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Review on Immunomodulatory of Ethanolic Extract of *Galium Aparine*

Abesh Das[1]*, Tiyas Chatterjee[2]*

[1,2]*Department of Pharmaceutics, Guru Nanak Institute of Pharmaceutical Sciences

ABSTRACT

The annual herb Galium aparine is slender and has branched roots. Petioled, ovate, slightly rough above, typically with a notch at the apex, cotyledons measure 8–15 mm in length and 6–9 mm in width. Up to 120 cm long, quadrangular in cross-section, with prominent ribs densely set with recurved thornlike spines, jointed, and branched at the first node, the stems are green, soft, freely branched, and numerous. Sessile, simple, narrow, oval lanceolate, mucronate, single-veined, 30–60 mm long, 3–8 mm broad, typically dark green, thin and lax, mucronate leaves are grouped in whorls of four to eight at the nodes. The leaf margins have a hairy upper surface, a row of forward-directed spines along the midrib, and a weakly retrosely scabrous lower surface. Flowers on peduncles in the axils of the leaf whorls have a diameter of 2 mm. They are arranged in cymes with two to five flowers per peduncle (four to six bracts). There are four white, acute lobes on the corolla. Flowers have one pistil with two styles and four stamens, making them bisexual. In equatorial view, pollen grains are oval, and the hexaploid plant's polar diameter, or width, varies from 25 to 31 pm. With two carpels per flower, the fruit is a schizocarp that forms two globose mericarps. Fruits are reniform when viewed from the side, oval in outline, grey, greyish-brown, or dark brown. These bristles typically originate from a small tubercle that is formed when the fruit's surface layer is elevated. Sweden uses the fruits of G. aparine, which are one of the best alternatives to coffee. The entire plant can be chopped up and fed to poultry, or it can be used as an alternative to tea. Adult beneficial insects that are not phytophagous find the flowers to be a significant food source (Batra 1984). Galium species can be used as food or wine flavorings because they have secondary plant substances with fungistatic properties.

Keywords: *Galium aparine*, quadrangular, hexaploidy, retrorsely, schizocarp.

Introduction

It has been reported that galium aparine competes well with sugarbeet, rapeseed, and cereals. It results in lodging, obstructs combined operations, and lowers potential yields by 30–60% in cereals. There have been reports of lower corn and sugarbeet yields in Europe. It is one of the most common winter cereal weeds in England. According to Pawlowski and Wszolek, it is the most common weed in winter wheat and spring barley in Poland. It is a serious weed of drained winter paddy in Japan. In many fields of wheat, barley, rapeseed, flax, field peas, and forage legume seed crops in Alberta and Saskatchewan, there are significant infestations of G. aparine. When G. aparine plants appear alongside rapeseed or even up to a week after the crop, they successfully outcompete it. A reduction of 13-28% in the yield of harvested rapeseed and 30-70 cleaver seeds per gram can be the outcome of early establishment. Due to their similar size and shape, galium aparine and rapeseed cannot be mechanically separated using current methods, which lowers the quality of oil extracted from rapeseed. Apart from the decrease in possible crop yields, G. aparine has been documented to possess multiple other detrimental traits. According to Mateev and Timotheev, the water-soluble extracts it contain substances that have allelopathic effects and inhibit the growth of oak seedlings. Anthraquinones, which are found in Galium species, have a low systemic toxicity to mammals but have the potential to irritate skin. Livestock that consume galium aparine experience internal inflammation as well as a diuretic effect. Stem eelworm, stem and bulb eelworm, and leaf eelworm are all hosted by Galium aparine. The potato aphid, Macrosiphum solidifies. G. aparine, according to a survey of aphids on sugar beets in England.

Numerous substances derived from plants, including glycoprotein, lectins, alkaloids, flavonoids, sterols, and polysaccharides, are employed in immunomodulation. Among polysaccharides, acidic rhamnogalacturonan and arabinogalactan, for instance, have been demonstrated to exhibit immunostimulatory effects both in vivo and in vitro. Numerous studies examine saponins' immunomodulatory properties.

