

**ANISOMELES INDICA: AN OVERVIEW**

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**ABSTRACT**

*Anisomeles indica* commonly known as 'Indian Catmint' is native to Southeast Asia and is distributed throughout India, China, Japan and southwards from Malaysia to Australia. The plant is used traditionally as an analgesic, anti-inflammatory and in skin problems such as snakebites. Medicinally it has been proven to possess various pharmacological activities like antioxidant, antimicrobial, anti HIV, anti *Helicobacter pylori* and anticancer activity. It is used in chronic rheumatism. Further studies reveal the presence of various phytochemical constituents mainly triterpenes,  $\beta$ -sitosterol, stigmaterol, flavones, apigenin and ovatodiolides etc. These studies reveal that *Anisomeles indica* is a source of medicinally active compounds and have various pharmacological effects; hence, this drug encourage finding its new therapeutic uses.

**KEYWORDS:** *Anisomeles indica*, Lamiaceae, Triterpenoids.

**INTRODUCTION**

*Anisomeles indica* (Lamiaceae) is a camphor-scented perennial woody shrub. It is found growing wild along borders of settled areas at low and medium altitudes. It is used in folk medicine in the treatment of diverse conditions such as inflammatory skin diseases, liver protection, intestinal infections, abdominal pain and immune system deficiencies. Aerial parts of the plant are valued as stimulant, expectorant, diaphoretic and insecticide. Leaves are considered useful in chronic rheumatism, psoriasis and other chronic skin eruptions. Bruised leaves are applied locally in snake bites.<sup>1,2</sup>

Figure 1 : View of *Anisomeles indica* plant.

Subphylum: Euphyllophytina

Infraphylum: Radiatopses

Class: Magnoliopsida

Subclass: Lamiales

Superorder: Lamiales

Order: Lamiales

Family: Lamiaceae

Subfamily: Pogostemoideae

Genus: *Anisomeles*Specific epithet: *indica*Botanical name: *Anisomeles indica* (L.) Kuntze**Botanical Description**Figure 2 : Aerial parts of *Anisomeles indica***Vernacular Names**

Hindi: Kala bhangra, Gobara

Manipuri: Thoiding angouba

Marathi : Gopali

Malayalam: Chedayan

Telugu: Adabeera

Kannada: Mangamari soppu

Bengali: Gobura, gopali, apang

Konkani : Gopali

Malaysia: Babadotan

Indonesia : Javanese

Philippines: Kabling parang

Thailand: Komko huai

Laos: San nga

**Taxonomical Classification**

Domain: Eukaryota

Kingdom: Plantae

Subkingdom: Viridiplantae

Phylum: Tracheophyta

The morphological characteristics of the leaves of *Anisomeles indica* are acute apex, crenate margin, asymmetric base, reticulate venation and hairy to softly pubescent shape. Leaves surface thick, with dimension 3.8-10 x 5.5-6 cm. Color is green to yellowish green; taste is slightly astringent with characteristic odor.<sup>3</sup>

Stem is erect, brown to pinkish black, acutely quadrangular, softly pubescent; internodes 7 to 10 cm long; pith white, fracture powdery & fibrous.

The inflorescence is a terminal spike, accompanied by more than 2 lateral spikes. The sepal measures 6 mm x 6.5 mm with the longest teeth 1.7 – 2 mm long.<sup>4</sup>

The fruit is 9 – 10 mm long where the upper part of the tube and teeth are hairy inside and the petal is up to 11 mm long while the lower lip measures about 8 mm x 3 mm, greenish to whitish, and with dark red lines inside but sometimes purple or blue. The filaments are didymous and 5 – 6 mm

long with the style about 9 mm long. The nutlets are subglobular, measuring 1.2 mm × 1 mm and shiny black.<sup>3,5</sup>

### Microscopic Description

#### Leaf

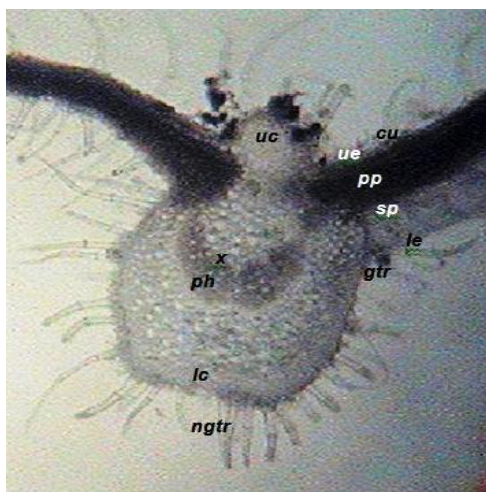


Figure 3 : Trans section of *Anisomeles indica* leaf.

