CHAPTER-II

PLANT SELECTED FOR STUDIES
2.1 Cleome gynandra
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Following three plants selected for the present study:

- *Cleome gynandra*,
- *Cocculus hirsutus*,
- *Lantana camara*.

2.1 Cleome gynandra

*Cleome gynandra* is a member of the family Cleomaceae, which is formerly included in Caprideraceae. It consists of 46 genera and about 700 species. Various species of Cleome are used medicinally in India, China, Philippines, North and Central America. It is commonly called as Cat’s whiskers. It is a common weed in all tropical countries. It is an erect herbaceous annual herb and predominantly used as a leafy vegetable. In Africa the tender leaves or young shoots and often the flowers as well are eaten boiled as a potherb, tasty relish, stew or side dish. In India it is eaten as a potherb and flavouring in sauces and in Thailand it is consumed fermented as a product called ‘Pak-sian-dong’.

According to Landor (1940) the plant referred to as *Gynandropis gynandra* and also known as among Malayas as maman putch, maman hantu or kemaman. It is a type of edible wild leafy vegetable that plays an important role in African agriculture and nutritional system.

Its root has a hot sharp taste and used against ‘vata’ stomach, tumours, ulcers, pain and earache and spleen enlargement. In combination with other drug the root is recommended for the treatment of snakebite and
scorpion sting. The leaves are applied externally to prevent the formation of pus. In the Gold coast the juice of the leaves commonly used for curing the earache and sometimes for curing headache. As it causes irritation when applied freely to eye or the ear hence, it should be used with great care. The Shangaans of South Africa apply the pounded leaf as a counter-irritant in rheumatism; neuralgia, headache and a stiff neck with care to withdraw the application before it produces a blister. In Lakhimpur (Assam), a paste of the seeds is applied locally in headache (carter) and in the Rajputana Desert the seeds infused in boiling water is commonly used as a cure for coughs, bruised; and applied as poultice to the sores that have maggots in them.

In Indo-China the plant is used as an antiscorbutic. Reputes for cure of cobra bite in Ceylon, the roots, leaves and seeds are applied to the bruised wounds. The plant is an antidot to snake and scorpion venom and it is reported to be useful for external application in the treatment of snakebite or scorpion sting (Kirtikar and Basu, 1976). Pammel (1911) describes the irritant properties of *Cleome graveolens*.

Various species of Cleome which are used medicinally are:

- *Cleome gynandra* Linn.
- *C. monophylla* Linn.
- *C. viscosa* Linn.
- *C. felina* Linn.
- *C. heptaphylla* Linn.
- *C. chelidonei* Linn.
• *C. graveolens* Ref.

• *C. brachycarpa* Vahl.

• *C. droserifolia*

The common names of *Cleome gynandra* in various languages are Tilvan and Kanphodi (Marathi), Hurhul and Karalia (Hindi), Ajagandha and Arkapusika (Sanskrit), Kinro (Sindhi), Vaminta (Telgu).

Dalziel (1937) noted that in West Africa the bruised leaf of *Gynandropsis pentaphylla* has been applied as a rubefacient and counterirritant. Chopra *et al.* (1956) noticed the rubefacient and vesicant properties of the seeds and leaves. Behl *et al.* (1966), Oliver (1959) and Quisumbing (1951) refer the use of the bruised leaf as a counterirritant. Kjaer (1960) reported glucocapparin and other thioglucosides from which isothiocynate and other mustard oil are released when the seeds are crushed. Qin *et al.* (2000) isolated a trinortriterpenoid from *Cleome chrysanthha*.

Bhalla *et al.* (1992) found that leaf parts of *Cleome gynandra* Linn. has been used in rheumatism, neuralgia, headache and stiffness. Its warm juice is a popular remedy for ear diseases. Saxena and Vyas (1983) reported that expressed juice of *Cleome gynandra* (Hurhur) fresh leaves is applied externally for the cure of pyorrhoea and it is also used as a wormicidal.

Ahmad *et al.* (1986) found triterpinoids and dilactone compounds in *Cleome brachycarpa*. Kumar *et al.* (1987) reported the presence of Clemiscoinds D, A and coumarino-lignan from the seeds of *Cleome viscosa*. 
Ahmad et al. (1987) reported the presence of deacetoxybrachycarpone biterpinoid, cabralealactone and ursolic acid.