The development of a wide range of dietary supplements for the prevention of immune system disturbances, or human immunity system enhancement, as well as for the prevention and treatment of allergies, was aided by the demonstrated effects of triterpenoid glycosides on the immune system of mammals.

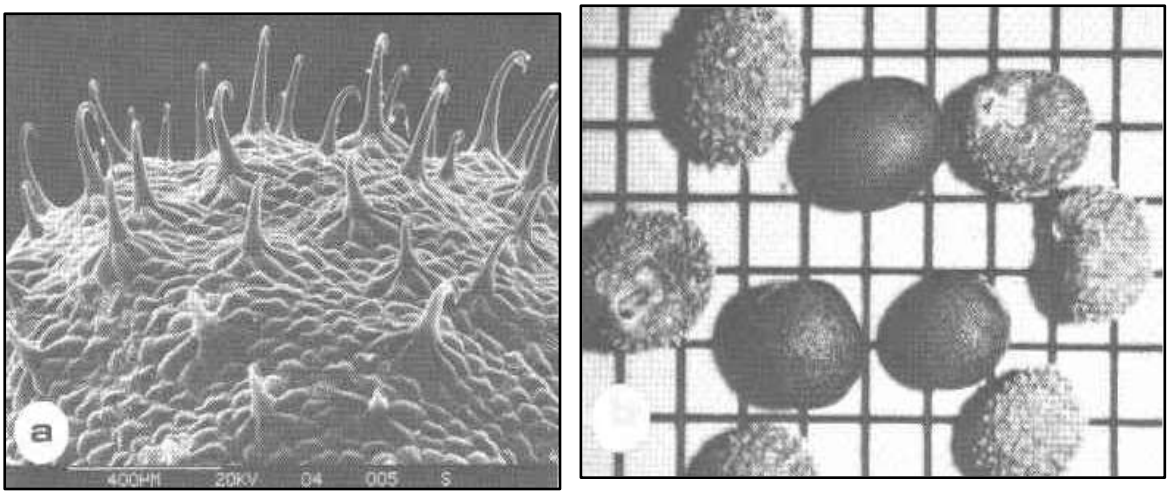

Figure 1: (a) Surface of spiny fruit of G. aparine (b) G. aparine, and rapeseed, grid:l mm

Morphological Character

Scientific Name - ***Galium aparine* L.** *(Rubiaceae)*

General shape: globular

Normal size: 1.5-3.0 mm diameter (a large variation in size is common)

Color: greenish to grey-brown

Texture: dull, bristly, covered with round tubercles which are themselves surmounted by spiny, fragile, and hooked bristles.

Distinguishing features: coming from a diachene exhibits a round hollow in the middle of the seed. The hilum is in the hollow.

Embryo: the embryo is curved along the dorsal side of the seed in the length of the hollow and is embedded into the nutritive storage tissue.

Figure 2: Magnification images of normal seeds of *Galium aparine*

Geographical Distribution

Globally, temperate zones are home to galium aparine, which is also found in the tropics at higher elevations. It stretches across the prairie provinces, Ontario, Quebec (north to James Bay, Anticosti Island, and Gaspe Peninsula), Newfoundland, New Brunswick, and Nova Scotia, and south to California, Texas, and Florida in North America. It begins in the Aleutian Islands and southern Alaska and ends in British Columbia. With the exception of northern and western Asia, galium spurium is found throughout Europe. G. spurium is found in Canada in the southwest regions of Ontario and Quebec, as well

as on the southernmost point of Vancouver Island and throughout the prairie provinces. According to Thomas and Wise, infestations are minimal throughout Manitoba, with the exception of the Gilbert Plains, where they are becoming more prevalent. The infestations are mild in Saskatchewan's west and east-central regions. The authors noted light to moderate infestations of the spiny, intermediate, and smooth-fruited forms in the northeastern Saskatchewan parkbelt during the summers of 1985–1987. The northern and eastern portions of the Peace River region as well as the central portion of Alberta are home to moderate to severe but localized infestations, according to field surveys the authors conducted during the summers of 1982 and 1983.

