant known as Plantago ovata (Syn: Plantago indica; Plantago afra) Forskal, family Plantaginaceae. In the pharmaceutical field, the seeds and the dried seed coats, known as isapgol husk, are used.

## Geographical Source:

The plant is cultivated largely in Gujarat, Punjab and South Rajasthan. The factory for preparation of husk is located at Sidhpur in North Gujarat. In Maharashtra, it is found to be grown successfully near Pune. About 50 thousand hectares of area is said to be under cultivationfor the drug in India.

## Cultivation and Collection:

Isapgol (Fig. 8.8) is a Rabi crop and needs well-drained loamy soil with a pH 7.5 to 8.5 and cool and dry weather, Heavy rains and cloudy weather at its maturity affect the yield adversely. The drug is cultivated by broadcasting method, in the month of November. About 6-12 kg seeds are needed per hectare. RI-87, RI-89, GI-1, GI-2, HI-1, HI-2, HI-5, MIB-121 area of 8-10 the species preferred for cultivation in Gujarat state. Irrigation is done 7-8 times at an interval of 8- 10 days. Ammonium sulphate is found to be satisfactory fertilizer for the plant. 25 kg of nitrogenous fertilizers and 25 kg per hectare are most suitable spray of 5.0% aldrin on the soil controls root-eaters. Aerofungin is used to control mid-dew. The crop is harvested in March/April and the average yield of the seeds per hectare is 7.4 quintals. It is collected by cutting the plant just above the ground, converting it to sheaves and drying. Thrashing is done and the thrashed material is winnowed and sieved to maintain quality. India is producing 48000 tones of seeds annually at present.The world demand for psyllium and isapgol seeds and husk is increasing (approx. 50,000 tonnes) and the main markets are in U.S.A., France, West Germany, and U.K. The export of isapgol husk and seeds together during 1995-96 was 155 crores and during 1996-97 it was 137 crores.

## Macroscopic Characters:

Color : Pinkish-grey to brownOdour: None

Size: 10-35 mm in length and 1 - 1.75 mm in widthShape: It is ovate cymbiform.

Seeds are hard, transparent and smooth with grey or reddish brown oval spot in the centre of the convex surface. Concave surface contains the hilum covered with thin membrane having two perforations. 1 gm accommodates 500-600 seeds.

## Macroscopical Characters:

It is in the form of pale buff ovate flakes with more or less lanceolate shape. The pieces are 1-2mm in size; flakes are odourless, smooth and free flowing.

Indian psyllium or Isapgol seeds are preferred in the world market for the following reasons.

1. Indian psyllium seeds are available at a lower price.
2. The mucilage content of this species is more.
3. It yields practically colourless mucilage.
4. The husk of the Indian psyllium cracks off under slight mechanical pressure and even it can beeasily separated from the seed.

## Uses:

The seeds, as well as, husk are used as demulcent, laxative, emollient in the treatment of chronic constipation, amoebic and bacillary dysentery. Isapgol husk is preferred to the seeds as the husk contains more mucilage and seeds are said to be irritant as compared to the husk. Mucilage of theisapgol is used in the preparation of tablets and also as a stabilizer in the ice cream industry. The Chrushed seeds are, many a time, used in the form of poultice for rheumatic pain.

## Aloe: [126]

**Synonyms:** Aloe, Musabbar, Kumari.

**Biological Source:** Aloes is the dried juice of the leaves of Aloe barbadensis Miller, known as Curacao aloes; or of Aloe perryi Baker, known as Socotrine aloes; or of Aloe ferox Miller and hybrids of this species with Aloe africana Miller and Aloe spicata Baker, known as Cape aloes, belonging to family Liliaceae.

## Geographical Source:

Aloes is indigenous to eastern and southern Africa and grown in Cape colony, Zanzibar and islands of Socotra. It is also cultivated in Caribbean islands, Europe and many parts of India,including North West Himalayan region.

## History:

The word aloes has originated from an Arabic word viz. alloch meaning a shining bitter substance. Among the different species, 'vera' means true, 'ferox' means wild, 'spicata' refers to flowers in spikes, and 'barbadensis' and 'africana' refer to habitat of the plant. Among the folkloreuses, it has been reported that in Congo region of Africa, the natives used to rub the mucilage of leaves for reducing perspiration and masking of human odour, thereby offering protection from wild animals. It is also known that Aloe barbadensis was used along with burnt alum for healing sore eyes.

## Cultivation and Collection:

The genus Aloe consists of about 200 species, some of which are used as sources of Aloes. These plants have rosettes of subulate, succulent large leaves (Fig. 9.1). The leaves are sessile

and have a strong spine at apex and also number of spines along the margins. The lower portion is rounded and upper portion is slightly concave.

For the cultivation, root suckers are used for propagation. The plants grow even in poor grades of soils and in dry climatic conditions. The root suckers are planted in the rows about 50 cm apart. Water logging near the plant must be prevented. The roots do not penetrate much in the soil. For the purpose of manure, a mixture of nitrogen, potassium and phosphorus is used. The leaves are cut for the first instance in second year of cultivation and the drug is obtained from leaves for twelve years. After twelve years, the plants are completely harvested by uprooting and once again the land is worked for replantation. During the collection of leaves, a cut is given to leaves near their bases, by which the juice located in parenchymatous cells of pericycle exudes out, due to the pressure exerted by mucilage cells. A single incision is sufficient for drawing out all the juice from entire system of pericyclic cells. The preparation of various types of aloes is outlined here.

## Microscopic Characteristics of Aloe Leaf:

T. S. of the leaf exhibits outermost cuticle followed by epidermis, palisade tissue and mucilaginous mesophyll. parenchymatous

Mesophyll encloses vascular bundles which are covered with pericyclic layer. Inside the pericycle few large elongated thin walled aloeitic cells are located. These aloeitic cells contain highly viscous, yellow juice (aloe gel). The leaves are sessile and when they are cut at the base, the juice flows down and which is to be collected. Few calcium oxalate crystals are present in theparenchyma.

## Microscopic Characters of Aloe Powder:

The microscopy of the different varieties of aloe is more significant for identification of their powdered forms. The microscopic characters are studied in lactophenol, because in this reagentthe particles are gradually solubilized so that crystals are clearly and quickly observed.

(i) Curacao aloes: It shows fragments consisting of a large number of very small needles orslender prisms.

(ii) Cape aloes: This variety appears as transparent, brown, angular or irregular fragments.

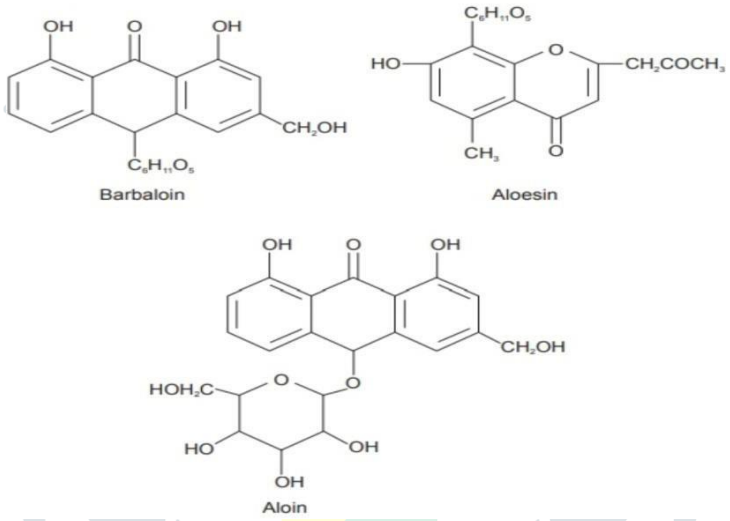
(iii) Socotrine aloes: It is characterised by fragments consisting of quite large prisms either present in group or in

dispersed form.

