Review of Some Lesser Known Members of Zingiberaceae Family

Jyoti Hajong1*, Rosy Gupta2

1MD Scholar, Department of Dravyaguna, Post Graduate Training and Research Institute, Government Ayurvedic College, Patiala, Punjab, India.
2Incharge and Reader, Department of Dravyaguna, Post Graduate Training and Research Institute, Government Ayurvedic College, Patiala, Punjab, India.

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 officinale, 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.

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

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, etallaria, alpinia, maranta, canna, and musa. However, in the present article, only the following genera are considered.

Genus – Curcuma: 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

1. Sthulagranthi (Z. zerumbet Rosc.)
2. Karchura (C. zedoaria Rosc.)
3. Kalihaldi (C. caesia Roxb.)
4. 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, Sanhita Granthas or different Nighantas. However, in Bhavaprakash Nighantu, it has been mentioned in the name of Mahahbbh Vacha among the four types of Vacha under Haritakayadi Varga (verse no. 106). Further, he described two types of Mahahbbh Vacha – Kulanjan (Alpinia galanga) and Sthulagranthi (Sugandha) which must be the Narakarchura (Z. zerumbet Rosc.).

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

- Sanskrit: Sthulagranthi, Ahava, Avanti, Karpurharidra, Kolanjana, Kumbhika, Viranam
- English: Bitter ginger
- Hindi: Mahahbbharivacha, 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.

3.2.1.5. Chemical constituents

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

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.

2. Rhizome is used like the Official ginger. It is employed as a hot remedy for coughs, asthma, worms, leprosy, and other skin diseases.
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, antiplaque activities, antioxidant, cytotoxic activity, antiulcer, anticancer, antimicrobial, antihyperglycemic, etc.[10]

3.2.2. Karchura (C. zedoaria Rosc.) or Amomum zerumbet

3.2.2.1. History
Acarya Caraka has described this plant in Susrasthana, Annapanavidhyadhyaya (27); Astanga Hrdaya added in Susrasthana, Annaswarupavijyanadhyya (6); Siddhasara Nighantu has mentioned in chapter 28; Dhanvatari Nighantu has mentioned in Chandanadivarga; Kaidev Nighantu has mentioned in Aushadivaraga; Bhavaprakash Nighantu described under Karpuradi varga; Raj Nighantu has mentioned in Pippalyadivarga.

Nighantuvars 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, Durlabhha, Gandhamulaka, Ganhasara, Jatala, kalpaka, Karchura, Karshya, Mukhya, Shathi, Vedhya.
- Hindi: Karchura, Kalihaldi
- English: Zedoary

3.2.2.3. 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 cylindrical 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, Shotty starch are prepared from this rhizome and use as a substitute of Barley and Aaarot. 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, Vipaka: Katu
Karma: Vata-Kaphahara, Doshasneham
Vipāka: Katu
Karma: Vata-Kaphahara, Rucya, Dipana
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), Rajaovarodha (amennorhea), Kashirttara (dysmenorrhea), Artavajana (uterine tonic), Puyameha (gonorrhea), Mutrakrichha (UTI), Mutrajana (diuretics), Sothahara (anti-inflammatory), Vedanathapapana (analgesic), Yakrituttejak (stimulates hepatic functions), Raktasodhaka (blood purifier), and Vajikarana (aphrodisiac).

2. The rhizomes are Krimighna (anthelmintic), Jwaraghna (anti-inflammatory), Vaghagha (alexiteric), Mukhadaaurgandhya (destroys foulness of the breath), Kushtaghna (useful in leukoderma), Arsha (piles), Swasha (asthma), Arbuda (tumours), tuberculous glands of the neck, Piliaghna (enlargement of the spleen, and Apasmar (epileptic seizure).

3.2.3. Kalihihdi (C. caesia Roxb.)

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

3.2.3.2. Vernacular name
- Hindi: Kalihihdi, 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. 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 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]

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-ulcerogenetic, antihelmintic, anti-inflammatory 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 Traya but Nighanthus like Bhava Prakasha mentioned it under Haritakya varga and Porf. PV Sharma ji in Dravyaguna Vijnana Vol II mentioned it under Kusthghna varga.

3.2.4.2. Vernacular name

- Sanskrit: Dravyibeda, Amragandhi, Surabhiddar, Karpura haridra, Padmapatra, Surimat and Suratataka
- 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., oblance-lanceolate, acute or acuminate, narrowed to the base, glabrous and green on both sides: Petoles 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, phytoesterol.[21]

3.2.4.7. Properties[22]

Rasa: Tikta, katu
Guna: Rudsha, 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; appetite; 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 Roxb., 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 Sihulagranthi (Z. zerumbet Roxb.), 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 Sihulagranthi (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, antihelmintic, and skin diseases.