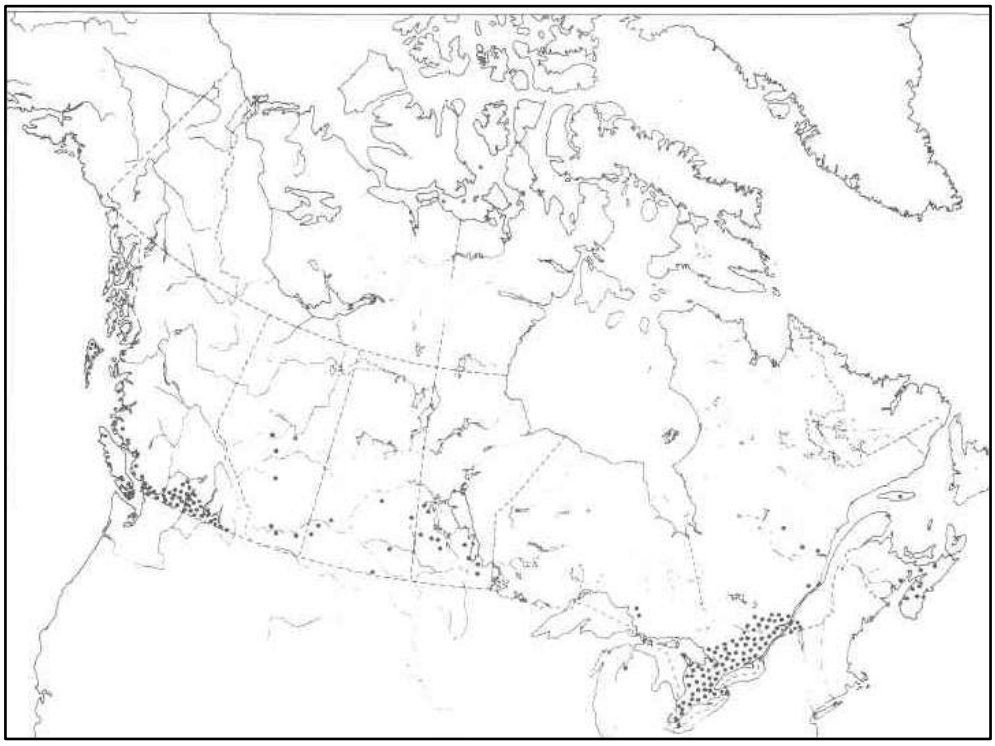

Figure 3: Distribution of G. apaine across Canada plotted from the following sources: Survey of Weeds in Alberta, Moore, Scoggan, Taylor and Mulligan, Thomas and Wise

(1982, 1983, 1986), CanadaWeed Survey, herbaria of Biosystematic Research Center, and the University of Alberta.

Extraction

In 2012, a collection of Galium aparine L. herbs was made in the flowering stage in the Lugansk region of Ukraine. Voucher specimens from the National University of Pharmacy's Pharmacognosy Department Herbarium were used to identify the plants.

Chloroform was used as the extracting agent in an exhaustive circulative extraction procedure in a Soxhlet apparatus to produce a lipophilic complex.

The plant material to extragent ratio was 1:10, and the extraction process took 30 hours. Following the extraction process, the extragent was evaporated in a vacuum-circulated apparatus at a temperature of 35–40 0C until all of the extragent was removed.

Figure 4: Extract of *Galium aparine*.

