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Eclipta alba Species Role in Natural Medicine

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Abstract

Objectives: *Eclipta alba* is a seasonal medicinal plant native to Pakistan and it is vastly found in tropical and sub-tropical regions, having multi-branched white flowers. Almost all parts of *E. alba* are being used in the treatment of various ailments due to the presence of wide range of phytochemical constituents. Therefore, this review article has been written to compile the therapeutic applications of said medicinal herb.

Material and Methods: Selective reference material was selected using different search engines like PubMed, NCBI, Google Scholar, Science direct etc.by putting Keywords including *E. alba*, its medicinal uses, nutritional benefits of *E. alba*, diseases, and *E. alba* etc.

Results: Researches revealed that traditionally *E. alba* is well known to cure several diseases like hair growth disorders, efficacious hyperglycemic activity through inhibition of alpha-glucosidase and aldose reductase as well as by stimulating insulin secretion. Obesity is considered as the mother of disease, and many health problems occurs because of obesity, so by its lipid-lowering activity, it lowers all types of fat. Mosquitoes as vectors cause serious human diseases like malaria, filariasis, Japanese encephalitis, yellow fever, dengue fever, and chikungunya have become major causes of mortality and morbidity among people. *E. alba* has insecticidal, larvicidal and ovicidal activity to control the mosquitoes borne diseases. Liver ailments such as liver enlargement, hepatitis, + and cirrhosis of liver have been a major issue for public issue. Wedelolactone, the chemical constituent of *E. alba* is very potent in liver ailment and due to its anti-viral activity, it can kill the virus responsible for hepatitis and other viruses as well. *E. alba* has efficacious anti-inflammatory activity, because of anti-oxidant constituents present in this herb. A very important role of this herbal plant is in hair growth promotion activity, so it has major value to treat hair problems such as alopecia, thinning of hair and hair color problems. It activates the hair follicles and enhances the hairs

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growth. It also has anti-hemorrhagic, antibiotic, antiseptic, anti-microbial activity and has very in snake bite scorpion sting.

Conclusion: Although, *E. alba* has several health-related benefits, but still more research is under consideration in scientific community related to its phytochemical constituents and mechanism of actions.

Introduction

The presence of wide range of phytoconstituents have made medicinal plants have numerous effective pharmaceutical values in the management of many kinds of diseases. *E. alba* owing to efficacious medicinal activity is highly preferred as a remedy for many medical ailments [1]. *E. alba* belongs to the Asteraceae family. It is commonly known as False daisy, bhringaraja, Maka, and Bhangra. The plant is found throughout the world. This is highly distributed, small, multi-branched, annual herb scrambling up to 2000 m on the hills. The flowers of this plant are white in color. The plant is hot, dry, excruciating and bitter in taste. Traditionally, this plant is widely used for the treatment of jaundice, night blindness, headache and also promotes hair growth and due to this, it can be called as rejuvenator. It is narrated that it possessed anti-septic activity, analgesic effect, anti-pyretic role, anti-viral [2], anti-spasmodic, imunomodulant [3] and anti-malarial. It also possesses a hepatoprotective role [4]. It is used for the treatment of hepatitis and cirrhosis. It also has much other potential like anti-oxidant [5], anti-anaphylactic, anti-hyperglycemic, anti-bacterial and antihemorrhagic. It is used against snake bite and scorpion stings. It's cardioprotective and applications as anti-obesity agents are also well known. The main focus of this review article is to compile data about *E. alba,* from different research engines related to the phytochemical constituents and their health benefits.

Chemical composition

Chemical

Chemically it is composed of coumestan derivatives such as wedelolactone and dimethylwedelolactone, which have anti-hepatoprotective activity. It was reported that different parts of this herbal plant possess different medicinal properties due to the presence of various phytochemical including ascorbic acid. organochlorine, organophosphorus, carbamates, pyrethroids playa role as an anti-malarial, against dengue fever etc. phenols, phenolic acid, flavonoids, alkaloids, terpenoids, polypeptides, etc. play anti-microbial activity (Table 1).

Table 1: *Phytochemical constituents present in different parts of E. alba*

Parts	Chemical constituents [6]
Leaves	Stigmasterol, a-terthienymethanol, wedelolactone, desmethyl-wedelolactone-7-glucoside
Roots	Hentriacontanol14, Heptacosanol11& Stigmasterol4, Ecliptal12
Aeronautical parts	Sulpher compounds, ß-amyrin& Luteolin-7-0-glucoside5, Cinnarosideand apigenin
Plant's Stems	Wedelolactone
Plant's Seeds	Sterols obtained from plant
Twigs of the plants	Unnamed alkaloids
Plant as a whole	Resins, Oleanolic acid, Ecliptine, Ecalbatin, Reducing sugar6, Stigmastero9, Triterpene saponin, nicotine andUrsolic acid.

