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Phytochemical and Pharmacological Profile of *Leucas lavandulaefolia*: A review

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ABSTRACT

World is endowed with a rich heritage of medicinal plants. The use of medicinal agents presumably predates the earliest recorded history. The medicinal plants are widely used by the traditional practitioners for various ailments. *Leucas lavandulaefolia* (Labiatae) commonly known as 'Gumo' is a well-known plant used in the Indian system of medicine. Various parts of this plant have been used in traditional medicine. The plant include phytochemicals are acacetin, chrysoeriol, linifoliside, linifoliol, chrysoeriol-6"(OAc)-4'-β-glucoside, lupeol and taraxerone. The various *in-vivo* study of *L. lavandulaefolia* reported to have hepatoprotective, hypoglycemic, antipyretic, antidiarrhoel, antitussive, wound healing and psychopharmacological, antimicrobial properties. This review discusses on botany, traditional use, phytochemistry and pharmacological data of the plant.

Key words: *Leucas lavandulaefolia*, ethnomedicine, phytochemistry, bioactivity

INTRODUCTION

Nature has provided a complete storehouse of remedies to cure ailment of mankind. Medicinal plants have been used for centuries as remedies for disease because they contain component of therapeutic values. According to the WHO, 80% of the world population continues to rely mainly on traditional medicines for their health care (WHO, 1993). Presently there is an increasing interest worldwide in herbal medicines accompanied by increased laboratory investigation into the pharmacological properties of bioactive ingredients and their ability to treat various diseases. Numerous drugs have entered the international market through exploration of ethnopharmacology and traditional medicine. Although, scientific studies have been carried out on a large number of Indian botanicals, a considerably smaller number of marketable drugs or phytochemical entities have entered the evidence-based therapeutics. Efforts are needed to establish and validate evidence regarding safety and practice of Ayurvedic medicines (Cooper, 2004; Patwardhan *et al*., 2005).

Plant profile: *Leucas lavandulaefolia* Rees (Family-Labiatae) commonly known as 'Gumo' (Hindi) and 'Halkusha' (Bengali) is herbaceous, erect, annual weed (30-60 cm high) found in pastures and wastelands throughout India (Anonymous, 1962). It is erect, slightly pubescent or tomentose, 0.3 to 0. 75 m high usually branched; branches are quadrangular. Leaves are 4.5 to 9 cm long, lanceolate, obtuse, entire or sparingly serrate, glabrous, base tapering; petiole 0-1.3 cm long.

Flowers subsessile or shortly pedicellate with axillary and terminal whorls 1.3 to 2 cm diameter, towards the end of the branches; bracts 5 to 8 mm long, narrowly linear-subulate, bristle-tipped, finely pubescent. Calyx are 1 mm long from the base to the top of the uppermost tooth, 4.5 mm long from the base to the top of the lowest tooth, entirely glabrous or slightly pubescent; mouth glabrous, very oblique, contracted. Corolla white, nearly 1.3 cm long; tube 6 mm long, annulated inside about the middle; upper lip are 5 mm long, white-woolly; lower lip 6 mm long, the middle lobe large, obovate, rounded, the lateral lobes small. Nutlets 3 mm long, oblong, rounded at the apex, the inner face is slightly angular, while dorsal face are brown and rounded (Anonymous, 1962; Kirtikar and Basu, 1975; Kamat and Singh, 1994).

