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REVIEW ARTICLE

Review of Some Lesser Known Members of Zingiberaceae Family

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ABSTRACT

Introduction: The Zingiberaceae family, commonly known as the ginger family, comprises 53 genera and more than 1300 species distributed throughout tropical Africa, America, and Asia, several important genera including curcuma, kaempferia, hedychium, gastrochilus, amomum, zingiber, costus, elettaria, alpinia, maranta, canna, and musa. The members of Zingiberaceae family have been used for centuries in various traditional medicine systems such as *Ayurveda*, Traditional Chinese Medicine and Unani medicine. The plants of this family hold significant importance across multiple domains such as medicine, culinary arts, economic impact, cultural practices, and environmental contributions are not the less important.

Aim: The article focuses some lesser explored plants of this family, the characters and properties of *Sthulagranthi* (*Zingiber zerumbet* Rosc.), *Karchura* (*Curcuma zedoaria* Rosc.), *Kalihaldi* (*Curcuma caesia* Roxb.) and *Amahaldi* (*Curcuma amada* Roxb.) are discussed here in the present article.

Materials and Methods: For this article, the data were scrutinized from the texts of Botany, classical *Ayurvedic* texts, as well as databases from PubMed, Google Scholar, Research Gate, and other online sources.

Discussion: Since all these plants share some synonyms and morphological features, confusion and difficulty arise in their identification. However, they bear some distinctive characters also, which are highlighted in the present article.

Conclusion: Mostly these drugs are carminatives, appetizers, having distinct therapeutic effects on respiratory disorders such as *Kasa, Swasha, and Hikka*; skin disorders such as leucoderma, prurigo, and leprosy; and are useful in peptic ulcers, stomach-ache, piles, etc.

1. INTRODUCTION

The ginger family "Zingiberaceae" is a well-known plant family under the order Zingiberales (previously known as Scitamineae). Although in the true sense "ginger" refers to the rhizome of *Zingiber offcinale*, in the broad sense, all the members of the Zingiberaceae family are called "gingers." This family comprises two subfamilies (Zingiberoideae and Costoideae), 53 genera and more than 1300 species distributed throughout tropical Africa, America, and Asia. India is having 22 genera and about 176 species of gingers on which the maximum diversity of the ginger family is observed in North-east India containing 19 genera and about 88 species.[1] Zingiberaceae is among the 10 largest monocotyledonous families in India. Many members of the Zingiberaceae family are valued for their culinary, medicinal, and ornamental uses. Ginger (*Zingiber officinale*), turmeric (*Curcuma longa*), and cardamom (*Elettaria cardamomum*) – the "queen of spices," are among the most widely recognized and economically important species. These are perennial herbs with creeping horizontal and tuberous rhizomes having specific aroma due to which they have been cultivated for centuries as culinary spice and traditional medicine as they are aromatic, stimulant, stomachic, carminative, and sialagogue. Moving forward, the characteristics of the Zingiberaceae family are discussed in detail, as well as of the members of this family that have great therapeutic potential but are less explored.

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2. MATERIALS AND METHODS

The literature review was compiled from available texts of Botany, Ayurvedic texts such as *Samhitas* and *Nighantus* and online sources

using the keywords – Zingiberaceae, *Karchur*, *Curcuma zedoaria*, *Sthulagranthi*, *Zingiber zerumbet* Rosc., *Kalihaldi*, *Curcuma caesia* Roxb., *Amahaldi*, and *Curcuma amada* Roxb. Various published articles were searched from electronic databases such as PubMed, Google Scholar, and Research Gate.

3. REVIEW OF LITERATURE FOR THE DRUGS

3.1. Characters of the Zingiberaceae Family[2]

Habit: Perennial herbs, perennating by means of creeping.

Roots are often thick and fleshy, rarely fibrous or with slender tuber-like ends (Curcuma).

Stem may or may not be aerial, generally short, covered by leaf-sheaths or a pseudostem may be formed by convolute leaf-sheaths as in Musaceae.

Leaves are simple, sheathing basally. A ligule is present at the junction of the blade with petiole. Blade is linear to elliptic and usually large with parallel veins.

Inflorescence: Sometimes it is terminal on a leaf shoot (Hedychium), on special-scale leaf-bearing shoot from rhizome (Zingiber), or from base of the leafy stem. It forms a bracteate spike or raceme; each bract subtending a single flower with a lateral or oblique posterior bracteole. The bracts are distichous or spirally arranged, colored, often stiff, and overlap giving the inflorescence a cone-like appearance (Zingiber).