(iv) Zanzibar aloes: It exhibits irregular lumps in which modular masses are embedded.

In commerce, aloes is available both as crystalline and amorphous substance. It generally appears that amorphous form is cape aloe and crystalline one is curacao aloe, depending on their response to the tests. If both the varieties are mounted in cresol and viewed under polarised light, crystalline aloe, insoluble in cresol shows a shining bright colour. Amorphous aloe, as it gets quickly dissolved, remains invisible.

## Chemical Constituents:




All the varieties of aloe are the major sources of anthraquinone glycosides. The principal active composition of aloe is aloin, which is a mixture of glucosides, among which barbaloin is the chief constituent. It is chemically aloe-emodin anthrone C - 10 glucoside and it is water soluble.

Barbaloin is a C-glycoside and it is not hydrolysed by heating with dilute acids or alkalis. Ferric chloride decomposes barbaloin by oxidative hydrolysis into aloe-emodin-anthrone, little aloe- emodin and glucose. Along with barbaloin, aloes also contains isobarbaloin, ß-barbaloin, aloe- emodin and resins.

The drug also contains aloetic acid, homonataloin, aloesone, chrysophanic acid, chrysamminic acid, galactouronic acid, choline, choline salicylate, saponins, mucopolysaccharides, glucosamines, hexuronic acid, coniferyl alcohol, etc. The amount of barbaloin in different commercial varieties varies to a large extent. Curacao aloes contains about 22 per cent of barbaloin. Indian variety, generally Aloevera, contains very less quantity (3.5 - 4 per cent).
Curacao aloes contains two and half times quantity of aloe-emodin, as compared to Cape-aloe-emodin. The resin of aloe principally contains Aloesin. It is a type of a C-glucosyl chromome. Aloesin is also responsible for purgative action of aloes.

## Uses:

Aloes is used as a purgative. Its effect is mainly on colon. It has a stronger purgative action in theseries sofaen with drugs with anthracene glycosidal content. To counter effect the action in action, it is given with carminatives. Aloin is preferred now-a-days to aloes, both of which are official. Besides purgative property, aloes enjoys many other uses. It is an ingredient of compound tincture of benzoin (Friar's balsam).

It is also used in the treatment of pains and itchings and also to slow down ulceration and keratosis, Aloe gel is used in skin cosmetics as a protective due to its antiwrinkle properties. Aloe is also used externally for painful inflammation.

## Rhubarb: [126]

**Synonyms :** Radix rhei, Rheum, Revandchini.

**Biological Source:** Rhubarb consists of the dried rhizome of Rheum emodi Wall (Indian rhubarb), Rheum palmatum Linn and Rheum webbianum Royal (Chinese-rhubarb), family Polygonaceae. It is collected from 6-7 year old plants just before flowering season and marketedwith cortex intact or partially decorticated.

## Geographical Source:

It is obtained both from wild and cultivated species grown in regions ranging from south east China to Tibet and Korea. It is also obtained from Kashmir and Sikkim in India; and West Germany and other European countries.Collection and Preparation :

The drug is mostly obtained from wild plants. High altitude (more than 3,000 meters ) is a prerequisite for growth of that. It is a drought resistant plant. It is propagated by seeds or from comes. The drug is obtained from 6-10 year old plants. The rhizome portion is dug up in springor autumn. Aerial portion dies in winter and rhizomes remaining in ground regenerate in next spring. the collected rhizomes are cleaned, decorticated and dried. The larger rhizomes are cut Transversely or longitudinally. The pieces are threaded by piercing a hole in them and such threaded pieces are dried under shade. Some of the pieces are artificially dried. The drug is packed in wooden cases and exported from Shanghai or Tientsin. In India, it is collected from Kashmir, Kulu and Manali regions.

## Macroscopic Characters:

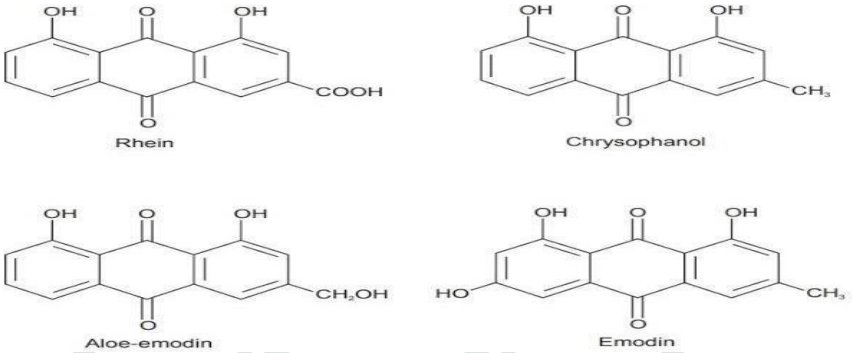
The drug coming to market is called as either "Flats" or "Rounds". Round pieces are prepared from small rhizomes which are cut only transversely and hence they are barrel shaped, cylindrical or conical with 10cm length and 4 cm thickness. Flat pieces are prepared from large rhizomes which are cut longitudinally and hence they are plano convex and tapering at both ends. Flats are 7-10 cm in length and 3 - 6 cm in thickness towards middle portion. Both types of pieces have a sharp odour and bitter astringent taste. The surface is covered with a yellow powder smooth and pale brown to red in colour. The pieces also show holes, through which theyare threaded. Brownish red

interwoven medullary rays are seen on surface.

The drug breaks with an irregular granular fracture. But, the drug with a pink fracture is regardedas a high quality product. The drug shows the presence of star spots which indicate the abnormal vascular bundles. They appear as reddish-orange lines. In such vascular bundles, the medullary rays appear as star shaped. In Rheum officinale, they occur irregularly, while in R palmatum, they are present in a continuous ring like manner.

Chinese rhubarb is available in three forms viz. Shensi, Canton and high dried rhubarb, each withflats or rounds.

## Chemical Constituents:



Rhubarb contains anthraquinone glycosides and astringent principles. The anthraquinone glycosides range from 2 to 4.6 per cent and are categorised into four groups.

(1) Anthraquinones with a carboxyl group like rhein and glucorhein.

(2) Anthraquinones without a carboxyl group like aloe-emodin, emodin, chrysophanol, physcion and also their glycosidal forms.

(3) Anthrones and dianthrone of aloe-emodin, emodin, chrysophanol and physcion.

(4) Heterodianthrones like palmidin A, palmidin B, and palmidin C. They are formed from two different anthrone molecules.

Palmidin A ⟶ aloe - emodin anthrone + emodin anthrone Palmidine B ⟶ aloe - emodin-anthrone + chrysophanol anthrone Palmidine C ⟶ emodin-anthrone + chrysophanol anthrone

The astringent part mainly consists of gallic acid as glucogallin, along with tannin, catechin and epicatechin. The drug also contains rheinolic acid, pectin, starch, fat and calcium oxalate. The amount of calcium oxalate ranges over 3 to 40 per cent and hence the total ash also varies.

