



PHARMACOLOGICAL ACTIVITIES OF *AERVA LANATA*: A PERSPECTIVE REVIEW

Gajalakshmi S, Vijayalakshmi S, Devi Rajeswari V*
School of Biosciences and Technology, VIT University, Vellore -14, India

Article Received on: 18/11/11 Revised on: 21/12/11 Approved for publication: 06/01/12

*Email: sdevirajeswari@gmail.com

ABSTRACT

India has the richest bio-resource of medicinal plants that have long life history of application in the treatment of diseases from the ancient times. The drugs that are obtained from the medicinal plants have been well favored by the people because of its treatment efficacy which is less when compared to the modern drugs but causes lesser side effects. This advantage lead the research field of pharmacy to discover more potent plants of medicinal value and the discovery of the active constituents that are responsible for causing the pharmacological action on human body. The active constituents from the medicinal plants are more effective and do not cause any side effects. This review encompasses especially on the medicinal plant *Aerva lanata* which possess the pharmacological properties includes anti-microbial, anti-hepatotoxicity, antioxidant effect etc. This review would be helpful to the young researchers in knowing the pharmacology of the plant to discover more functions out of it.

Keywords: Maharshi Ayurved, *Amaranthaceae*, Pashanabeda, Demulcent, Ehrlich ascites carcinoma, Nephroprotective

INTRODUCTION

Herbal medicines were represented as the most important field of traditional medicine all over the world. Hence, it is very essential to study the medicinal plants in order to promote their proper use and also to determine their potential as the primary source for the preparation of the new drugs¹. The primary health care needs majority of 80% of the world's population which relies completely on the plants of potent medicinal as reported by World Health Organization. The chemical substances that are present in the medicinal plants were responsible for their physiologic action on the human body. The most significant of these bioactive compounds of the plants includes alkaloids, flavonoids, tannins and phenolic compounds. Thus, the phytochemical researches mainly focus on the ethno-pharmacological information which is generally considered to be a effective approach in the part of discovering the new anti-infective agents from the higher plants².

The knowledge obtained from the chemical constituents of plants is not only desirable for the discovery of therapeutic agents but also considered to be valuable in disclosing the new sources of economic materials such as tannins, oils, gums, precursors for the synthesis of complex chemical substances. In addition to the above benefits, the knowledge of chemical constituents from plants would be further valuable in discovering the actual value of folkloric remedies³.

The chemically constituents of the plant may be therapeutically active or inactive. The substances that are active in nature are called as active constituents and the inactive ones are called as the inert chemical constituents⁴. Indian systems of medicine (ayurveda, unani, siddha, yoga and naturopathy) are primarily based on the medicinal plants which have been developed over a long period of time. Ayurveda stands as the oldest medication system of disease prevention in the world and hence it is called in its complete form under the name maharshi ayurved⁵. The World Health Organization has also approved its efficacy⁶.

Most of the literatures shows that India is a varietal emporium of the medicinal plants and hence proved as the

richest country in the world in regard to the genetic resources of medicinal plants. It possesses a wider range in terms of topography and climate that helps in bearing of the vegetation and floristic composition. Moreover, the additional factor such as agro-climatic conditions is also found to be conducive for the development and domestication of the new exotic plant varieties⁷.

Plant Description

Aerva lanata belongs to the family of *Amaranthaceae* is one of the important medicinal plant that grows throughout the plains of India⁸. *Aerva lanata* is found to be an erect or the prostrate herbaceous weed that is common throughout the hotter parts of India especially all over the plains that extends upto an altitude of 3000 m. It is also found to be present in Sri Lanka, Arabia, Egypt, tropical Africa, Java and Philippines. In India, it spreads especially in the states of tamilnadu, andhra Pradesh and karnataka⁹. *Aerva lanata* was used in the Indian folk medicine for the treatment of diabetes mellitus, urinary calculi, hematemesis, bronchitis, nasal bleeding, cough, scorpion stings, fractures, spermatorrhea, to clear uterus after delivery and also to prevent the lactation¹¹. *Aerva lanata* (L.) Juss. ex Schultes that was commonly known as 'Sunny khur' is widely used in Indian folk medicine for the treatment of diabetes mellitus¹³. Petroleum ether extract obtained from the whole plant showed positive for the presence of the steroids and flavonoids and ethyl acetate extract for steroids, terpenes and flavonoids and methanol extract for steroids and glycosides¹⁰.

