

Medicinal Effects of *Mollugo cerviana* - A Review

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Abstract— Over the past few years, human kind have been diagnosed with lot of infections and disorders. But the availability of effective allopathic drug in market are less. In this scenario, using plant extracts the immune system is supported to fight against infections based on the knowledge in the Ayurveda and siddha practices. One of the phytochemical enriched herb available in India is *Mollugo cerviana* (commonly known as thread stem carpet weed). This plant is commonly used to treat fever, stomach ache, jaundice, gout and rheumatism. It is also used to promote vaginal discharge after child birth. The plant shows antimicrobial, anti-inflammatory, antioxidant activity and spermicidal activity. In excess, the plant has hepatoprotective efficiency and photo-protective capacity due to the presence of phytochemicals like carbohydrates, saponins, tannins, terpenoids, flavonoids, steroids, phenols, proteins and alkaloids. In short, the plant extract has most of the medicinal applications. This review is a collection of useful researches on *Mollugo cerviana* and their bioactivities.

Keywords—Allopathic Drug, Ayurveda, Siddha, *Mollugo cerviana*, Thread Carpet Weed

I. INTRODUCTION

Drugs derived from medicinal plants are beneficial to mankind for curing many of the diseases. World Health Organization (WHO) reports that about 80% of the population in world depends on the traditional medicine [1]. The increased knowledge in disease pathogenesis and bioactive components in last few years helps in the development of drugs. National Medicinal Plant Board reports that in India, more than 17,000 – 18,000 flowering plants are existing. In that, 7,000 species are reported as medicinal plants [2]. For more than 6000-7000 years plants are exploited as herbs in India [3]. These plants are used to treat most of the diseases in the form of Kashayam and Legiam.

The pharmaceutical properties of most of the herb's extracts were assessed and reported already. *Mollugo cerviana* (L.) Ser is an herb existing in southern parts of India and it is reported to have an antimicrobial and anti-inflammatory properties [4,5]. Specially it is seen in all the districts of Tamilnadu. *Mollugo cerviana* (L.) Ser has two sub species namely *Mollugo cerviana* var. *spathulifolia* and *Mollugo cerviana* var. *cerviana*. It usually found as a weed in wheat paddy field [6]. It is commonly known as threadstem carpetweed and in Tamil it is parpaadagam or Pada [7]. The extracts of *Mollugo cerviana* (L.) Ser can act as a uterine stimulant, antiseptic, febrifuge [8] and it is also used to treat jaundice [9].

Beside this, in India, it is identified as a suppressor of stomach ache and to promote vaginal discharge after child birth [10,11]. It also enhances eyesight, reduces body odor [12]. Decoction of flowers and tender shoots are used to treat diaphoretic effect. Roots are used in gout and rheumatism [13]. The presence of C-glycosylflavonoids compounds are found in *Mollugo* species [14]. In 2012, it was reported that crude extract of *Mollugo cerviana* and n-butanol fraction contain alkaloids, saponins, flavonoids, tannins, glycosides, triterpenoids, and phenolic groups while the ethyl acetate fraction contains active constituents like saponins, glycoside, triterpenoids and steroids [4]. Different extracts show distinct biological activity, since they have diverse chemical compounds in them. Rest of this review is organized as follows, Section I contains introduction about *Mollugo cerviana*, Section II contains the information about availability and morphology of *Mollugo cerviana*, in Section III chemical compounds present in the extracts are compiled, Section IV contains the medicinal properties like anti-inflammatory, antioxidant, antimicrobial, antidiabetic, hepatoprotective and photo-protective activities of *Mollugo cerviana* extracts.

II. SYSTEMIC POSITION AND MORPHOLOGY

The genus *Mollugo* comprising 35 species is found mostly in tropical or warm regions [15]. *Mollugo cerviana* (Figure 1) belongs to the family Molluginaceae and its taxonomic order is mentioned in Table 1 [16].