[cu: cuticle, ue: upper epidermis, uc: upper collenchyma, pp: palisade parenchyma, sp: spongy parenchyma, x: xylem, ph: phloem, lc: lower collenchyma, le: lower epidermis, gtr: glandular trichomes, ngtr: non-glandular trichomes]

T.S. shows it is a dorsiventral leaf. In T.S., the upper and lower epidermises comprise uniseriate, spherical to polygonal cells. Both epidermises are covered with cuticle. The cuticle thickness is approximately the same on both epidermises in *Anisomeles indica*. There are covering and non covering trichomes on both epidermises. Numerous caryophyllaceous or diacytic stomatas are present in epidermises. Mesophyll is traversed by large number of veins and is represented by groups of few spiral vessels.

*Anisomeles indica* midrib shows concavo-convex outline in the basal and middle region which becomes more or less plano convex in the apical region. 4-6 layered collenchymas located below both epidermises, vascular bundles are surrounded by a parenchymatic bundle sheath. Palisade parenchyma are triseriate under the upper epidermis. Collateral vascular bundle is prominent, occupying the central portion of the midrib. Xylem vessels are covered by xylem fibres.<sup>5,6</sup>

#### Stem

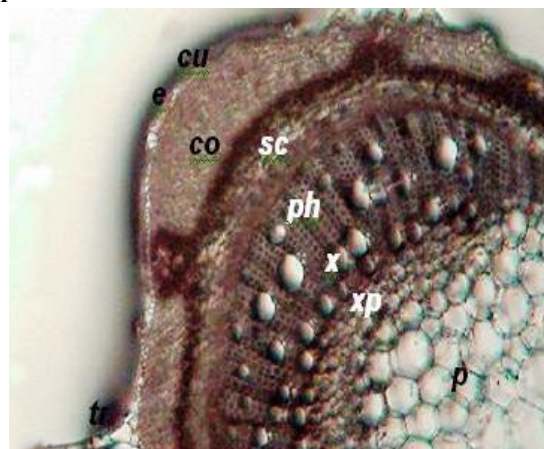


Figure 4 : Trans section of *Anisomeles indica* stem.

[cu: cuticle, e: epidermis, tr: trichomes, co: cortex, sc: sclerenchyma, ph: phloem, x: xylem, xp: xylem parenchyma, p: pith.]

T.S. of stem is quadrangular in shape exhibiting 4 equidistantly placed pubescent ridges, central wide parenchymatous 4 angled pith encircled by a ring of xylem, very narrow phloem and collenchymatous hypodermis. The epidermis consists of single layer rectangular cells, and is surrounded by a thin cuticle layer, traversed with few stomata and bearing simple covering multicellular (2-3 cell) and glandular (non-covering) trichomes. Cortex is collenchymatous, 2 to 4 layered but many more; reaching up to 10 beneath the primary ridges. Endodermis is distinct. There are lignified sclerenchyma fibers between the cortex and vascular tissue. Sclerenchyma fibers are seen as a continuous ring. Cambium is indistinguishable. Central wide pith is parenchymatous; it shows presence of simple starch grains and calcium oxalate crystals.<sup>5</sup>

#### Phytochemical Studies

Preliminary chemical examination of *Anisomeles indica* revealed presence of triterpenoids in entire plant. Whole plant is reported to contain anisomelic acid (terpenoid), ovatodiolide (terpenoid), 4,7 - oxycycloanisomelic acid (terpenoid), iso-ovatodiolide,  $\beta$ -sitosterol, stigmasterol, flavones and apigenin and yields an essential oil.<sup>7,8</sup>

Constituents of the essential oils of *Anisomeles indica* are found to be  $\alpha$ - pinene (7.0 %),  $\beta$ - pinene (28.0 %), d- limonene (3.0 %), methyl chavicol (19.2 %), d- alpha - thujene (3.5 %), citral (9.5 %), borneol (2.13 %), 1,8 cineole (11.9 %),  $\alpha$ - terpineol (2.2 %), eugenol (24.5 %), azulene (6.0 %), and caryophyllene (15.2 %).<sup>9</sup>