## Uses:

Rhubarb is used as bitter stomachic as well as useful in treatment of diarrhoea in small doses in children. In large doses it is used as a purgative.

## HONEY:

**Synonyms:** Madhu, Honey Purified, Mel.

**Biological Source:** Honey is a sugar secretion deposited in honey comb by the bees, Apis mellifera, Apis dorsata, and other species of Apis, belonging to family Apidae, order Hymenoptera.

**Geographical Source:** Honey is produced in Africa, Australia, New Zealand; California andIndia.

## Description:

Color: Pale yellow to yellowish-brown liquidOdour : Characteristic, pleasant

Taste: Sweet and faintly acid [126].

**Chemical Constituents:** The average composition of honey rangles as follows: Moisture 14-24%, Dextrose 23-36%, Levulose (Fructose) 30-47%, Sucrose 0.4-6%, Dextrin and Gums 0- 7% and Ash 0.1-0.8%. Besides, it is found to contain small amounts of essential oil, beeswax, pollen grains, formic acid, acetic acid, succinic acid, maltose, dextrin, colouring pigments, vitamins and an admixture of enzymes,e.g., diastase, invertase and inulase. Interestingly, the sugar contents in honey varies widely from one country to another as it is exclusively governed by the source of the nectar (availability of fragment flowers in the region) and also the enzymatic activity solely controlling the conversion of nectar into honey[127].

**Uses:** It is used as a sweetening agent in confectionaries, demulcent for coughs, colds, sore- throats and constipation and as a good nutrient source[127].

## CASTOR OIL: [127]

**Synonym:** Ricinus oil.

**Biological Source:** Castor oil is the fixed oil obtained by the cold expression of the seeds of Ricinus communis, family Euphorbiaceae.

## Geographical Source:

Castor seeds are produced in almost all tropical and sub-tropical countries. In India, castor is one of the major oilseed crops, and India is the second largest producer of castor seeds in the world, producing about 2,80,000 tonnes per annum. Brazil, U.S.S.R., Thailand, U.S.A. and Romania are other countries producing this drug on large scale. In India, it is largely grown in Andhra Pradesh, Gujarat, and Karnataka. Andhra Pradesh produces about 60 per cent of the total crop in India. About 0.6 million hectares of land in India is under cultivation of castor.

India exported, medicinal castor oil worth 376 crores during 1994-95. The export of medicinal castor oil during 1996-97 was to the tune of approximately 550 crores. The other two forms of castor oil i.e. hydrogenated and dehydrated are also getting exported regularly. The exports of hydrogenated castor oil during 95-96 and 96-97 were 61.5 crores and 47.0 crores, while dehydrated castor oil for the year 95-96 and 96-97 were 8.9 crores and 31.0 crores respectively.

## Composition of Seeds:

Since castor oil is a fixed oil of therapeutic importance and purgative in action, it cannot be consumed freely. Apart from the oil, seeds also contain some of the toxic substances. Castor seeds consist of 75 per cent kernel and 25 per cent of hull. Seeds weigh from 0.1 to 1 g. Castorseeds are rich in phosphorus content and most of it is in the form of phytin. Hull is rich in

mineral and also contains an alkaloid ricinine, resin, pigment, etc. The oil content of the kernel varies from 36 per cent to 60 per cent. Amongst different varieties, the Hyderabad muggelai variety is supposed to be the richest (about 48 per cent) in the oil content. Castor seeds contain several enzymes including lipase, maltase and invertase. The proteinous toxic principle ricin, constituting about 3 per cent of the whole seeds, is poisonous. Aruna and Gujarat castor hybrid-3varieties are of shortest span (120 days).

## Description:

Colour : Pale yellow or almost colourless liquid.Odour : Slight and characteristic.

Taste : First it is bland but afterwards slightly acrid, and usually nauseating.

It is a viscous and transparent liquid. is soluble in alcohol (an exception to the category of fixed oils); miscible in chloroform, solvent ether, glacial acetic acid and petroleum ether. It is insolublein mineral oil.

## Chemical Constituents:

Castor seeds contains 35-50% of castor oil. Castor oil chiefly contains triglyceride of ricinoleic acid (about 80 per cent). Other glycerides are also present in the drug, where the fatty acids are represented by isoricinoleic, linoleic, stearic and isostearic acids. The viscosity of the castor oil isdue to ricinoleic acid.

Ricinoleic acid: CH3 (CH2)6 CHOH CH2 CH = CH (CH2), COOH Castor oil also containheptaldehyde (heptanal) undecenoic acid and sebacic acid.

**Uses:** Cathartic, Laxative, Lubricant, Preparation of soaps.

## Cascara: [127]

**Synonyms:** Sacred bark, Chittem bark, cascasa bark, Cascara sagrada, Cascara buckthorn.

**Biological Source:** Cascara sagrada is the dried bark of Rhamnus purshiana belonging tofamily Rhamnaceae. It is collected at least one year before use.

**Geographical Source:** It is available in wild as well as cultivated source from regions ofUnited States.

**Macroscopical Characters:**

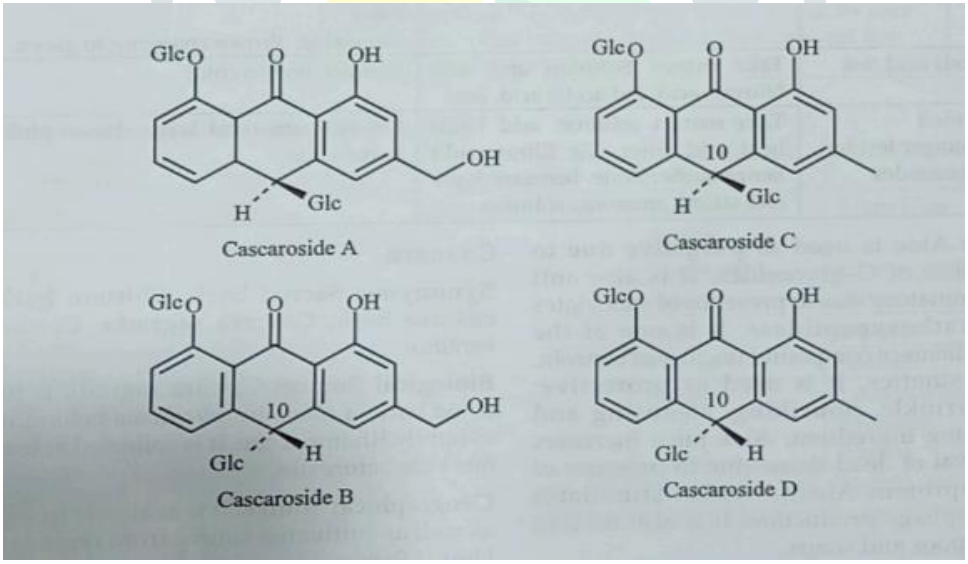
Colour: It is greenish-brown externally and reddish black internally.Odour: Faint.

Taste: Persistently bitter. A lactone present in the drug makes it bitter in taste. Size: About 1-4 mm in thick and 20 cm long. Shape: Flat curved, quill or channelled pieces. Fracture: Short forouter bark and fibrous for inner bark.

