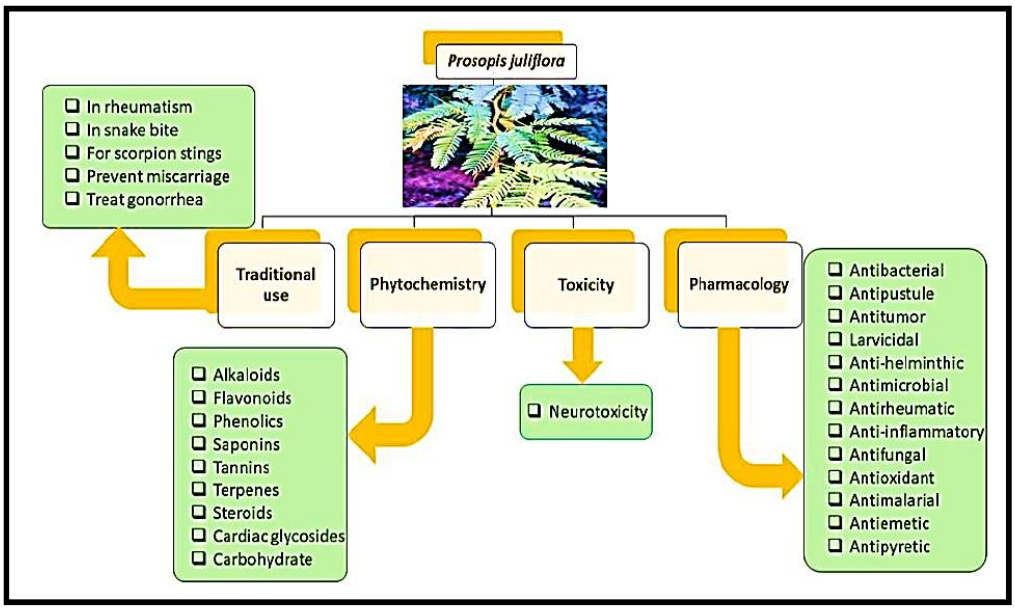
IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

An Analysis of Prosopis Juliflora's Pharmacognostic and Pharmacognostical Properties

Sagar Shivaji Sangale[1] and Dr. Tejas Shivram Pachpute[2]
Research Scholar, Department of Pharmacy[1]
Research Guide, Department of Pharmacy[2]
Sunrise University, Alwar, Rajasthan, India

Abstract: *Mesquite grows widely in semiarid and arid environments. It's a competitive weed and toxic in many places. Due to their low side effects and accessibility of access, WHO estimates that 80% of the population takes herbal medicines for sickness treatment. Leguminosae Prosopis juliflora is a superb traditional medicine. All plant parts include flavonoids, alkaloids, tannins, phenolics, terpenes, and saponins. The plant has antibacterial, anti-pustule, anticancer, larvicidal, anthelminthic, antimicrobial, anti-rheumatic, anti-inflammatory, antifungal, antioxidant, and antimalarial properties. This helpful weed is cytotoxic and invasive. Ruminants like goats are more prone to get "Cara-torta" from Prosopis juliflora pod eating, which disrupts nerve cell mitochondria. Thus, this page provides all Prosopis juliflora plant data from journals and publications.*

Keywords: Prosopis juliflora, pharmacology, pharmacognosy.



I. INTRODUCTION

With 44 species, Prosopis juliflora is among the most invasive plants in the world and in India. It is a member of Mimosoideae and Leguminosae [1,2].Wounds, diarrhea, colds, dysentery, flu, inflammation, measles, hoarseness, and sore throats have all been treated using P. juliflora [3]. Paperboard, charcoal, activated carbon, and paper and hardboard fiber are all made from P. juliflora wood. P. juliflora blooms are used to make honey, and the pods are used as animal feed [4,5, 6]. It is regarded as a noxious weed in many countries because it dries up the soil and competes with other plants, particularly grasses in dry places [1,7]. Drought-tolerant genes from P. juliflora expressed sequence tags are used by other transgenic plants and crops [8]. P. juliflora has been proven in several studies to have therapeutic applications. Its extracts have been reported to have cholinesterase inhibitory, anthelmintic, antiemetic, larvicidal,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

insecticidal, antioxidant, and antimalarial qualities [9]. Ethnopharmacological research indicates that P. juliflora is used as an astringent, a remedy for rheumatism, and a repellant against snakebite and scorpion stings [10]. Numerous phytoconstituents, including as flavonoids, saponins, and alkaloids, are present in the plant. The plant's biological and pharmacological properties suggest that it may be exploited to produce phytomedicines [11].