14 constituents were isolated from the methanolic extract of the whole plant of *Anisomeles indica* which were (1) 7-methoxy-3,4,5,6-tetrahydroxyflavone (pedalitin), (2) apigenin, (3) ovatodiolide, (4) methylgallate, (5) 3,4-dihydroxybenzoic acid, (6) scutellarein 7-O-d-glucuronide methyl ester, (7) apigenin 7-O-glucuronide, (8) desrhamnosylverbascoside (calceolarioside), (9) cistanoside F, (10) betonyoside A, (11) campneoside II, (12) acteoside, (13) isoacteoside and (14) apigenin 7-O-d-(6-O-p-coumaroyl)glucopyranoside (terniflorin) respectively.<sup>10,11</sup>

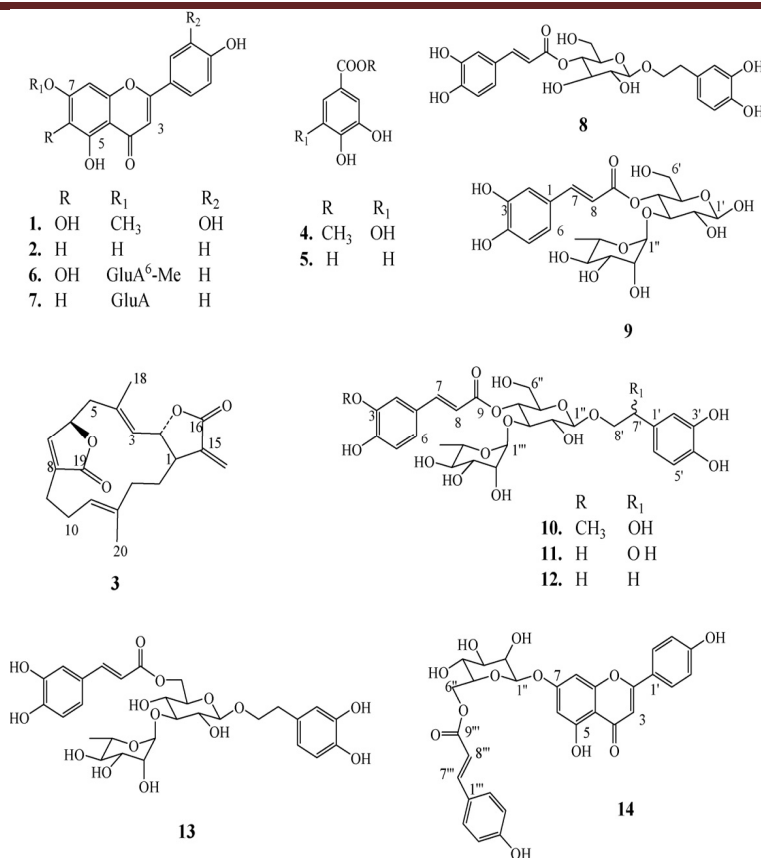


Fig. 5 : Chemical structures of *Anisomeles indica* isolates (GluA = glucuronic acid).

[(1) 7-methoxy-3,4,5,6-tetrahydroxyflavone (pedalitin), (2) apigenin, (3) ovatodiolide, (4) methylgallate, (5) 3,4-dihydroxybenzoic acid, (6) scutellarein 7-*O*-*d*-glucuronide methyl ester, (7) apigenin 7-*O*-glucuronide, (8) desrhamnosylverbascoside (calceolarioside), (9) cistanoside F, (10) betonyoside A, (11) campeoside II, (12) acteoside, (13) isoacteoside and (14) apigenin 7-*O*-*d*-(6-*O*-*p*-coumaroyl)glucopyranoside (terniflorin)]

## Pharmacological Studies

### Anti-HIV activity

The cytoprothic effects of HIV-1 infection was inhibited by ovatodiolide over a modest concentration range with EC<sub>50</sub> of 0.10 µg/mL and IC<sub>50</sub> of 1.20 µg/mL with maximum cellular protection of 80–90%. Ovatodiolide was completely cytotoxic to the host cells at 5.0–6.0 µg/mL. The anti-HIV activity of ovatodiolide was compared to that of AZT, a known anti-HIV drug which showed an EC<sub>50</sub> of 0.0037 µg/mL.<sup>12</sup>

