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Artemisia scoparia : A Review

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ABSTRACT: The genus *Artemisia* is reported to possess bitter, stimulant, tonic, antispasmodic and anthelmintic properties. *Artemisia scoparia* Waldst and kit (Compositae) is an important source of chemicals of immense medicinal and pharmaceutical importance such as Scoparone, Rutin and Esculetin which are effective as immunosuppresants, hepatoprotective, antispasmodic, hypotensive, antiatherogenic, anti-inflammatory agents. Hence, in view of the immense medicinal importance of the plant this review is therefore an effort to compile all the information reported on its phytochemical and pharmacological activities, so that interest could be diverted towards this ignored herb, because of less awareness, for the treatment and relief from various ailments and diseases.

KEY WORDS: *Artemisia scoparia,* Compositae, Scoparone, Rutin.

INTRODUCTION

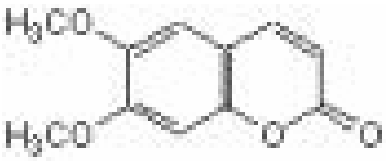
Artemisia scoparia Waldst and kit (Compositae) is an annual, biennial or perennial usually aromatic herbs or sub shrub often grows to a height of 5-6 ft. It is found widely distributed all over the world specially India, China, Japan, Afghanistan, and central Europe. It is the only species of *Artemisia scoparia* that grows in the plains in India. In India, it occurs mainly in north-western parts, where it extends from Western Himalayas in Kashmir to Lahul at 5,000 to 7,000 ft, in Sindh, Punjab, Upper Gangetic plain and west Tibet at 7,000 ft,-12,000 ft. *Artemisia scoparia* commonly known as wormwood. In India, is known by various names in different regions viz., Dona and Jhan in Punjab and Churisaroj and Danti in Bombay, (1, 2). It is reported to have many important medicinal properties. In the indigenous system of medicine, *Artemisia scoparia* has been claimed to be useful for earaches, its smoke is considered good for burns. Infusion of plant is used as a purgative (2, 3). Aerial parts have been claimed to have hepatoprotective (4,5), antimicrobial (6) antitumor (7), immunomodulator (8) and antiasthmatic properties (9) because of the presence of certain important compounds of medicinal importance such as Rutin, Scoparone etc. A decoction of flowering heads is considered an excellent mouthwash in all tooth troubles. The main constituents reported are lactone, flavonoids, coumarins, terpenes, camphor and some steroids. Although a number of varieties of *Artemisia scoparia* growing all over the world have been worked for their constituents but in comparison little work is done on the chemical examination of *Artemisia scoparia* growing in India.

PHYTOCHEMISTRY

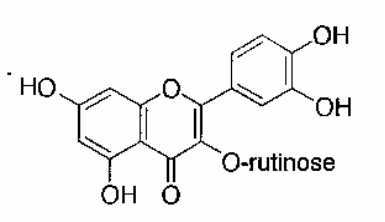
Little work is done in the field of phytochemical investigation of the plant. Preliminary phytochemical studies performed by Parihar and Dutt (10) have showed the presence of 0.92 % essential oil and 0.75 % lactone. Petroleum ether extract was reported to contain lactone named as 'Scoparin' having molecular formula $C_{16}H_{20}O_5$. It contains an α: β unsaturated, one ketonic group and two methoxy groups. In yet another work by Parihar and Dutt (11) also reported the presence of coumarin (6, 7, dimethoxy coumarin) named Scoparone and the structure of Scoparone was elucidated by Singh *et al.*(12). Elaborate pharmacognostic studies on *Artemisia scoparia* were carried out by Shome *et al.,* (13). The parameters studied included were anatomical and microscopic details of the different parts; certain physico-chemical constants such as ash values, percentage of tannins and successive extractives; as well as qualitative detection of the main chemical constituents in the various extractives. TLC and fluorescence tests of drug powder were also carried out. Presence of casparian strips in the endodermis, resin canals, 4- to 8-celled characteristic glandular hairs on the corolla and absence of pappus were some of the diagnostic features found in the drug. Kapoor *et al.,* (14) carried out extensive studies on essential oil composition of *Artemisia scoparia*. Hydro distilled oil obtained from aerial parts was analyzed by capillary GC and GC-MS.

