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Phytochemical and pharmacological investigation of *Vernonia cinerea*: Asteraceae

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Abstract

The plants of the genus *Vernonia cinerea* (Asteraceae) are widely distributed in most tropical and subtropical countries. It is commonly known as 'Sahadevi'. *V. cinerea* have many therapeutic uses in the practice of traditional medicine. It has been used to treat a number of disorders including fever, inflammation, pain, cancer, diuresis, and various gastro-intestinal disorders. In the present study the botanical characters, taxonomic status, phytochemical constituents, traditionally uses and pharmacological activity are discussed.

Keywords: Medicinal, Ayurveda, chemicals, diseases

Introduction

Medicinal plants have been used for years in daily life to treat disease all over the world [1]. Medicinal plants are an important source of drugs in traditional system of medicine [2]. Plants have been known to relieve various diseases in Ayurveda and hence characterization and analysis of plant constituents are gaining interest among researchers [3]. Plants produce various organic chemical compounds to protect themselves. These compounds are synthesized by primary and secondary metabolism of plants. Secondary metabolites are valuable chemical constituents that are used in human therapy, veterinary, agriculture and scientific research. Large number of such compounds has shown therapeutic values and is used in drug development [4]. The knowledge of indigenous medicines is passing from generation to generation orally worldwide [5].

The plants of the genus *Vernonia* (Asteraceae) are widely distributed in most tropical and subtropical countries, and have long been used in traditional medicine to treat various types of diseases. *Vernonia cinerea* L. (Asteraceae) is an annual herbaceous plant, distributed throughout India and grown as a weed plant [6]. It is commonly known as 'Sahadevi' in Sanskrit and Hindi, 'Little ironweed' in English, 'Kukshim' in Bengali, 'Puvamkurunnel' in Malayalam [7]. *V. cinerea* have many therapeutic uses in the practice of traditional medicine. Every part of the plant can be used medicinally. This herb has been used to treat a number of disorders including inflammation, fever, worms, pain, diuresis, cancer, abortion, and various gastro-intestinal disorders [8]. The whole plant is used in decoction or infusion to treat fever and eye infections. It has been used as remedy for spasms of the urinary bladder and strangury, also often combined with quinine to treat malaria. Seeds are used as a source for alexipharmic and anthelmintic drugs [9].

V. cinerea occurs mostly in sunny or slightly shaded habitats, in general corresponding with young secondary vegetation, wasteland, roadsides, disturbed areas, cultivated land and other anthropogenic habitats [10]. *V. cinerea* reproduces and spreads by seeds which are adapted to wind dispersal. In addition, seeds may be secondarily dispersed as a contaminant in crop seeds, pasture seeds, and in agricultural machinery [11].



Fig 1: *Vernonia cinerea* (Sahadevi)

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Biology

It is an erect, slender, rarely branching annual herb that grows up to 1.3 m tall. The stems are finely pilose and glandular. The leaves are alternate, lower ones being petiolated while the upper ones are reduced and sessile. They measure between 2-6 cm long; more or less, densely and finely hairy. The heads are small, about 7 mm long and 2.5 mm in diameter. The flowers are all tubular, rather bright purple, pink, or white about 20 in each head, twice as long as the involucre bracts. The pappus bristles, measure 3-5 mm long. The achenes are rounded, nearly ribless and measure about 1.5 mm long [12].

Phytochemical Contents

V. cinerea contains vernolide-A and vernolide-B (two novel sesquiterpene lactones) [13]; β -amyirin, lupeol and their acetates; and β -sitosterol, stigmasterol, α -spinasterol and phenolic resin in the whole plant. The roots contain δ -amyirin acetate, α -amyirin acetate, β -amyirin acetate, β -amyirin and α -amyirin [14]. In addition, the leaves contain urticifolene (new polyene), lutein (carotenoid) and sitosterol (triterpenoid). The stem, bark and leaves contain lupeol, 12-oleanen-3-ol-3 β -acetate and stigmasterol [15-16].

Traditionally Used

V. cinerea is an important medicinal plant having application in abortion, cancer and various gastrointestinal disorders [17]. The whole plant is used in decoction or infusion to treat fever and eye infections. It has been used as remedy for spasms of the urinary bladder and strangury, also often combined with quinine to treat malaria. Seeds are used as a source for alexipharmic and anthelmintic drugs. Leaves of *Vernonia cinerea* have analgesic, antipyretic and antiinflammatory effects. The whole plant is used for kidney disorders, stomach pain, diarrhoea, eczema, menstrual pains and decoction for diuretic. Juice of this plant is given to children to treat bed-wetting. Recently research is going on this plant as an aid to give up cigarette smoking. Natural products provide abundant opportunities for the formulation of novel drug. The compounds in plants are part of phytomedicines that can be derived from leaves, stem, bark, root, flowers and seeds. Analysis of these compounds provides insight into the biological activity of plants [18].

Pharmacological Potential

A wide range of chemical compounds including steroids, flavonoids, sesquiterpene lactones [19], esters, triterpenoids [10] and glycosides have been isolated from *V. cinerea*. Extracts and metabolites from this plant have been known to possess pharmacological properties [20].

Antitumour activity

Antitumour activity is significantly seen in ethanolic and chloroform extracts of aerial parts of *Vernonia cinerea* against Dalton's ascitic lymphoma. In vivo studies in mice showed a decrease in cancer cell count with the injection of extracts and this protective effect is also concluded by hematological parameters [21].

Antiarthritis activity

The flower extract of *V. cinerea* showed that the adverse physical, biochemical and histopathological changes in arthritic animals.

Anti-hyperglycemic activity

The ethanolic extract contains phytochemical bioactive

compounds like glycosides, esters, flavonoids, steroids, tannins and terpenoids which have anti hyperglycemic activity [22].

Antioxidant activity

Alkaloids are a major component present in the plant and are said to have antioxidant and immunomodulatory effect. It is due to the DPPH scavenging activity of the carbon tetrachloride fraction of methanolic extract of the plant. These extracts are used for medicinal and preservative purposes. The antioxidant activity of the plant is due to its phenolic activity and may also play a role in neurofibrillary tangles and neurotic plaques [23].

Antitumour activity

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Antimicrobial activity

Saponins present in flower extracts and flavonoids present in leaf and flower extracts are known to have anti-microbial activity. Hexane and crude extracts of flower shows maximum inhibition against *B. cereus*, *E. aerogenus* and *S. aureus* whereas leaf extracts showed activity against *B. cereus* and *E. aerogenus* but not against *S. aureus*. Ether extracts also showed antibacterial against *B. cereus*, *E. aerogenes* and *S. aureus*. Antibacterial activity of various extracts of the plant against both gram positive and gram negative bacteria exhibited different effects with a maximum antibacterial activity in case of methanolic extract than hexane extract [25].

Conclusion

India is a rich source of plant and animal wealth, which is due to its varied geographical and agro-climatic regions [26]. The plant possesses great medicinal value in diverse traditional usage in different nations. Medicinal plant is the most exclusive source of life saving drugs for majority of the world's population [27]. Based on above findings, we hope that this review will help people in near future to create interest towards *Vernonia cinerea* and may also be useful in development of new formulations of this plant with more potential therapeutic and good economical value.

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