Flowers are hermaphrodite, zygomorphic, and perianth is biseriate having 3-merous whorl, distinct into calyx and corolla. Calyx: Tubular or bell-shaped, corolla: 3-lobed often showy, connate at the base. Median (posterior) stamens of the inner whorl are fertile with a broad connective, lateral stamens united to form a petaloid labellum. Two lateral stamens of the outer whorl sometimes present as *staminodes*. Ovary is inferior, trilocular with axile placentation or unilocular with parietal placentation. Style is slender, lying in a channel of fertile stamen, stigma variously developed.

Fruit is a loculicidal capsule, may be fleshy, indehiscent, and berry-like with copious hard and mealy endosperm. Pollination is through the agency of insects.

This family includes various genera – curcuma, kaempferia, hedychium, gastrochilus, amomum, zingiber, costus, elettaria, alpinia, maranta, canna, and musa. However, in the present article, only the following genera are considered.

Genus – Curcuma:[3] Curcuma genus has 35 species. Stemless herbs with tuberous rootstocks bearing sessile and long-stipitate tubers. Leaves are usually oblong, often very large. Flowers in dense compound spikes, vernal or aestival or autumnal and contemporaneous with the leaves, crowned by a coma of enlarged coloured bracts. Calyx short, cylindric, minutely toothed. Corolla-tube funnel-shaped, lobes usually ovate, or oblong. Stamen 1 perfect; filament short; anthers not crested, with contiguous cells spurred at the base; lateral staminodes oblong, petaloid, connate with the filament. Ovaries 3-celled; ovules numerous on axile placentas; style filiform; stigma 2-lipped, the lips ciliate. Fruit a tardily dehiscent globose membranous 3-valved capsule. Seeds ovoid or oblong, usually arillate.

Genus - Zingiber: This genus has a total species of 55. Herbs with elongated leafy stems and horizontal tuberous rootstocks. Leaves oblong-lanceolate. Flowers in spikes usually radical; peduncle short or long; bracts persistent, usually 1-flowered. Calyx cylindric, shortly 3-lobed. Corolla 3-lobed, with a cylindric tube; lobes lanceolate, the upper concave. Stamen 1 perfect (bisexual); filament short; anther 2-celled, the cells contiguous. Ovary 3-celled; placentas axile; style filiform; stigma small, sub-globose. Fruit an oblong capsule, tardily dehiscent. Seeds large, globose, arillate.

3.2. Some Lesser Known Members of Ginger Family

I. *Sthulagranthi* (*Z. zerumbet* Rosc.)
II. *Karchura* (*C. zedoaria* Rosc.)
III. *Kalihaldi* (*C. caesia* Roxb.)
IV. *Amahaldi* (*C. amada* Roxb.)

3.2.1. Sthulagranthi (Z. zerumbet Rosc.)

3.2.1.1. History

No reference is found about the drug *Sthulagranthi* (*Z. zerumbet* Rosc.) in Vedic literature, *Samhita Granthas* or different *Nighantus*. However, in *Bhavaprakash Nighantu,* it has been mentioned in the name of *Mahabhari Vacha* among the four types of *Vacha* under *Haritakyadi Varga* (verse no. 106). Further, he described two types of *Mahabhari Vacha – Kulanjan (Alpinia galanga)* and *Sthulagranthi (Sugandha)* which must be the *Narakarchura* (*Z. zerumbet* Rosc.).[4] Prof. P.V Sharma ji in *Dravyaguna Vijnana* Vol. II has described this plant under the types of *Sunthi*.

3.2.1.2. Vernacular name[5]

- Sanskrit: *Sthulagranthi, Ahava, Avanti, Karpurharidra, Kolanjana, Kumbhika, Viranam*
- English: Bitter ginger
- Hindi: *Mahabharivacha, Narkachura*

3.2.1.3. Habitat

It is distributed throughout India, Ceylon, Malay Peninsula and widely cultivated in the tropics of the World.

3.2.1.4. Description

Rhizomes are large, not much branched, hard, biennial, yellow inside, with a strong aromatic ginger-like taste, but with some bitterness. Leaves are 20–30 by 5–7.5 cm., sessile, oblong-lanceolate or oblanceolate, acuminate, glabrous, base narrowed; ligule 1.3–2 cm. long, truncate, membranous. Flowers are pale sulphur-yellow, conico-oblong or ovoid obtuse spikes 7.5–10 by 5 cm.; Bracts: 2.5–3.8 cm. long, closely imbricate, ovate-oblong or obovate, with rounded apex and pale membranous margins, bright green at first but becoming red in fruit. Calyx-tube 2.5 cm. long, appressed to the corolla-tube, 3-toothed, glabrous. Corolla-tube 3.2 cm. long. Anther glabrous. Style glabrous; stigma minute, funnel-shaped with ciliate mouth. long. Seeds 4 mm. long, oblong, black.