**Extra Features:** Outer surface of the bark is very smooth and shows the presence of scattered Jenticels, lichens and cork. Externally, liverworts and sometimes, insects are also present on the bark. Bark shows internally, longitudinal striations

**Microscopic Characters:** The transverse section shows cork covered with parenchymatous cells containing yellowish. brown substance, cortex composed of collenchyma, externally and cellulosic parenchyma on inner side, sclereids, phloem parenchyma containing prisms of calciumoxalate crystals, crystal sheath to each group of phloem fibres, primary and secondary phloem.

**Chemical Constituents:** Cascara contains both O- and C-glycosides in concentration 10-20% and 80-90% respectively. Major constituents are four primary glycosides, ie, cascarosidesA, B of aloin and C, D of chrysaloins. The bark also contains various dianthrones of emodin, aloe emodin. chrysophanol; heterodianthrones like palmidins A, B, C and D; free aloe-emodin,barbaloins and chryusaloin, emodin chrysophanol and O-glycosides derived from them.



**Uses:** Cascara is mild purgative drug in larger doses and bitter stomachic, tonic in small doses.

**Clove : [127]**

**Clove Synonyms:** Caryophyllum; Clove flower: Clove buds

**Biological Source:** Clove consists of dried flower buds of Eugenia caryophyllus of familyMyrtaceae.

**Geographical Source:** It is indigenous to Amboyna and Molucca islands and cultivated chiefly in West Indies, Sri Lanka and India (Nilgiri, Tenkasi-hills and in Kanyakumari, TamilNadu state, Kerala).

**Cultivation and Collection:**

**Propagation:** Seed sown from August to October after six months, they are transplanted tothe pots where they are allowed to grow for a year; Soil: Deep rich loamy soil with high humuscontent: Climate: warm humid climate; Rainfall: 150 to 250 cm; Fertilizers: Ammonium sulphate, super phosphate and potash: Yield: 3 kg per tree of the drug.

**Harvesting:** When the cloves start changing their colour from green to slightly pink Dryingand storage: Dried in the sun and stored in airtight containers in cool dry places.

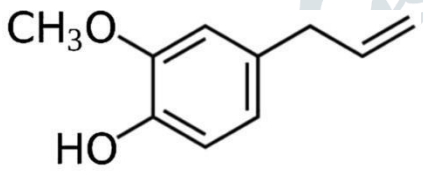
## Macroscopic Characters:

Colour: Crimson to dark brown; Odour Slightly aromatic; Taste: Pungent and aromatic followed by numbness and Size: About 10 to 17.5 mm in length, 4 mm in width, and 2 mm thick: Shape: Hypanthium is surmounted with 4 thick acute divergent sepals surrounded by dome shaped corolla. The volatile oil of the drug contains, Oil of clove, is colourless to pale yellow in colour. It becomes thick and darker in colour on storage.

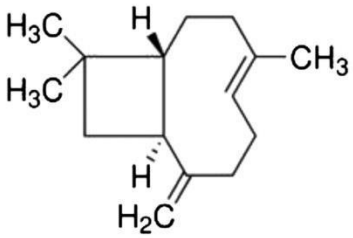
## Microscopic Characters:

TS shows presence of epidermis with thick cuticle, straight walled cells, large anomocytic stomata, ovoid and schizoly-sigenous oil gland, Phloem fibres, Cluster crystals of calcium oxalate and stone cells. Starch grains are absent.

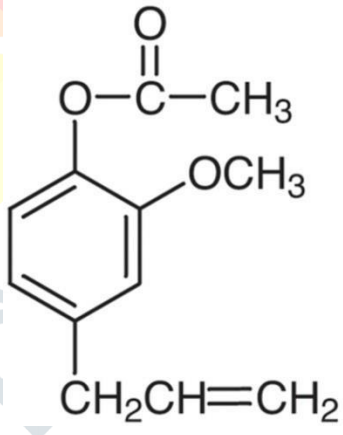
**Chemical Constituents:** It contains about 15 to 20% of volatile oil composing eugenol (about 70 to 90%), eugenol acetate, caryophyllenes and small quantities of esters, ketones and alcohols. It also contains 10% to 13% of tannin (gallotannic acid), resin, chromone and eugenin.



Eugenol



Beta-caryophyllene



Eugenol Acetate

**Uses:** It is used as aromatic, flavouring agent, carminative, dental analgesic, stimulant and antiseptic. The oil is used in the manufacture of vanillin.

**Fennel: [127]**

**Synonym:** Fennel fruits, Fructus foeniculum, Common fennel.

**Biological source:** Oil is obtained from dried ripe fruits of plant known as Foenoculum Vulgare, Family-Umbelliferae should not contain less than 1.4% of volatile oil dulce varietygives sweet oil.

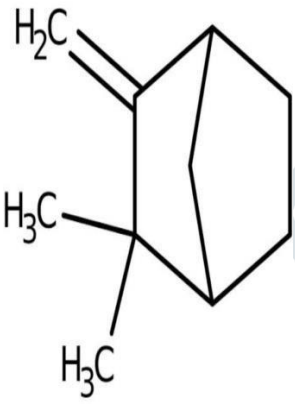
**Geographical source:** Indigenous to southern Europe, cultivated in Russia, Germany, France, Japan, India (Gujarat).

**Cultivation and collection:** Perennial herb grown as biennial/annual plant Propagation: Seeds; Soil: Well drained calcarious soil; Climate: Sunny; Fertilizer. NPK, FYM; Harvesting: When fruits are ripe, dried and seeds thrashed out.

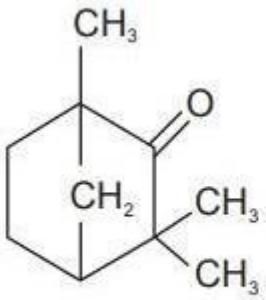
**Macroscopic character:** Fruit: Green to yellowish: Odour-sweet Aromatic; Taste- Bitter and Aromatic; Flower-Yellow in colour, seed greenish in colour, fruit in the form of cremocarp.

**Microscopic characteristic:** Presence of anomocytic stomata on epidermis of pericarp and mesocarp containing lignified reticulate parenchyma, rosette ca-oxalate crystals present.
Parquetry cells, vittae, aleurone grain are present but starch grains are absent.

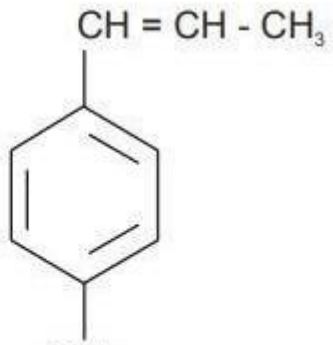
**Chemical constituent:** It contains 2.5-5% of Volatile oil constituting pungent principle Fenchone and sweet principle Anethole along with alpha pinene, camphene, d-alpha- phellandrene and dipentene. Dulce variety contains high amount of anethole and absence offenchone so it is of finest quality, and odour and flavour is very sweet.




Camphene




Fenchone




Anethole

**Use:** It is used as Carminative, condiment, Aromatic, Stimulant, Expectorant and flavouringagent in food, liquors.

**Conclusion:** Constipation is a bowel dysfunction that makes bowel movements infrequent or hard to pass.The stool is often hard and dry. Other symptoms may include abdominal pain, bloating, and feeling as if one has not completely passed the bowel movement. Complications from constipation may include hemorrhoids, anal fissure or fecal impaction, piles, irritable dowl syndrome.The use of medicinal plants inthe management of various illnesses is due to their phytochemical constituents and dates back to historicalage. The prime reason is that other system of medicine although effective come with a number of side effects that often lead to serious complications. Plant based system of medicine being natural does not posses serious problems. Almost all the medicinal plants like Haritaki, amla, Senna, Isapgol, Rhubarb,honey, castor oil , cascara, clove, fennel. Posses antioxidants, laxative, purgative, carminative,

digestive, antipyretic, anti-inflammatory,wound healing , anti-ulcerogenic, anti-bacterial properties. These plants plays an important role in preventing innumerable health disorders. The review of the literature thus concluded that all these plants are useful and effective for the treatment of constipation.

