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Review Article

"ANDROGRAPHIS PANICULATA THE INDIGENOUS PLANT TO ASIA" REVIEW

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ABSTRACT

Andrographis paniculata is an annual herb leaves are used in Ayuervedic medicine for treatment of various diseases and illness. The plant possess many useful bioactivities such as anti-inflammatory, antiviral, anticancer and immune stimulation properties Mostly the leaves and roots were used for medicinal purpose. Where mostly the leaves and roots have been traditionally used as a folklohe remedy for a wide spectrum of oilments like diabetics, hypertension, fever, stomach problems and as tonic. This plant has been used for long without any known toxicity and tonic. This palnt has been used for long without any known toxicity and has strong traditional usage from safety point of view Hence this article to cures the various properties of Andrographis *paniculata*.

INTRODUCTION

Medicinal plants have grown enormously from the use of herbal products as natural cosmetics and as selfmedication by the general public scientific for their beneficial effects (Sharma and joshi 2011). *Andrographis paniculata* is a herbaceous plant in the family *Acanthacaceae*, Native to India and Srilanka. In north Eastern india the plant is known as maha-tita literally king of bitters known as varous verimucular names (Abhi shek *et al*., 2010). The Tamil has been using Nilavembu. As it is called in Tamil-for centuries. *Andrographis paniculata* is also referred to a Bile of the earth due to its bitterness (Coon and Ernst., 2004). This medicinal herbs *Andrographis paniculata* otherwise called as king of bitter because it has extremely bitter in taste. where it is used treat various infections and diseases. The leaves and roots are highly used for medicinal purposes often being used before antibiotics were created.

Habitat

Andrographis paniculata is an herbaceous plant in the family *Acanthaceae*, native to India and Srilanka. It is an annual herb. The leaves are used traditionally in Asian traditional medicine and particularly in Ayurveda for treatment of various diseases and illness. The plant is cultivated in many areas, as well. It grows well in sunny location. The seeds are sown during May and June. The seedling are transplanted at a distance of 30×60 cm. The seeds are small and remain dorment for 5-6 months. If possible seedling should be raised in shade to protect them from heat (Seema *et al*., 2002). It is distributed in tropical Asian countries, often in isolated patches. It can be found in a variety of habitats such as plains, hillsides, coastlines, roadsides forms and waste lands (Prajapati *et al* 2003)The plant grows in waste grounds and prefors moist habitat *Andrographis paniculata* plant is widely cultivated in Southern Asia, Apporoximately,28 species of are known and indigenous to Asia. The species also found in Hangkong, Thailand, Brunei, Singapore and other parts of Asia, where it may or may not be native. It is widely cultivated in Southern and South Eastern Asia to treat infections and some diseases. *A.paniculata* grow erect to a height of 30-110 cm in moist, shady places. The slender stem dark green. The lance-shaped leaves have hairless blades measuring 8 cm long by 2.5 wide. The small white purple or spotted purple flowers are borne in spreading racemes. The fruits in a capsule around 2 cm long and a few millimeters wide. It contains many yellow brown seeds where it is used to treat infections and some diseases, often being used before antibiotics were created. Mostly the leaves and roots were used for medicinal purpose. Where mostly the leaves and roots have been traditionally used as a folklohe remedy for a wide spectrum of oilments like diabetics, hypertension, fever, stomach problems and as tonic. This plant has been used for long without any known toxicity and has strong traditional usage from safety point of view (Puri *et al*., 2003).

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Chemical Compounds of Andrographis Paniculata

Medicinal plants are natures gift to human beings to lead a Disease-free and healthy life. Antibiotic resistance has become a global concern hence the continuous and urgent need to discover new antimicrobial compounds with diverse chemical constituents and new mechanism of action. The phytochemical screening showed that the different solvent extracts of *A.paniculata* revealed the presence of Tannin, Phenol, alkaloids, streoids, anthraquinones, and saponins. Tannins are known for their astringent property and antimicrobial activity (Cowan, 1999) (Kathad *et al*., 2010). Observed that ethanol leaf extract had the highest Phenolic and antioxidants content hence antibacterial activity of ethanol extract can be said to be due to the presence of these compounds, plant phenolic compounds have been found to possess potent anti-inflammatory activity (Sakat *et al*., 2010). Polyphenols and flavonoids are the plant secondary metabolites and are very important by virtue of their antimicrobial (Igbinosa *et al*., 2009) and antioxidant activity (Annegowda *et al*., 2010).

