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RESEARCH ARTICLE

ANDROGRAPHIS PANICULATA A REVIEW PAPER

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ABSTRACT

Andrographis paniculata is as a traditional medicinal plants. Andrographis paniculata is reported to exhibit mosquito controlling properties against some variety of mosquitoes. This review to provide a detailed study of Scientific classification, Vernacular names, Origin, Geographical and Morphological distribution, Propagation and planting, Phytochemicals, Medicinal values and other uses of plant.

Key words:

Andrographis paniculata,
Andrographolide, Phytochemical,
Bioactive, Medicinal values.

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INTRODUCTION

Andrographis paniculata is an annual herbaceous plant extremely bitter in taste in all parts of the plant body. In the Acanthaceae, native to India and Sri Lanka. It is widely cultivated in Southern and Southeastern Asia, where it has been traditionally used to treat infections and some diseases. Mostly the leaves and roots were used for medicinal purposes. It can be found in a variety of habitats, such as plains, hillsides, coastlines, and disturbed and cultivated areas such as roadsides, farms, and wastelands. In many developing countries, it is estimated that about two third of the population relies heavily on traditional practitioners and medicinal plants to meet primary healthcare needs (Farnsworth et al., 1991). As a result of the numerous problems associated with orthodox drugs, many plant species are now being revalued by researchers based on variation in plant species and their therapeutic chemical principles. Therefore, the need to do a thorough literature search on some species with a view to update the current state of knowledge is imperative. One of such plant species is *Andrographis paniculata* used in ancient oriental and ayurvedic medicine. The genus *Andrographis* which belongs to the Acanthaceae family comprises of about 40 species. Only a few are popular for their use in folk medicine for assorted health concerns.

Of these few, *Andrographispaniculata* is the most important. *Andrographis paniculata*, commonly known as King Bitters or kalmegh, is an annual, branched, erect handsome herb running half to one meter in height. It is native to open insular India and Sri Lanka and is also distributed in different regions of Southeast Asia, China, America, West Indies and Christmas Island. It is cultivated because of its well known medicinal value and it grows well in most soil types thus it is widely distributed (Latto et al., 2006).

The aerial parts and roots of the plant have been widely used as traditional medicine in China, India, Thailand and other Southeast Asian countries to treat many ailments. A wide array of studies has been conducted by researchers, especially in Asia, following reports about the medicinal properties possessed by this plant mostly according to traditional medical practitioners in ayurvedic medical system. Phytochemical studies have revealed that *Andrographis paniculata* contains diverse compounds including labdane diterpenoid lactones, flavonoids and miscellaneous compounds. It has been shown to possess wide spectrum of pharmacological properties (Mishra et al., 2007; Khare Khare, 2007). Furthermore, this review also discusses a detailed study of scientific classification, vernacular name, origin and geographical distribution, Morphological distribution, Propagation and planting, Phytochemicals, Bioactive constituents, Medicinal values, Side effects and Other uses of plants.

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Scientific classification

Kingdom: Plantae Division: Magnoliophyta Class: Magnoliopsida
 Order: Lamiales
 Family: Acanthaceae Genus: *Andrographis*
 Species: *Andrographis paniculata*

List of vernacular names of *Andrographis paniculata*

Language	Name
India (Sanskrit) Kalmegha, Bhunimba and Yavatika (Hindi) Kirayat (Tamil and Telugu) Nilavembu (Malayalam) Nelavebu, Kiriyaattu, (Kannada) Nelaberu	
Indonesian Sambiroto, Sambiloto	
English The Creat, King of Bitters	
French Chirette verte, Roi des amers	
Chinese Chuan Xin Lian	
Japanese Senshinren	
Philippines	Aluy, Lekha and Sinta
Spanish	Andrografis
Persian	Nain-e Havandi
Scandinavian	Green Chiratta
Malay	Hempedu Bumi, Sambiloto

Origin and Geographical Distribution: *Andrographis paniculata* is native to Taiwan, Mainland China, and India. It is also commonly found in the tropical and subtropical Asia, Southeast Asia, and some other countries including Cambodia, Caribbean islands, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, and Vietnam (Niranjan *et al.*, 2010., Wu Z *et al.*;1996; Benoy *et al.*, 2012). This plant is also found in different phytogeographical and edaphic zones of China, America, West Indies, and Christmas Island. The herb is found in a variety of habitat viz . plains, hills slopes, waste lands (Zhry *et al.*, 1986), farms , dry or wet lands (Muniramappa *et al.*, 1997), seashore and even in the road side. The plant grows well in all types of soil which explains its wide distribution. It grows in soil types where almost no other plant can be cultivated, particularly 'serpentine soil', which is relatively high in metals such as aluminum, copper and zinc (Samantaray *et al.*, 2001). However, soil that is flooded or wet throughout the year may be avoided for its cultivation. The species was also observed to grow luxuriously in mild humid locations with tropical temperature and high rainfall (Datta Kumar Animesh *et al.*, 2012).