Medicinal Properties

Aerva lanata was used as the principle source of "Pashanabeda" a sanskrit term that is cited in literature in order to identify a group of certain plants that was extensively used in the Ayurvedic system of medicine in order to dissolve the urinary calculi and stones. Folkloric medicine of Rayalaseema region has reported the usage of *Aerva lanata* as a nephroprotector which was used in the treatment of various kidney ailments. The plant was also utilized by the Yanadi tribals of the Chittor district as a diuretic agent and also for the treatment of nephrocalcinosis and urethral stones. The plant has been well documented

earlier for its therapeutic effects in the renal diseases by some of the Unani physicians. *Aerva lanata* has been identified for its treatment in the control of the kidney disorders in the dry zones of Sri Lanka. *Aerva lanata* has been reported to possess many of the chemical components such as flavonoids, alkaloids, steroids, polysaccharides, tannins, saponins etc⁹.

Different solvent fractions that were obtained from the whole plant were found to possess antimicrobial and cytotoxic activity. *A. lanata* was also identified to be useful in the prevention of the cisplatin and gentamicin induced acute renal failure. It was also used in Indian folk medicine for the treatment of diabetes mellitus. Leaf extract of *A. lanata* was investigated for its effectiveness on the urinary risk factors of calcium oxalate urolithiasis and reported to be very effective⁸.

It was also found to be effective demulcent, diuretic and used in the treatment of lithiasis. It is evaluated for its effect on cough and as a vermifuge for children and in the treatment of headache and showed effect in the case of arsenic poisoning and was found to be very powerful¹⁰.

Pharmacological Activities

Anti-hepatotoxicity and antioxidant effect

A. lanata was found to be very much effective in the amelioration of the deleterious effects of various toxic chemicals. An experiment that was conducted to evaluate the potentiality of partially purified fraction (PF) from *A. lanata* in the protection of liver injury which was caused by the administration of carbon tetra chloride in sprague dawley rats and identified that the PF administration has reversed the histopathological changes significantly and also restored the elevated activities of liver marker enzymes and also enhanced the antioxidant enzyme activities. The extract was also found to reduce the hepatic lipid peroxidation and increased the serum total protein and albumin/globulin (A/G) ratio. The preliminary phytochemical analysis of PF showed the presence of alkaloids which clearly indicates that the PF contains antioxidant alkaloids that capable of ameliorating the by virtue of its antioxidant activity. The PF treatment was found to ameliorate the deleterious effects of CCl₄ on the lipid peroxidation in whole liver and microsomal fraction by acting as an antioxidant⁸.

Antimicrobial activity and cytotoxicity

Antibacterial and antifungal activity of the plant was studied by disc diffusion method and cytotoxicity test by using *Artemia salina* (Brine shrimp). Gram-positive bacteria such as *Bacillus subtilis*, *Bacillus cereus*, *Staphylococcus aureus* and the gram-negative bacteria such as *Escherichia coli*, *Shigella dysenteriae*, *Shigella shiga*, *Shigella sonnei*, *Shigella flexneriae*, *Shigella boydii*, *Klebsiella* sp. were used for the antibacterial test and fungi such as *Aspergillus fumigatus*, *Aspergillus niger*, *Candida albicans*, *Hensinela californica*, *Rhizopus oligosporum* were used for the antifungal test. The study showed among the tested extracts taken, ethyl acetate extract was found to exhibit more interesting antibacterial and antifungal activity than that of the petroleum ether and methanol. The significant cytotoxic activity was reported to be exhibited in all the tested extracts¹⁰.