Nagaya et al. (1997) found cytotoxic triterpines in Cleome africana. Nicola et al. (1996) studied the extract of Cleome drosorifolia in improving glucose and lipid metabolism and its relation to insulin resistance in fatty liver. Raghunathan et al. (1997) reported the presence of rutin from flowers of Cleome gynandra. Perumal et al. (1999) showed the activity of Cleome gynandropis and Ageratum conzoides in controlling the growth of Alkaligenes viscolatis, Klebsiella aerogenas, Bacillus cereus and Streptococcus pyrogens. Fushiya et al. (1999) isolated two flavonoids from Cleome drosorifolia, which suppresses the NO production from immune cells. Das et al. (1999) isolated cleogynol, a triterpenoid, from Cleome gynandra. Hashem et al. (2000) identified some isothiocyanates in the extract of Cleome chrysantha and explained that these isothiocyanates and the volatiles of the herb showed good antimicrobial activity against E. coli, Pseudomonas pulida and Rhizobium meloloti. Deena and Thoppil (2000) tested essential oil of Lantana camara, against seven bacteria and eight fungi, showed a wide spectrum of antibacterial and antifungal activities. Devi et al. (2003) observed the methanolic extract of Cleome viscosa Linn. showed significant reduction in normal body temperature and yeast-provoked elevated temperature in a dose-dependent manner. Williams et al. (2003) studied anti-bacterial effects of the haxene extract of Cleome viscosa L. and the extract was found to be a potent anti-bacterial agent according to the thin layer chromatography autobiographic assay. Devi et al. (2004) observed that the methanolic
extract of Cleome viscosa Linn. in doses of 200-400 mg/kg has significant psychopharmacological activity. Hebbar et al. (2004) reported that many herbal plants including Cleome gynandra are used to treat toothache. Narendhirakanan et al. (2005) reported that methanolic extract of Cleome gynandra are used for the treatment of rheumatic and other inflammatory condition, results demonstrate that the plant extract has no harmful effect and exert in vivo anti-inflammatory properties against adjuvant-induced arthritis.
2.2 Cocculus hirsutus
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*Cocculus hirsutus* is a member of the family Menispermaceae and commonly known as "Jamti ki bel" (Local), 'Dahidahika' (Oriya), 'Ulumchum' (Santal) and 'Vasang' etc. It is a climbing shrub. Its various parts are known for their medicinal properties in indigenous system of medicine. (Chopra et al., 1958, Kirtikar et al., 1933, Nadkarni, 1976)

*Cocculus hirsutus* is a widely growing plant found in the plains of India in dry localities. The plant is a climber with green flowers. Flowers bloom in the month of February-March and fruits in May-June. In some places it is found along with water stream, hedges. Tribals of Jhabua, Khargone and Dhar use the fruit of *Cocculus hirsutus* to cure jaundice. (Samvatsar et al., 2000) Various species of Cocculus are as follows:

- *Cocculus orbiculatus*
- *Cocculus trilobas*
- *Cocculus laurifolius*
- *Cocculus carolinus*
- *Cocculus pendulus*

Earlier investigation on various parts of this plant led to the isolation of trilobene, isotrilobene, coclaurine, magnoflorine and sitosterol (Chughtai et al., 1979). Indian tribes used it for a wide range of ailments including constipation and kidney problems (Kirtikar et al., 1933, Caius et al., 1986, Usher et al., 1984)
The aqueous extract of the aerial parts and roots are used for the treatment of rheumatism fever and also as a diuretic and laxative (Girach et al., 1994).

Elsohly et al. (1976) isolated the alkaloids; cocculolidine and cocculine from the ethanolic extract of fruit of Cocculus carolinus D.C. Ahmad et al. (1987) isolated a triterpenoid “hirsudiol” from the aqueous extract of the Cocculus hirsutus. Itokawa et al. (1987) reported an antitumor morphinane alkaloid, sinococuline, from Cocculus trilobus. Ahmad et al. (1991 and 1993) isolated cohirsinine and Jamtine alkaloids from Cocculus hirsutus. Satyanarayan et al. (2001) described hypoglycaemic and cardiotonic properties of Cocculus hirsutus. Ganapaty et al. (2002) reported that aqueous extract of Cocculus hirsutus produce sedation, increased urination and defecation at all test doses. Extract or powdered leaves of Cocculus hirsutus cures many diseases like dysentery, flatulence, indigestion and spermatorrhoea. Chang and Wu (2005) isolated two new bisbenzylisoquinolines alkaloids and two new amidic aporphines from Cocculus orbiculatus, and the alkaloid coccuorbiculatine A, showed cytotoxic activity against cancer cell lines. Rahman et al. (2004) phytochemically investigated Cocculus pendulus resulted in the isolation of two new and three known bisbenzylisoquinoline alkaloids and these alkaloids showed cholinesterase inhibitory activities.
2.3 Lantana camara
2.3 *Lantana camara*

*Lantana camara* is a member of family Verbenaceae contained seven species, six from South America and one from Ethiopia. Now it is very common and occurs in approximate 50 countries where several species are cultivated under hundreds of cultivars names. The recorded number of Lantana species is about 150. The genus is difficult one to classify taxonomically, as species are not stable and hybridisation is widespread. The shape of the inflorescence changes with age and colour of the flower vary with age and maturity (Munir *et al*., 1992).