Table 1. Scientific Classification [16]

Kingdom	Plantae
Clade	Angiosperm
Clade	Edicot
Order	Caryophyllales
Family	Molluginaceae
Genus	Mollugo
Species	<i>Mollugo cerviana</i>

Figure 1. *Mollugo cerviana* Plant - Dried

Mollugo cerviana is an annual herb which can grow up to 20 cm tall with straight, slim and cylindrical stems. It has branches, thick nodes and sweet-scented roots. 4-8 denser leaves are present at every node and they are 6-13 mm long. Leaves are arranged as spatulate or linear-spatulate. Plant has numerous number of flowers on stiff filiform pedicles in axillary and terminal peduncles to the height 1.2 cm long usually in groups of 3. Fruits are round and closed with leaf-like petals. It has numerous number of seeds which are smooth and yellowish-brown in color [17].

III. CHEMICAL COMPOSITION

With the application of standard methods, *Mollugo cerviana* plant contains the phytochemical compounds such as carbohydrates, saponins, tannins, terpenoids, flavonoids, steroids, phenols, proteins and alkaloids. Glycosides were not present in methanol extract. Ethyl acetate and n-butanol extracts contain flavonoids, tannins, saponins, triterpenoids, phenolic groups and glycosides [18]. This plant extract contains the C-glycosylflavones specifically orientin (Figure 2a) and vitexin (Figure 2b) [19].

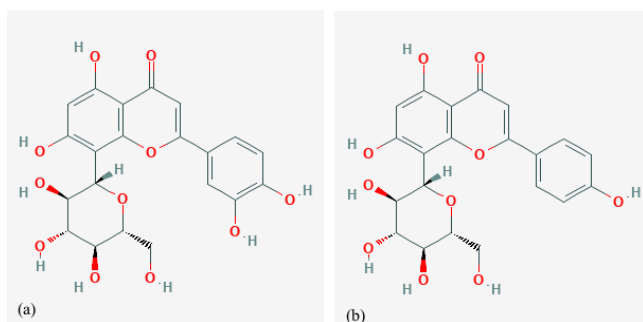


Figure 2. C-glycosylflavonoids in *Mollugo* species; (a) Orientin [20]; (b) Vitexin [21]

Reports revealed that methanol extract of *Mollugo cerviana* plant contains significant amount of total phenol (0.160 mg/gm), alkaloids (0.23 mg/gm), saponin (0.120 mg/gm) and flavonoids (0.80 mg/gm). It is also reported that the areal parts of the plants contain triterpenoids and mollugenol A and B. Mollugenol A showed antifungal and spermicidal activity. The whole plant extract showed anti fertility effect in male albino rat [8].

Based on the phytochemical screening of *Mollugo cerviana* alcoholic extract, tannin, saponin, steroids, terpenoids, triterpenoids, alkaloids, amino acids and protein are present in larger amount comparatively. In the same time, carbohydrates, flavonoids, anthraquinone, glycine and polyphenols are in lesser amount where phlobatannins are absent. Other than this, it contains vitamins A, C and D. Qualitative analysis of inorganic elements showed that calcium, sodium, potassium, iron, sulphate, phosphate and chloride are in higher concentration. Nitrate is present in lesser amount and magnesium and carbonate are not absorbed [22,23].

IV. MEDICINAL PROPERTIES

Anti-inflammatory effects

Sadique *et al.*, 1987 reported the anti-inflammatory activity of *Mollugo cerviana*. The plant as a whole was dried in shade and it was given orally to the male albino rats of Wister strain in which inflammation was induced by injecting Carrageenan. It showed 26 % anti-inflammatory activity in acute inflammation induced rats and it was 46 % in chronic inflammation rats. The effects were compared with those of standard anti-inflammatory drug, hydrocortisone. With this, they also have an inhibitory activity towards lipid peroxides, acid phosphatase and gamma- glutamyl transpeptidase. 100 µg/ml concentration of alcoholic extract showed 49.6 % inhibition of Phospholipase A2 [2].

