Phytochemistry and pharmacological profile of *Prosopis cineraria*: a review

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***ABSTRACT*: *Prosopis cineraria* are commonly known as Khejri, Its synonym is *Prosopis spicigera.* It belongs to the family Leguminosae and subfamily Mimosoideae. The leaves are good fodder for camels, goats and donkeys. The tree prosopis have climatic adaptation so it can easily survive in a broad range of climatic variation. It is very useful tree and famous especially in desert area due to its spread ability and importance. It is also known as "Golden tree" or "Wonder tree" of the desert. The plant possesses the major pharmacological activities which includes analgesic, anthyperlipidemic, antipyretic and antimicrobial activity. It is used traditionally in the treatment of various infirmities like leukoderma, leprosy, asthma, dyspepsia etc. The numbers of phytoconstituents like tannins, steroids, flavone derivatives, alkaloids etc. has been isolated from the plant. Pharmacological activities like antiinflammatory, anticonvulsant, antifungal, anticancer, antidiabetic, hypolipidemic, abortifacient, antioxidant, antimicrobial and wound healing properties have been reported of different plant extracts. The present review deals with phytoconstituents and potential pharmacological activities of *Prosopis cineraria*.**

***KEYWORDS*: *Prosopis cineraria*, Phytoconstituents, Pharmacological activities.**

INTRODUCTION

The Great Indian Desert, popularly known as the Thar, includes some portion of northwest India. It constitutes almost 90% of the Indian arid zone and the state of Rajasthan alone accounts for 61.8% (Khandelwal *et al*., 2015). .The importance of khejri is increased due to the socio economic development of the India specially Thar Desert in the rajasthan. Khejri is the tree of medium size and can withstand at a temperature up to 480c.Khejri is also known as "Kalpatru" which means "the king of desert" due to its food, feed and medicinal value. Khejri is worshipped by a number of communities. *Prosopis cineraria* is cultivated in a number of countries in all over the world but it is specially cultivated in western and southern Asia including Afghanistan, Iran India, Oman, Saudi Arabia and Pakistan (Pareek *et al*., 2015). The medicinal uses of plant in the treatment of various human infirmities are referenced in Ayurveda and other traditional medicinal systems (Girase *et al*., 2016). The Khejri is also used for soil improvement and sand dune stabilization. The bark of the tree has abortifacient and laxative properties. Plants and its products are used as medicine from the ancient time (Sachdeva *et al*., 2014). Recently there has been a shift in universal trend from synthetic to herbal medicine. Plants have been an exemplary source of medicine. Ayurveda and other traditional medicinal systems mention the use of plants in treatment of various human ailments. India has about 45,000 plant species and among them, several thousands have been claimed to possess medicinal properties (Garg *et al*., 2013). *Prosopis cineraria* tree grows in dry and arid regions of Arabia and in regions of India mainly Rajasthan, Haryana, Punjab, Gujarat, Western Uttar Pradesh and drier parts of Deccan and extends as far as South in Tuticorin (Khatri *et al*., 2010).

The crude extracts of *prosopis cineraria* shows positive results in supporting of health benefits and in prevention of wide range of illness includes protein and mineral deficiency. *prosopis cineraria* is extensively planted as fast growing and drought tolerant fuel and fodder tree but in a large number of countries it spreads readily without control as invasive weed. The wood of Prosopis is an excellent source of fuel, and Firewood and charcoal are the important part to provide an economic value to the poor farmers. State branches of the tree are used for fence posts,and poles in construction of homes and shelters. Sawn timber of prosopis is used for making furniture and flooring. Honeys produced from the prosopis have highest quality with long and abundant flowering. The gum obtained from the bark is similar to the gum Arabic with high quantity. Leaves of the prosopis are collected by the farmers and used as a source of compost on the agricultural field. The leaves of the prosopis have some fungicidal and insecticidal activity. Bark of the prosopis used as a source of tannin, dye and fibres so it is used for the preparation of medicines mostly for stomach, skin and eye problem. prosopis is a nitrogen fixing tree, so it improves fertility and physical characteristic of the soil (Karim *et al*., 2012).