ETHNOMEDICINAL USES

Leucas lavandulaefolia is a well known ethnomedicinal plant has been used in Indian traditional medicines from time immemorial. Plant have been extensively used by rural people of Mithila region (Bihar) in human and cattle ailments, such as cough, cold, fever, loss of appetite, skin diseases, headache, snake bite and scorpion sting (Chopra and Handa, 1958). It was reported that the leaves of this plant may be used in migraine when this plant is mixed together with seeds of *Brassica campestris* and rhizome of *Curcuma longa* are grounded together to form a paste, applied to the forehead. The juice of the plant along with a little amount of salt is applied into the eye to cure conjunctivitis. A decoction of leaves is used as a sedative in nervous disorders, as expectorant, carminative, vermifuge and stomachic. Flowers are stimulant, expectorant and diaphoretic. Juice of flower with honey and a few grains of borax mixed together are very much useful for nasal and laryngeal coughs and colds. The aerial parts have a strong characteristic odour and are used as sedative, laxative, anthelmintic, inflammation, jaundice, dyspepsia, vermifuge, stomachic, scabies, psoriasis, dermatosis, migraine, glaucoma, asthma, anthelmintic, urinary discharge, fever and paralysis (Anonymous, 1962; Kirtikar and Basu, 1975; Nadkarni, 1982; Kamat and Singh, 1994).

This herb is cooked as vegetable by local tribes in Orissa (Girach and Aminuddin, 1992). It was also reported that after grinding 3 pieces of root, flower of this herb with three teaspoonfuls of turmeric powder with a little bit of water may be given orally to the patient suffering from stomach pain and remarkable cure has been observed (Boissaya and Mazumder, 1980).

PHYTOCHEMISTRY OF *L. LAVANDULAEFOLIA*

Phytochemical analysis was carried out using ethanolic extract showed the presence carbohydrate, alkaloids, steroids flavonoids, triterpenoids, essential oil, fatty alcohol, saponins, tannins (Shiraji, 1947; Bhattacharya, 1995; Mukherjee *et al*., 1998). Acacetin and chrysoeriol were isolated from the chloroform extract and diethyl extract of this plant (Smith, 1985; Chandrashekar *et al*., 2006). The isopimarane rhamnoglucoside, linifolioside were isolated from the ethanolic extract and were established by paper chromatography and gas liquid chromatography. A colourless crystalline moiety, linifoliol were also obtained and its IR spectrum showed carbonyl absorption at 1670 cm^{-1} indicate the presence of α, β- unsaturated ketone functional groups in the molecule (Mahato and Pal, 1986). Lupeol and taraxerone were isolated from petroleum ether extract of this plant. A new flavonoid glycoside, chrysoeriol-6'' (OAc)-4'-β-glucoside were isolated from ethyl acetate extract of aerial parts and its structure were elucidated on the basis of UV-Visble, IR, ^{1}H and ^{13}C NMR and mass spectroscopic methods (Chandrashekar *et al*., 2005, 2006). Figure 1 shows the structures of biologically active compounds that have been isolated from