**Acknowledgement:** I am privileged to express my sincere gratitude to our principal sir for providing us the opportunity to write this review under the guidance and support of Mr. Badwaik sir and also my institute Chhatrapati Shivaji College of pharmacy, Deori for kind support and encouragement.

## Reference :

1. PS. Borhade , TA. Deshmukh , VR. Patil and KR.Khandelwal, Constipation and churna for its Treatment ,vol.21(), Jan-Mar, 2013 , page no.37

2. Amol Sharma 1, Satish Rao 2 - Constipation: Pathophysiology and Current Therapeutic Approaches (PMID:28185025 DOI: 10.1007/164_2016_111

3. Global prevalence of constipation in older adults: a systematic review and meta-analysis (Nader Salari 1, Mohammadrasool Ghasemianrad 2, Mojtaba Ammari-Allahyari 3, Shabnam Rasoulpoor 4, Shamarina Shohaimi 5, Masoud Mohammadi 6 - PMID: 36826591 DOI: 10.1007/s00508-023-02156-w.

4. Pakvashayagata Vayu - In pakwashagata vayu, internal pathology is vata aggravators which bring roughness in large intestine and thats why proper peristaltic movement is not form and very hard stool is formed, patient passes stool very hardly. In chikitsa we have to give firstly varti (Suppository), niruha basti (Medicated water enema)- to remove hard stool,Anuvasan basti (Medicated oil enema)- to bring proper unctuousness, smoothness in large intestine for proper peristaltic movement.

5. Hyams JE, Colletti R, Faure C, et al. Functional gastrointestinal disorders: working group report of the first world congress of paediatric gastroenterology, hepatology and nutrition. J Pediatr Gastroenterol Nutr 2002;35(suppl 2):S110-S117.

6. Kokkonen J, Haapalahti M, Tikkanen S, Karttunen R, Savilahti E. Gastrointestinal complaints and diagnosis in children: a population based study. Acta Paediatr 2004;93:880-886.

7. de Araújo Sant'Anna AM, Calçado AC. Constipation in school-aged children at public schools in Rio de Janeiro, Brazil. J Pediatr Gastroenterol Nutr 1999;29:190-193.

8. Wald ER, Di Lorenzo C, Cipriani L, Colborn DK, Burgers R, Wald A. Bowel habits and toilet training in a diverse population of children. J Pediatr Gastroenterol Nutr 2009;48:294-298.

9. Devanarayana NM, Rajindrajith S. Bowel habits and behaviours related to defecation in 10 to 16 year olds: impact of socio-economic characteristics and emotional stress. J Pediatr Gastroenterol Nutr 2011 (In press)

10. Shaman Rajindrajith and Niranga Manjuri Devanarayana . Constipation in Children : Novel Insight Into Epidemiology , Pathophysiology and Management , J Neurogastroenterol Motil, Vol. 17 No. 1 January, 2011 DOI: 10.5056/jnm.2011.17.1.35 , Page no. 36,37.

11. Bassotti G, Villanacci V, Maurer CA, et al. The role of glial cells and apoptosis of enteric neurones in the neuropathology of intractable slow transit constipation. Gut 2006; 55(1): 41-6.

[http://dx.doi.org/10.1136/gut.2005.073197] [PMID: 16041063]

12. Prather CM. Pregnancy-related constipation. Curr Gastroenterol Rep 2004; 6(5): 402-4.

[http://dx.doi.org/10.1007/s11894-004-0057-7] [PMID: 15341717]

13. Scott SM, Picon L, Knowles CH, et al. Automated quantitative analysis of nocturnal jejunal motor activity identifies abnormalities in individuals and subgroups of patients with slow transit constipation. Am J Gastroenterol 2003; 98(5): 1123-34.

[http://dx.doi.org/10.1111/j.1572-0241.2003.07419.x] [PMID:12809838]

14. Hemingway DM, Finlay IG. Effect of colectomy on gastric emptying in idiopathic slow-transit constipation. Br J Surg 2000; 87(9):1193-6.

[http://dx.doi.org/10.1046/j.1365-2168.2000.01505.x] [PMID:10971427]

15. Mollen RMHG, Hopman WPM, Oyen WJG, Kuijpers HHC, Edelbroek MAL, Jansen JBMJ.Effect of subtotal colectomy on gastric emptying of a solid meal in slow-transit constipation. DisColon Rectum 2001; 44(8): 1189-95.

[http://dx.doi.org/10.1007/BF02234643] [PMID: 11535861]

16. Penning C, Vu MK, Delemarre JB, Masclee AA. Proximal gastric motor and sensory function in slow transit constipation. Scand J Gastroenterol 2001; 36(12): 1267-73.

[http://dx.doi.org/10.1080/003655201317097100] [PMID:11761015]

17. Gonlachanvit S, Patcharatrakul T. Causes of idiopathic constipation in Thai patients: associations between the causes and constipation symptoms as defined in the Rome II criteria. J Med Assoc Thai-land= Chotmaihet thangphaet 2004; (6): S22-8.

18. Lundin E, Karlbom U, Westlin J-E, et al. Scintigraphic assessment of slow transit constipation with special reference to right- or left-sided colonic delay. Colorectal Dis 2004;6(6): 499-505.

[http://dx.doi.org/10.1111/j.1463-1318.2004.00694.x] [PMID:15521943]

19. Rao SSC, Sadeghi P, Batterson K, Beaty J. Altered periodic rectal motor activity: a mechanism for slow transit constipation. Neurogastroenterol Motil 2001; 13(6): 591- 8.[http://dx.doi.org/10.1046/j.1365-2982.2001.00292.x] [PMID:

11903920]

20. Preston DM, Lennard-Jones JE. Severe chronic constipation of young women: 'idiopathic slow transit constipation'. Gut 1986;27(1): 41-8.

[http://dx.doi.org/10.1136/gut.27.1.41] [PMID: 3949236]

21. Camilleri M, Thompson WG, Fleshman JW, Pemberton JH. Clinical management of intractable constipation. Ann Intern Med 1994;121(7): 520-8.

[http://dx.doi.org/10.7326/0003-4819-121-7-199410010-00008] [PMID: 8067650]

22. Doig CM. ABC of colorectal diseases. Paediatric problems--I. BMJ1992; 305(6851): 462-4.

[http://dx.doi.org/10.1136/bmj.305.6851.462] [PMID: 1392963]

23. Klauser AG, Schindlbeck NE, Müller-Lissner SA. Symptoms in gastro-oesophageal reflux disease. Lancet 1990; 335(8683): 205-8.