Botanical information

Table 1 Taxonomical classification.

Kingdom	Plantae
Phylum	Angiosperms
Class	Dicot
Order	Fabales
Family	Leguminosae
Subfamily	Mimosoideae
Genus	Prosopis
Species	Juliflora

Synonym

Prosopis pallida, Prosopis inermis, Prosopis horrida, and Mimosa juliflora [1].

Common Name

Mesquite and honey mesquite [12].

Geographical source

P. juliflora is a preserving and bionomic tree species found in semi-arid and arid places in the world. In India, it occurs throughout the area from Punjab to Tamil Nadu and from Gujrat to the dried region of Orissa. On earth, different species of Prosopis are found with differences in their physical, chemical and physiological properties. The states in India where this species mainly occur are: Andhra Pradesh, Karnataka, Rajasthan, Madhya Pradesh, Haryana, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and Orissa.

Vernacular Names

Hindi - Velayati babul, Velayati Babool, Velayati khejra; Gujrati - Gando baval; Marathi – Velayati kikar; Marwari - angrezi bavaliya; Kannada - Bellari jali; Tamil - Velikaruvel, Velimullu [13].

Morphology

P. juliflora grows as a shrub or tree of different sizes. It is mostly aculeate, xerophilous, spiny, and armed. The glands are located where the pin and leaflets meet. After drying, the legume has a straw-yellow or brown color and is 8–29 cm in length, 9–17 mm in width, and 4–8 mm in thickness. Its apex is straight and curled inward, but it may sometimes be falcate, compressed, linear, stipulate, rectangular, or subquadrate. Plants may have solitary or paired spines that range in length from 0.5 to 5 cm [14, 15].

Tree form and size

In addition to genetic and environmental variables, different kinds of trees have different sizes and shapes. P. juliflora may reach a maximum height of 12 m, but under perfect conditions, it can reach up to 20 m.

Seeds

The green or light green, meaty cotyledons are epigeous during germination and emerge after the first true leaves have developed [15].

Wood

When P. juliflora wood is found in dried form, it has a light brown color and a gross structure that is diffusely porous. P. juliflora has fibers (48%), vessels (18%), rays (18%), and axial parenchyma (16%) at the microscopic level [13].

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

Leaves

Their rachis, petiole, and nodes are all 5–20 cm long, and they are bipinnate in nature. The leaves are 10–20 cm long and medium to huge. Leaflets have a pointed tip and range in form from elliptic-oblong to linear-oblong to ovate, with a length of 8 to 18 mm. At the intersection of pinnae or leaflets, glands are found. They are sessile and have a cuculiform apical hole [14].

Flowers

Racemes, a kind of long, spike-like inflorescence, are cylindrical flowers. Their color ranges from yellow to yellow-white. Inflorescences (9.5–16.5 cm) with 237–344 blooms, almost the same length as the leaves, or slightly longer or shorter. In nature, flowers are pentamerous, actinomorphic, sterile, and hermaphrodite. Many components make up an inflorescence, including the calyx, corolla, pistils, petals, stamen, and pedicel [15].

Fruit

Due to the arrangement of the several fruit sections, this species is also a member of the Leguminosae family. The fruit is an indehiscent legume with a parallel border or not, and an incurved apex. The fruit's edges measure 16–28 cm in length, 14–18 mm in breadth, and 6–10 mm in thickness without any parallel borders. When the pods, which we refer to as fruit, are immature, they are green, and when they are completely grown, they are yellow. They are compressed to sub-compressed and sub-moniliform, flattened to subquadrate in section, acuminate, and stipitate.

Thorns

There are divergent and geminate axillary spines. They may be either single or paired on the same branch, straight, uni- or multimodal, and solitary. The size and quantity of thorns on a tree's branches varies; they might be present on some branches or missing [16].