The pharmacological properties of *Z. zerumbet* Rosc. are the same as *Sunthi*.[6]

3.2.1.5. Chemical constituents

Zerumbone (a monocyclic sesquiterpene), flavonoids, aromatic compounds, vanilline, and other polyphenolic compounds are reported in *Z. zerumbet* Rosc.[7]

3.2.1.6. Traditional uses

1. The rhizome is used like the officinal ginger. It is employed as a hot remedy for coughs, asthma, worms, leprosy, and other skin diseases. In Madagascar, the boiled rhizome is given in pulmonary affections.[8]
2. Rhizome is used like the Officinal ginger. It is employed as a hot remedy for coughs, asthma, worms, leprosy, and other skin diseases.[9]

3. *Z. zerumbet* is most widely known around the world as the Shampoo Ginger." It is in fact used as a shampoo in Asia and Hawaii and is one of the ingredients in several commercial shampoos. *Z. zerumbet* Rosc. was applied for sprains, indigestion and other ailments. The pulp from the grounded roots was wrapped in cloth and loosely bound around the injured area. The ground and strained root material was mixed with water and drunk to ease stomach ache. In Polynesia and Hawaii, *Z. zerumbet* Rosc. is used against toothache and stomach ache.[7]

3.2.1.7. Therapeutic properties

1. The zones of inhibition produced by the crude ethanol extract and aqueous extract of *Z. zerumbet* for the Gram-positive bacterial strains which are *Streptococcus mutants*, *Enterococcus faecalis, Staphylococcus* spp. *and Lactobacillus* spp. were ranged from 9.17 to 25.5 mm. The highest antibacterial activity (25.5 mm) was noted against *Enterococcus faecalis*, but for the aqueous extract against *Staphylococcus* spp. the zone of inhibition was not noticeable.[7]
2. The rhizome has been demonstrated to possess anti-inflammatory, antipyretic, hepatoprotective, anti-nociceptive, antiallergic activity, immunomodulatory activity, antiplatelet activities, antioxidant, cytotoxic activity, antiulcer, anticancer, antimicrobial, antihyperglycemic, etc.[10]

3.2.2. Karchura (C. zedoaria Rosc.) or Amomum zerumbet[11]

3.2.2.1. History

Acarya Caraka has described this plant in *Sutrasthana*, *Annapanavidhyadhyaya* (27); *Astanga Hrdaya* added in *Sutrasthana, Annaswarupavijyanadhya* (6); *Siddhasara Nighantu* has mentioned in chapter 28; *Dhanvatari Nighantu* has mentioned in *Chandanadivarga; Kaidev Nighantu* has mentioned in *Aushadivarga; Bhavaprakash Nighantu* described under *Karpuradi varga; Raj Nighantu* has mentioned in *Pippalyadivarga*.

Nighantukars have also mentioned *Shati* among the synonyms of *Karchura*, but in reality, both are different plants. Probably this has happened due to the use of *Karchura* as a substitute of *Shati (Hedychium spicatum)*.

3.2.2.2. Vernacular name[12]

- Sanskrit: *Dravida, Durlabha, Gandhamulaka, Ganhasara, Jatala, kalpaka, Karchura, Karshya, Mukhya, Shathi, Vedhya*.
- Hindi: *Kachura, Kalihaldi*
- English: Zedoary

3.3.2.3. Habitat

It is cultivated in gardens in many parts of India, especially in Eastern Bengal and in districts of Chittagong and Tipperah.[11] A large perennial herb with underground tuberous root-stock, growing wildly in Eastern Himalayas and in moist deciduous forests of the central region of Karnataka.[13]

3.2.2.4. Description

Rootstock of palmately branched sessile cylindric oblong annulate tubers, pale yellow inside, with a camphoraceous odour and bitterish spicy taste. Leaves with long petioles 30–60 cm. long, oblong-lanceolate, finely acuminate, glabrous on both surfaces, clouded with purple down the middle. Flowers are yellow in spikes 7.5–12.5 by 5–7.5 cm.; flowering bracts 3.8 cm. long, ovate, recurved, cymbiform, green tinged with red; bracts of the coma reaching 5 cm. long, crimson or purple. Calyx 8 mm. long, obtusely 3-toothed. Corolla-tube twice as long as the calyx, funnel-shaped. Seeds ellipsoid with a white lacerate aril.[12]