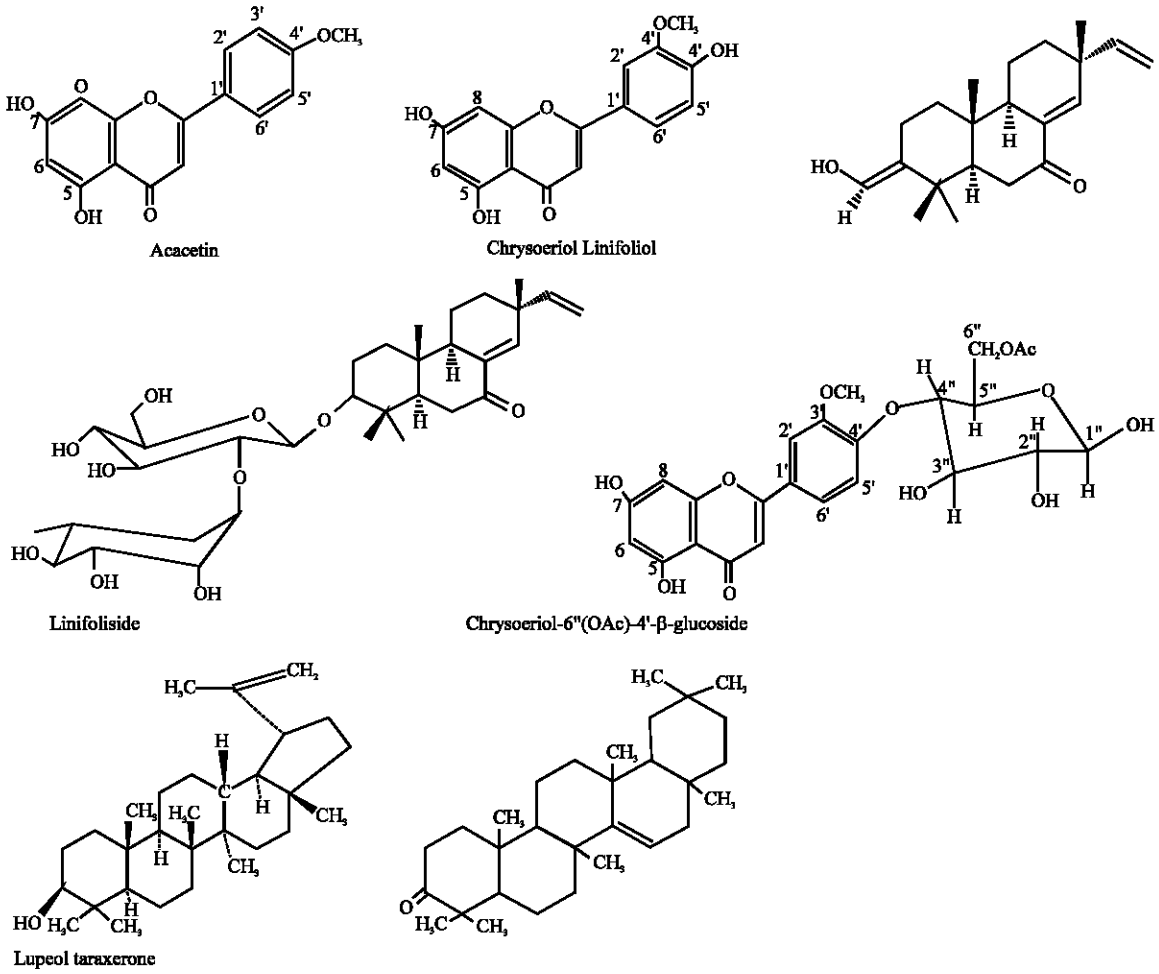

Fig. 1: Structures of biologically active compounds isolated from *L. lanvendulaefolia*

L. lanvendulaefolia. Formulation and evaluation of tincture of *L. lanvendulaefolia* has been reported and then it was characterized by examination of co-chemical properties, thin layer chromatography and spectroscopic analyasis (Mukherjee *et al*., 1996).

PHARMACOLOGICAL PROPERTIES OF *L. LAVANDULAEFOLIA*

Researchers have reported the different biological actions of *L. lavandulaefolia* in various test models. *L. lavandulaefolia* aerial parts, flowers, whole plant have been found to exhibit hepatoprotective, hypoglycemic, antipyretic, antidiarrhoel, antitussive, wound healing and psychopharmacological, antimicrobial properties.

Hepatoprotective properties: The hepatoprotective activity of *L. lavandulaefolia* aerial parts were tested against carbon tetrachloride (CCl_4) induced hepatic damage in rats. Histopathological examination of the liver section of the rats treated with toxicant showed intense centrilobular necrosis and vaculization. Whereas, ethyl acetate extract given at a dose level of 400 mg kg^{-1} showed an significant reduction ($p<0.01$) in serum glutamic pyruvate transaminase (SGPT), Serum Glutamic Oxaloacetic Transaminase (SGOT), alkaline phosphatase (ALP) and total bilirubin levels