TAXONOMIC CLASSIFICATION

Kingdom : planate
Order : fables
Family : fabaceae
Genus : prosopis
Species : cineraria

PLANT DESCRIPTION

Evergreen or nearly so, it forms an open crown and has thick, rough gray bark with deep fissures (Kumar *et* al., 2011). *Prosopis cineraria* are a tree to 6.5 m high with cinereous cortex with intermodal prickles. It produces new flush leaves before summer. The flowers are small in size and yellow or creamy white in colour; appear from March to May after the new flush of leaves. The pods are formed soon thereafter and grow rapidly in size attaining full size in about two months' time. *Prosopis cineraria* are a tree to 6.5 m high with cinereous cortex with intermodal prickles, scattered, straight and somewhat macroscopic and with conical broad bases.

Root: Root is a taproot more than 3 m long.

Leaves: Leaves are 1-3-jugate, glabrous or puberulous; petiole and rachis is 0.5-4 cm long, thepinnae is 2-7 cm long; leaflets are 7-14-jugate, ovate, straight to subfalcate, without nerves (or 2-4nerved at base, the midrib excentric), mucronate, 415 mm long x 2-4.5 mm broad, grayish when dry; stipules foliaceous, deciduous.

Flower: Flowers are yellow, glabrous; calyx truncate, 0.8-1.2 mm long; corolla 3.5 mm long, glabrous, the petals rolled back in age; anthers 0.8-1 mm long; pistil glabrous.

Fruit: Fruit is slender, elongate, 8-19 cm long (including the stipe 0.8-2 cm), subcylindrictorulose, 4-7 mm in diameter, glabrous; pericarp is thin, brittle; endocarp segments are thin, longitudinal, little developed.

Seeds: Seeds are distant, longitudinal, ovate, 6 mm long, the tegument with open horse-shoe fissural line on faces, 10-15 in a pod, brown.

PHYTOCHEMISTRY

Prosopis cineraria L. have a number of chemical constituents that have nutritional value and also have certain action in the prevention and treatment of the disease. The whole plant contains methyl heptacosanoate, heneicosanoic acid, 4-hydroxy benzoic acid, methyl 4-hydroxycinnamate, methyl 2-methoxy-5hydroxycinnamate and O-Coumaroylglycrol (Khan *et al*., 2006). The seeds contain prosogerin C (Bhardwaj *et al*., 1978), prosogerin D (Bhardwaj *et al*., 1980), prosogerin E, gallic acid, patuletin, patulitrin, luteolin, and rutin(Gangal *et* al., 2009; Iches *et* al., 1973). The seed contains relatively large proportion of unsaturated fatty acids, with linoleic and oleic acids (Shankaranarayan *et* al., 1979). Patulitrin has been reported significantly cytotoxic active against in vivo Lewis lungs carcinoma (Sharma *et* al., 1964). Alkaloidal mixture extracted from *Prosopis spicigera* reported to cause bradycardia and immediate mortality in dogs at a dose of 1mg/kg (Liu *et* al., 2012). The flowers contain patuletin glycoside patulitrin (Ferguson *et* al., 2005), sitosterol, spicigerine, flavone derivatives Prosogerin A and Prosogerin B (Malik *et* al., 2007).

Dried pods contain 3-benzyl-2-hydroxy-urs-12-en28-oicacid, maslinic acid 3-glucoside, linoleic acid, prosphylline, 5, 50-oxybis-1,3benzendiol, 3, 4, 5, trihydro-xycinnamic acid, 2-hydroxy ethyl ester and 5, 30, 40-trihydroxyflavanone 7-glycoside (Jewers *et* al., 1976). Hydroxycin-namic acid and coumaric acid derivatives have been reported to possess antioxidant properties and are believed to reduce the risk of stomach cancer by reducing the formation of carcinogenic nitrosamines (Panda *et* al., 2009). The leaves contain steroids like campesterol, cholestrol, sitosterol and stigma sterol, actacosanol, hentriacontane, methyl docosanoate, Diisopropyl10,11-dihydroxyicosane-1,20-dioate, Tricosan-1-ol, and 7,24-Tirucalladien-3-one along with a piperidine alkaloid spicigerine(Robertson *et* al., 2011; Maideen *et* al., 2011). Steroids like b-sitosterol, campesterol, sitosterol and stigmasterol reduce blood levels of cholesterol; also possess potent antioxidant, hypoglycemic and thyroid inhibiting properties (Dharani *et* al., 2011).