These drugs are having specific therapeutic values and useful in many health conditions. Sihulagranthi (Z. zerumbet Rosc.) is specifically indicated in the conditions such as Kasa (coughs), Svasha (asthma, pulmonary affection), Krimi (worm infestation), Kusta (skin diseases) leprosy, used in stomach-ache, peptic ulcers, carminatives, etc. Karchura (C. zedoaria Rosc.) is used in Kasa, Svasha, Hikka, Jwara, Pratishaya, Kushta, 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.

6. ACKNOWLEDGMENTS

Nil.

7. AUTHORS’ CONTRIBUTIONS

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

8. FUNDING

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9. ETHICAL APPROVALS
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10. CONFLICTS OF INTEREST
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11. DATA AVAILABILITY
This is an original manuscript and all data are available for only review purposes from principal investigators.

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REFERENCES

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

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Common name</td>
<td>Bitter ginger/Shampoo ginger</td>
<td>White turmeric</td>
<td>Black turmeric</td>
<td>Mango Ginger</td>
</tr>
<tr>
<td>2.</td>
<td>Hindi name</td>
<td><em>Mahabaribacha, Narkachura</em></td>
<td><em>Kachura</em></td>
<td><em>Kalihaldi</em></td>
<td><em>Amahaldi</em></td>
</tr>
<tr>
<td>3.</td>
<td>Leaves</td>
<td>20–30 cm, sessile, oblong-lanceolate, acuminate, glabrous, narrow base</td>
<td>30–60 cm, oblong-lanceolate, finely acuminate, glabrous on both surfaces, clouded with purple colour down the middle</td>
<td>Leave sheath 30–60 cm oblong with a broad purple-ferruginous(brown) cloud down the middle which penetrates to the lower surface also</td>
<td>Leave tufts 30–45 cm, oblong-lanceolate, acute or acuminate, narrow base, glabrous and green on both sides</td>
</tr>
<tr>
<td>4.</td>
<td>Bract</td>
<td>Pinecone-like heads of bracts from which white flowers emerge. On maturity the heads turn bright red and exude a wonderfully thick soapy liquid</td>
<td>3.8 cm, ovate, cymbiform, green tinged with red, crimson or purple</td>
<td>Green with a ferruginous tinge. Coma deep bright red, tending to crimson</td>
<td>2.5 cm, greenish-white, tinged with pink or red</td>
</tr>
<tr>
<td>5.</td>
<td>Season of Flower-spike</td>
<td>August–September (Monsoon)</td>
<td>Vernal (spring) or aestival (summer)</td>
<td>Vernal (spring) or aestival (summer)</td>
<td>Autumnal</td>
</tr>
<tr>
<td>6.</td>
<td>Flowering stem</td>
<td>30–45 cm. long</td>
<td>20–25 cm. long, appearing before the leaves</td>
<td>About 30 cm. long with the peduncle, appearing before the leaves</td>
<td>About 15 cm. long with peduncle, appears in the center of the tuft of the leaves</td>
</tr>
<tr>
<td>7.</td>
<td>Flowers</td>
<td>Pale sulphur-yellow</td>
<td>Yellow</td>
<td>Pale yellow, reddish at the outer border</td>
<td>White or very pale yellow</td>
</tr>
<tr>
<td>8.</td>
<td>Rhizomes</td>
<td>Large, not much branched, root fibers verminform</td>
<td>Cylindric oblong annulate tubers</td>
<td>Yellow brown long fibrous and tapering adventitious roots are present all over the surface of rhizome</td>
<td>Sessile tubers thick, cylindric or ellipsoid</td>
</tr>
<tr>
<td>9.</td>
<td>Rhizomes color</td>
<td>Yellow</td>
<td>Externally greyish-buff and internally cream</td>
<td>Bluish-Black</td>
<td>Pale yellow inside</td>
</tr>
<tr>
<td>10.</td>
<td>Aroma in Rhizomes</td>
<td>Strong aromatic ginger-like taste, with some bitterness</td>
<td>Camphoraceous odor</td>
<td>Camphoraceous sweet odor</td>
<td>Mango such as</td>
</tr>
<tr>
<td>11.</td>
<td>Chemical constituents</td>
<td>Polyphenols, saponin, alkaloids and terpenes zerumbone</td>
<td>Essential oil and resin</td>
<td>Volatile oil</td>
<td>Starch, phenolic acids, volatile oils, curcuminoinds and terpenoids like difurocumenol, amadannulen and amadaldehyde</td>
</tr>
<tr>
<td>12.</td>
<td>Specific pharmaceutical uses</td>
<td>Intestinal worms, leprosy, other skin diseases, stomach-ache, peptic ulcers, carminatives and anticancer</td>
<td>Leucoderma, piles, menstrual disorders, aphrodisiac, <em>Hrid-dourbalya, Gulma, Mutrakriccha</em>, tuberculous glands of the neck, enlargement of the spleen and epileptic seizure</td>
<td>Bruises, contusions, in cosmetics, rheumatic pains, smooth muscle relaxant activity, menstrual disorders and anticancer</td>
<td>Appetizer, stomatitis carminatives, useful in prurigo, skin diseases, and scabies</td>
</tr>
</tbody>
</table>