PART I

INTRODUCTION

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The intimate and inseparable relationship of human race with plants can hardly be exaggerated. The advancement of civilization has all the more accelerated the dependence of human race on plants for the essential commodities of life, like food, clothings, fuels, medicines, colouring matters and many other necessary elements. In fact, with the aid of scientific knowledge man is now keen on deriving the benefits of the numerous resources of Nature. It is in this modern urge for making the best use of natural products that phytochemistry has its origin. However, its distinctive existence as an important branch of organic chemistry may well be attributed to the growth and development of different essential oil industries, industries based on colouring matters and subsequent improvement in the field of agriculture.

The modern phytochemical studies may be traced mostly in the European countries. It must deserve mention in this connection that there are many references to the systematic use of herbal drugs as a remedy for diseases in the ancient records like the Rig Veda, Samhitas[1], which seem to

exhibit the practice of the same in a rudimentary state in India. In fact, the use of herbal drugs comprised the major part of chemotherapy in the Ayurbedic and Unani systems of medicine[2,3]. Even today, the plant extracts are extensively used to effect remedy against specific disease. However, the development of the chemistry of the plant products in Europe gave an impetus to the search for active principles in plants of Indian origin.

The result of the investigation, reported in this thesis relates to the phytochemical study of two Indian medicinal plants, belonging to the family Flacourtiaceae. A large number of its species are to be found in the forests of the Himalayan region, specially those attached to Darjeeling district[4], to which the centre, where the present author carried on his investigation also belongs. The family Flacourtiaceae is well known for a long period for its characteristic medicinal oils. Some of the oils are reported to have medicinal application to skin diseases with some success.

What attracted the researcher's attention is the fact that despite its high medicinal potentialities no extensive investigation has been made on this family so far. Lack of extensive work on the family as well as its medicinal implication were the impetuous consideration for the selection of the family, Flacourtiaceae. It will be relevant to make a brief discussion on the morphological features of the plants investigated and the review of the previous works on the plants belonging to this family.

SECTION A

MORPHOLOGICAL FEATURES OF THE PLANTS OF FLACOURTIACEAE FAMILY

Flacourtiaceae[5] is a family of seventy genera and more than five hundred species, which chiefly found in tropical and sub-tropical regions.

Members of this family are usually shrubs or trees.

Leaves are simple, alternate, stipules often soon falling off.

Flours are hermaphrodite or unisexual, often diocious or polygamous and variously arranged. Sepals are sometimes not distinguisable from the petals, imbricate or often in bud. Petals sometimes are not arranged regularly in relation to the sepals — large, small or absent, with or without an opposite scale inside the base imbricate. Stamens are numerous, rarely few hypogymous, free; anthers are two celled, often short, opening lenthwise by slits. Ovary is single celled with one or more pariental placentas or rarely the placentas meeting in the middle; ovules are two or more on each placenta; styles or stigmas as many as the placentas.

Fruits are indehiscent, mostly a berry or drupe, very rarely a capsule, sometimes large. Seeds are with fleshy endosperm and medium-sized embryo; cotyledous often broad.

Gynocardia odorata (R Br) .

A moderate-sized ever green tree; all parts are globrous. It flowers April and May and fruits November to January[6]. Wood is hard, red, but not sufficiently common, nor scrarely straight enough for general use. Bark is

about 6 mm thick, smooth, Leaves which are quite glabrons, in shape a parallel-sided elongated oval about 20 cm long by 6 cm with a very abrupt tip, are alternately arranged along long dropping branchlets. Flowers are pale yellow, almost 3.8 cm diametre, the females larger, fragrant, on 3.8 cm long peduncles fascicled, arising from tuberosities from the trunk and larger branches; stamens in males very numerous, with wooly filaments; staminodes in females 10, pinnatified, villous; barries as large as an orange. It is easily recognized by hard round fruits which grow on the stem and main branches[7]. The fruit is hot, anthelmintic; useful in bronchitis, ulcers, skin diseases, small tumours and slight inflammations, leprosy, diabates, gourrhoea, fever, piles (Ayurveda). Each fruit contains 10-15 seeds.

The oil is used in leprosy and other forms of skin diseases.

In Indo China, the seeds are considered tonic, but they are used externally only; they are highly poisonous. Dry seeds with about 9% water produce up to 0.8% HCN and fresh seeds over 1% HCN[8].

Distribution : Sikkim, Khasia Hills, Chittagong, Martaban Hills, West of the river Tista.

Vernacular : Hindi - Chaulmogra, Chhalmugra, Choulmungri.
Bengali - Chaulmugra, Chaulmugri, Petarkura.
Sanskrit - Alasakapaha, Kushthapa, Sagarodbhuta.
Nepali - Bandre, Gante.