Physiochemical properties

The ash value and moisture content of P. juliflora vary depending on the parameter: they are 6.1±1.36% in green pods, 7.3±1.88% in dry pods, 4.8±1.02 in leaves, 8.9±1.19 in bark, and 61.3±5.44 in green pods, 26.3±4.09 in dry pods, 56.0±6.38 in leaves, and 35.0±4.99 in bark, respectively [17].

Traditional use

The Prosopis genus has several biological, agricultural, chemical, and medicinal properties and was used for a variety of purposes in the past. It is used as a medication for rheumatism and as a treatment for scorpion stings and snake bites. Additionally, pregnant women in certain areas utilize sugar-coated flower powder for safety. Neisseria gonorrhoeae, which was isolated from symptomatic patients and is used to treat gonorrhea, is another pathogen that P. juliflora is potent against.

Other Prosopis species are also used to treat hepatic and ophthalmic issues and as a diuretic [18]. The leaves, bark twigs, and roots of Prosopis Africana are used to cure diarrhea, dermatitis, tooth decay, malaria, and cramping in the stomach. It is also used in some places to cure scrapes and wounds, dental decay, and sore throats [19]. In Iran, prosopis farcta has long been used to treat angina pectoris and chest discomfort [20]. Prosopis cineraria is used to treat a variety of conditions, including dyspepsia, leukoderma, asthma, dysentery, and earaches [21].

Phytochemistry

The air-dried leaves of P. juliflora, known as Velayati Kikar, were tested for alkaloids, flavonoids, phenols, saponins, and tannins [22]. Alkaloids and saponins alone are antiviral, antibacterial, anticancer, and anti-inflammatory. P. juliflora, or mesquite, has numerous metabolites in its pods, flowers, leaves, stem, and seeds. Pods and leaves have more phytoconstituents than other P. juliflora components [3].

In 2012, Singh examined P. juliflora's leaves, pod, flower, root, and stem for phytochemicals and found that various portions had variable levels. According to phytochemical analysis, pods and leaves include alkaloids, steroids, terpenoids, flavonoids, tannins, and phenolics. Floral extract contains alkaloids, steroids, terpenoids, flavonoids, and phenolics. The stem contains the lowest quantity of phenolics, terpenes, flavonoids, and steroids, while root extracts include these compounds plus tannins, alkaloids, and saponin. Saponin is exclusively found in the roots, although phalobatannin and cardiac glycoside are absent [23].

Isolating phytoconstituents or screening for phytochemicals begins with extraction. In increasing order of polarity, petroleum ether, benzene, chloroform, ethyl acetate, ethanol, and water are used to extract all secondary metabolites. Water is the most polar solvent and petroleum ether the least [24].

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

Allelopathic P. juliora metabolites like (-)-lariciresinol, phenylpropanoids, and piperidine alkaloids like secojuliprosopinal are produced by two main biosynthetic pathways: the shikimic acid pathway and the acetic acid or polyketide metabolic pathway via the lysine amino acid pathway [38]. P. juliflora leaves include phenolic compounds and alkaloids such juliflorine, julifloricine, julifloridine, juliprosinene, juliprosine, and juliprosopine [39]. Syringin, (-)-lariciresinol, L-tryptophan, juliprosopine, juliprosine, and juliprosopinal are water-soluble and precipitate into plant leaf [40]. The chemical composition and concentration of phytoconstituents vary among organs and sections throughout development [41]. Antifungal characteristics of P. juliflora bark include quercetin, 4,7-dimethylether, kaempferol 4-O-methylether, retusin, and L-mannopyranoside. Anti-inflammatory secojuliprosopinal (3-oxo-juliprosopine) is also present. Besides leaves and bark, pods, heartwood, flowers, and roots contain biologically active chemicals [9].

Table 2 Plant metabolites (in gram) extracted by using various solvents from dry plant material [23].

Solvent → Plant part ↓	Hexane	Chloroform	Acetone	Ethanol	Water	Total
Leaf	1.31	2.85	0.96	5.63	4.97	15.72
Stem	0.82	1.51	0.68	3.08	2.48	7.92
Pod	1.05	2.23	0.72	5.55	5.84	15.30
Flower	0.95	2.62	0.77	5.04	4.30	13.68
Root	0.74	1.79	0.56	4.04	3.35	10.48

Wood

Cellulose, hemicellulose, lignin, and extractives make up 40-45%, 25-30%, 11-28%, and 3-15% of woody biomass [42].