Dried pieces of rhizomes of *Karchura* which are available in market are greyish in colour and smell like *Karpura*. In Bengal, Shoty starch are prepared from this rhizome and use as a substitute of Barley and Aararot. Flowering season is summer.[14]

3.2.2.5. Constituents

Essential Oil, Resin, Starch (82.6%), glucose and organic acid.[14,15]

3.2.2.6. Properties and action[14]

Rasa: Katu, Tikta
Guna: Laghu, Tiksna
Virya: Usna
Vipāka: Katu
Karma: Vata-Kaphahara, Rucya, Dipana and *Mukhavaishadyakara.*

3.2.2.7. Parts used

Tubers and leaves.

3.2.2.8. Medicinal uses

1. In classical texts, it is indicated in *Hrid-dourbalya* (cardio-tonic activity), *Rajoavarodha* (amenorrhea), *Kashtartava* (dysmenorrhoea), *Artavajana* (uterine tonic), *Puyameha* (gonorrhea), *Mutrakrichha* (UTI), *Mutrajana* (diuretics), *Sothahara* (anti-inflammatory), *Vedanasthapapna* (analgesic), *Yakrituttejak* (stimulates hepatic functions), *Raktasodhaka* (blood purifier), *and Vajikarana* (aphrodisiac).
2. The rhizomes are *Krimighna* (anthelmintic), *Jwaraghna* (antipyretic), *Vishaghna* (alexiteric), *Mukhadaurgandhya* (destroys foulness of the breath), *Kusthaghna* (useful in leukoderma), *Arsha* (piles), *Swasha* (asthma), *Arbuda* (tumours), tuberculous glands of the neck, *Plihaghna* (enlargement of the spleen, and *Apasmar* (epileptic seizure).

3.2.3. Kalihaldi (C. caesia Roxb.)

3.2.3.1. History

No reference is found about the drug *Kalihaldi* (*C. caesia* Roxb.) in Vedic literature, *Samhita granthas* or different *Nighantus*.

3.2.3.2. Vernacular name

- Hindi: *Kalihaldi, Narkachura*
- English: Black Zedoary.
- Habitat: It is found cultivated in gardens in Bengal. It is one of the two Zerumbads of Persian writers on Materia Medica.[16]

3.2.3.3. Descriptions

The whole plant is about 1.2 m height. Leaves are 30–60 cm by 12.5–15 cm., broadly lanceolate or oblong, glabrous, with a deep ferruginous purple cloud down the middle which penetrates to the lower surface. Petiole and sheath about as long as the blade. Spikes appearing rather before the leaves, about 15 cm. long or altogether about 30 cm. high with the peduncle. Flowering bracts green with a ferruginous tinge. Coma deep bright red, tending to crimson. Flowers are pale yellow, and reddish at the outer border, rather shorter than their bracts.[17] Its rhizomes have knots which are blackish grey in color and have circular rings. The inner part is greyish blue in color, very hard and like a horn. Their taste and smell are similar to camphor.[18]

3.2.3.4. Medicinal uses

1. The medicinal properties are the same as those of *C. zedoaria* (*Ayurveda*), *Z. zerumbet* (Unani). In Bengal, it is used in the fresh state like turmeric.[17]
2. It is chiefly used as a cosmetic. It is considered to have nearly the same medicinal properties as *C. zerumbet*. It is used as a domestic

remedy in the fresh state much like *C. longa.* Its paste is applied to bruises, contusions and rheumatic pains.[16]

3. In northeast India, the powder of rhizomes is used as a face-pack. Fresh rhizomes are crushed and applied as a paste on forehead for relief from migraine or applied on the body for sprains and bruises. The rhizomes act against leukoderma, epilepsy, cancer and HIV/AIDS. Intake of the small amount of rhizome paste is claimed to expel gases from the stomach and cure menstrual disorders.[19]

3.2.3.5. Therapeutic properties

1. *C. caesia* Roxb. has biological activities such as smooth muscle relaxant, anti-ulcerogenic, anthelmintic, anxiolytic and CNS depressant activity, and many other miscellaneous activities.

