

***LEPIDAGATHIS CRISTATA* WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES**

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Abstract

Medicinal plants are meritoriously used in traditional medicines for centuries. The present review aims at gathering vast pharmacological applications of *Lepidagathis cristata*, Willd (Acanthaceae) a multipurpose medicinal plant. Traditionally this herb is used for the treatment of fever, eczema, psoriasis, epilepsy, skin abscess, burns, mouth ulcer, snake bites, wounds, skin itching and other skin diseases. The present article highlights the phytochemical screening and pharmacological properties such as antimicrobial, hypoglycaemic, antiemetic, anti-inflammatory, analgesic, immunosuppressive and wound healing. Taking great concern of the useful benefits of the plant it can be used as safe drug for mankind.

Keywords: *Lepidagathis cristata*, Acanthaceae, antimicrobial, hypoglycaemic, antiemetic, anti-inflammatory, analgesic, immune suppressive , wound healing

***LEPIDAGATHIS CRISTATA* WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES**

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Medicinal plants are the richest bio-resources of folk medicines and traditional systems of medicines, food supplements, pharmaceutical and clinical entities for synthetic drugs [1].The World Health Organization reported that about 75%- 95% of world population of developing countries were chiefly rely on traditional medicines and major part of traditional therapies involves the use of plant extract products on their active constituents [2].

Researchers are increasingly turning their attention to folk medicine looking for new leads to develop better drugs against cancer, as well as viral and microbial infection [3].

India is a varietal emporium of medicinal plants and it is one of the richest countries in the world as regards genetic resources of medicinal plants. It exhibits a wide range in topography and climate, which has a bearing on its vegetation and floristic composition. About 2,500 plant species are known to be useful and more than 6,000 manufactures produce about 1,500 Ayurvedic, Unani and Siddha medicinal preparations from plants. South India in particular blessed with diverse medicinal taxa. In recent past, the Ethno botanical survey has been triggered to gather the medicinal knowledge of tribal as well as non-tribal groups [4].

Hence the present study has designed to throw light on an medicinal herb *Lepidagathis cristata* Willd belongs to the family Acanthaceae for its ethnomedicinal uses, phytochemical constituents and pharmacological activities.

1. Botanical description:

L.cristata is commonly known as Nakkapidi, Lankapindi (Yanadi tribal), Mullabanthi(Telugu), Karappan poondu (Tamil), Karappanundu (Malayalam) and Otdhomp (Santhal tribe) [5]. It is distributed in central and eastern peninsular India; Konkan, Deccan North Circars, Carnotic and other regions. Usually it

appears in dry places and waste lands. It is a perennial herb, branches numerous from highly reduced main stem; Leaves- sessile, 3-6 × 0.5-1 cm, linear-lanceolate, pubescent, acute at both ends, margin entire to serrulate; Flowers- in globose heads, crowded at the base of the stem; bracts elliptic, spinescent ; bracteolate. Calyx- lobes 5, hairy; Corolla- white with brown or purple spots; Stamens 4,didynamous anther two celled and exerted; Style slender ; Stigma simple, Fruit capsule ,oblong and Seeds 2. Flowering seasons is January – March [6].

2. Traditional uses :

The powder of shade dried *L.cristata* plant mixed with honey in two spoonfuls is administered twice a day for about twenty days for asthma disease [4]. Whole plant powder is mixed with coconut oil to treat itchy infections in ethnic groups of Kurnool, Andhra Pradesh [7] ash of entire plant is boiled with coconut oil and the infusion is applied externally on chronic wounds of pet animals twice a day up to 6-8 days [8], dried shoot ash used for skin infections [9] and whole plant paste is used for itching infections [10].

