**ANDROGRAPHIS PANICULATA: A REVIEW ON ETHNOMEDICINAL POTENTIAL AND BIOLOGICAL ACTIVITIES**

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Abstract: *Andrographis paniculata* Nees (Acanthaceae) the ‘Kalmegh’ of Ayurveda is an erect annual herb extremely bitter in taste. It is also known as ‘Bhui Neem’, since the plant though much smaller in size shows similar appearance and has bitter taste as that of Neem. Present review reflects its ethnomedicinal uses. Since ancient times, *A. paniculata* is used as a wonder drug in traditional Siddha, ayurvedic systems of medicine as well as in tribal medicine in India. The plant extract exhibits antiphyphoid and antifungal activities. Kalmegh is also reported to possess antiepatoxic, antibiotic, antimalarial, antithrombogenic, antiinflammatory, antisnake venom and antipyretic, anti HIV activity. As the dependance on herbal medication is increasing day by day, this review may be helpful for further research on this wonderful medicinal plant.

Keywords: *Andrographis*, Kalmegh, Antiepatoxic, Antithrombogenic, Antiinflammatory

**INTRODUCTION**

*Andrographis paniculata* Nees, the kalmegh of Ayurveda belongs to family Acanthaceae is also known as Bhui Neem since the plant shows similar appearance and has bitter taste as that of Neem (*Azadirachta indica*). *Andrographis paniculata* is an erect annual herb extremely bitter in taste in each and every part of plant body. *Andrographis paniculata* plant extract is known to possess a variety of pharmacological activities it has been used in no. of disease as herbal ailment. The herb is well known for drugs as ‘green chireta’ and forms the principle ingredient of a reputed house hold medicine ‘alui’. *Andrographis paniculata* has immense potential for treating various diseases. This review present information about botanical description, distribution ethnomedicinal and pharmacological aspects of *Andrographis paniculata* which may be used as wonder full herbal drug. Since ancient time *A. paniculata* is used as wonder drug in traditional siddha in ayurvedic system as well as in tribal medicine in India and some other countries for multiple clinical applications. The therapeutic value of kalmegh is due to its mechanism of action which is by enzyme induction. The plant extract exhibit antiphyphoid, antifungal, antiepatoxic, antibiotic, antimalarial, antithrombogenic, anti-inflammatory, anti snake venom, anti-HIV activity. Recent studies confirm anti HIV activity of andrographolide, the main alkaloid found in *Andrographis paniculata*.

**Distribution**

*Andrographis paniculata* is distributed in tropical Asian countries in isolated patches it can be found in a variety of habitats viz plains, hills slope, waste land, farms, dry or wets lands, sea shore and even roads sides. Native populations of *A. paniculata* are spread throughout South India. It prefers a sunny location the seeds are sown during May to June. The seedlings are transplanted at a distance of 60 cm X 30 cm. (Zhou et al., 1987)

**Botanical Description**

*Andrographis paniculata* grows erect to a height of 32 to 100 cm in moist shady places with glabrous leaves and white flowers with rose-purple spots on the petals. Stem is dark green 0.3 to 1.0 m in height, 2 to 6mm in diameter, quadrangular with longitudinal furrows and wings on the angle younger parts, slightly enlarged at the nodes: Leaves glabrous up to 8.0 cm long and 2.5 cm broad lanceolate, pinnate. Flowers are small, possess calyx with five sepals which are small and linear, corolla lanceolate, about 6mm long, bilabiate upper lip oblong, lower tips are broad , three lobed, white with violet markings. Stamens 2, inserted in the throat. Flower is hypogynous. Fruit is a capsule, compressed longitudinally furrowed with thin glandular hairs. Seeds are very small.

According to karyomorphological studies chromosome number is 2n= 50 (Govindarajan et al., 1983).

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Chemical Composition of Andrographis Paniculata

It contains bitter diterpenoid lactones such as 14-deoxyandrographolide (Sangalunkarn et al. and Garcia et al.), andrographolide. Neoandrographolide (a non-bitter derivative 14-deoxy11,12-didehydroandrographolide identified by Dhammaupakorn et al. Du et al.), separated andrographolide and neoandrographolide from the leaves of Andrographis paniculata using HPLC. Andrographolide content depends on collection time and growing region. Leaves of A. paniculata may contain more than 2% andrographolide before the plant blooms and less than 0.5% after blooming. The stem contains 0.1% to 0.4% of andrographolide. The best harvesting time is early autumn (Zhu et al.). The other active chemical constituents include diterpene (Sharma et al.) and flavonoids.