and was comparable to that of silymarin, used as a standard drug (Chandrashekar and Prasanna, 2010a). Different extracts of the *L. lavendulaefolia* leaves were tested against D-galactosamine (D-Gal N) induced liver toxicity in rats. SGOT, SGPT, ALP, GGT, of the serum and HTG of the rat's liver were estimated after 48 h of intoxication. Microscopic observation of the liver along with the body weight, liver weight and also food intake were also studied during the experiments. The result indicated that methanol extract (100 mg kg^{-1}, p.o.) exhibited significant hepatoprotective activity (Kotoky *et al*., 2008). Chloroform extract of aerial parts of *L. lavandulaefolia* at a dose of 200 and 400 mg kg^{-1} was administered orally as a fine suspension in 0.3% sodium carboxy methyl cellulose for 14 days. Liver damage was induced by administration of D (+) galactosamine. Treated group showed significant decrease in ASAT, ALAT, ALP, TB, LDH, TC levels in serum when compared with D (+) Gal N administered group. It can be concluded that chloroform extract of this plant seems to possess hepatoprotective activity in rats. Further studies are needed to evaluate the potential usefulness of this extract in clinical conditions associated with liver damage (Chandrashekar *et al*., 2007).

Hypoglycemic properties: The investigation was performed to study the effect of chloroform extract on *L. lavendulaefolia* flowers (LLFEt) on blood glucose, glycosylated hemoglobin and oral glucose tolerance in alloxan-induced diabetic rats using glybenclamide as a reference compound. The oral administration of 0.15, 0.20 and 0.25 g kg^{-1} of chloroform extract of LLFEt for 30 days resulted in significant reduction in blood glucose, glycosylated hemoglobin and an increase in total haemoglobin and the effect was highly significant in the case of 0.25 g kg^{-1}. It also prevents decrease in body weight. There was a significant improvement in glucose tolerance in animals treated with LLFEt (Chandrashekar and Prasanna, 2010b).

Methanolic extract of plant at doses of 200 and 400 mg kg^{-1} and glybenclamide (1 mg kg^{-1}) administered concurrently to streptozotocin induced diabetic rats. The potency of the extract was maximum with a significant reduction in blood glucose level by 39.5% ($p<0.001$) at a dose of 400 mg kg^{-1} compared with control groups (Saha *et al*., 1997a).

Anti-inflammation, analgesic and anti-pyretic properties: Anti-inflammatory potential of flavones glycoside (Chrysoeriol-4′-O-α-L-rhamnopyranosyl (1>2) β-D-glucopyranoside) isolated from ethanolic extract of aerial parts of plant. The extract was tested for anti-inflammatory activity using carrageenan induced paw edema in albino rats. The extract at a dose of 300 mg kg^{-1} showed 62.5% inhibition of paw edema after 3 h, which was comparable to the standard drug, diclofenac (Chandrashekar and Prasanna, 2010c). Another researcher also reported anti-inflammatory potential of these plant (Saha *et al*., 1997b).

The analgesic activity of ethyl acetate extract of plant were investigated in rat was studied using acetic acid induced writhing model and hot plate methods. In acetic acid induced writing test, extract (400 mg kg^{-1}) reduced writhing count significantly. The result of hot plate test indicated a significant increase ($p<0.001$) in reaction time 2 and 3 h, comparable to the reference drug pentazocin, but lesser ($p<0.05$) at 1 h. The extract might suppress the formation of pain inducing substances in the peripheral tissues; prostaglandins and bradykinin were suggested to play an important role in the pain process. The activity may be attributed due to the presence of flavanoid compound known chrysoeriol-(OAC)-glucoside present in ethyl acetate extract of the aerial parts of herb (Chandrashekar *et al*., 2004).

Methanol extract of *L. lavandulaefolia* was studied for antipyretic properties with yeast induced pyrexia in rats. A yeast suspension (10 mL kg^{-1}, s.c.) increased the rectal temperature 19 h after administration. The extract at doses of 100, 200, 400 mg kg^{-1} (i.p.) produced remarkable dose dependent lowering of body temperature; antipyretic effect produced was comparable to that of a standard antipyretic drug, paracetamol (Mukherjee *et al*., 2002a).