[http://dx.doi.org/10.1016/0140-6736(90)90287-F] [PMID:1967675]

24. Loening-Baucke V. Encopresis and soiling. Pediatr Clin North Am 1996; 43(1): 279-98.

[http://dx.doi.org/10.1016/S0031-3955(05)70406-5] [PMID:

8596685]

25. Voderholzer WA, Schatke W, Mühldorfer BE, Klauser AG, Birk-ner B, Müller-Lissner SA.Clinical response to dietary fiber treatment of chronic constipation. Am J Gastroenterol 1997; 92(1): 95-8.

[PMID: 8995945]

26. Ashraf W, Park F, Lof J, Quigley EMM. An examination of the reliability of reported stoolfrequency in the diagnosis of idiopathic constipation. Am J Gastroenterol 1996; 91(1): 26-32.

[PMID: 8561138]

27. Mertz H, Naliboff B, Mayer E. Physiology of refractory chronic constipation. Am J Gastroenterol 1999; 94(3): 609-15.

[http://dx.doi.org/10.1111/j.1572-0241.1999.922_a.x] [PMID:10086639]

28. Lembo A, Camilleri M. Chronic constipation. N Engl J Med 2003;349(14): 1360-8.

[http://dx.doi.org/10.1056/NEJMra020995] [PMID: 14523145]

29. Boccasanta P, Venturi M, Stuto A, et al. Stapled transanal rectal resection for outletobstruction: a prospective, multicenter trial. Dis Colon Rectum 2004; 47(8): 1285-96.

[http://dx.doi.org/10.1007/s10350-004-0582-3] [PMID: 15484341]

30. D'Hoore A, Penninckx F. Obstructed defecation. Colorectal Dis2003; 5(4): 280-7.

[http://dx.doi.org/10.1046/j.1463-1318.2003.00497.x] [PMID:12814403]

31. Dipalma JA, Cleveland MV, McGowan J, Herrera JL. A randomized, multicenter, placebo- controlled trial of polyethylene glycol laxative for chronic treatment of chronic constipation. AmJ Gastroenterol 2007; 102(7): 1436-41.

[http://dx.doi.org/10.1111/j.1572-0241.2007.01199.x] [PMID:17403074]

32. Leung L, Riutta T, Kotecha J, Rosser W. Chronic constipation: anevidence-based review. J Am Board Fam Med 2011; 24(4): 436-51. [http://dx.doi.org/10.3122/jabfm.2011.04.100272] [PMID:21737769]

33. Benninga MA, Voskuijl WP, Taminiau JA. Childhood constipation: is there new light in thetunnel? J Pediatr Gastroenterol Nutr 2004; 39:448-464

34. Borowitz SM, Cox DJ, Tam A, Ritterband LM, Sutphan JL, Pen-berthy JK. Precipitant ofconstipation during early childhood. J Am Board Fam Pract 2003;16:213-218.

35. Benninga MA, Buller HA, Taminiau JA. Biofeedback training in chronic constipation. Arch Dis Child 1993;68:126-129.

36. van der Plas RN, Benninga MA, Staalman CR, et al. Megarectum in constipation. Arch DisChild 2000;83:52-58.

37. Benninga MA, Büller HA, Tytgat GN, Akkermans LM, Bossuyt PM, Taminiau JA. Colonic transit time in constipated children: does pediatric slow-transit constipation exist? J Pediatr Gastroenterol Nutr 1996;23:241-251.

38. Gutiérrez C, Marco A, Nogales A, Tebar R. Total and segmental co- lonic transit time and anorectal manometry in children with chronic idiopathic constipation. J Pediatr Gastroenterol Nutr 2002;35:31-38.

39. Zaslavsky C, da Silveria TR, Maguilnik I. Total and segmental co-lonic transit time with radio-opaque

markers in adolescents with functional constipation. J Pediatr Gastroenterol Nutr1998;27:138- 142.

40. Hutson JM, Chow CW, Borg J. Intractable constipation with a de- crease in substance P-immunoreactive fibres: is it a variant of in- testinal neuronal dysplasia? J Pediatr Surg 1996;31:580-583.

41. Wheatley JM, Hutson JM, Chow CW, Oliver M, Hurley MR.

Slow transit constipation in childhood. J Pediatr Surg 1999;34:829-832.

42. Stanton MP, Hutson JM, Simpson D, et al. Colonic manometry via appendicostomy shows reduced frequency, amplitude and length of propagating sequences in children with slow-transit constipation. J Pediatr Surg 2005;40:1138-1145.

43. Koch T, Hudson S. Older people and laxative use: literature review and pilot study report. J Clin Nurs. 2000;9:516–525. [PubMed] [Google Scholar]

44. Campbell AJ, Busby WJ, Horwath CC. Factors associated with constipation in a community based sample of people aged 70 years and over. J Epidemiol Community Health. 1993;47:23–26. [PMC free article] [PubMed] [Google Scholar]

45. Schaefer DC, Cheskin LJ. Constipation in the elderly. Am Fam Physician. 1998;58:907–914. [PubMed] [Google Scholar]

46. Abyad A, Mourad F. Constipation: common-sense care of the older patient. Geriatrics. 1996;51:28–34, 36. [PubMed] [Google Scholar]

47. Donald IP, Smith RG, Cruikshank JG, Elton RA, Stoddart ME. A study of constipation in theelderly living at home. Gerontology. 1985;31:112–118. [PubMed] [Google Scholar]

48. Whitehead WE, Drinkwater D, Cheskin LJ, Heller BR, Schuster MM. Constipation in the elderly living at home. Definition, prevalence, and relationship to lifestyle and health status. J Am Geriatr Soc. 1989;37:423–429. [PubMed] [Google Scholar]

49. Harari D, Gurwitz JH, Avorn J, Bohn R, Minaker KL. How do older persons define constipation? Implications for therapeutic management. J Gen Intern Med. 1997;12:63–66.[PMC free article] [PubMed] [Google Scholar]

50. Talley NJ, O'Keefe EA, Zinsmeister AR, Melton LJ 3rd. Prevalence of gastrointestinal symptoms in the elderly: a population-based study. Gastroenterology. 1992;102:895–901. [PubMed] [Google Scholar]

51. Camilleri M, Lee JS, Viramontes B, Bharucha AE, Tangalos EG. Insights into the pathophysiology and mechanisms of constipation, irritable bowel syndrome, and diverticulosis in older people. J Am Geriatr Soc. 2000;48:1142–1150. [PubMed] [Google Scholar]

52. McH ugh SM, Diamant NE. Effect of age, gender, and parity on anal canal pressures. Contribution of impaired anal sphincter function to fecal incontinence. Dig Dis Sci. 1987;32:726–736. [PubMed] [Google Scholar]

53. Bannister JJ, Abouzekry L, Read NW. Effect of aging on anorectal function. Gut. 1987;28:353–357. [PMC free article] [PubMed] [Google Scholar]

54. Laurberg S, Swash M. Effects of aging on the anorectal sphincters and their innervation. Dis Colon Rectum. 1989;32:737–742. [PubMed] [Google Scholar]

55. Engel AF, Kamm MA. The acute effect of straining on pelvic floor neurological function. IntJ Colorectal Dis. 1994;9:8–12. [PubMed] [Google Scholar]

56. O'Keefe EA, Talley NJ, Zinsmeister AR, Jacobsen SJ. Bowel disorders impair functional status and quality of life in the elderly: a population-based study. J Gerontol A Biol Sci Med Sci. 1995;50:M184–M189. [PubMed] [Google Scholar]

57. Virginia F, William EW, A Review of Laxative Therapies for Treatment of Chronic Constipation in Older Adults, The American Journal of Geriatric Pharmacotherapy, 2010; 8,514– 550

58. Pierre Paré MD FRCPC FACG, Ronald Bridges MD FRCPC, Malcolm C Champion MBFRCP(UK) FRCPC, Subhas C Ganguli MD FRCPC MSc, James R Gray MD FRCPC, E Jan Irvine MD FRCPC MSc, Victor Plourde MD CSPQ MSc PhD, Pierre Poitras MD FRCPC, Geoffrey K Turnbull MD FRCPC, Paul Moayyedi BSc MB ChB PhD MPH FRCP(London) FRCPC, Nigel Flook MD CCFP FCFP, Stephen M Collins MC MBBS FRCP(UK) FRCPC, Recommendations on chronic constipation (including constipation associated with irritable bowel syndrome) treatment, Can J Gastroenterol Vol 21 Suppl B April 2007,page no.7B

59. Aiyer KN, Kolammal M, Pharmacognosy of Ayurvedic drugs, Series1, Number 7. Trivandrum, Dept. of Pharmacognosy, University of Kerala, 1963, 102-105.