Fruit

Fruit pulp makes about 56% of its weight. Sucrose (45%) makes about 90% of pulp's soluble sugar. Other reducing sugars include glucose, fructose, inositol, raffinose, and xylose [43,44].

Leaves

Leaves contain the most important amino acids (AA) but little S-AA. Also present are alkaloids, tannins, flavonoids, polyphenols, and chemicals. Leaf ingredients include nitrogen-free extract, basic extractives, and minerals. Leaf extracts include protein (26.3%), fiber (24.8%), extract (8.5%), ash (1.4%), and vitamins and macronutrients [45,46].

Table 3 Phytochemicals present in the extracts obtained from various parts of P. juliflora [23].

Plant parts → Phytochemicals ↓	Leaf	Pod	Flower	Stem	Root
Tannin	+	+	-	-	++
Phenolics	+++	+++	+++	+	++
Flavonoids	+++	++	+++	+	++
Cardiac glycosides	-	-	-	-	-
Alkaloids	++	+++	++	-	+
Terpenes	++	++	+	+	++
Steroids	+++	++	+	+	+
Saponin	-	-	-	-	+

"+" low concentration, "++" moderate concentration, "+++" high concentration, "- "absent

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

Pharmacological activity

P. juliflora inhibited E. coli, Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonas aeruginosa, Shigella sonnei, and other phytopathogens [27]. with rabbits, Juliflorine modulated immunological response when delivered intramuscularly with Freund's complete adjuvant (FCA) containing Listeria hemolysin (antigen) at varied concentrations [47]. Choudhary et al. found that P. juliflora's juliflorine alkaloid inhibits acetylcholinesterase [48]. In addition, juliflora pollen contains antioxidant flavonoids [49]. Ethanolic extracts of several south Indian medicinal plants were tested for antiplasmodial action against Plasmodium falciparum. P. juliflora flower, leaf, and bark extracts revealed IC50 values over 100 µg/ml [50]. It helps regulate inflammatory disorders, cancer, and diabetes due to its antioxidant properties.

