

## CHAPTER 3

### REVIEW OF LITERATURE

#### 3.1 PLANT INTRODUCTION

*Limonia acidissima* Linn (*Feronia elephantum*, *Feronia limonia*, *Hesperethusa crenulata*, *Schinus limonia*) family Rutaceae (Citrus family). It belongs to monotypic genus *Limonia*, native to India, Pakistan, Srilanka and Southeast Asia east to Java. Common names in English include wood-apple, elephant-apple, monkey fruit, curd fruit and Kath bel. This plant is prescribed as a traditional medicine for the treatment of various ailments [50].

*Limonia acidissima* Linn fruits (Figure 3.1 and Figure 3.2) are commonly known by the following vernacular names.

Bengali	:	Bela, Kait, Koth bel
English	:	Curd fruit, Elephant apple, Monkey fruit, Wood-apple
French	:	Citron des mois, Pomme d' elephant, Pomme de bois
Hindi	:	Bilin, Kait, Kaitha or Katbel, Kavitha
Javanese	:	Kawis or Kawista
Kannada	:	Belada Hannu / Byalada Hannu
Lao (Sino-Tibetan)	:	Ma-fit
Malay	:	Belinggai, Gelinggai
Marathi	:	Kavath
Oriya	:	Kaitha

Sanskrit	:	Kapitha
Sinhalese	:	Divul.
Tamil	:	Velam, Velan, Vila, Vilanga
Telugu	:	Vellaga pandu
Thai	:	Ma-khwit



**Figure 3.1** *Limonia acidissima* tree with its fruits



**Figure 3.2** Fruits of *Limonia acidissima* and its cross section

*Limonia acidissima* is a deciduous, slow-growing, erect tree with a few upward-reaching branches bending outward near the summit where they are subdivided into slender branchlets drooping at the tips. Fruit round to oval, 5-12.5 cm wide, with a woody, amazingly hard rind which can be difficult to crack, greyish-white, scurfy rind about 6 mm thick, pulp brown, mealy, odorous, resinous, astringent, acid or sweetish, with numerous small, white seeds scattered through it. There are two forms, one with large, sweet fruits and the other with small, acid fruits [51].

### 3.2 MEDICINAL CLAIMS

*Limonia acidissima* is well-known for its medicinal properties. This species has numerous described medicinal uses as capably. It has a wide range of biological activities viz., adaptogenic activity, for blood impurities, for leucorrhoea, for dyspepsia [52], for jaundice and hepatoprotectant [53]. All parts of the plants are prescribed in indigenous system of medicine for the treatment of various ailments.

Leaves, barks, roots and fruit pulp are all used against snakebite [54]. The bark is chewed with that of *Barrington* and applied on venomous wounds.

In India the fruit is used as a liver and cardiac tonic, in diarrhoea and dysentery, in effective treatment for Hiccough, in sore throat and diseases of the gums. The pulp is poultice onto bites and stings of venomous insects.

Mixture of young leaves juice, milk and candy is given as a remedy for biliousness and intestinal troubles of children.

The powdered gum, mixed with honey, is given to overcome dysentery and diarrhoea in children [55].

Oil derived from the crushed leaves is applied on itch and the leaf decoction is given to children as an aid to digestion. The spines are crushed with those of other trees and an infusion taken as a remedy for menorrhagia.

Traditionally, the constituents (in paste form) from the stem bark of *Limonia acidissima* is mixed with water and applied mainly to the face [56]. It is believed that the regular application on the skin helps to keep skin cool, smooth, fair and well-textured complexion [57]. It is also known to be protecting against skin cancer by blocking UV rays. 'Thanaka', a root paste made from the pulp of *L. acidissima*, is a facial cosmetic to remove small spots and lesions on the skin [58].

### 3.3 CONSTITUENTS

Food value per 100g of edible pulp (ripe): Moisture, 74.0%; protein, 8.00%; fat, 1.45%; carbohydrates, 7.45%; ash, 5.0%; calcium, 0.17%; phosphorus, 0.08%; iron, 0.07%; tannins, 1.03% (according to analysis in India).

The unripe fruits contain 0.015% Stigmasterol. Leaves contain Stigmasterol (0.012%) and Bergapten (0.01%) and bark contains 0.016% Marmesin [59].