They reported presence of eight monoterpenes, predominantly β myrcene (24.4 %), γ - terpinene (18.3 %), neral (12.5%) and cis p-mentha – 2 – en – 1 – ol (5.1 %). Seven sesquiterpenes were also reported, prominent one included β - caryophyllene (3.4 %), p – cymene (17.4%) and p – cymene – 8 – ol. In trace amounts, aliphatic constituents were also found namely n – eicosane. Sefidkon *et al.,* (15) studied chemical composition of the essential oil of 5 Artemisia species from Iran. *Artemisia scoparia* was one among them and main constituents present in this plant were found to be Capillene (48.5 %), β - pinene (9.8 %), 1, 8 – cineole + limonene (9.2 %) camphor (6.9 %) and Capilline (5.6 %).

Artemisia scoparia is also a significant source of Rutin, well known flavonoids and has been traditionally used in liver damage (16, 17). In yet another work, essential oil in *Artemisia scoparia* was found to be rich in Camphor (11 %), 1, 8 cineol (21.5%) and β - caryophyllene (6.8 %) (18). On chemical investigation of essential oil by Thappa *et al.,* (19), a fraction distilling between 108 – 111 / 7 mm could not be easily characterized as it was mixture of two components. Mixture was repeatedly resolved by TLC and characterized by NMR spectroscopy. Compound obtained was found to be caryophyllene epoxide. Taxonomic studies on *Artemisia scoparia* were done by Qureshi *et al.,* (20) and gave a detailed account on its morphology and medicinal importance. Ghomi *et al.,* (21) reported main constituents to be 1 – phenyl – penta 2, 4 diene (30. 9 %), β - pinene (23.3 %) limonene (10.2 %) and β - osimene (9.7 %). Methanolic extract of the flower bud of *Artemisia scoparia* when analyzed by UV, NMR and MS, indicated the presence of six compounds out of which demethyl capillarisin, Capillartemisin β, Kumatakenin and isoscopoletin beta D-glucoside were reported for the first time (22). For the first time four new flavones were also reported to be present in flower bud and were identified as hyperin, eupafolin, pedalitin, 5, 7, 2, '4' – tetrahydroxy 6, 5' dimethoxy flavone (23). Two isomeric forms of Sabandin (Sabandin A, B) Coumarin were isolated and studied by Ali *et al.,* (24).



Scoparone



Rutin

Pharmacology

In the indigenous system of medicine, *Artemisia scoparia* has been used for treatment of earache, burns, liver damage, bronchitis, cough, jaundice, purgation etc. Although a lot of pharmacological investigations have been carried out based on the ingredients presents but a lot more can still be explored, exploited and utilized. It is an old traditional herbal remedy for neonatal jaundice with a newly identified risk (25).

Huang *et al.,* (26) studied a chemical "Scoparone found in *Artemisia scoparia* which is useful for the development of letter immunosuppressive agents with vaso-relaxant actions which can be used against transplant rejections and autoimmune diseases. Gilani *et al.,* (4) investigated the hepatoprotective effect of *Artemisia scoparia* against carbon tetrachloride induced hepatotoxicity and confirmed its role in providing protection against liver damage. Elaborative investigation of pharmacological action of 6, 7 dimethoxy coumarin (Scoparone) was done by Jamwal *et al.,* (27). Scoparone exhibited marked hypotensive and tranquilizing actions in experimental animals. Hypotensive effect was demonstrated on anaesthetized normotensive animals (dogs, cats, rats) and hypertensive dogs. Scoparone caused peripheral vasodilation and showed antispasmodic and relaxant effects on smooth muscles. It was also found to possess moderate sedative and anticonvulsant properties. LD_{50} in rats and mice was found to be 210 mg/ kg and 180 mg/kg I.P respectively and 350 mg/kg P.0 in rats. (27) Scoparone obtained from Chinese herb was found to have marked vasodialator effect (28). *Artemisia scoparia* was also found to have antiserotonergic and general spasmolytic activities (29).