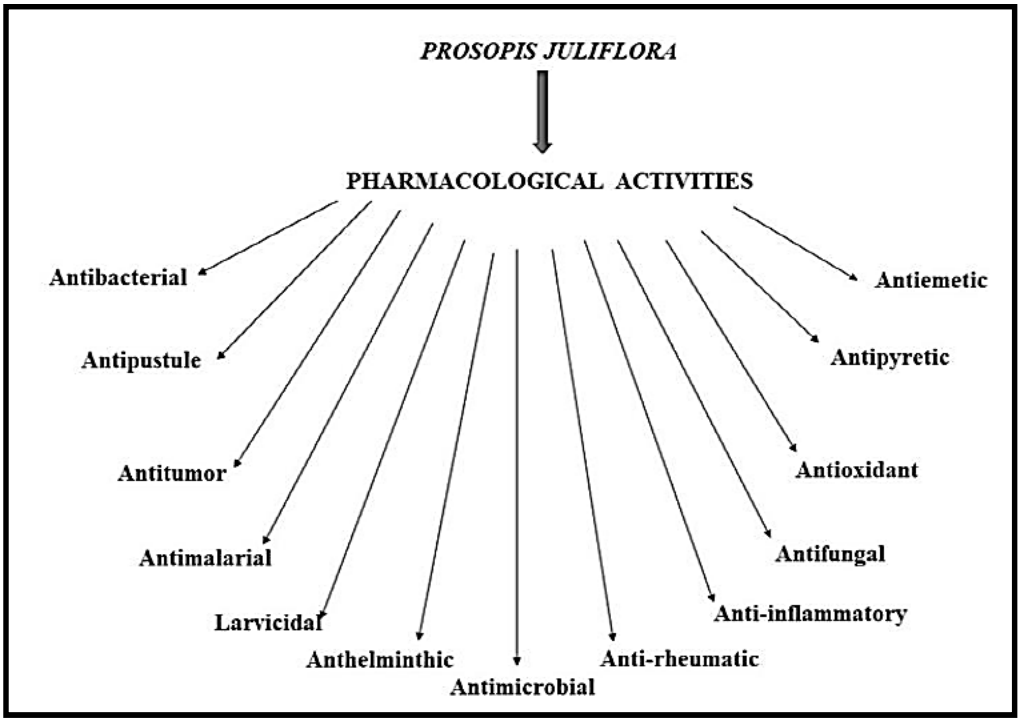


Figure 1 Pharmacological Activities of P. juliflora

Antibacterial activity

P. juliflora includes several alkaloids that were evaluated for antibacterial activity using disc diffusion on gram-positive and gram-negative bacterial strains. P. juliflora leaf extract was more active than other plant components. Klebsiella was more susceptible than Acinetobacter and Alcaligin [33]. The extract showed dose-dependent inhibitory activity against all bacterial strains, including Pseudomonas aeruginosa, Escherichia coli, Staphylococcus epidermidis, Klebsiella pneumonia, M. luteus, S. aureus, Bacillus subtilis, and Salmonella typhimurium. Raghavendra et al. conducted a well-diffusion test on Gram-positive (Staphylococcus aureus, Bacillus sp., and Streptococcus sp.) and Gram-negative (E. coli and Klebsiella sp.) bacteria to determine the extract's inhibitory effect. Green leaves had the widest zone of inhibition (22 and 19 mm) compared to dry leaves. Gram-positive bacteria were more damaged than gram-negative bacteria, according to the research. Methanol extract of green P. juliflora leaves was more effective than dried leaves [24].

Antimalarial activity

Due to resistance to various antimalarial medications used to treat malaria and fever, many plants have been tested for in-vitro antiplasmodial action. Simonsen et al. found favorable antiplasmodial action in P juliflora ethanolic extracts from flower and fruit, with an IC50 value of 24 µg/ml. Another research compared chloroquine to the formate salts of

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

julifloridine and juliprosopine from P. juliflora for in-vivo antimalarial activity. Juliprosopine was more potent at 2 mg/kg than chloroquine at 50 mg/kg.

Anti-tumor activity

Marketed vinblastine, vincristine, and vinorelbine are among 60 plant-derived anticancer medicines. Mani et al. examined P. juliflora leaf extract alkaloids' in vitro anti-tumor potential. Extracts (10-100 µg/ml) were tested for cytotoxicity using MTT after 24–72 hours exposure to T-cell leukemia (Molt-4) (1×106 cells/ml medium) and mitogen-stimulated T-lymphocyte cultures from healthy volunteers' venous blood. The extract has 72.65% cytotoxicity for malignant cells and 46.51 % for normal cells. The research showed that T-cell leukemia cytotoxicity relies on time and dosage without genotoxicity.

Larvicidal activity

Yadav et al. tested plant extracts to create a mosquito-controlling extract. P. juliflora, Malvastrum coromandelianum, Vernonia cinerea, and Hyptis suaveolens leaves were tested for larvicidal activity in methanol, isopropanol, dimethyl sulfoxide, acetone, and water. Vernonia cinerea was most active in acetone, followed by P. juliflora in methanol. In another investigation, Vernonia cinerea acetone extract and Callistemon viminalis isopropanol extract were most efficient against Aedes albopictus larva with LC50 values of 64.5 and 71.34 ppm. A 100 ppm P. juliflora acetone extract was similarly efficient in deterring Aedes albopictus mosquito oviposition.

Anthelmintic activity

Nematode infections kill many tropical animals, and synthetic anthelmintics don't work. Fast-growing and drought-resistant P. juliflora is readily accessible in severe environments. Rechab et al. found anthelmintic activity in the ethanolic extract of P. juliflora leaf and root compared to Albendazole in 2011. The leaf ethanolic extract was more effective than the root extract in anthelmintic activity, however Albendazole was similarly effective. Saponins, condensed tannins, and alkaloids are the primary anthelmintic components of the extract. Such phytoconstituents may be useful for developing veterinary drugs to treat worm infections.

