CHAPTER I

INTRODUCTION
Simaroubae is an order of monocotyledonous flowering plants, which includes 9 families, 69 genera and about 1,500 species. Plants of this order are abundant and conspicuous throughout west tropics. They are herbaceous perennials in the sense that most of them have little or no woody tissue, but the plants and their leaves are, in many cases, very large; and in the wet tropics, they are evergreen. Because their stems lack the power of secondary growth in thickness, their possible habits are restricted, but within these limits they are remarkably varied.

Though the order is represented by conspicuous plants throughout the tropics, the distribution of the constituent families is diverse. All the plants of this order have some basic growth habits but this is disguised by difference in foliage and the presence of varying developments of rhizomes. The first erect root of a seedling is usually small; successive ones becoming larger until the nature size is reached after which the pattern is repeated indefinitely. The rhizomatous species at least, are potentially immortal and how long individual plants live in nature is unknown. This ultimately leads to a sympodial type of growth pattern.
The majority of species of this order are shade plants of the rain forest of evergreen tropical regions, though some grow mainly on forest margins or in clearings or on river banks.

One of the common characters of all members of this order is arrangement of tissues seen in cross-section of a leaf stalk, which includes predominant arches of vascular bundles and air canals.

Variations on the basic flower structure pattern exist in families with five and with one stamen. The fruits are usually dehiscent. Reduction in the number of seeds in few cases to one, occurs independently. Flowers provide the basis for division of the order into families, while inflorescence structure is more important in distinguishing genera.

Zingiberaceae is the largest family of Zingiberales containing about 45 genera and 1,000 species. These aromatic herbs grow chiefly in the moist swampy tropical and subtropical regions. Members of the family are perennials that frequently have sympodial fleshy rhizomes. A few species are epiphytes with aerial roots exposed to humid atmosphere. The rolled up sheathing bases of the leaves sometimes form an apparent short aerial stem. The commonly green sepals differ in texture and colour of the petals. Tracts are spirally arranged and flowers display a pine cone like growth pattern. The flowers of this family resemble an orchid because of its labellum joined with
a pair of petal like sterile stamens. Nectar is present in
the slender flower tube. The brightly coloured flowers may
bloom for only a few hours and are thought to be pollinated by
butterflies.

Many species are economically valuable for their spices
and perfume. The dried thick rhizomes of *G_Complex* provide
turmeric, while seeds of *Alpinia officinarum* are the source for
cardenz. Ginger is obtained from the rhizomes of *Zingiber
officinale*. Several species of shell flower (*Alpinia*), a
genus of ginger like herbs are cultivated as ornamentals.
Apart from these uses, many genera are medicinally impor-
tant.²⁵,⁶,⁷,⁸,⁹

The genera belonging to this family are —
(i) *Globa*, (ii) *Curcuma*, (iii) *Indigofera*, (iv) *Alpinia*,
(v) *Bacopa*, (vi) *Centropogon*, (vii) *Zingiber*,
(viii) *Alpinia*.

*Eugenia* is a genus of rhizomatous herbs distributed
in the tropics and subtropics of Asia and Africa. About 10
species occur in India, a few exotics are grown in gardens
for their handsome foliage and flowers. The flowers are borne
close to the ground and plants are usually grown in potted
light soil, liquid manure being applied to promote growth.
Repotting is necessary once in two years.¹⁰,¹¹
The rhizomes are stomachic, cholagogue and emmenagogue. 

*Le clava* Lindl., *Le monandra* Roxb., *Le mitinda* Lindl. and *Le muenstiblia* Poe 12 are used medicinally in China and Indochina. *Le muenstiblia* Poe, known in Sanskrit as "Thamichampa" is a handsome aromatic herb with a tuberous rhizome distributed throughout India and cultivated for ornamental purposes. Leaves, erect oblong or ovate-lanceolate up to 30 x 7.5 - 10.0 cm, flowers fragrant, white, borne in a crowded radical spike opening successively, lip lilac.