A.paniculata have lower phenolic content the earlier report (Tanwer *et al*., 2010). (Sule *et al*., 2010) reported that Flavonoids, alkaloids and glycosides were present in methanol, aqueus and dicholoromethane extracts Tannins, aminoacids and Saponins were present in methanol and aqueus extracts. However, terpenoids and steroids were found to be present in dicholoromethane and methanol extracts. *A.Paniculata* has a several water soluble lactone andrographoloidic properties. medicinal plants are more important in field of pharmaceutical industries for new drug preparation (Sule *et al*.,2010). Andrographolide is the most medicinally active phytochemical found in the plant, including other constitutents such as deoxy andrographolide,19 B-D-glucoside, neo- andrographolide,14-deoxy-11,12-di-dehydroandrographolide,
homoandrographolide, andrographan, andrographosterin and stigmasterol (Cava *et al*.,1965, Chem and Liang, 1982; Sharma *et al*., 1992; Siripong *et al*.,1992).

Screening Techniques

Few studies (Praveen *et al*., 2009) demonstrated that the use of cell cultures techniques to increase the yield of andrographolide by adventitious root culture method. Elicitation of cell culture with signal compounds such as methyl jasmonate, salicyclic acid due to their signal transduction Pathway and used as wide spectrum of elicitors (Zid and Orihara., 2005, Jeong *et al*., 2005). Surya Kala Gandi *et al*., 2012) has reported that the role of elicitation of andrographolide in the suspension culture of *A.paniculata*.

Nandan 2004 reported the Andrographolide is used standard to analyze kalmegh. There is a wide variation in the amount and any type of chemical constitutents is samples of different species, in sample that differ in method and time of collection. Kleipool 1952 suggested that potency, quality and purify of drugs have to be evaluated. Active constitutents can be analyzed by several methods such as colorimetric, titrimetric, gruvimeteric, spectrometric and chromatographic techniques. Nnabuk *et al*., 2011 reported the chemical structures of ethanol extract of *Andrographis paniculata* and to investigate their corrison inhibition potentials for mild steed in solutions of HCL (using gravimetric and gasmetric methods)

The gravimetric method described in Indian Pharmacopoeia was found to give high value (Pharmacopia of India 1955) This is due to some yellow colouring substance other than andrographolide which is also soluble in ethyl acetate. The spectrometric method propsed by Maiti *et al*., 1959. Reported that the red color farmed with the addition of alcoholic poltasium hydroxide to the solution of andrographolide is unstable and tades away quickly. Subbarao has suggested a chemical method involving a Lactone titration. but the method has been reported to be not suitable for detecting minute quantities. High performance Liquid Chromatographic methods were reported for estimation of Andrographolode in *A.paniculata* (Sharma *et al*., 1992, Phophana *et al*., 2004, Srinivastava *et al*., 2004, Du *et al* 2003 and Chen *et al* 2007) and in rabbit serum (Kumaran *et al* 2003). Accurate simple specific and reproducible HPLC method has been developed validated (ICH Topic Q2B validation of analytical procedure, 1196) for the determination of andrographolide in *A.paniculata* herb, at two different stages of life cycle (Meenu Sharma *et al*., 2012).

Pharmacological activity

Kalmegh (*Andrographis paniculata)* is one of the widely use medicinal herb. Whole plant has wide range of pharmacological activity. In siddha medicine *A.paniculata* used widely to treat fever like chikunguny, swineflu, typhoid, snake bite and common cold etc (Dhiman *et al*., 2012). *A.paniculata* is also used for medical purpose digestive problems, blood cleanser, fever, sore throat (Sharma and johhi, 2011). *A.paniculata* is used to cure fever and cold (Koul and kapil., 1994). It is one of the best anti-malarial agent compared to the commercial products of quinine (Parvataneni *et al*., 2010).