Antifungal activity

Raghavendra et al. tested P. juliflora's antifungal activity against Alternaria alternata (causes brown spot of tobacco) in petroleum ether, chloroform, benzene, ethanol, methanol, and aqueous solvents using poisoned food. The most antifungal solvent extracts were methanol and ethanol. Fractionated methanol extract was compared to synthetic fungicides (blitox, captan, dithane M-45, and thiram) at 1000 ppm for antifungal activity to isolate alkaloids. Alkaloid extract at 1000 ppm outperformed synthetic fungicides at low doses. Dale found that P. juliflora contains a majority of alkaloids having biological activity against several seed-borne fungus. P. juliflora alkaloid extract was modified with all chemical fungicides at 1.5 and 1 g/L. The combination of chemical fungicides altered with alkaloid extract had significantly higher antifungal activity than the chemicals alone at the dose. The extract should minimize chemical fungicide use and boost seed mycoflora inhibition.

Antimicrobial activity

Dos santos et al. discussed P. juliflora crude extracts, alkaloid-enriched fraction, and extracted alkaloid for in-vitro antibacterial testing. Satish et al. revealed its potential to battle agricultural microbes in 1999, while Caceres et al. examined its usage to treat gonorrhea. That plant material was macerated in 50% alcohol and examined for in-vitro activity by measuring the inhibition zone. The leaf extract or tincture inhibited Neisseria gonorrhoeae (Isolated from symptomatic patient) best at 9.6 mm. In addition to human-affecting microorganism research, Satish et al. reported antibacterial properties exclusively in P. juliflora, Lawsonia inermis, and Oxalis corniculata aqueous extracts. P. juliflora leaves show antibacterial activity against several Xanthomonas sp. (inhibition zone 18–23 mm) equivalent to bacterimycin and streptocycline and manage agricultural problems. Dos santos et al. reported in-vitro antibacterial activity to assess P. juliflora pods as feed additives for ruminants with alkaloid-enriched fractions in 2013. Alkaloids in chloroform extract of P. juli-ora pods exhibit in-vitro antimicrobial activity against Micrococcus luteus (MIC = 25

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

µg/ml), Staphylococcus aureus (MIC = 50 µg/ml), and Streptococcus mutans (MIC = 50 µg/ml), with gas production evaluated using monensin as the positive control. Extract produced less gas than monensin during ruminant fermentation [32].

Antioxidant activity

Flavonoids and phenolic substances are crucial to plant pollen antioxidant capabilities. Polyphenolic hydroxy group compounds, especially those with dihydroxy at the 30th and 40th positions of the B ring of flavonoid compounds, are antioxidants. P. juliflora honeybee pollen is more antioxidant than Amaranthus hybridus. Prasad et al. found antioxidant activity in P. juliflora aqueous leaf extract utilizing rat liver enzymes. When administered 5% aqueous extract, rats demonstrated protection against S. aureus-induced hepatotoxicity. Sirmah et al. also tested if P. juliflora extract (heartwood) may provide antioxidants for food, cosmetics, and pharmaceuticals. In P. juliflora extract, flavonoids (4-O-methyl-gallocatechin) and (-)-mesquitol are the primary secondary metabolites and provide antioxidants [35].

Antipyretic activity

When evaluated for brewer's yeast-induced hyperthermia in rats, P. juliflora ethanolic extract included flavonoids, alkaloids, anthraquinones, quinines, tannins, Leucoanthocyanidin, and Ellagic acid glycosides. The extract has been evaluated for antipyretic efficacy at various doses. Gopinath et al. evaluated the antipyretic effects of P. juliflora extract at 250 and 300 mg/kg p.o. to paracetamol (150 mg/kg in WFI). P. juliflora showed antipyretic properties by lowering rectal temperature at 2, 3, and 4 hours.

Antiemetic activity

Ul Hasan et al. compared chlorpromazine to methanolic extracts of P. juliflora leaves and other plants for antiemetic efficacy. Copper sulfate (50 mg/kg, p.o) induced emesis in four-day-old male chicks. To conclusion, mean reduction in retching in control, test, and standard groups was calculated. Adenanthera pavonina, Peltophorum roxburghii, Prosopis cineraria, and P. juliflora extracts were compared to controls and the standard for emesis reduction. P. juliflora showed the highest antiemetic activity at 76.64%, while chlorpromazine reduced retches by 32.71%.