### 3.4 PHYTOCHEMICAL REVIEW

The different parts of the plant have been investigated phytochemically by several workers and found to contain coumarins, furanocoumarins, lignans, alkaloids, steroids and flavonoids. The plant has been reported to contain limonoids in stem bark and root bark, alkaloids, benzoquinone, flavonoids, triterpenoids in root bark, stem bark, leaves and fruits. The unripe fruits contain Stigmasterol. Root bark yielded Osthenol, Geranyl umbelliferone, Marmin, Marmesin, Aurapten, Bergapten, Isopimpinellin, Fern oil [60-63].

**Table 3.1 The structures of isolated compounds**

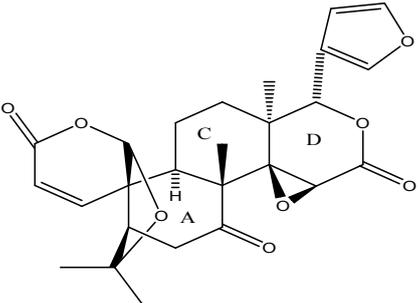
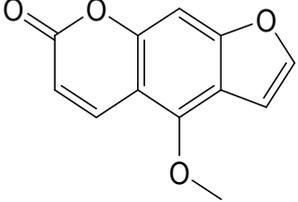
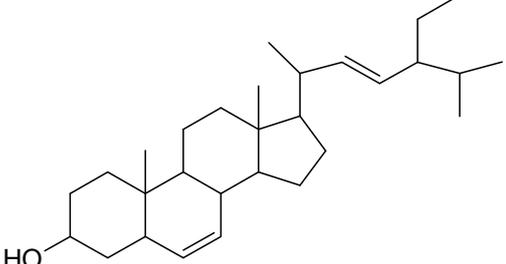
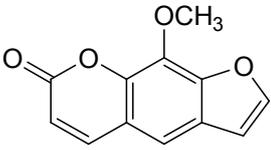
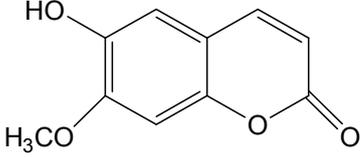
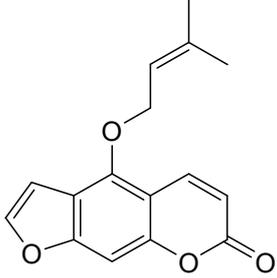
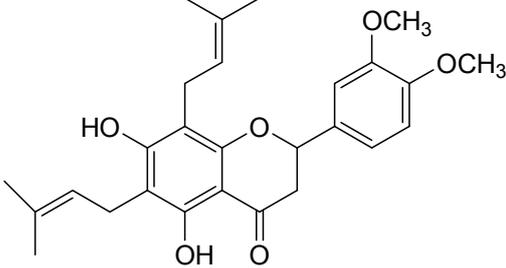
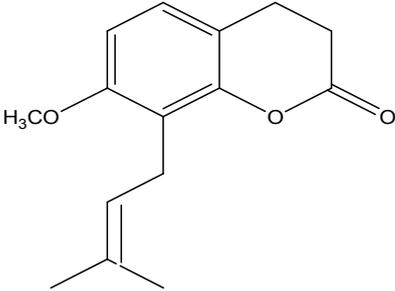
Structure of Isolated Compounds	Name of the compound
	Acidissimin
	Bergapten
	Stigmasterol
	Xanthotoxin

Table 3.1 (Continued)

Structure of Isolated Compounds	Name of the compound
	<b>Scopoletin</b>
	<b>Isoimperatorin</b>
	<b>5,7-dihydroxy-3',4'-dimethoxy-6,8-di(3-methylbut-2-enyl) Flavone</b>
 <p style="text-align: center;">Ostheno</p>	<b>Ostheno</b>

### 3.4 PHARMACOLOGICAL REVIEW

Rahman et al (2000) have studied Fruits and stem bark of *F. limonia* for larvicidal activity [64]. Rahman et al (2002) have screened the stem bark for antimicrobial activity [65]. Ahmed et al (2008) proved anti-inflammatory, antipyretic and analgesic activities of the Fruit pulp of *F.limonia* as well as the anthelmintic activity of leaves of the *F. limonia* [66,67], Kamat et al (2006) have proved the hepatoprotective activity of Leaves of the *F. limonia* [68].