60. Padhi MM, Medicinal plants in geriatric health care, CCRIAS, Dept. of AYUSH, Min. of Health & Family Welfare, Govt. of India, 2008,39-42.

61. Krishnan KS, The Wealth of India, Raw Material, Vol. X: Sp-w, 1998,170.

62. Sharma PC, Yelne MB, Dennis TJ, Database on Medicinal Plants Used in Ayurveda, Vol. 3, CCRIAS, Dept. of AYUSH, 2005, 286.

63. Krishnan KS, The Wealth of India, Raw Material, Vol. X, Sp-w, 1998,171.

64. Gupta AK, Quality Standards of Indian Medicinal Plants, Vol. 1, 2003, 206.

65. Shu HZ, Flora of China, Terminalia chebula Retzius, Vol. 13, 1788, 309-319

66. Aiyer KN, Kolammal M, Pharmacognosy of Ayurvedic drugs, Series 1, Number 7, Trivandrum, Dept. of Pharmacognosy, University of Kerala, 1963, 102-106.

67. Richter HG, Dallwitz MJ, Description Language for Taxonomy, Commercial timbers: descriptions, illustrations, identification, and information retrieval, 2009.

68. Sharma PC, Yelne MB, Dennis TJ, Database on Medicinal Plants Used in Ayurveda,CCRIAS, Vol. 3, 2005, 284.

69. P. A. a. D. s. Aparna upadhyay, "A REVIEW ON THE PHARMACOLOGICAL ASPECTS OF TERMINALIA CHEBULA," INTERNATION JOURNAL OF PHARMACOLOGY, pp. 289-298, 2014.

70. S. Z. H. Hilal Akhtar1, "A Descriptive Review on Traditional Herbal DrugTerminalia Chebula," Journal of Advanced Research in BioChemistry and Pharmacology, vol. 2, no. 1, pp.21-28, 6 june 2019.

71. R. a. G.Thilagavathi, "Terminalia Chebula - Review on Pharmacological and Biochemical Studies," International Journal of PharmTech Research , vol. 6, no. 1, pp. 97-116, 2014 .

72. S. Thirumoorthyswamy, "Pleiotrophic Evaluation of Haritaki," American Journal of Phytomedicine and Clinical Therapeutics , pp. 033-044 , 2014.

73. S. K. B. R. R. C. Anwesa Bag, "The development of Terminalia chebula Retz. (Combretaceae) in clinical research," Asian Pacific Journal of Tropical Biomedicine, pp. 244-252, 2013.

74. k. s. r. b. s. s. m. Yadav Babita, "A PERSPECTIVE STUDY OF HARITAKI," INTERNATIONAL JOURNAL OF RESEARCH IN AYURVEDA AND PHARMACY, pp.1466-1470, 2011.

75. D. s. k. Dr.Shalu sharma, "A Critical Review of Pharmacological Action of Haritaki(Terminalia chebula Retz.) In classical texts," Journal of Ayurveda and IntegratedMedical Sciences, pp. 258-269, 2019.

76. S. S. a. M. L. Monika Agrawal1, "Haritaki (Terminalia chebula Retz.), A Boon of Nature: A Review," Int J Ayu Pharm Chem , pp. 46-53, 2018.

77. M. E. a. C. R. Arbind K1, "Ethnopharmacological Review of Terminalia chebula," Bioequivalence & Bioavailability International Journal, vol. 3, no. 1, pp. 1-8, 4 January 2019

78. . B. S. A. N. Thrigulla Saketh Ram1*, "Review Article PRAGMATIC USAGE OF HARITAKI (TERMINALIA CHEBULA RETZ): AN AYURVEDIC PERSPECTIVE VISÀ- VIS CURRENT PRACTICE," International Journal of Ayurveda and Pharma Research , pp. 72-82 , 2013.

79. . A. M. P. B. R. S. S. K. V. G. A Gupta1*, "Phytochemistry and pharmacological activities of Haritaki – A review," Journal of Pharmacy Research, pp. 417-424, 2010.

80. D. M. K. a. A. B. Patil, "PHARMACOLOGICAL AND THERAPEUTIC POTENTIAL OFTERMINALIA CHEBULA RETZIUS – A CRITICAL REVIEW," World Journal of Pharmceutical AND Medical Research , pp. 226-234, 2016.

81. N. K. Ran Vijai K. S. Maurya1*, "Haritaki (Terminalia chebula Retz.): A Magic Bullet for Various Remedies," International Journal of Pharmaceutical & Biological Archives , pp. 1 - 8 ,2016.

82. T. M. W. V. M. K. H. M. K. Nalini Sofia H*1, "Phyto Pharmacology and Ethnomedical Approach of Terminalia chebula (Kadukkaai): A Review," Scholars Academic Journal of Pharmacy (SAJP) , pp. 446-453 , 2017.

83. . P. K. K. D. A. K. S. D. R. C. M. D. P. S. a. D. M. P. Dr. Deepak Verma1*, "AN ANALYSIS OF TRIPHALA POWDER WITH TTHE IMPORTANCE OF HARITAKI(TERMINALIA CHEBULA LINN.) SPECIES: ANCIENT MIRACLE FORMULA," World Journal of Pharmaceutical Research , pp. 452-458, 2017.

84. Kokate CK, Prohit AP, Gokhale SB, Pharmacognosy, Thirty-eighth ed, 2007, 257

85. . Evens WC, Trease GE, Trease and Evans Pharmacognosy, Fifteenth ed, 30, 2009, 226-472.

86. Bhaumik T, Chemical investigation of Tenninalia chebula Retz. Bull, Medico Ethnobot, 10 (3-4), 1989, 190-192.

87. . Dutta SS, Chemistry of vegetable tanning materials, Indian Leath. Technol. Assoc.,10 (2),1962, 66-72.

88. Biswas HG, Tannic acid from myrobalans, J. Sci. Ind. Res, 6 B (9), 1947, 122, 123.

89. Das BM, Barat SK, Scaria K, Nature of tannins in Terminalia chebula, Proc. 43rd Indian Sci. Congr., 1956, 85.

90. Hathway DE, Myrobalans, an important tanning material, Leather Trades Rev., 137, 1960,13-14.

91. Nayudanuna Y, Rao JB, Sastry KNS, Vegetable tannins - Pt. I.: Myrobalan tree, Bull. Cent. Leath. Res. Inst., 5 (12), 1959, 495-507.