Flacourtia sepiaria (Roxb)

A very thorny small rigid bush; thorns are straight, sharp, up to 5 cm long, sometimes branched, many of them bearing clusters of leaves and flowers, and longer than the leaves; twigs pubescent. Leaves on the young shoots are alternate, on the older fascicled, small, 2-3.5 cm by 12 mm, very rarely 2.5-7 cm in luxuriant plants, elliptic, obovate or obcordate, or orbicular, rarely oblong or oblanceolate, cuneate or narrowed at the base or cordate, more or less crenate-serrate except at the base, glabrous, stiff; secondary nerves 3-4, reticulate between; petioles 3-6 mm long, often pubescent. Flowers are dioecious, small, axillary, greenish, solitary at the ends of the short shoots or in racemose clusters shorter than the leaves. Male sepals are ovate, obtuse. Female flowers on pedicels are about 5 mm long, sepals orbicular. Styles 3-7, stigmas bilobed. Berry is globular, smooth, reddish, turning dark-coloured when ripe, with about 6-10 mm diametre; pyrenes angular, rugose; testa smooth. Cotyledons are broadly orbicular, base sometimes cordate; radicle excluded, straight.

This tree is said to yield an antidote to snake-bite from an infusion of the leaves and roots. The bark triturated in sesamum oil, is used as a liniment in rheumatism.

In Madagascar an infusion of the leaves is given in cases of snake-bite; the bark triturated in oil is used as a liniment in gout; the ashes of the root are considered serviceably in kidney diseases.

Neither the leaves nor the roots are an antidote to snake venom.

Distribution : Kumaon, dry jungles throughout Bengal, Bihar, Orissa[9].

Vernacular : Hindi - Kondai, Kondari.

SECTION B

REVIEW OF THE INVESTIGATED PLANTS OF FLACOURTIACEAE

The Flacourtiaceae family is well known for its characteristic medicinal oils obtained from their seed kernels. Some of the plants are reported to have medicinal applications in liver diseases, diarrohea, enlarged spleen and to relieve nausea. A short review of the plants of this family which have been investigated by different workers are given in the following.

Hydrocarpus kurzii

Oils obtained from their seed kernals, Chaulmoogra oil[10] has been used for the treatment of skin diseases, especially for leprosy[11] and as oinment for tuberculosis[12] patients. Although many fatty acids, monosaccharides and glycerides have been reported from seed and bark extracts of the plant, no triterpenoid has been reported.

Hydnocarpus octandra

Mangostin[13] and six new triterpenoids[14], namely octandrolal (3α-hydroxy-30-friedelanal), octandrolol (friedelan-3α,30-diol), octandrolic acid (3α-hydroxy-30-friedelanoic acid), octandronal (3-oxo-30-friedelanal), octandronol (3-oxo-30-friedelanol) and octandronic acid (3-oxo-30-friedelanoic acid) have been isolated from the bark of plant.

Hydnocarpus venenata

Therapeutically effective oils[15] have been obtained

from Hydnocarpus venenata. The bark of the plant has been found also to contain small amounts (approx 0.004%) of betulinic acid (3β-hydroxy-20(29)-lupen-28-oic acid), O-acetylbetulinic acid, ursolic acid (3β-hydroxy-12-ursen-28-oic acid), O-acetylursolic acid and sitosterol[16].

Hydnocarpus anthelminthious

Therapeutically effective oils have been isolated from seeds of Hydnocurpus anthelminthious[17]. The seeds have also been found to contain monosaccharides and glycosides[18].

Caseria thwaitessi

The timber and bark of the plant yielded β-amyrin (12-oleanen-3β-ol) and sitosterol[16].

Chlorocarpa pentachista

Cycloartenol (9β,19-cyclo-24-lanosten-3β-ol), cycloarlenone (9β,19-cyclolanost-24-en-3-one) and sitosterol have been reported to be present in the bark and timber of the plant[16].

Erythrospermum zeylanicum

Betulinic acid (3β-hydroxy-20(29)-lupen-28-oic acid) is found to be present in bark and sitosterol in bark and timber of the plant[16].

Scolopia schreberi

β-Amyrin, 3β-friedelanol, friedelan-3-one and sitosterol have been reported to be present in the bark and timber of the plant[16].

Trichadena zeylanica

From the bark and wood extracts of Trichadena zeylanica, six new triterpenoids have been reported[19]. The triterpenes are trichadenic acid A (3α-hydroxy-26-friedelanoic acid), O-acetyltrichedenic acid A (3α-acetoxy-26-friedelanoic acid), O-acetyltrichadenic acid B (3β-acetoxy-26-friedelanoic acid), trichadonic acid (3-oxo-26-friedelanoic acid), trichadenal (3β-hydroxy-26-friedelanal), and O-acetyltrichadenal (3β-acetoxy-26-friedelanal).

Xylosma velutina

Xylosma velutina afforded three products[20]. Two were flavonoids, namely, velutin (3',7-dimethoxy-4',5-dihydroxyflavone) and genkwanin (4',5-dihydroxy-7-methoxyflavone) and the third one was a new triterpenoid acid, velutinic acid (21α-hydroxy-3-oxo-28-friedelanoic acid).

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