Vijaya *et al.*, recommended the use of vermicompost coirpith for the reclamation of soils from industrial sites for the cultivation of *Andrographis paniculata* in a small scale nursery. It is an erect, annual herb and 30-90 cm tall with upper part of stem quadrangular while the lower part nearly rounded stem. Leaves are opposite sessile or subsessile, linear-lanceolate or lanceolate, 3-8 cm long, acute, glabrous or minutely puberulous beneath and base cuneate, margin slightly undulate. Flowers are pedicelled, biliped, white-purple or spotted purple and solitary. Pedicel is 2.5-10 mm in size, slender and glandular pubescent. Bracts are acicular and 2.5 mm long. Calyx lobes are subacute, 2.5-3.7 mm long and glandular.

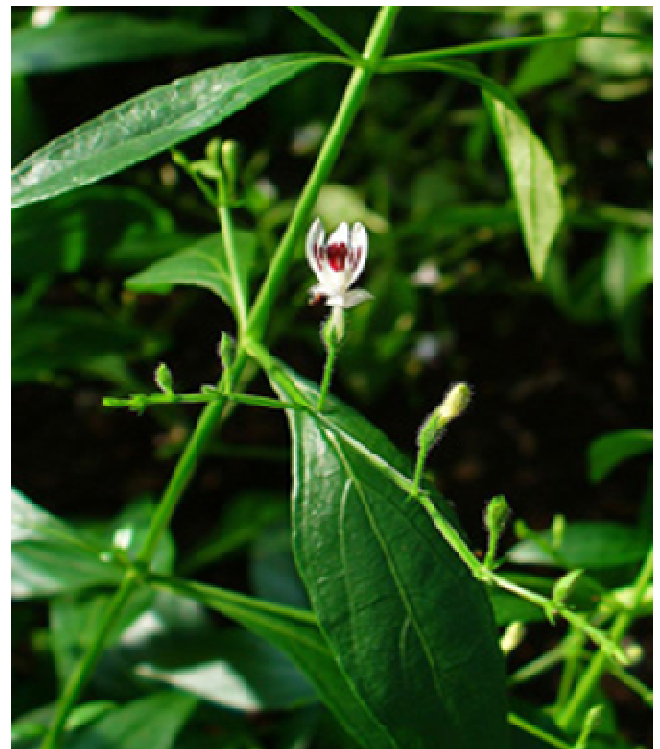
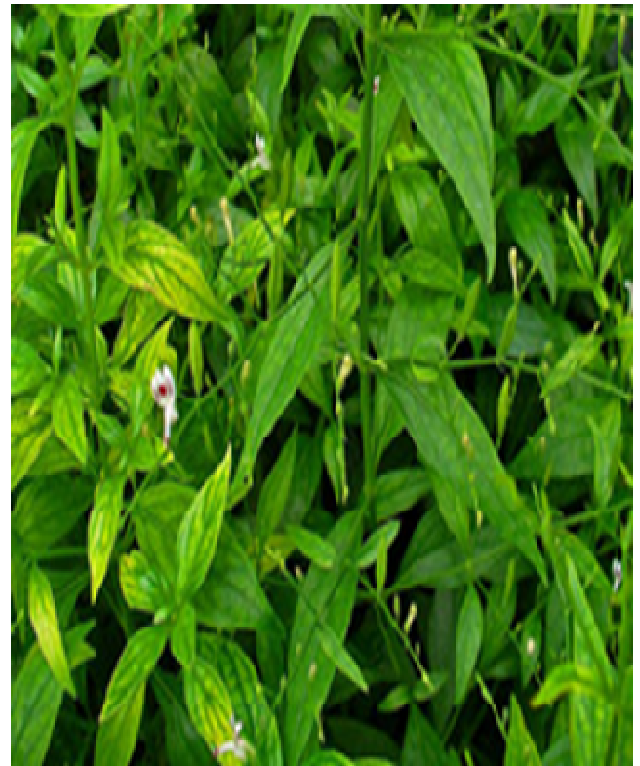
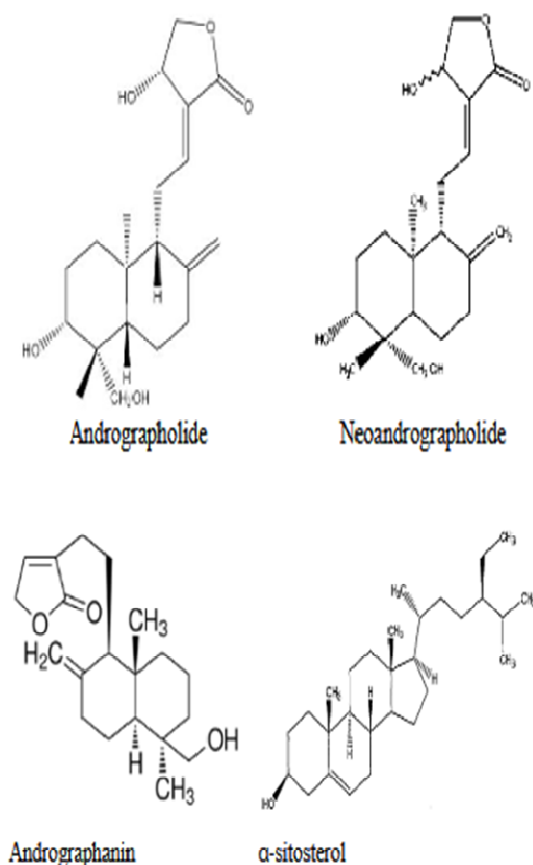