### Anti-Helicobacter pylori activity

The ethanol (95%) extracts of the leaf and stem of *Anisomeles indica* showed strong anti-*H. pylori* activities with minimum inhibitory concentration (MIC) values ranging from 2.56 to 5.12 mg/mL against 3 strains of *H. pylori*.<sup>13</sup>

### Analgesic, anti-hyperalgesic and anti-inflammatory activities

The leaves and stems of pre-flowering and flowering *Anisomeles indica* were extracted with water and tested for analgesic and anti-hyperalgesic activities with aspirin as the control compound. Testing for analgesic activity was conducted in male and female rats using the hot plate and the tail flick techniques. While testing for antihyperalgesic activity was conducted in male rats which were injected with 1% carrageenan suspension and the reaction time assessed using the hot plate technique. The extract from pre-flowering plant showed a dose-dependent analgesic effect up to 6 h of treatment in both tests. The analgesic effect of the pre-flowering plant extract was not affected by the gender nor by the stage of the estrous cycle and was not abolished by naloxone. This extract also showed a dose-dependent

antihyperalgesic activity. In contrast, the extract obtained from flowering plants showed no analgesic activity at 500 mg/kg.<sup>14</sup>

The extract from pre-flowering plants reduced the amplitude of spontaneous contractions of the isolated diestrous rat uterus and induced plasma membrane stabilization of rat erythrocytes in a dose-dependent manner, all of which suggests that the analgesic and antihyperalgesic effects are mediated by the impairment of prostaglandin synthesis through inhibition of COX-1.

Anti-inflammatory activity of the plant extracts was evaluated using carrageenan-, formaldehyde- and adjuvant-induced paw edema models in rats. The pre-flowering plant extract elicited a dose-dependent anti-inflammatory effect in all 3 models while no significant anti-inflammatory effects were seen with the extract from flowering plants. The extract from pre-flowering plants also showed significant and dose-dependent anti-histamine and free radical scavenging activities, although the *in vitro* activity of lipoxygenase was not affected. Both its antihistamine and its free radical scavenging effects were thought to contribute to its anti-inflammatory activity.<sup>15</sup>

It was found that the diterpenoid, flavonoids and acteoside compounds of *Anisomeles indica* showed anti-inflammatory properties. *Anisomeles indica* also inhibit DNA replication by inhibiting NO, TNF-α and IL-12 without affecting cell viability in a dose-dependent manner.<sup>16</sup>

### Anticancer activity

The ovatodiolide compound showed cytotoxicity effects by causing apoptosis in producing reactive oxygen species and



down-regulation of FLICE inhibitory protein leading to cell cycle arrest towards oral squamous cell carcinoma.<sup>17</sup>

#### TOXICITIES

Rats treated with oral doses of aqueous extracts obtained from pre-flowering plants (125, 250 & 500 mg/kg) and flowering plants (500 mg/kg) did not show any overt signs of acute toxicity or stress. The body weights of the rats were not altered nor were the serum activities of AST and ALT (liver marker enzymes) or serum concentration of albumin. Rats given the extract from pre-flowering plants for 30 days showed a markedly reduced serum creatinine concentration.

Phytotoxicity effect from leaf and root of *Anisomeles indica* towards little seed canary grass makes it a useful herbicide in wheat fields.<sup>18</sup>

#### CONCLUSION

In Chinese and Indian system of medicine *Anisomeles indica* has been widely used to treat gastric dysfunction, inflammatory disorders and hypertension. It possesses carminative, astringent and tonic properties. The dried or fresh material is used as a wash for external afflictions, eczema, pruritis and skin problems such as snakebites. The leaves are chewed for toothaches. It has been used in rheumatism, cold, fevers, abdominal pain, intermittent fever, and dyspepsia. The plant is burned to act as a mosquito-repellent. A decoction from the aerial parts of the plant is used in Sri Lanka as an analgesic. Hence it is clear that although *Anisomeles indica* holds a good promise for managing variety of ailments yet the other biological effects of *Anisomeles indica* remain unknown. Further studies are thus required to explore the nature of compounds present in the plant and their effects.

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