Pharmacological profile

E. alba the small annual herb has a long history of use in traditional medicine in many countries mainly in tropic and subtropic regions of the Asian countries including Pakistan, India, Bangladesh etc. This herb is especially known for its curative properties. A wide range of its chemical constituents, its extracts, leaves, roots, juice, etc. have versatile pharmacological properties (Table 2).

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Table 2: *Potential pharmaceutical activities having E. alba different parts [7]*

Parts	Activity
Seeds	Sexual debility, Tonic, Aphrodisiac.
Juice of leaves	It is very useful in Skin diseases, in allergic Urticaria, Inflatulence, Colic infection and liver affections, in respiratory system diseases e.g. Asthma and Bronchitis, also used in Enlargement ofglands, in Dizziness, Vertigo and Blurred vision.
Leaves paste	Very effective in swelling.
In Powder form	Used in the respiratory system related problems such as Bronchitis, Cough and asthma. Also used in Rheumatism and Skin Diseases.
Decoction of plant	Used in Graying of hair, in Bleedings, Spermatorrhoea and Menorrhagia.
In paste form	Good for Healing effect and Headache. Can be used in Toothache.
Roots of plant	Used as a Liver tonic, effective Emetic and Purgative, best Antiseptic for ulcers and for Wounds.
Plant as a whole	Also called Rejuvenating, Detoxifying agent Anti-septic and used for blood purification, Anemia, Spleen enlargement, liver enlargements, used in Catarrhal jaundice, in stomach problems such as in Hyperacidity, Gastritis and Dysentery.

Hepatoprotective activity

To evaluate the hepatoprotective activity of *E. alba* many studies have been carried out. Alcoholic extract of this plant has the best protective effect on the damaged liver. This plant plays its hepatoprotective role by affecting on sub cellular components to restore the functions of damaged liver and inflammation. Coumestanwedelolactone and desmethyl-wedelolactoneas active components were identified as anti-hepatotoxic activity on the basic studies against ccl4 induced cytotoxicity [8]. *E. alba*'s extract has significant effect on restoring the declined level or loss of acid phosphatase and alkaline phosphatase. Wedelolactone has been stated to be a powerful and discerning 5-lipoxygenase inhibitor [9]. The plant comprises an alkaloid, Ecliptine, which has a choleretic act and lipid peroxygenation, the liver secretory activity. Due to its antioxidant activity, it inhibits the free radical formation that results from toxic substances metabolism which can cause damage proteins, membranes by oxidation and neutralized them. When free radicals oxidized the target cell, they lose the capability to function properly and become damaged. It is considered that decoction of *E. alba* is best for hepatitis (which result from virus and due to its anti-viral activity) and due to the anti-inflammatory mechanism of wedelolactone which is effective and selective 5-lipooxygenase inhibitorprevent from stress which results from super-oxides and causes inflammation of the liver.

Hair grouth Promoting activity

Alopecia is a dermatological condition in which hair loss take placed. Baldness is very common in men and it is reported that over 50 years of age 50 percent of men affected by this. Although this disease affected women hair loss is less as compared to men. In women thinning of hairs occurred mostly. *E. alba* is claimed best for hair growth promotion. Petroleum ether and ethanol extract obtained from *E. alba* is considered very efficacious for hair growth in a very short time period. For improving lusters of hairs, it is also used [10]. Bhavaprakash also used for improving the quality of hair. Traditionally, the leaves and aerial parts provide beneficial effects for blackening of hair. *E. alba's* methanol extract definitely aids in promoting hair follicles growth which is interesting phase. This plant also prevents hair loss [11].

Immunomodulator activity

Immunity play an important role for our protection and our immune system keep us safe and protected from various diseases so for good health strong immunity is compulsory. Effects of this herbal plant have been reported and protection of neuronal tissue has been reported due to *E. alba's* immunomodulatory activity. Due to no well reported side effects, and due to low-cost natural products are always

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remained the primary choice to modulate effective immune system. The leaf extract of this plant is considered best for immunomodulation activity. Leaf extract of *E. alba* is best immune-stimulant; it enhances the natural resistance of the body againt different pathogens [12].

Anti -inflammatory activity

Inflammation is characterized by destruction and injury of tissues which occur due to a variety of pathological conditions and cytological and chemical reactions. To treat this pathological condition herbal way of treatment with anti-inflammatory plants is considered best and preferred than non-steroidal anti-inflammatory drug due to least side effects and potent action. *E. alba's* extract is very effective for the treatment of inflammation. It reduces or prevents inflammation by blocking the mediator's histamine and serotonin and inhibits the enzyme cyclooxygenase. Histamine is an important inflammatory mediator, causes vasodilation by increasing the permeability of vessels, so by inhibiting histamine release, inflammation is reduced. Both types of inflammation, acute as well as chronic are well treated by this plant extract. As Chronic inflammation occurs due to the formation of granuloma tissues, so by inhibiting the release of fibroblast, collagen, and mucopolysaccharides which take part in granuloma formation, inflammation is inhibited [13].