Andrographis paniculata has blood purifying property, so it is recommended for use in leprosy, gonorrhea. Scabies, boils skin eruptionsa and chronic and seasonal fever. Juice of fresh leaves used to treat liver disorders, bowel complaints of children. Colic pain, common cold and upper respiratory tract infection (Akbar, 2011). *A.paniculata* is having number of bioactivies such as anti-inflammation, anticancer, immune modulation, anti-infection, anti-hapato toxicity, anti-atherosclerosis, anti-diabetes and anti-oxidation (Niranjan *et al*., 2010).

Extensive research has revealed that the whole-plant extract possess many useful bioactivites, such as anti-inflammatory (Shen *et al*., 2000). anti -viral(Calabrese *et al*., 2000) anti-cancer (Kumar *et al*., 2004) and immune stimulatory (Puri *et al*.,1993: Iruretagoneya *et al*., 2005) activities on the other hand, male reproductive toxicity(Akbarsha and Murugaian, 2000) and cytotoxicity (Nanduri *et al*., 2004) of this plant have been reported as well. Extensive studies have been performed to explore their potential for treatment on prevention of oilments. The aerial parts of *A.paniculata* have been traditionally used as a hepato protective and hepato stimulate agen in South East Asian folkore remedy to treat abroad range of disorders including liver disorders and jaundice (Kapil *et al*., 1993; Trivedi and Rawal, 2000).

The herb has shown an ability to reduce inflammation (heat) and fight viral infections and is used as a principal ingredient in traditional Chinese medicinal formulas for Lung support from colds (Sheeja *et al*., 2006) *A.paniculata* is a blood purifier so it is used to cure turbid liver, jaundice, dermatological diseases

syspepsia, febrifuge and anheihemic. *A.paniculata* acts to dispel heat and remove toxin. Andrographaloid was found to be more potent and a standard hepato protetective agent (Visen *et al*., 1993).The whole plant of *A.paniculata* is used extensively as an anti-inflammatory and antipyretic drug for the treatment of laryngitis, diarrhea. The juice of fresh leaves generally contains andrographolide. It is used a domestic remedy in the treatment of colic pain, loss of appetite, irregular stools and diarrhea (Mishra *et al*., 2007). Since ancient times *A.paniculata* has been known in traditional Asian medicine as an immune system booster, to treat infections in the gastrointestinal tract and upper respiratory tract, harps, sore throat and a variety of other chronic infectious diseases (Wang boonskul *et al*., 2006). Extensive research has revealed that *A.paniculata* has a surprisingly broad range of pharmacologic effects has Anti-inflammatory (Shen *et al*., 2000, 2002) anti-malarial (Rohman *et al*., 1999). Cardiovascular (Tan *et al*., 2004) and anti-inflammatory activities (Thiyagarajan *et al*., 2011). Levital *et al*., 2010.

Andrographol the major constitutant of the extract is implicated in its pharmacological activity (John Britto *et al*., 2004). The herb is well known drug "green chiretta" It has various medicinal properties like antidiarrhoreal, immunostimultant and anti-inflammatory (Mishra *et al*., 2009). Ethanol extract and purified diterphene andrographodies of *Andrographis paniculata* induces significant stimulation of antibody delayed type hyper sensitivity response in fish (Subash chandran *et al*., 2010). Pharmaceutically important andrographolide exhibits anticancer, immunomodulatory (Kumar *et al*., 2004). Anti – inflammatory, anti-diabetic, anti-hypersenstive, anti-venom, anti-thrombotic, anti-reteroviral, anti-cardioprotective, anti-oxidant (Tewari *et al*., 2010). The conventional method of regenerated plants *Andrographis paniculata* yield limited level of andrographolide 0.7%-2.3% (Sharma *et al*., 1991).The primary medicinal component of *A. paniculata* is andrographolide, which is a diterpene lactone. Andrographolide has been reported for its anti-cancer (Sheeja and kuttan 2007), anti-HIV (Calabrese *et al*., 2000), cardioprotective (Yoopam *et al*., 2007) and Hepatoprotective (Trivedi *et al*., 2007) properties among others.