Chemical Constituents

Preliminary phytochemical screening of Galium aparine aerial parts in ethyl acetate and methanol extracts showed the presence of alkaloids, anthraquinones, coumarins, iridoids, asperuloside, alkanes, flavonoids, and saponins in the plant [25–27]. Galium aparine seeds contained 2.76±0.03% alkaloids, 0.99±0.03% saponins, 6.36±0.03% flavinoids, and 16.96±0.01% tannins, according to quantitative analysis. Galium aparine was found to contain anthraquinone aldehyde nordamnacanthal [1,3-dihydroxy-anthraquinone-2-al].The plant extracts had total phenolic contents of 41.00 ± 0.280 mg GAE/g in the methanol extract and 50.00± 0,036 mg GAE/g in the ethyl acetate extract. In 1 ml of ethyl acetate extract, 598.2 ppm of rutin was found, and in 1 ml of methanol extract, 597.7 ppm.

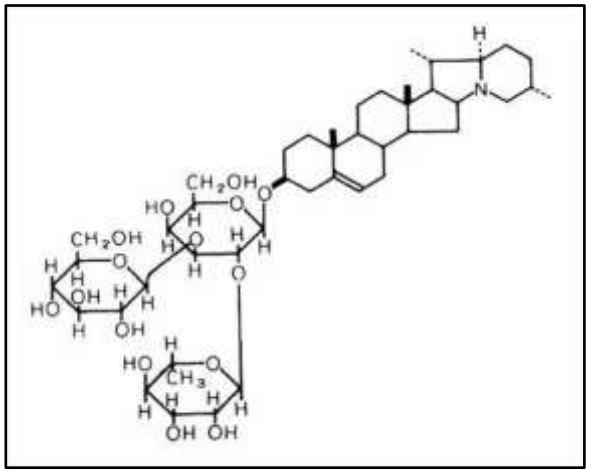

Figure 5: Chemical structure of *Galium aparine.*

Antimicrobial Effect

The antimicrobial activity of the ethanolic extracts of Gallium species was evaluated against two strains of bacteria that are Gram-positive (Staphylococcus aureus [ATCC 49444], Listeria monocytogenes [ATCC 13076]), two strains of bacteria that are Gram-negative (Escherichia coli [ATCC 25922], Salmonella typhimurium [ATCC 14028]), and one strain of fungus (Candida albicans [ATCC10231]). When tested against the tested microorganisms, ethanolic extracts of Gallium aparine exhibited no antibacterial activity.

Antioxidant Effect

Gallium aparine ethanol extract's in vitro antioxidant activity was measured using the DPPH radical bleaching method. Gallium aparine's ethanol extract demonstrated strong radical scavenging activity (IC50 = 116.43 ± 0.46 μgm/l). The amount of total polyphenols and this activity had a strong correlation.

Anticancer Activity

Human colon cancer cells [Caco-2] [ATCC HTB-37], human breast cancer cells [MCF-7] [ATCC HTB-22], and human peripheral lymphocytes were tested for anticancer effects. When compared to methanol extract, ethyl acetate had a greater cytotoxic and apoptotic effect on human peripheral lymphocytes. On the MCF-7 cell line, ethyl acetate extract showed cytotoxic effects that were concentration-dependent [34.35%, 43.27%, and 49.30% for 100, 200, and 300 μg/ml, respectively]. Higher cytotoxic effects were observed in MCF-7 cells when exposed to methanol extract (34.30±0.063, 55.67±0.131, and 71.14% for 100, 200, and 300 μg/ml, respectively). MCF-7 and Caco-2 cell lines were subjected to concentration-dependent apoptotic effects by extracts of galium aparine, ethyl acetate, and methanol. Methanol extract showed greater effectiveness after 48 hours.

Dose

2-4 grams of dried herb or three times a day as an infusion.

2-4 ml of liquid extract (1:1 in 25% alcohol) three times a day. Juice (3–15 ml) expressed three times a day.

Conclusion

This review examines the pharmacological makeup, therapeutic effects, and chemical makeup of galium aparine, an herbal remedy that shows promise due to its efficacy and safety.

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