Fig 1 and Fig 2 *Andrographis paniculata*

Corolla is 7.5-12.5 mm in size, tube about half as long as the corolla. Filaments are hairy and anthers are purple beared at base. Fruit is a capsule, oblong, 18-20 x 4.5-5.0 mm, young ones sparsely glandular and hairy; when mature it is glabrous. Seeds are sub quadrate, yellow to brownish in colour and rugose. Flowering and fruiting occurs in October to December (North India) species is native of tropical South-East Asia and occurs throughout hotter parts. The plant comes up well in tropical and subtropical regions all over India. It is a hardy species, therefore, can be grown in medium fertile sandy loam to clay-loam soils, possibly with irrigation.



It can withstand partial shade of trees, say few hours, but it is cultivated in open fields.

Propagation and planting: Its propagation is through shattered seeds in nature. Vegetative propagation is also possible in certain special cases through layering as each node is capable of producing enough roots. Seeds are small and remain dormant for five to six months. For raising crop in one hectare three beds of 10x2 m size should be tilled, pulverized and leveled during the month of May. Liberal use of organic manure in nursery is advised for raising healthy seedling. Seeds should be covered by very thin layer of soil and compost mixture. Beds should be covered properly by suitable mulch and irrigated regularly with water fountain till seedlings merge (6-7 days). Immediately after germination, mulch is removed to avoid elongation of the seedlings. After 10-15 days regular flood irrigation can be given till it becomes ready for planting. Transplanting of seedling is done in second fortnight of June at a row and plant spacing of 45 to 60 cm and 30 to 45 cm respectively. Beds should be irrigated immediately after planting.

Bioactive constituents: Active compounds extracted with ethanol or methanol from the whole plant, leaf and stem (Cheung *et al.*, 2001., Matsuda *et al.*; 1994., Pholphana N *et al.*, 2004) include over 20 diterpenoids and over ten flavonoids have been reported from *Andrographis paniculata* (Kishore *et al.*, 2003., Li, Huang *et al.*, 2003). Andrographolide (C₂₀H₃₀O₅) is the major diterpenoid in *Andrographis paniculata*, making up about 4%, 0.8~1.2% and 0.5~6% in dried whole plant, stem and leaf extracts respectively (Burgos *et al.*, 1997). The other main diterpenoids are deoxyandrographolide, neoandrographolide, 14-deoxy-11,12-didehydro andrographolide

and isoandrographolide (Reddy MVB *et al.*, 2003). From ethyl acetate (EtOAc)-soluble fraction of the ethanol or methanol extract, 5-hydroxy-7,8-dimethoxyflavone, 5-hydroxy-7,8, 2',5' tetramethoxyflavone, 5-hydroxy-7,8,2',3'-tetramethoxyflavone, 5-hydroxy-7,8, 2'-trimethoxyflavone, 7-O-methylwogonin and 2'-methyl ether were isolated as the main flavonoids (Kuroyanagi *et al.*; 2003., Chao WW; 2010., Radhika *et al.*, 2010).