Antipustule activity

Pimple removal is the focus of cosmetic research. They are caused by Staphylococcus species that enlarge and form pimples. Well diffusion showed that P. juliflora acetone extract inhibits staphylococcus sp. Rajadurai et al. determined 0.75 mg/ml as the lowest inhibitory concentration of P. juliflora acetone extract. FTIR confirmed the functional group and growth curve analysis revealed acetone extract inhibition. When used with synthetic creams, the extract increases anti-pustule action and reduces skin blackening, irritation, and tissue damage.

Antigiardial and Amoebicidal activity

Giardiasis, a parasitic gastro-intestinal illness, affects 200 million people worldwide. Giardia lamblia causes diarrhea in infants and adults. P. juliflora leaves extracted in petroleum ether and methanol were tested at various doses. The greatest effective concentration of P. juliflora petroleum ether extract against Giardia lamblia was 1000 ppm, with 78.91% mortality after 72 hours and 38.55% mortality in 24 hours. Mortality after 72 hours was 83.42% with 312.5 ppm metronidazole. After malaria and schistosomiasis, Entamoeba histolytica caused the third most deadly illness worldwide. Although approximately 90% of amoebiasis infections are asymptomatic, hemorrhagic colitis and amoebic liver abscess impact 50 million individuals worldwide. Most effective P. juliflora methanol extract concentration against Entamoeba histolytica was 1000 ppm, with 71.97% death after 72 hours. Lowest antiamoebic concentration is 125 ppm in petroleum ether extract, with 31.88% mortality in 24 hours. Also, 312.5 ppm metronidazole caused 78.01% 72-hour mortality. In both instances, Garbi et al. found that the petroleum extract of P. juliflora leaves was better than metronidazole, which causes negative effects.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

Cholinesterase inhibitory activity

Choudhary et al. found that alkaloids in P. juliflora, including juliflorine, inhibit acetylcholinesterase and butyryl cholinesterase non-competitively with IC50 values of 0.42 and 0.12 µM and Ki values of 0.4 and 0.1 Molecular docking showed that the alkaloid inhibits calcium channels and interacts with acetylcholinesterase's active site. Juliflorine is an intriguing Alzheimer's alkaloid, as validated by human neutrophil viability test. Juliflorine demonstrated spasmolytic and calcium channel blocking action in rabbit jejunum at doses ranging from 30 to 500 µg/ml.

Anti-inflammatory activity

Choudhary and Nagori devised a phytochemical research to test the anti-inflammatory effectiveness of P. juliflora leaf ethanolic extract (100, 200, and 400 mg/kg) against carrageenan-induced paw edema in rats. The phytochemical screening found flavonoids, saponins, carbohydrates, cardiac glycosides, tannins, and alkaloids in P. juliflora leaf ethanolic extract. Ethanolic extract had an oral median lethal dosage (LD) of 3807.9 mg/kg in mice and > 5000 mg/kg in rats. P. juliflora extract reduces paw edema best at 400 mg/kg. This research supports the use of P. juliflora to treat inflammation.

Toxicity studies

Chemicals and biological systems interact toxically. Any material that harms living things is poisonous. Due to its benefits, animals and humans utilize P. juliflora, mesquite, and algarroba components. Consumption may intoxicate animals, especially ruminants (USA, Peru, Brazil). Mesquite is a popular plant in arid locations and abundantly accessible, but pod intake causes animal toxicity. Ruminants, especially goats and cattle, are particularly susceptible to "Cara-torta" illness. In this, cranial nerve malfunction, degeneration, and absence of trigeminal motor nucleus neurons that maintain food in the mouth during mastication cause lateral head deviation. Only animals that ingest P. juliflora pods for 8 months get this sickness. During rumination, animals show dysphagia, incoordination of chewing motions, atrophy, excessive salivation of the masseter muscle, ruminal atony, anemia, submandibular edema, and gradual weight loss. All symptoms degrade brain flora, including neuromuscular alteration, histologic lesions like spongiosis and gliosis, loss of Nissl granules, fine vacuolation of the perikaryon of neurons from trigeminal motor nuclei, and neuronal cell degeneration and disappearance.