Antioxidant activity

Tissue injury, inflammation, neurodegenerative diseases, cancer and aging can be induced by free radicals. Most of the phytochemical can scavenge the free radical to a greater potential. Valarmathy *et al.*, 2015 checked the free radical scavenging activity of methanol extracts by using 1,1-diphenyl-2, 2- picryl hydrazyl free radical (DPPH) assay method. The in-vitro model exhibited different level of antioxidant activity where the *Mollugo cerviana* extract showed significant activity ($84.12 \pm 1.06\%$) and the percentage inhibition of nitric oxide scavenging activity was significant (60.56 ± 2.74) at a concentration of 400 µg/ml [24].

Antimicrobial activity

Valarmathy *et al.*, 2012 studied the antimicrobial activity of *Mollugo cerviana* plant on six bacterial strains totally. They were *Staphylococcus aureus*, *Bacillus subtilis*,

Streptococcus faecalis (gram positive), *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia* (gram negative). The fungal strains used in the study were *Aspergillus niger*, *Aspergillus fumigatus*, *Mucor*, *Candida albicans*. Antimicrobial activity was tested using the disc diffusion method. Inhibition zones in 22-32 mm range was observed for the methanol extract against all the above-mentioned organisms where 18-25 mm range is observed as an inhibition zone for n-butanol fraction. Ethylacetate fraction showing 12-20 mm range will come under inhibition zones [4].

The work by Parvathamma and Shanthamma, 2000 shows that the callus induced from the leaf explant also shows antimicrobial activity against *Escherichia coli* (Gram-negative) and *Bacillus subtilis* (Gram positive) and two fungi, *Aspergillus niger* and *Aspergillus flavus*. Ethanolic extracts of *M. cerviana* aerial shoot and its leaf, callus showed more antimicrobial effect on *B. Subtilis* (>10 mm diameter) than *E. coli*. However, they were not effective than the reference drug streptomycin sulphate. The antifungal activity of methanol extract was almost nil. However, both fungi were inhibited maximum by the reference drug, griseofulvin. Hexane and chloroform extracts were in effective against these bacterial strains [25].

Hepatoprotective efficiency

Liver plays a major role in detoxification of blood in animals. Some chemical agents, infectious pathogens and alcohol consumption lead to liver cell damage. The hepatoprotective activity of alcoholic extract of *Mollugo cerviana* was assessed in CCl₄ treated liver cells. Extract exhibited positive effect on hepatocytes due to the presence of essential phyto constituents such as flavonoids, saponins, terpenoids and tannins. Group of animals were fed with alcoholic and aqueous extract and 200 mg/kg of body weight was identified as an effective dose for the treatment. Also, it was reported that the alcoholic extract was more effective than aqueous extract [9].

Photo-protective potential

Excess exposure of skin to solar UV radiation leads to the production of free radicals. Larger number of free radicals can oxidize biomolecules and stimulates cascade of biological events which result in DNA modification and abnormal expression of genes. Nowadays, synthetic sunscreen lotions or creams are available in market. But the side effects of synthetic compound as an effective alternate is obligatory. With respect to that, so many researchers are trying to use plant extracts as photo-protectors. Aqueous extracts of *Mollugo cerviana* in 1 mg/ml concentration was tested for UV absorption and the sun protection factor (SPF) was identified as 25 which was higher than the commercially available products [26].

V. CONCLUSION AND FUTURE SCOPE

Mollugo cerviana commonly found in most of the south Indian states. It is an important herb in Ayurveda medicine which is used as antimicrobial, antioxidant, hepatoprotective and photo-protective agent. But, the exact bioactive compound available and their mode of action is not clearly studied yet. Since the researches on this plant extracts are not sufficient to show its anticancer activity, antiaging property, antidiabetic activity, spermicidal activity, effect of its compounds in gastrointestinal tract and effect on uterus after child birth. In the drug development process, identification and characterization of phytochemicals are more important. In this scenario, information on *Mollugo cerviana* and its bioactive compounds will help the scientists for the further studies.

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Authors Profile

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