*Lantana* derives from Latin word “lento” means to bend, and also it resembles a little, the genus Viburnum. *Lantana camara* is commonly known as wild or red sage. It grows at an elevation up to 2000m in tropical, sub-tropical and temperate regions (Sharma *et al*., 1988). The plant is an aggressive, obligate out breeder weed that has invaded vast expanses of pastures, orchards and forest areas in many tropical and sub-tropical regions. *Lantana camara* is said to form a useful hedge and to provide a good preparation for crops. The ash of *Lantana camara* is rich in potassium and manganese.

Some taxa of *Lantana camara* are toxic to ruminants and poisoning has been reported from many parts of India, Australia, New Zealand, South Africa and the America (Seawright *et al*., 1983; Pass *et al*., 1991). Various compounds like lantadenes, triterpenes, oclanolic acid and ursolic acid etc. have been reported from *Lantana camara*. Oclanolic acid and ursolic acid have significantly inhibited human leukocyte elastase activities. This
enzyme participates in the destruction of elastin and plays a role in chronic disorders such as pulmonary emphysema, cystic fibrosis, hepatitis and rheumatic arthritis (Rwangabo et al., 1988).

The plant has been used in many parts of the world to treat a wide range of disorders. Lantana leaves and twigs are often used in India as green milk. In tropical countries the ripe blue bark berries are eaten, but ingestion of the green berries has led to human fatalities (Mortan, 1994, Ross et al., 1999). *Lantana camara* found use in folk remedies for cancer and tumours. A tea prepared from the leaves and flowers was taken against fever, influenza, stomachache, cold, rheumatism, asthma and high blood pressure. In some places of the world, the leaves were made into a poultice to treat sores, chicken pox and measles. Decoctions were applied externally for leprosy and scabies.

There are various species of Lantana from which many compounds of our interest were isolated, these are:

- *Lantana achyranthifolia*
- *Lantana indica*
- *Lantana hybrida*
- *Lantana liacia*
- *Lantana montevidensis*
- *Lantana orangemene*
- *Lantana salviifolia*
- *Lantana tiliaeefolia*

Yamauchi et al. (1976) explained that geniposide, the biosynthetic precursor of thevesid, isolated from roots of *Lantana camara*, was
metabolised to the aglycone genipin which was found in all the gastrointestinal tract especially the cecum and the colon of mice. Baslas et al. (1980), Baslas et al. (1980) reported that the essential oil of L. orangemene was obtained in 0.2% yield and was shown to consist primarily of monoterpenes. Johns et al. (1983) showed weak antibacterial and antifungal activity of umuhongerin isolated from the leaves of Lantana trifolia and also explained that it is the species used in the folk medicines of Rwanda. Seawright et al. (1983) reported that some taxa of Lantana camara are toxic to ruminants and poisoning has been reported from Australia, India, New Zealand, South Africa and America. Rwangabo et al. (1988) studied about the most common Lantana in Brazil, i.e. Lantana tiliacaria cham. Leaves and stem, did not contain lantadene but the content of ursane derivatives was higher. Some compounds like ursonic, ursolic and oleanonic acid were isolated from it. Singh et al. (1996) isolated some minor constituents from Lantana camara. Pass (1991) showed that lantana is generally toxic. Singh et al. (1991) explained that Lantana indica Roxb. is a shrub native to India and it has been used as a sudorific, intestinal, antiseptic, diaphoretic and in the treatment of tetanus, rheumatism and malaria in the Ayurvedic System of medicine. A rare flavone glucoside is isolated from the polar fraction of the leaves of Lantana camara. The antibacterial activity is done against a wide range of Gram+ve and Gram-ve bacteria to determine the minimum inhibitory concentration.

Ghisalberti et al. (2000) isolated iridoid glycoside and is used in folk medicine for the preparation of bitter tonics, sedatives, febrifuges, cough