PHARMACOLOGICAL ACTIVITY

Analgesic and antipyretic activities

Petroleum ether, ethyl acetate and ethanol extract of stem bark were prepared by using soxhelt apparatus. Ethanoic extract showed a significant analgesic activity Eddy's hot plate model at a dose of 300 mg/Kg B. W. in experimental rats. The Petroleum ether extract of stem bark exhibited a significant antipyretic activity using Brewer's yeast induced hyperpyrexia model in experimental rats. The ethanolic extract of root was evaluated by using tail immersion and hot plate method and showed significant results. The aqueous extract of leaves was evaluated for analgesic activity by using acetic acid induced writhing test model. The Analgesic activity exhibited in Swiss Albino mice was significant as compared to control. The extract also exhibited a significant antipyretic activity at same dose using Brewer's yeast induced hyperpyrexia model (Joseph *et* al., 2011)

Antihyperglycemic and Antioxidant Activities

50% Hydro-alcoholic extract of stem bark was evaluated for anti-hyperglycemic activity using Alloxan induced Hyperglycemia Model. Extract at a dose of 300 mg/Kg B.W. was administered to hyperglycemic mice orally once in a day for 45days. Body weight loss in mice was significantly controlled as compared to control group. Fasting blood glucose level decreased by 27.3%, comparable to that of standard glibness amide which produced 49.3% reduction and liver glycogen content was significantly increased as compared to control group. Declined activity of antioxidant enzymes and concentration of non-enzymatic antioxidants were also normalized by drug treatment, thereby reducing the oxidative damage in the tissues of diabetic animals and hence indicating anti-diabetic and antioxidant efficacy of the extract (Sharma *et* al., 2010)

Antimicrobial Activity

For screening of Antimicrobial activity of ethyl ether and alcoholic extracts of leaves of *Prosopis cineraria* three micro-organisms Staphylococcus aureus (Gram positive), Escherichia coli (Gram negative) and Candida albicans (Fungal pathogen) were used.The growth medium used for Staphylococcus aureus and Escherichia coli was Nutrient broth (10% peptone, 0.5% labanco and 0.5% NaCl, pH adjusted to 7.5) and for Candida albicans liquid medium (1% peptone, 4% glucose, pH adjusted to 5.8). Paper discs of known concentration of standard antibiotics namely chloramphenicol, penicillin and mycostatin were used for comparison. Both ethyl ether and alcoholic (50% ethanol) leaves extracts showed positive reactions against all the three test organisms (Kumar *et* al., 2011).

Antibacterial Activity

The antibacterial activity of the various extracts of the stem bark of *Prosopis cineraria* was evaluated by the agar well diffusion method. The methanolic and aqueous extracts of the stem bark of *Prosopis cineraria* exhibited moderate antibacterial activity with all the tested strains of microorganisms at 250 µg/ml concentration on comparison with the standard ciprofloxacin. The obtained activity may be due to the presence of flavonoids and tannins (Velmurugan *et* al., 2010)

Antitumor Activities

Hydro alcoholic extracts of leaves and bark were evaluated for antitumor activity against Ehrlich as cites carcinoma tumor model. The activity evaluated using survival time, peritoneal cells, lipid peroxidation, hematological studies, and solid tumor mass and in vitro cytotoxicity. Both the extract showed substantial antitumor activity at doses of 200 and 400mg/kg (Velmurugan *et* al., 2012). Methanolic extract of leaves was evaluated for protective action against induced experimental liver tumors in male Wister rats. The levels of mitochondrial lipid peroxidation (LPO) and liver weight were found to be decreased by the administration of extract (200 and 400 mg/kg) in dose dependent manner. The extract also increased the levels of mitochondrial enzymatic antioxidants (Vijay *et* al., 2013).

Conclusion

From the above review, it can be concluded that *Prosopis cineraria* is promising medicinal plant having wide ranges of pharmacological activities and used traditionally. This is the tree that is effective in treatment of various diseases without producing any side effect. However, after identification of various newer compounds from the plant, the researchers reported numbers of new activities and hence the plant is now achieving importance place to develop some more new search for the future development by understanding the gene level study. Therefore, considering its versatile medicinal uses, there is an ample scope for future research on *Prosopis cineraria* Linn.

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