The root paste is mixed with seed powder of *Abrus precatorius* and karanj oil applied for leucoderma [11]. The root of the herb also used as antidysenteric and reduces heat in stomach and fumigation of herb inhaled for the treatment of epilepsy [12]. In Chhattisgarh, the leaf extract used for malarial fever and to clean the cattle in rainy season and it is also used for skin itchy affection, burns and wounds. The leaf juice with copper sulphate is given during snakebite for gaining consciousness [13]. The aqueous extract of leaves mixed with *Ocimum* juice in 10:1 ratio is used to cure fever by Yanadi tribal of Andhra Pradesh [5]. Leaf extract is externally applied for ring worm and skin diseases [14].

The inflorescence ash mixed with coconut oil applied affected part for week to treat

***LEPIDAGATHIS CRISTATA* WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES**

inflammation, skin abscess and tumors [15]. The tuberous flower ash mixed with coconut oil is applied externally for burns and wounds [16] and smoke of flower head is used to treat to treat mouth ulcer [17]. Inflorescence ash mixed with oil applied externally for black patches on face [18].

3. Phytochemical and antimicrobial studies:

The chemical constituent in *L.cristata* is 6-hydroxyluteolin, 6-hydroxyluteolin-7-apioside a tryptophan derived alkaloid cristatin A which is responsible for treating eczema, psoriasis and other skin diseases [19].

The study of antibacterial activity of *L.cristata* with different solvents extracts such as polar (methanol and ethanol) and non-polar (toluene and acetone) were tested against human pathogenic bacteria namely, *Bacillus subtilis*, *Proteus vulgaris*, *Klebsiella pneumonia*, *Salmonella typhi* and *Pseudomonas aeruginosa*. Among the extracts tested, polar solvent extract showed significant activity than the non-polar solvent extracts. It was further observed that the extracts of the herb seemed to be more effective against Gram positive bacteria than Gram negative bacteria tested [20].

In *L.cristata*, bioactive compounds oleic acid, 3-(octadecyloxy) propyl ester from inflorescence[21], Heptadecane, 9-hexyl, Ethyl iso-allocholate from leaf [22] and Heptadecane, 9-hexyl, Octadecane, 3-ethyl-5-(2-ethylbutyl) from root [23] were analyzed by GCMS analysis and these compounds are found to be highly effective to plant pathogenic fungi *Colletotrichum fulcatum* NCBT 146, *Fusarium oxysporum* NCBT 156 and *Rhizoctonia solani* NCBT 196 as well as for the human pathogenic fungi *Curvularia lunata* MTCC 2030 and *Microsporium canis* MTCC 2820.

4. Pharmacological activities:

4.1 Analgesic activity

The analgesic activity of *L.cristata* flower was tested in chloroform, ethyl acetate and methanol solvents. These extracts were use for

analgesic activity in two dose level of 200 and 400 mg/kg body weight in two screening methods, Hot plate (n=5) and Tail Immersion method (n=5). The plant extract did not exhibit any mortality up to 4000 mg/kg dose level. The ethyl extract showed 47%, 57.1% activity at 200 and 400 mg/kg body weight after 30 minutes by Eddy's Hot plate method respectively. Values are expressed in MEAN±S.E.M. for five animals each group. ANOVA followed by Tukeys multiple comparison test. Values are statically ^ap<0.05, ^bp<0.01, and ^cp<0.001 when compared with 0 min interval. All flower extracts showed dose dependent analgesic activity in thermal model. The flower ethyl extract has maximum analgesic activity with 57.1 % (p<0.001) [24].

Analgesic activity was tested in *L.cristata* root with methanol, ethyl acetate, chloroform solvents and these were in two dose level that is 200-400 mg/kg body weight in two screening methods, one is Hot Plate (n=5), another is Tail Immersion method(n=5). The root extracts were showed significant analgesic activity when compared with the 0 time intervals. The root methanolic extract (RME) was showed maximum analgesic activity with 50% (p<0.01) and 55.5% (p<0.001) protection [25].