3.2.4. Amahaldi (C. amada Roxb.)

3.2.4.1. History

This herb is not described in the *Brihat Trayi* but *Nighantus* like *Bhava Prakasha* mentioned it under *Haritakyadi varga* and Porf. PV Sharma ji in *Dravyaguna Vijnana* Vol II mentioned it under *Kusthghna varga*.

3.2.4.2. Vernacular name

- Sanskrit: *Dravibheda, Amragandhi, Surabhidaru, Karpura haridra, Padmapatra, Surimat* and *Surataraka*
- Eng. – Mango ginger.
- Hind. – *Amahaldi, Amiyahaldi*

3.2.4.3. Habitat

It is a perennial herb mostly grown in Bengal and hills on the West Coast of India.

3.2.4.4. Description[17]

Rootstock is large, sessile tubers thick, cylindric, or ellipsoid, pale yellow inside. Leaves long-petiolate, in tufts, the blade 30–45 by 7.5–12.5 cm., oblong-lanceolate, acute or acuminate, narrowed to the base, glabrous and green on both sides: Petioles as long as the leaf- blade (30–45 cm.). Flowers in autumnal spikes 7.5–15 by 3.8–5 cm, in the center of the tuft of leaves; peduncle 15 cm. long or more; flowering bracts 2.5 cm. long, greenish-white; bracts of the coma longer and narrower, tinged with pink or red. Calyx nearly 13 mm. long, obtusely 3-toothed. Corolla white or very pale yellow; tube about 2.5 cm. long; lobes oblong, acute. Lip semi-elliptic, yellow, 3-lobed, the middle lobe emarginate.

3.2.4.5. Parts used

Rhizome.

3.2.4.6. Constituents

Essential oil, resin, sugar, gum, starch, albuminoids, crude fiber, organic acids and ash;[20] d-α-pinene, d-camphor, d-curcumene, phytosterol.[21]

3.2.4.7. Properties[22]

Rasa: Tikta, katu
Guna: Ruksha, laghu
Virya: Sita
Vipak: Katu
Karma: Kapha-pitta hara

Action: *Vatanulomana* (Carminative), *Shital* (cooling), aromatic*, Deepana, Pacana* (stomachic) and *Grahi*.

3.2.4.8. Medicinal uses[17,20]

- It is useful in prurigo (all kinds of itching) and skin diseases. Tubers rubbed with the leaf-juice of Caesalpinia bonduc are given for worms.
- It is used in food industry; infusion of the root is employed to give the flavor of the mango artificially to confectionery.
- Diuretic, emollient, expectorant, antipyretic; appetizer; useful in inflammations, they are topically applied over contusions and sprains, troubles in the mouth and the ear, gleet, ulcers on penis, scabies, lumbago, stomatitis. Table 1. Difference between Zingiber zerumbet Rosc., Curcuma zedoaria Rosc., Curcuma caesia Roxb., Curcuma amada Roxb.

4. RESULTS

The above botanical description of different parts of these four plants species helps to distinct them on the basis of morphological features. The organoleptic, chemical composition and geographical distribution additionally help to identify different species, as all are used with a difference, apart from some common usage also.

5. DISCUSSION AND CONCLUSION

The Zingiberaceae family is immensely valuable across various sectors, from health and medicine to culinary arts and economic development. Their wide-ranging benefits underscore the importance of preserving and promoting the use of these plants in traditional and modern contexts. The present study emphasizes the knowledge on the plants such as *Sthulagranthi* (*Z. zerumbet* Rosc.), *Karchura* (*C. zedoaria* Rosc.), *Kalihaldi* (*C. caesia* Roxb.) and *Amahaldi* (*C. amada* Roxb.) as they belong to the same family and due to their similar vernacular names like *Narakarchura* is synonyms for both *Sthulagranthi* (*Z. zerumbet* Rosc.) as well as for *Kalihaldi* (*C. caesia* Roxb.) and similar morphological features, they pose difficulty in identification.

Common uses of all- All exhibit properties of *Deepana, Pachana* and useful in respiratory diseases such as cough, asthma, bronchitis, antipyretic, anthelmintic, and skin diseases.