Immunomodulatory and antitumor activity

Cancer is found to be responsible for the millions of deaths each year worldwide. Pharmacological intervention that is associated with the plant-derived products either in the

isolation or in the combination was found to reverse, suppress or prevent the cancer progression that inturn plays a key role in fighting against the terrible cancer disease. *Aerva lanata* which is an important medicinal plant was used widely in traditional systems of medicine like ayurveda and siddha. Ethanolic extract of whole plant of *A. lanata* was found to exhibit the immunomodulatory and antitumor activity. Intraperitoneal administration of the extract was found to enhance the total WBC count, bone marrow cellularity and the number of α -esterase-positive cells. *Aerva* treatment was also found to show the enhanced proliferation of splenocytes, thymocytes and bone marrow cells. The number of plaque-forming cells (PFC) in spleen and the circulating antibody titer was also increased. The extract was found to show 100% cytotoxic to Dalton's lymphoma ascites (DLA) and Ehrlich ascites carcinoma (EAC) cells at a concentration of 500 μ g/mL was also found to be cytotoxic towards the tested L929 and HELA cells at higher concentrations¹¹. The partially TLC-purified fraction (PEF) of petroleum ether extract was proved to be cytotoxic to Dalton's lymphoma ascites (DLA), Ehrlich ascites (EA) and B16F10 cell lines in vitro¹².

Anti-diabetic activity

Diabetes mellitus (DM) is a metabolic disorder that affects the carbohydrate, fat and protein metabolism. A study which was undertaken to investigate the effect of an alcoholic extract of *A. lanata* on blood glucose and other biochemical parameters in alloxan-induced diabetic rats showed that the AAL was found to reduce the increase of blood sugar that was tested in the alloxan-induced diabetic rats. The extract was also found to prevent a decrease in the body weight and reduced the increased lipid peroxides. The study revealed that the chronic administration of the above extract reduced the blood sugar level and hence found to be capable of acting as an anti-diabetic agent¹³.

Effect of *Aerva lanata* on acute renal failure

Acute renal failure refers to the symptom of sudden and usually reversible loss of renal function that develops over a period of days or weeks. The most common acute renal failure is the acute tubular necrosis that occurs either by means of ischemia or nephrotoxins like cisplatin and gentamicin that accounts for about 85% of the disease incidence. The ethanol extract of the entire plant of *Aerva lanata* was investigated for its nephroprotective activity in the cisplatin- and gentamicin-induced acute renal injury in the albino rats of either sex. The extract administration showed the dose-dependent reduction in the elevated blood urea and serum creatinine levels and was found to normalize the histopathological changes that occur in the curative regimen. The study resulted that the ethanol extract of *Aerva lanata* possesses the marked nephroprotective activity with minimal toxicity⁹.

Effect of *A. lanata* leaf extract on the urinary risk factors

Urolithiasis is found to be the third most common afflictions found in humans. The plant was investigated for its efficacy as the antilithic agents in the urolithic rat model. Hyperoxaluria that was induced in rats using 0.75% ethylene glycol in drinking water was administrated with the *Aerva lanata* and was monitored for the urinary risk factors. Increased urinary excretion of calcium, oxalate, uric acid, phosphorus and protein in the hyperoxaluric rats was significantly brought down by the administration of *A.*

lanata. The drug was found to increase the urine volume and thereby helped in the reduction of the solubility product with respect to the calcium oxalate and other crystallizing salts. The efficacy of the drugs suggests their role to be used as the antilithic agent¹⁴.

CONCLUSION

Medicinal plants were the potent source of pharmaceutical drugs that causes more effective physiological action with lesser side effects. They possess anti-microbial, cytotoxic, anti-tumour, anti-hepatotoxicity, anti-oxidant, anti-diabetic and immunomodulatory activities. They also show their positive effect on the urinary risk factors and on the renal failure. The research work done in the above plant were very few and hence the plant has to be explored more to reveal more pharmacological activities out of it. Isolation of the active constituents or the bioactive compound from the plant should be done further in order to discover more drugs out of it. The pharmacological industry could be benefitted by utilizing the above properties in order to produce the new drug compounds. Especially the plants anti-cancer activity could be utilized to reduce the number deaths caused due the less efficacy of the synthetic anti-cancer drugs. Medicinal plants have attained a historical impact because of its potent nature on the pathological diseases. Hence more interest should be focused on the field to discover new drugs.

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Source of support: Nil, Conflict of interest: None Declared