The ethanolic, ethylacetate and chloroform leaf extracts of *L.cristata* were prepared and used for analgesic activity in two dose level that is 200 and 400 mg/kg body weight per oral in two screening methods, one is HotPlate(n=5), another is Tail Immersion method (n=5), and the leaf extracts are showed significant analgesic activity and did not exhibit any mortality up to the dose level 4000mg/kg. Values are expressed in MEAN±S.E.M. for five animals each group. ANOVA followed by Tukeys multiple comparison tests. Values are statically ^ap<0.05, ^bp<0.01, and ^cp<0.001 when compared with 0 min interval. The 400mg/kg dose of leaf chloroform extract has highest activity in both the experimental models with 62.5% protection after 30min and 47.3% after 60 min with the significance of p< 0.001 when compared with 0 time interval and after 90 min. it was shown 50%

***LEPIDAGATHIS CRISTATA* WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES**

of protection and all the extracts had graded dose response [26].

4.2 Antiemetic activity

The phytochemical screening and antiemetic activity was tested in chicks using ethanolic extract of the herb. Chicks were divided into three groups of five each. The extract was dissolved in 1% Tween 80 and administered at a dose of 50, 100 and 200 mg/kg orally (10ml/kg). 1% Tween 80 Metoclopramide used as standard (50 mg/kg) B.W (Intrapetritionally) 10 minutes later 50mgs anhydrous copper sulphate / kg body weight was administered orally to each chicks. The number of retches (an emetic action without vomiting gastric material) was counted for next ten minutes. Primary phytochemical study revealed the presence of alkaloids and terpenoids. The chicks treated with 50 mg/kg inhibited the retches up to 22.7%, 100 mg/kg up to 48.7% and 200 mg/kg showed 73.8%. Therefore the ethanolic extract of 200 mg/kg inhibited emesis to an extent equal to standard [27].

4.3 Anti-inflammatory activity

The anti-inflammatory activity of flower extracts of the plant with methanol, ethyl acetate, and chloroform solvents by soxhlet extraction method. These extracts were used for anti-inflammatory activity in two dose level that is 200 and 400 mg/kg body weight in two screening methods, one is carrageenan induced paw edema method (n=5), another is formalin induced paw edema method (n=5). Values are expressed in MEAN±S.E.M. for five animals each group. ANOVA followed by Tukeys multiple comparison test. Values are statically ^ap<0.05, ^bp<0.01, and cp<0.001 when compared with 0 min interval. The chloroform extracts showed maximum activity in both models with 50 and 43.4 % of protection at 120 and 180 min intervals at the dose of 400mg/kg body weight respectively [28].

The pharmacological activity of *L cristata* root with different solvents like methanol, ethyl acetate and chloroform. These extracts were used for anti-inflammatory activity in two dose level that

is 200 and 400 mg/kg body weight in two screening methods, one is carrageenan induced paw edema method (n=5), another is formalin induced paw edema method (n=5) and values are expressed in MEAN±S.E.M. for five animals each group. ANOVA followed by Tukeys multiple comparison test. Values are statically ^ap<0.05, ^bp<0.01, and cp<0.001 when compared with 0 min interval. The chloroform extracts of root were showed maximum activity in both models with 43.4 and 29.7% of protection at 120 and 60 min intervals at the dose of 400mg/kg body weight [29].

4.4 Antipyretic activity

The antipyretic activity of whole plant of *L. cristata* in Brewer's Yeast induced Hyperpyrexia in Wistar strain albino rats was analyzed. The Petroleum ether extracts at a dose of 100mg/kg & 200mg/kg were evaluated for antipyretic activity. The extract of < 0.01) dose dependent antipyretic effect in yeast induced elevation of body temperature in experimental rats. Values are expressed as mean ± S.E.M for 4 groups of six animals each. The data were analyzed for significance using the unpaired two-tailed Student's t-test. The Petroleum ether extracts have significant antipyretic activity when compared with the standard drug paracetamol [30].