It also relaxes tracheal smooth muscles (30) and prolongs asthmogenic latent periods in asthmatic guinea pigs by spray inhalation of Scoparone (31, 32). It has also been reported to directly decrease intracellular Ca^{+2} ion conc. in isolated guinea pig tracheal smooth muscle (32). These results indicated strong anti–asthmatic action exhibited by Scoparone.

Fang *et al.,* (33) reported a new method for assessing serum level of Scoparone by simple HPLC method in order to establish a drug administration regime applicable to clinical therapies. Antihypertensive activity of Scoparone was confirmed by work carried on by Sharma (34). The structure activity relationship studies demonstrated that Scoparone was the optimum compound of the series that possessed the marked and persistent hypotensive activity (35). Scoparone also produces marked reduction in catecholamine content of various tissues, but the pharmacological activities of Scoparone as an antihypertensive were found to be independent of its catecholamine lowering action (36). Sharma (37) also studied the mechanism of hypotensive action of Scoparone and suggested direct vasomotor inhibition at the central site involving ganglionic, α-adrenoreceptor blockade, and marked peripheral vasodilation of arterial blood vessels to be the possible mechanism of action of Scoparone as antihypertensive agent. Furthermore, vasodilator effect of Scoparone on isolated aorta of rats was studied by Li *et al.*(38).

Scoparone is also reported to reduce total cholesterol and triglycerides and also retards the characteristic pathomorphological changes in hypercholesterolaemic diabetic rabbits possibly due to its ability to scavenge reactive oxygen species, inhibition of tyrosine kinesis, and potentiation of prostaglandin generation (39). It also possess antiatherogenic properties in hyperlipidaemic diabetic rabbits as Scoparone treated group showed less advanced atherosclerosis with a lower plasma cholesterol (40). Its anti-inflammatory activity was also confirmed by its ability to inhibit tissue factor expression in lipopoly saccharides in activated human umbilical vein endothelial cells mediated by the mechanisms suppressing superoxide anion formation and tissue factor transcription, which is an important regulator and effecter molecule of coagulation in various inflammatory states (41). Rutin is well known and extensively studied flavonoid, which is obtained from *Artemisia scoparia*. This compound is found to possess multiple pharmacological activities including antibacterial and antiviral (6) antiprotozoal (42), antitumor (7), antiallergic (8), antifungal, antihelmintic activities, antiplatelet activities (44). Janbaz *et al.,* (45) studied protective effect of Rutin on paracetamol and CCl_4 induced hepatotoxicity in rodents. Thus, significant presence of Rutin in *Artemisia scoparia* may be the contributory factor towards folkloric use of plant in liver damage. The essential oil component of *Artemisia scoparia* also possess marked antimicrobial activity against almost all oral bacteria with various degrees of inhibition (17). In yet another similar works antimicrobial activity of methanolic extract of *Artemisia scoparia* was confirmed by studying its effect against *S. aureus, B. subtilis, C. albicans* (46). It has also been found to have marked effect on reproductive processes studied in rats (47). Esculetin (6,7 dihydroxy coumarin) one of the component of *Artemisia scoparia* is found to suppress proteoglycan metabolism by inhibiting production of matrix metalloproteins in rabbit (48). An allergenic protein from *Artemisia scoparia* pollen when incorporated into liposomes led to more effective immunotherapy of allergies (49).

CONCLUSION

The extensive survey of literature revealed that *Artemisia scoparia*, an important source of so many pharmacologically and medicinally important chemicals, such as Rutin, Scoparone, a number of often useful Coumarins and flavones. Aerial parts of the plant are mainly rich in essential oil and lactone. This plant has been extensively studied in terms of its pharmacological activity and results indicated it to have potent antihypertensive, antimicrobial antiasthmatic, immunomodulator, antitumor, antiallergic, anti-inflammatory, hepatoprotective and tranquilizing anticholesterolemic activities. Although a lot of work has been carried out in terms of the pharmacological activity of its major constituents, but researches are still insufficient in terms of its chemical constituents in the non-aerial parts, tissue culture studies, so that pharmacologically important components, such as Scoparone, Rutin can be produced in a significant amount for therapeutic benefit of mankind. In the recent years, with the increased inclination of human towards nature and its assets, herbal medication has become the need of the hour and can further be exploited for the welfare of human race.

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