92. Reddy BM, Chemical investigation of the fruits of Teminalia chebula, Int. 1.Pharmacognosy, 32 (4), 1994, 352-356.

93. Das BM, Barat SK, Astringency of some common Indian vegetable tanning materials (Myrobalans), Osterr. Lederzig., Chern. Abstr., 1954, 48 (22), 47-51

94. . Gaind KN, Saini TS, Identification of purgative principle of Terminalia chebula Retz., Indian J. Pharrn., 30 (10), 1968, 233-234.

95. Ghosal S, Triphati VK, Chauhan S. Active constituents of Emblica officinalis: Part 1 - The chemistry and

antioxidative effects of two new hydrolysable tannins, Emblicanin A and B. Indian J Chem 1996;35B:941-8.

96. Sampath KP. Recent trends in potential traditional Indian herbs Emblica officinalis and its medicinal importance. J Pharm Phytochem 2012;1(1):18-28.

97. Srivasuki KP. Nutritional and health care benefits of amla. J Pharm 2012;3(2):141-51.

98. Zhang LZ, Zhao WH, Guo YJ, Tu GZ, Lin S, Xin LG. Studies on chemical constituents in fruits of Tibetan medicine Phyllanthus emblica. Zhongguo Zhong Yao Za Zhi 2003;28(10):9403.

99. Udupa KN. Ayurveda for promotion of health. J Ayurveda 1985;3: 70-81.

100. 7. Jain PK, Das D, Jain P. Evaluating hair growth activity of herbal hair oil. Int J PharmTech Res 2016;9(3):321-7.

101. Jain PK, Joshi H, Dass DJ. Drug that causes hair loss and promotes hair growth - A review. Int J Res Pharm Biomed Sci 2012;3(4):1476-82.

102. Jain PK, Dass DJ. Evaluating hair growth potential of some traditional herbs. Asian J Pharm Clin Res 2015;8(6):150-2.

103. 0. Madhuri S, Pandey G, Verma KS. Antioxidant, immunomodulatory and anticancer activities of Emblica officinalis: An overview. Int Res J Pharm 2011;2(8):38-42.

104. Scartezzini P, Antognoni F, Raggi MA, Poli F, Sabbioni C. Vitamin C content and antioxidant activity of the fruit and of the Ayurvedic preparation of Emblica officinalis Gaertn. JEthnopharmacol 2006;104(1-2):113-8

105. Anthony C. Emblica officinalis or Amla: The Ayurvedic Wonder. Dweck, Chesham:Chemicals Ltd.; 2010.

106. Ayurvedic Pharmacopia of India. Vol. 1. Government of India, Ministry of Health & Family Welfare, Department of ISM & H; 2001. p. 5-8.

107. Patel SS, Goyal RK. Emblica officinalis geart: A comprehensive review on phytochemistry, pharmacology and ethnomedicinal uses. Res J Med Plant 2012;6:6-16

108. Jain SK, Akhurdiya DS. Anola: Potential fruit for processing. Delhi Garden Mega2000;38(1):50-1.

109. Bharthakur NN, Arnold NP. Chemical analysis of the emblic (Phyllanthus emblica L) and its potential as a good sources. Sci Hortic 1991;47:99-105.

110. Meena AK, Singh A and Rao MM. Evaluation of physicochemical and preliminary phytochemical studies on the fruit of Emblica officinalis Gaertn. Asian J. Pharma. and Clin. Res.,2010; 3(3): 242-243.

111. Khan KH. Roles of Emblica officinalis in medicine – A Review. Botany Research International, 2009; 2 (4): 218-228.

112. Madhulika Bhagat , Idian Gooseberry (Emblica officinalis ): Pharmacognosy Review. Utilisation and Management of Medicinal Plants Vol. 2 , page no. 473.

113. Zhang LZ, Zhao WH, Guo YJ, Tu GZ, Lin S, Xin LG, Studies on chemical constituents in fruits of Tibetan medicine Phyllant hus emblica,ZhongguoZhong Yao ZaZhi, 28(10), 2003, 940-3.

114. Bhattacharya SK, Bhattacharya A, Sairam K, Ghosal S, Effect of bioactive tannoid principles of Emblica officinalis on ischemiareperfusion induced oxidative stress in rat heart,Phyt omedicine, 9(2), 2002, 171-4.

115. Yi-Fei W, Ya-Fenga W, Xiao-Yana W,Zhea R,Chui-Wena Q, YiChenga L, Kitazatoc K,Qing-Duan Q, Yan W, Li-Yun Z, Jin-Hua Z, Chong-Rene Y, Qinge L, Ying-June Z,Phyllaemblicin B inhibits Coxsackie virus B3 induced apoptosis and myocarditis, AntiviralResearch, 84, 2009, 150-58.

116. Rehman H, Yasin KA, Choudhary M A, Khaliq N, Rahman A, ChoudharyM I, M alik S, Studies on the

chemical constit uents of Phyllanthus emblica, Natural Product Research, 21(9),2007, 775- 81.

117. Jain SK, Khurdiya DS, Vitamin C enrichment of fruit juice based ready-t o-serve beveragesthrough blending of Indian gooseberry (Emblica officinalisGaertn.) juice, Plant Foods for Human Nutrition, 59(2), 2004, 63-6.

118. Scartezzini P, Antognoni F, Raggi M A, Poli F,Sabbioni C, Vitamin C cont ent and antioxidant activity of the fruit and of the Ayurvedic preparation of Emblica officinalisGaertn,Journal of Ethnopharmacology, 104(1-2), 2006, 113-8.

119. Krishnaveni M , M irunalini S, Therapeutic pot ential of Phyllanthus emblica (amla): theayurvedic wonder, Journal of Basic and Clinical Physiology and Pharmacology,21, 2010, 93-105.

120. El-Desouky SK, RyuSY, Kim YK, A new cytotoxic acylatedapigeninglucoside from Phyllanthus emblica L, Natural Product Research, 22(1), 2008, 91-5.

121. Zhang LZ, Zhao WH, Guo YJ, Tu GZ, Lin S,Xin LG, St udies on chemical constituents in fruits of Tibetan medicine Phyllanthus emblica, ZhongguoZhong Yao ZaZhi, 28(10), 2003, 940-3.

122. Pushpendra Kumar Jain, Ak Singhai and Debajyoti Das. Alternative herbal drugs used for treating hair disease. Asian J Pharm Clin Res 2016;9(1):75-7.

123. Jain PK, Das D, Jain P, Jain P. Pharmacognostic and pharmacological aspect of Bacopamonnieri: A review. Innov J Ayurvedic Sci 2016;4(3):7-11.

124. . Jain PK. Ethanopharmacological study of Cyperus rotundus - A herb used by tribal community as a traditional medicine for treating various diseases. Innov J Ayurvedic Sci2016;4(2):4-6.

125. Ramchander, Pavan Jalwal And Anil Middha , Recent advances on senna as a laxative : A comprehensive revieew , Journal of Pharmacognosy and Phytochemistry 2017; 6(2): 349-353.

126. A text book of Pharmacognosy by C.K. Kokate , A.P. Purohit ,S.B.Gokhale.
127. A text book of Pharmacognosy and Phytochemistry by S.L.Deore , S.S. Khadabadi , B.A.Baviskar.