4.5 Hypoglycaemic activity

The hypoglycaemic activity was studied in ethanolic extract of *L. cristata* in alloxan induced diabetic rats. Wistar rats weighing 200-250gms were selected and diabetes was induced by injecting alloxan monohydrate (120mg/kg bodyweight) intraperitonally. Animals were divided into six groups, I group was kept as a normal, II group as a control group, III group was treated with standard drug Glibenclamide (5mg/kg). Remaining three groups were treated with different doses of 100,200 and 400mg/kg body weight of ethanolic extract of leaves of *L. cristata* for a period of 3 weeks. Results were analyzed by estimating the fasting blood glucose levels. The effect of EELC leaf extract on blood glucose, serum enzymes SGOT, SGPT, ALP and TC, TG, LDL and HDL were measured on days

***LEPIDAGATHIS CRISTATA* WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES**

7, 14 and 21. Data was expressed as mean \pm SEM, (n=6).Statistical analysis was done using one-way analysis of variance (ANOVA) followed by Tukey's multiple comparison. Values were considered statistically significant when at $p < 0.05$. Ethanolic extract showed a significant fall in fasting blood glucose at all the doses. But, at the dose of 400mg/kg were showed activity on par with standard [31].

4.6 Immunosuppressive activity:

In *L. cristata*, the immunosuppressive activity (IC_{50}) of alkaloid- I (cristain) was assayed against con-A (2 μ g/ml, T-cells) and LPS- induced (B- cells) proliferation of mouse splenic lymphocytes, here con- A and LPS were used as controls and cyclosporine A was used as standard drug. The immunosuppressive activity of alkaloid - I (IC_{50}) against con A and LPS induced proliferation is higher (1 μ g/ml) than the immunosuppressive activity of tardioxopiperzine A against the con A LPS induced proliferation and lower than that of cyclosporine A (IC_{50} 0.06 and 0.10 μ g/ml) [32].

4.7 Wound healing activity

The pharmacological analysis of wound healing activity of ethanolic extract of *L.cristata* by excision wound healing model in Wistar albino rats. The wound healing effect was comparatively evaluated with simple ointment and standard drug nitrofurazone for a period of 18 days. Ethanolic extract of the herb showed significant reduction in wound area in comparison with control from 4th day ($p < 0.01$) on wards and very high from 8th day to 18th day ($p < 0.001$). Results are expressed as mean \pm SE. The differences between experimental groups were compared by student t' test (control vs. treatment) and was considered statistically highly significant when $p < 0.01$ and significant when $p < 0.001$. The effect produced by the extract,

in terms of wound contracting ability, wound closure, decrease in surface area of wound, and tissue regeneration at the wound site were significant in treated rats [33].

4.8 Acute toxicity study

Acute toxicity study was carried out using female albino rats(150-200g) by up and down /staircase method as per Organization for Economic Co-operation and Development Guidelines No.434, (OECD) guidelines [34]. All the extracts were orally administered to different groups of rats at the doses of 50, 300, 1000, 2000 and 5000 mg /kg observed for 48h to study the general behavior of animals. Sign of discomfort and nervous manifestation. All the extract was found devoid of mortality of animals at the dose of 2000 mg/kg body weight. Hence the 1/10th (200 mg/kg, p.o) and 1/5th (400 mg/kg, p.o) of dose selected for the screening of analgesic and anti-inflammatory activity.

5. Conclusion

From the enormous literature study and experimental results analysis it can be concluded that *Lepidagathis cristata* is a traditional remedy for fever, eczema, psoriasis, epilepsy, skin abscess, burns, mouth ulcer, snake bites, wounds, skin itching and other skin diseases. The various bioactive compounds present in this herb are highly responsible for its antibacterial and antifungal activities against both plant and human pathogens. It has also various pharmacological activities like Analgesic, Antiemetic, Anti-inflammatory, Hypoglycaemic, Immunosuppressive and Wound healing. Taking great concern of the useful benefits of the plant, it can be fortified as a safe and highly important medicinal plant for human beings and pet animals.

LEPIDAGATHIS CRISTATA WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES

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LEPIDAGATHIS CRISTATA WILLD.(ACANTHACEAE): A REVIEW OF ITS PHYTOCHEMICAL AND PHARMACOLOGY ACTIVITIES

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