Antimicrobial Activitiy

Now a days microbes are resistance to various antibiotics, The resitant of microbes is due to indiscriminate utilization of commercial antimicrobial medicines supported by many scientists investigation for modern antimicrobial substances from several medicinal plants (Alagesa boopathi and Kalaiselvi., 2012). In this attempt, isolated active constitutents of plant and screened for antimicrobial activity. Which can be used further in research to develop antimicrobial compounds or their synthetic analogues, Antimicrobial agents have been used in clinical practice for over 40 years (Zhanel *et al*., 1991).

Antibacterial

In the preliminary screening of antibacterial activity of methanol leaf extract of *A. paniculata* exhibited maximum activity when compared with other plant parts and also from different solvent extracts (Manoharam, and Manoharan, 2013). The maximum activity was observed for the pathogens *E.coli* followed by *Salmonella typhi*, *Staphylo cocus* sp and *Pseudomonas* sp maximum zone of inhibition was recorded with 75µl methanol extract against *S.cureus*, in accordance with previous studies reporting that 75µl methanol is better than other solvent for anibacterial activity (Pushpendra kuamr Mishra *et al*., 2013). Vijiakumar Arul Doss and kalaichelvan 2012, was investigated to identify the compounds active for the antitoxicant and antimicrobial activity of the leaf extract of *A. paniculata.*

The methanolic extracts of *A. paniculata* at the highest concentration showed the strongest bacterial inhibitory acivity of other exracts. This similar observation reported by many researchers (Negi *et al*., 2005; Parkeh and chanda, 2010; Al-Bayati, 2008; Kaushik and Goyal, 2011) (Jam 1991; Ahamed *et al*., 1998) Suggested invitro study corroborates the antibacterial activity of *A. paniculata* used in folkloric medicine to treat skin infections. Abubackar and vasantha 2010 wer in investigated invitro antibacterial activity of ethanolic leaf extract of *A. paniculata* and andrographolide against the pathogenic bacteria showed the maximum inhibitory action against *E.coli*, *K.pneumoniae* and *P.vulgaris*. The antibacterial activity of different plants viz., root, stem and leaf were investigated using agar well diffusion method against some of *Staphylococcus sp*., *E.coli*, *S. typhi* and *Pseudomonas* (Baby shalini, 2015).

Disease Control Agent

Andrographis paniculata Nees traditionally employed for countries is Asia and Europe as a folklone remedy for a wide spectrum of oilments, or an herbal supplement for health promotion, is now a days incorporated into a number of herbal medicnal preparations. It is found in the Indian pharmacopoeias and is a prominent component in atleast 26 Ayuvedic formulas (Madav *et al*., 1995). In traditional Chinese medicine, it is an importatnt "cold property" herb used to rid the body of heat, as in fever and to dispel toxins from the body (Deng, 1978) In Scandinavian countries, it is commonly used to prevent and treat the common cold (Caceres *et al*., 1997). *Andrographis paniculata* is one of the top 10 herbal medicines, which the Thai FDA has promoted as an alternative medicinal theraphy for fever and inflammation.

Minimum Inhibitory Concentration

The ethanolic extract of leaves *A. paniculata* exhibited significant antimicrobial activity against dermatophytes of at the concentration of 50µland above.An ethanol extracts of *A.paniculata* leaves showed antibacterial activity against K.pneumonia .P.auerginosa (21mm) and S.aureus (17mm) at concentration of 75 µl and also show moderate activity against *K.planticola* and *E.coli*. The development of zone is mainly based on the concentration of extract. (Roy *et al*., 2010., Salna *et al* 2011., Suparna *et al*., 2014). Baby shalini and Sriman narayanan 2015 suggested that the methanol leaf extract was studied for minimal inhibitory concentration concept for various concentration viz.,0,25,50,75 and 100 µl.Among the different concentrations,75 µl showed maximum activity for all the pathogenic organisms and recorded highest for *E.coli* (32.3mm) and it was on par with 100 *µl* concentrations. Maximum zone of inhibition was recorded with 75 µl methanol extract against S.aureus, in accordance with the previous studies reporting the 75 µl methanol is better than other solvent for antibacterial activity (Pushpendra kumar Mishra *et al*., 2013).

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