Psychopharmacological properties: Methanol extract of plant was evaluated for psychopharmacological profiles with various animal models such as behaviour test, potentiation of sodium pentobarbitone sleep, exploratory behaviour (Head dip test and Y-maze test), muscle relaxant activity (Rotarod test, Traction test and 30° inclined screen test) in rats and mice. The extract has affected spontaneous activity sound, touch and pain responses at a dose of 100 mg kg^{-1}; potentiated pentobarbitone induced sleeping time in mice at doses of 200 mg kg^{-1}; significant decrease in head dip responses in mice at doses of 100 mg kg^{-1} and in Y-maze test, there was a remarkable decrease in the exploratory behaviour of rats treated with extract at dose of 100 mg kg^{-1}. In tests related with muscle relaxant activity, extract showed remarkable motor in-coordination and muscle relaxant activity (Mukherjee *et al*., 2002b).

Wound healing properties: The effect of methanolic extract in the form of ointment and injection of powdered plant material was evaluated for wound healing activity by the excision and incision wound model in albino rats. The formulation of extract significantly enhanced the rate of wound contraction, period of epithelialization, tensile strength and regeneration of tissues at the wound site and had activity comparable to standard drug nitrofurazone. The results justify the folkloric use of *L. lavandulaefolia* in the treatment of skin diseases (Saha *et al*., 1997c).

Antitussive properties: The methanol extract of *L. lavandulaefolia* was examined for its antitussive activity on a cough model induced by sulfur dioxide gas in mice using reference, codeine phosphate (10 mg kg^{-1}), a prototype antitussive agent. It exhibited significant effects when compared with control and frequency of cough depressed was found to be dose-dependent manner. The plant extract at doses level of 100, 200 and 400 mg kg^{-1}. p.o. showed inhibition of cough by 35.0, 51.9 and 56.5% within 1 h of performing the experiment. These results provide evidence justify the folkloric use of plant by tribal people of Tripura (Saha *et al*., 1997d).

Antidiarrhoel properties: Ethanol extract of different plants of the Khatra region of the Bankura district of West Bengal, India were investigated for anti-diarrhoeal activity against castor oil induced diarrhoea, gastrointestinal mobility test and PGE_2 induced enteropooling in rats. The aerial parts of *L. lavandulaefolia* at a dose of 400 mg kg^{-1} p.o. significantly inhibited the frequency of defecation, wetness of the faecal droppings, reduced diarrhoea by inhibiting gastrointestinal motility (Mukherjee *et al*., 1998). Hence, this plant can be used as nonspecific anti-diarrhoeal agents. The response might be due to presence of tannic acid and tannins thereby denature proteins forming protein tannate, which makes the intestinal mucosa more resistant and reduces secretion (Tripathi, 2004).

Antimicrobial properties: The antimicrobial activity of the chloroform and methanolic extract of leaves of *L. lavandulaefolia* has been found to be effective against *E. coli*, *S. aureus*, *B. subtilis* and *P.aeruginosa* (Saha *et al*., 1995).

Antiulcer properties: Study on indomethacin-induced gastric ulcers in rats showed the *L. lavandulifolia* extract exhibited ulcer protection activity in a dose-dependent manner (Gupta *et al*., 2010).

CONCLUSIONS

Presently there is an increasing interest worldwide in herbal medicines accompanied by increased laboratory investigation into the pharmacological properties of bioactive ingredients and their ability to treat various diseases. Numerous drugs have entered the international market through exploration of ethnopharmacology and traditional medicine. Although, scientific studies have been carried out on a large number of Indian botanicals, a considerably smaller number of marketable drugs or phytochemical entities have entered the evidence-based therapeutics. Efforts are needed to establish and validate evidence regarding safety and practice of Ayurvedic medicines.

Leucas lavandulaefolia is a plant distributed throughout the pastures and wastelands throughout India. This plant used in Indian and folkloric system of medicine for several ailments viz. sedative, laxative, anthelmintic, jaundice, inflammation, vermifuge, stomachic, scabies, psoriasis, dermatosis, migraine, glaucoma, asthma, anthelmintic, urinary discharge, snake bite, scorpion sting and in paralysis etc. The scientific research on *L. lavandulaefolia* suggested biological properties of the extracts might provide detailed evidence for the use of this plant in different medicines. Furthermore, clinical trial of this plant should need to be investigated.

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