The underground portion of the plant consists of subglobose tuberous rhizomes from which branches of fleshy rootlets bearing small oblong or rounded tubers are produced. The rhizomes and tubers have a bitter pungent camphoraceous odour and taste. 13

The tubers of the plants are widely used as a local application for tumors, swellings and wounds. They are also considered stomachic and given in gastric complaints. They help to remove blood clots and other purulent matter in the body. The juice of the tubers is given in tropical affections of hands and feet and of effusion in joints. The juice, however, causes colicitation and vomiting. The herbs are used in ointments for wounds. 14, 15

On steam distillation, the rhizomes yield 0.2% of light yellow volatile oil, specific gravity 0.8900 - 0.9000, optical
rotation + 120° with a pungent odour at first camphoraceous and latter resembling that of tarragon oil. The oil contains cineole and probably methyl chavicol.  

*Curuma* is a genus of herbs with rhizomatous and tuberous roots and usually with accessory tubers developed at the end of long fleshy roots. The genus have about 70 species of rhizomatous herbs. These are found not only in India but also in Malaya, Northern Australia and Siam. Thirty species of *Curuma* are found in India, but only a few of them are of economic and medicinal properties.

*C. annuifolia* Roxb.

The plant is a herb with small rosette matting, long fleshy fibres terminating in pale olbong pendulous tubers. Leaves (with petiole) 30 - 45 cm, blade lanceolate, acute, 15 - 30 cm long. Flowering spike lateral, apart from and usually appearing earlier than the leafy spike, crowned by several enlarged empty pink bracts. Flowers yellow, longer than their bracts, 3 or 4 together in axil of each bract opening in succession and quickly fading; sheaths of pseudo-stem pale green. Calyx 5-toothed. Corolla tube 23 mm long, somewhat gibbous; upper lobes erect, concave, ovate, longer than the 2 lateral ones. Lateral staminodes oblone, united to a filament; the lower large, broad, spreading, notched; connective produced at the base in a fork. Capsule ovoid, ultimately opening by 5 valves. Seeds many small.
The plant is distributed in outer ranges of Central Himalayas, West Bihar, North Bengal, extending to Bombay and Southern India. It is known as "Zelkova" in Hindi and "Peyakshira/Yavaja" in Sanskrit. 19

The root is sweetish, fragrant, cooling, oleaginous; tonic, aphrodisiac; useful in consumption, biliousness, leprous, burning sensation, dyspepsia, loss of taste, bronchitis, asthma, fever, thirst, jaundice and many other ailments.

Rameshoo and Pigan 20 have reported the presence of \( \alpha \)-pinene, \( \beta \)-pinene, \( \delta \)-cuminol, borneol and \( \delta \)-terpinenol in the essential oil of Is anthocladia. The oil also possesses antimineral activity.

Is anthocladia Roxb. 21, 22

The rhizome are known in Hindi as "Asahalidh". The fresh cut rootstock possesses the smell of green range. Rootstock large: sessile tubers thick, cylindric or ellipsoidal, pale yellow inside. Leaves long-petiolate, in tufts, the blade 30 - 45 x 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. Flowers in autumnal spikes, 7-5 - 15-5 x 5-5 - 5-0 cm, in the centre of the tuft or leaves; peduncle 15-5 cm long or more; flowering branches 2-5 cm long, greenish white. Calyx nearly 15 mm long, obtusely 5-toothed. Corolla white or very pale yellow; tube
about 2.5 cm long; lobes obovate, the middle lobe emarginate.

The rhizome is sweet, bitter, cooling; appetizer; antipyretic, aphrodisiac, laxative. It is claimed to be useful in biliousness, all kinds of itching and skin diseases, bronchitis, asthma, hiccup and inflammations due to injuries.

Jain and Mishra reported 1.25% essential oil in the rhizomes. The essential oil is composed of ∆-pinene 18.6%, ocimene 47.5%, linalool 11.2%, linalyl acetate 9.1%, eugenol 9.8% and unidentified substances 5.5%. Alcoholic and ethereal extracts of rhizomes of \textit{R. oppositifolia} are reported to lower the blood cholesterol level in the dose of 1.0 g orally. Anti-microbial and anthelmintic properties have also been attributed to the essential oil.

\textit{R. oppositifolia} Roxb.