Pharmacognosy

Andrographolide, chief constituent extracted from the leaves of the plant exhibited protective effects in carbon tetrachloride induced hepatopathy in rats (Handa and, 1990). This bitter principle was isolated in pure form by Gorter, 1911. Sharma, 1992. Andrographolide is also attributed with such other activities like liver protection under various conditions of treatment with galactosamine (Saraswati et al.), paracetamol (Visen et al. 1993) etc.

The hepatoprotective action of andrographolide is related to activity of certain metabolic enzymes (Choudhury and Poddar 1984, 1985; Choudhury et al., 1987).

Several studies have been conducted on cellular processes and targets modulated by andrographolide treatment in human cancer and immune cells. Andrographolide treatment inhibited the in vitro proliferation of different tumor cell lines representing various types of cancers. The compound exerts direct
anti cancer activity on cancer cells by cell cycle arrest at G0/G1 phase through induction of cell cycle inhibitory protein and decreased expression of cyclin dependent kinase 4 (CDK 4). Immunosstimulatory activity of andrographolide is evidenced by increased proliferation of lymphocytes and production of interleukin 2. Andrographolide also enhance the tumor necrosis factor production resulting increased cytotoxic activity of lymphocytes against cancer cells which may contribute for its indirect anti cancer activity. These results suggest that andrographolide is an interesting phychemical constituent with anti cancer and immunomodulator activity and hence has the potential for being developed as a cancer therapeutic agent. (Rajagopal et al 2003).

The herb is the well known drug kalmegh ‘green chiretta’, and forms the principal ingredient of a reputed household medicine (alui) used as a bitter tonic and febrifuge. The herb is reported to possess astringent, and is helpful in arresting dysentery, cholera, diabetes, influenza, bronchitis, swellings and itchies, piles and gonorrhea. A decoction of the plant is a blood purifier. It is used as a cure for jaundice. It forms the major constituents of the Ayurvedic drug SG-1 Switradiilpe which is effective for treating vitilgo- a dermatological disease. The macerated leaves and juice together with certain spices, such as cardamom, clove and cinnamon, are made into pills and prescribed for relief from stomach ache other stomach ailments in infants. A decoction or infusion of the leaves Is useful in general debility and dyspepsia. The leaves and roots are also used as febrifuge, tonic, stomachic, cholagogue and anthelmintic. Andrographis improves non specific immune response. The immune response maybe specific, directed at a microbial invader already present in the body or strengthening the immune system in preparation against future infections. Andrographis strongly stimulates phagocytosis and the production of specific antibodies. Following list shows various biological activities of A. paniculata Nees

### Biological activities of A. paniculata

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<th>No</th>
<th>Biological Activity</th>
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<tr>
<td>1</td>
<td>Anti allergic activity</td>
<td>Gupta et al., 1994</td>
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<td>2</td>
<td>Antibiotic activity</td>
<td>Gupta et al., 1993</td>
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<td>3</td>
<td>Anti fertility effects</td>
<td>Akbarsha et al., 1990; Akbarsha and Murugan 2000</td>
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<td>6</td>
<td>Anti hepatitis activity</td>
<td>Jayaram et al., 1989; Ramfi et al., 1992</td>
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<td>8</td>
<td>Anti HIV activity</td>
<td>Shukla et al., 1992; Otake et al., 1995; Calabrese et al., 2000, S. Rajagopal, 2003</td>
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<td>9</td>
<td>Antiinflammatory activity</td>
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<td>Antisnakevenom effects</td>
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<td>Antityphoid activity</td>
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<td>Immunostimulation effects</td>
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CONCLUSION

After reviewing the available literature it can be concluded that A. Paniculata has great potential as antiallergic, antimicrobial, antihepatotoxic, antifever remedy. The plant may be a constituent in various immunological applications for cancer. It is also beneficial for treating snake bites, abdominal problems. Andrographis paniculata can be advocated as herbal remedy for different human diseases. Further research would be helpful in assessment of more medicinal uses and possible adverse effects on human health

REFERENCES