Phytochemical of *Andrographis paniculata*: The present study describes the phytochemical profile and antimicrobial activity of *Andrographis paniculata*. For the present investigation, two samples of *Andrographis paniculata* extracts, obtained by extraction in chloroform and chloroform + HCl, respectively. Chloroform, methanol and water extracts of leaf powder of *Andrographis paniculata* showed positive result for the presence of most of the secondary metabolites. Except fixed oil and fats, all other phytochemical constituents like alkaloids, glycosides, flavonoids, tannins, phenols, saponins, terpenoids and steroids. Earlier reports were also confirmed this result (Aiyelaagbe *et al.*, 2009). Generally, plant contains the above said phytochemicals, will have high medicinal value. The flavonoids are reported to possess anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activities. (Oomah, 2003). Alkaloids have been used as antimalarial, pain killer and to manage heart diseases. Glycosides serve as defense mechanism against predation by many microbes (De M. Krishna DeA *et al.*, 1999). Steroids are known for their cardiogenic activities, insecticidal and antimicrobial properties (Callow, 1936). Phenols and tannins have antioxidant properties and Saponins, were used in hypercholesterolemia, hyperglycaemia, antioxidant, anticancer, anti-inflammatory and weight loss. Apart from this *Andrographis paniculata* is found to contain the major components like andrographolide, neoandrographolide and andrographanin are reported to have medicinal property (De-Lucca *et al.* 2005).

Medicinal values of *Andrographis paniculata*: The aerial parts, roots and whole plant of *Andrographis paniculata* have been used for centuries in Asia as traditional medicine for the treatment of various ailments. It has been used by traditional medical practitioners for stomachaches, inflammation, pyrexia, and intermittent fevers (Chopra, 1980., Jarukamjorn K *et al.*, 2010; Chaturvedi *et al.*, 1983; Balu *et al.*, 1993). The whole plant has been used for several applications such as anti-dote for snake-bite and poisonous stings of some insects, and to treat dyspepsia, influenza, dysentery, malaria and respiratory infections. The leaf extract is a traditional remedy for the treatment of infectious disease, fever causing diseases, colic pain, loss of appetite, irregular stools and diarrhea (Saxena *et al.*, 1998). In Malaysia, a decoction of the aerial parts is used to treat common cold, hypertension, diabetes, cancer, malaria and snakebite describes the medicinal uses of the parts of *Andrographis paniculata* (Perry *et al.*, 1980). It is an important constituent of at least 26 Ayurvedic formulas in Indian pharmacopoeia. In traditional Chinese medicine, it is seen as the cold-property herb used to rid the body of heat and fever and to dispel toxins from the body (Deng, 1978). In Ayurvedic medicinal system, tribals of Tamil Nadu, India use this herb for a variety of ailments like dysmenorrhoea, leucorrhoea, pre-natal and post-natal care, complicated diseases such as malaria, jaundice, gonorrhoea and general ailments like wounds, cuts,

boils and skindiseases (Alagesabooopathi *et al* ;1999.,Bensky *et al* ; 1993 ., Poolsup *et al.*, 2004).

Side effects of andrographis paniculata: Andrographis may trigger adverse effects like headache, fatigue, allergic reactions, nausea, and diarrhea. Anyone using medications (including blood-thinning drugs, blood pressure medicines, and chemotherapy drugs) should consult a physician before using Andrographis. Andrographis should not be administered intravenously. Acute kidney injury has occurred after intravenous use of Andrographis compounds. Due to a lack of research, little is known about the safety of using Andrographis. It's important to keep in mind that supplements haven't been tested for safety and dietary supplements are largely unregulated. In some cases, the product may deliver doses that differ from the specified amount for each herb. In other cases, the product may be contaminated with other substances such as metals.

Also, the safety of supplements in pregnant women, nursing mothers, children, and those with medical conditions or who are taking medications has not been established.

Other uses of Andrographis paniculata: Andrographis paniculata is prominent in 26 Ayurvedic formulations as evidenced from Indian Pharmacopoeia; while, in Traditional Chinese Medicine it is an important "cold property" herb used to release body heat in fever. The species is well explored therapeutically and effectively used as immune stimulant and for asthma, gonorrhoea, piles, dysentery and dyspepsia, blood purification, influenza, gastric complaints, diarrhea, pharyngitis, fever, loss of scalp hair, snakebite, myocardial ischemia, common cold, diabetes, respiratory tract infections, jaundice among others. The species also possesses antiulcerogenic, antityphoid, antsnake venom, anti platelet aggregation, anti HIV, antimalarial, antifertility, anti-inflammatory and antihyperglycemic properties. Bioeffectivity of the species against phytopathogens

Conclusion

Andrographis paniculata is generally distributed throughout India. Which is used as a traditional medicine, Therapeutic, Ayurvedic, Mosquito controlling etc. Phytochemicals present in leaves of Andrographis paniculata indicates their potential as a source of principles that supply novel medicines. Further more isolation, purification and standardized of the phytochemicals found present will make studies more interesting.

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