The plant is known in Hindi as "Falihaldi" and "Nar-kashmura". The plant is about 2 m, leaves 30 - 60 x 12.5 - 15.0 cm broadly lanceolate or obovate, glabrous, with a deep ferruginous purple cloud down the middle which penetrates to the lower surface. Scuticle and sheath about as long as blade. Spikes appearing rather before the leaves, about 25 cm long or altogether about 30 cm high, with the peduncle flowering bracts green with ferruginous tinge. Flowers pale yellow, rather shorter than their bracts.
The plant is often cultivated in Bengal. The rhizomes are commercial commodity and are largely employed for blending with smoking and chewing tobacco in order to impart fine aroma to them. They are also used in scenting hair oils. The fresh roots are considered cooling and diuretic. It is claimed that they check leucorrhoea and genitohypural discharges and purify the blood. The rhizomes are employed as stomachic and also applied to bruises and sprains as antiseptic and antiseptics. They form an ingredient in some of the strengthening conserves which are taken by women to remove weakness after child birth.27

The rhizomes are reported to contain essential oil and resin = 4.4%, crude fibre = 25.20%, gums and mucilages = 10.40%, starch = 19.75%. Butt, et al.28,29,30 examined the essential oil and reported the following components:

- camphor 76.65%
- camphene and bornylene 9.25%
- sesquiterpene 10.53% and unidentified residue 4.75%

According to Banerjee and Nigan, the essential oil has 1-α-cineole = 9.06%,
- cineole = 15.66%, α-camphor = 19.82%, δ-linalool = 20.42%,
- δ-coumarol = 7.0% and cinnamal = 12.6%. Antimicrobial activity and antihelmintic activity of the essential oil has also been reported.

**Medicago Linn.**

The plant is known in Hindi as "Keshura." Rootstocks
of palmately branched scapose cylindrical oblong annulate tubers pale yellow inside, with a camphoraceous odour and bitterish spicy taste, also bearing long fleshy fibres that terminate in smaller oblong less fragrant tubers. The leaves 30 - 60 cm long, oblong lanceolate, finely acuminate, glabrous on both surfaces, clouded with purple down in the middle. Flowering stem 20 - 25 cm long, appearing before the leaves, stout, clothed with obtuse sheaths. Flowers yellow in spikes 7.5 - 12 cm x 5 - 7 cm; flowering bracts 3 cm long, ovate, recurved, obovate, green tinged with red. Calyx 3 mm long, obtusely 3-toothed. Corolla - tube twice as long as calyx, funnel shaped.

The species is native of North East India and grows wild in eastern region of Khasiyan and in most deciduous forests of coastal tracts of Assam. It is also cultivated in India, Ceylon and China. The plant is propagated by cutting tuberous rhizomes into small pieces bearing buds and planting in soaked soil at the beginning of the monsoon. Areas with plantations which provide shady conditions and the banks of irrigations channel afford congenial conditions for its cultivation. The rhizomes are large and fleshy and are cut into thin transverse slices and dried. The dried slices usually have a grayish buff colour and camphoraceous odour, with pungent bitter taste.

"Shota" starch obtained from *Cassava* is highly valued as an article of diet, especially for infants. A red
powder "Miri" is prepared from powdered rhizomes by heating with decoction of suppon wood.36

The rhizomes are used medicinally in both Ayurvedic as well as Chinese system of treatment and are considered to be useful in cough and colds. They are also employed as gastrointestinal stimulant, in flatulent colics, in bronchitis, tumors, asthma, leucoderma, piles and epileptic seizure.37,38 The starch of commene is product extracted from tubers of *G. soldanella* and used as substitute for arrowroot and barley.39,40

The rhizomes of *G. soldanella* are reported to contain 32.8% starch, 1.2% essential oil, 15.0% moisture and 1.01% ash. The composition of essential oil has been reported as 1.5% α-pinene, 3.5% camphene, 9.6% cineole, 4.3% α-sapene, 1.5% α-thujene, 10.0% sesquiterpene and 40% sesquiterpene alcohol.41,42,43 Hiroshi, et al.44 have isolated a new sesquiterpene known as dehydrocarclione and a major antifungal principle, ethyl-p-nitroxy cinnamate has also been isolated. It is also reported that the essential oil possesses antimicrobial and anthelmintic activity.45,46,47

**G. loment.*

*G. loment.* has been one of the important constituents of ancient formulation and valued as a folk medicine. The rhizome has attracted considerable attention and has been
Garamin, a colouring matter from the rhizomes of *C. longa* has anti-inflammatory activity. The essential oil of *C. longa* is reported to be more potent than hydrocortisone with respect to anti-inflammatory activity. The petroleum ether, alcoholic and aqueous extracts of *C. longa* showed 80%, 60%, and 100% antifertility activity in albino rats. The rhizomes were found effective in case of bronchitis. Garama powder has been found to increase main content of gastric juice in rabbits. Garamin is reported to be an active choleretic. The antibacterial, anthelmintic and anti-proloucal activity have been attributed to the rhizomes.