These drugs are having specific therapeutic values and useful in many health conditions. *Sthulagranthi* (*Z. zerumbet* Rosc.) is specifically indicated in the conditions such as *Kasa* (coughs), *Swasha* (asthma, pulmonary affection), *Krimi* (worm infestation), *Kustha* (skin diseases) leprosy, used in stomach-ache, peptic ulcers, carminatives, etc. *Karchura* (*C. zedoaria* Rosc.) is used in *Kasa, Swasha, Hikka, Jwara, Pratishaya, Kustha, Krimi, Vrana, Arsha, Mutrakriccha, Gulma,* tuberculous glands of the neck, enlargement of the spleen, leucorrhoea (menstrual disorders), gonorrhea, aphrodisiac, etc. *Kalihaldi* (*C. caesia* Roxb.) is mostly used in cosmetics, leucoderma, allergies, bruises, contusions, rheumatic pain, migraine, epilepsy, cancer and as smooth muscle relaxant activity. *Amahaldi (C. amada* Roxb.) cures all kind of itching and other skin diseases, *Krimi* (scabies), *Vata-anulomana* (carminatives), *Deepana* (appetiser), etc.

This article highlights the specific pharmacological uses of these different drugs. These can be better identified on the basis of botanical features discussed in the present article.

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Nil.

7. AUTHORS' CONTRIBUTIONS

All the authors contributed equally in the design and execution of the article.

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9. ETHICAL APPROVALS

This manuscript not required ethical approval as it is a review study.

10. CONFLICTS OF INTEREST

Nil.

11. DATA AVAILABILITY

This is an original manuscript and all data are available for only review purposes from principal investigators.

12. PUBLISHERS NOTE

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Table 1: Difference between *Zingiber zerumbet* Rosc., *Curcuma zedoaria* Rosc., *Curcuma caesia* Roxb., *Curcuma amada* Roxb.

S. No.	Characters	*Zingiber zerumbet* Rosc.	*Curcuma zedoaria* Rosc.	*Curcuma caesia* Roxb.	*Curcuma amada* Roxb.
1.	Common name	Bitter ginger/Shampoo ginger	White turmeric	Black turmeric	Mango Ginger
2.	Hindi name	*Mahabaribacha, Narkachura*	*Kachura*	*Kalihaldi*	*Amahaldi*
3.	Leaves	20–30 cm, sessile, oblong-lanceolate, acuminate, glabrous, narrow base	30–60 cm, oblong-lanceolate, finely acuminate, glabrous on both surfaces, clouded with purple colour down the middle	Leave sheath 30–60 cm oblong with a broad purple-ferruginous(brown) cloud down the middle which penetrates to the lower surface also	Leave tufts 30–45 cm, oblong-lanceolate, acute or acuminate, narrow base, glabrous and green on both sides
4.	Bract	Pinecone-like heads of bracts from which white flowers emerge. On maturity the heads turn bright red and exude a wonderfully thick soapy liquid	3.8 cm, ovate, cymbiform, green tinged with red, crimson or purple	Green with a ferruginous tinge. Coma deep bright red, tending to crimson	2.5 cm, greenish-white, tinged with pink or red
5.	Season of Flower- spike	August–September (Monsoon)	Vernal (spring) or aestival (summer)	Vernal (spring) or aestival (summer)	Autumnal
6.	Flowering stem	30–45 cm. long	20–25 cm. long, appearing before the leaves	About 30 cm. long with the peduncle, appearing before the leaves	About 15 cm. long with peduncle, appears in the center of the tuft of the leaves
7.	Flowers	Pale sulphur-yellow	Yellow	Pale yellow, reddish at the outer border	White or very pale yellow
8.	Rhizomes	Large, not much branched, root fibers vermiform	Cylindric oblong annulate tubers	Yellow brown long fibrous and tapering adventitious roots are present all over the surface of rhizome	Sessile tubers thick, cylindric or ellipsoid
9.	Rhizomes color	Yellow	Externally greyish-buff and internally cream	Bluish-Black	Pale yellow inside
10.	Aroma in Rhizomes	Strong aromatic ginger-like taste, with some bitterness	Camphoraceous odor	Camphoraceous sweet odor	Mango such as
11.	Chemical constituents	Polyphenols, saponin, alkaloids and terpenes zerumbone	Essential oil and resin	Volatile oil	Starch, phenolic acids, volatile oils, curcuminoids and terpenoids like difurocumenonol, amadannulen and amadaldehyde
12.	Specific pharmaceutical uses	Intestinal worms, leprosy, other skin diseases, stomach-ache, peptic ulcers, carminatives and anticancer	Leucoderma, piles, menstrual disorders, aphrodisiac, *Hrid-dourbalya, Gulma, Mutrakriccha,* tuberculous glands of the neck, enlargement of the spleen and epileptic seizure	Bruises, contusions, in cosmetics, rheumatic pains, smooth muscle relaxant activity, menstrual disorders and anticancer	Appetizer, stomatitis carminatives, useful in prurigo, skin diseases, and scabies