Anti-diabetic activity

Diabetes mellitus is a group of metabolic syndrome associated with carbohydrate, proteins and lipid metabolism resulting from impaired insulin secretion in which there will be a high sugar level in blood. There are two types of diabetes as Type 1 diabetes mellitus which is insulin dependent (IDDM) and type 2 diabetes also known as Non-insulin dependent diabetes mellitus (NIDDM). Ethanolic extract of *E. alba* has an anti-diabetic effect and it was reported that diabetes associated complications like hyperglycemia, diabetic nephropathy, cardiovascular disorders etc. risk decreased. The phytochemicals present in this medicinal plant have potential to inhibit the alpha-glucosidase and aldose reductase. Alpha-glucosidase is an enzyme which is present in the mucosa of the small intestine and catalysis the conversion of complex carbohydrate to simple sugar which is absorbed in small intestine. By inhibiting the alpha-glucosidase, dietary uptake of carbohydrates is retarded and hyperglycemia is suppressed. Because of hyperglycemia, sugar level increases in body and excessive sugar start to deposit in the retina etc. so by inhibiting aldose reductase deposition will be inhibited [14].

Anti-cancer activity

Cancer is an abnormal uncontrolled proliferation of cells that might be benign or malignant in nature and spread /invade healthy tissues. Now these, cancer is leading cause of death. In the female, breast cancer is most common. Herbal medicinal plants have wide range of activities in treating various diseases. Anti-cancer activity of *E. alba* has been reported. Anti-cancer activity is carried out in non-metastatic human MCF 7, MDA-MB-231, and metastatic mouse 4T 1 cell lines and result suggested that it shows concentration-dependent growth inhibition in each cell line. *E. alba* destroyed the cancer cells by inducing the apoptosis in human breast cancer cell lines on damaging the membranes of mitochondria as well as by disrupting DNA [15].

Mosquito larvicidal and ovicidal activity

Mosquitoes as vectors comprise major health problem in the community and cause serious diseases like Malaria especially in tropical and sub-tropical regions of world. *E. alba*' many constituents such as organophosphorus, organochlorine, pyrethroid and carbamates are toxic to mosquitoes. Due to these phytochemicals this plant have larvicidal and ovicidal activities to kill mosquitoes and prevent the public from serious diseases like malaria, dengue fever, flariasis, chikungunya, yellow fever and Japanese encephalitis (Table 1) [16].

Table 3: *E. alba extracts activities to control vectors (Mosquitoes) borne human diseases.*

Chemical constituent	Activity	Against organism [16]
Petroleum ether extract	Larvicidal activity	Ae. Aegypti, Cx. Quinquefasciatus, Anophalesdirus, mansiniaunifarmis

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Methanol extract	Larvicidal and growth related activity	Cx. quinquefasciatus, Anophelesstephensi, ae.aegupti
Leaf extract	Larvicidal and ovicidal activity	Cx.quinquesfascitus, An. Stephensi
Acetone, chloroform, ethyl acetate, hexane and benzene	Ovicidal activity	Cx.quinquefascitaus

Anti-microbial activity

Many medicinal plants are the best source of anti-microbial agents which may be active or inactive. Phenol, phenolic acid, flavonoids, alkaloids, tannins, quinones, coumarins, polypeptides, terpenoids and essential oil are the major phytoconstituents of *E. alba* which made this as anti-microbial agent. *E. alba* plays vital role in traditional medicine and it has been reported that extract from aerial part of *E. alba* possesses strong anti-microbial activity.

Conclusion

E. alba is herb, produced in tropic a and sub-tropic regions. This is used traditionally as medicinal plant in management of various diseases. It has strong hepatoprotective activity, anti-viral and anti-microbial activities. It also has anti-cancer activity. Leaf extract of it is used as larvicidal and ovicidal and if it is applied on the scalp, it enhances the hairs growth by activating the hair follicle activity. It also has anti-inflammatory, anti-hemorrhagic, antimalarial activity. Extract of this plant is used against scorpion bite. Although, *E. alba* has a number of health-related benefits, but still more research is under consideration in scientific community related to its phytochemical constituents and mechanism of actions.

Conflicts of Interest

The authors hereby declare no conflicts of interest.

Authors` Contribution

All authors contributed in the experiments, analysis and preparation of this manuscript.

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Anti-viral activity

Now, these days, viral diseases have become more common and it has become major public health issue. Many medicinal plants have strong potential to fight against virus and inhibit their replication as well as disrupt their life cycle. *E. alba* is one of those medicinal plants which has strong anti-viral activity. Alcoholic extract of this plant is very effective against Ranikhet disease virus. It is also used in viral hepatitis commonly, kill the virus and protect the liver [18].

Not Applicable

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