Alpinia is a genus comprising of about 44 species of aromatic herbs distributed in the old world tropics and for sometimes called *Evango* Ploeging. 17 species are represented in India and some of which are of medicinal importance.


*Alpinia galanga* Willd.

The greater galangal is known in Hindi as "Sadhdun ki jada", and in "Salanjum" in Sanskrit. It is distributed
mainly in the eastern Himalayas and south west India.

Perennial, tuberous, slightly aromatic. Leaves 25 - 45 x 3 - 9 x 11.5 - 21 cm, oblong-lanceolate, acute, glabrous, green above, paler beneath, with slightly cellous white margins. Sheaths long, glabrous ligule reaching 10 mm long, but usually shorter, rounded. Flowers greenish white, in dense flowered peduncles 15 - 30 cm long, branches short; staminal pubescent; pedicels 3 - 4 mm long. Calyx 10 mm long, tubular irregularly 3-toothed. Corolla 3 + 2 cm long; tube 12 - 15 mm long; lobes oblong, obtuse, unequal 6 mm broad, stamen 2 cm long. Fruit, the size of a small cherry, orange red.

In indigenous system of medicine the rhizome are used in rheumatism and external affections specially in bronchial catarrh. Drug is depressant to cardiovascular system, respiration in experimental animals is stimulated by small doses, but depressed by larger ones. It has important action on bronchial.

The steam volatile portion of the extract of the rhizome stimulated the bronchial glands directly while the nonvolatile portion acted reflexly through the gastric mucosa. The alcoholic extract of rhizome produced hypothermia in mice and also potentiated amphetamine toxicity.
The volatile oil of the rhizomes inhibited the growth of *M. tuberculosis* in concentration of 25 mg/mL. The LD₅₀ of the oil in guinea pigs was found to be 0.068 ml/100 g body weight.

The green rhizomes contain 0.04% essential oil 
\[\varepsilon = 10^3 \times (\frac{\text{Absorbance}}{\text{Concentration} \times \text{Pathlength}})\]
\[\varepsilon = 10^3 \times (\frac{0.9780}{0.9550 \times 4.6}) = 1.5164\]
ester value 145 e. It consists of methyl cinnamate 46.0%, cineole 20.0, 30.0%, camphor 5.5% and probably d-pinene. In another finding, caryophyllene, d-borneol were also reported along with e-pinene. The rhizome when successively extracted with solvents exhibited the presence of tannins, phlobaphenes and starch.

Research Envisaged

Zingiberaceae is an important family of medicinal plants. The rhizomes of this family find considerable use in indigenous as well as folk medicines for a variety of purposes. The review of literature suggests that although considerable amount of work has been carried out on the rhizomes of *Z. longa*, other species of this genus offer further scope for studies. *Z. nobilis* and *Z. vaianca* are important articles of commerce and their identity is often confused and these rhizomes also need systematic investigations.

It was proposed to carry out pharmacognostical studies.
of these species to establish the identity of the drugs. The phytochemical screening and investigation for important plant constituents was also planned. A systematic study of the important constituents of drugs for their endowed pharmacological action was also proposed.

The rhizomes of following plants were selected for present study:

- *E. nptuna,*
- *G. mada,*
- *G. ammatifolia,*
- *G. mada,*
- *G. oleacea,*
- *A. oleacea.*

Since these rhizomes are rich in starch, it was thought worthwhile to investigate pharmaceutical properties of the isolated starches along with their physico-chemical properties.
References


23 Ibid., pp. 2421.


28 Halvina, B.K. and Butts, S., "Private Mote Ample Inde", 1940, 10, 64.

30 Patt, S., Ind. Econ. J., 1940, 6, 243 - 45; through Ind. J., 1940, 24, 6019.