Silva et al. isolated, purified, and identified juliprosopina and juliprosinene from the alkaloids in a P. juliflora toxicity research. Lab animals demonstrate toxicity to piperidine alkaloids because they directly affect brain cells, producing mitochondrial damage. Neural cell cultures were employed to study "cara torta" disease's key cellular changes and piperidine alkaloids, P. juliflora leaves and pods' principal neurotoxic ingredient. This research found that autophagy protects brain cells from mitochondrial damage-induced programmed cell death.

Using rat astrocyte culture media, P. juliflora activates glial cells, causes cytotoxicity, and produces NO. The whole alkaloid extract of P. juliflora leaves and its chromatographic fractions were added to the culture to determine their direct effects and toxicity. LDH activity and MTT tests showed that TAE and other alkaloids in culture media cytotoxic to astrocytes or vice versa.

Mailoi et al. conducted a study on the neurotoxicity and mechanism of action of juliprosopine alkaloid in isolated rat mitochondria. The study found that juliprosine mostly affects neuronal cell membrane potential, stimulates respiration (10-25 µM), and affects ATP production (15-25 µM). Uncoupling of oxidative phosphorylation lowered neuronal cell ATP generation, causing cell death, malfunction, and neurotoxicity].

Mani et al. evaluated acute toxicity when rats were given P. juliflora extract orally at dosages from 50 to 500 mg/kg for 72 hours. No toxic symptoms were found below 200 mg/kg. A subacute toxicity study found no change in hematological, biochemical, renal, or liver function parameters at 200 mg/kg for 30 days or longer. All characteristics were the same in experimental animals on day 31, when they were slaughtered and blood and serum samples were examined for biochemical parameters. Ethanolic extract of P. juliflora was shown to be nontoxic and employed for long-term in-vivo pharmacological research.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

II. CONCLUSION

According to the review, P. juliflora has therapeutic qualities. According to many literatures, people customarily utilize it to meet their wants. P. juliflora is anthelmintic, antioxidant, antipyretic, cytotoxic, antigiardial, amoebicidal, antipustule, and more. It works well in food, cosmetic, pharmaceutical, agricultural, and renewable energy sectors. It also aids science and technology. Cara torta, produced by overeating P. juliflora pods, causes emaciation, masseter muscle atrophy, spongiosis, neuronal degeneration, and gliosis. Literature showed that autophagy protects brain cells from mitochondrial damage-induced programmed cell death. This plant's bioactive metabolites may be exploited to generate novel drugs to meet society's unmet medicinal needs.

REFERENCES

[1]. Burkart A. A monograph of the genus prosopis (leguminosae subfam. mimosoideae). Journal of Arnold Arboretum. 1976; 57(4): 219–249.
[2]. Patil J, Kuppast IJ, Kumar KMA, Kishan KG. Prosopis juliflora, Research Journal of Pharmacology and Pharmacodynamics. 2016; 8(4): 5958.
[3]. Khandelwal P, Sharma RA, Agarwal M. Phytochemical analyses of various parts of Prosopis juliflora. Mintage Journal of Pharmaceutical and Medical Sciences. 2016; 5(1): 16–18.
[4]. Prasad MNV, Tewari JC. Prosopis juliflora (SW) DC: Potential for bioremediation and bioeconomy. Bioremediation and Bioeconomy, (Elsevier Inc.). 2016; 49-76.
[5]. Choge SK, Pasiecznik NM, Harvey M, Wright J, Awan SZ, et al. Prosopis pods as human food, with special reference to Kenya. Water SA. 2017; 33(3): 419–424.
[6]. Kailappan R, Gothandapani L, Viswanathan R. Production of activated carbon from prosopis (Prosopis juliflora). Bioresource Technology. 2000; 75(3): 241–243.
[7]. Goel VL, Behl HM. Genetic selection and improvement of hard wood tree species for fuelwood production on sodic soil with particular reference to Prosopis juliflora. Biomass and Bioenergy. 2001; 20(1): 9–15.
[8]. Ukande MD, Shaikh S, Murthy K, Shete R. Review on Pharmacological potentials of Prosopis juliflora. Journal of Drug Delivery Therapeutics. 2019; 9(4-s): 755–760.
[9]. Dahms H, Sethuraman P. Pharmacological potentials of phenolic compounds from Prosopis spp. - A review. Journal of Coastal Life Medicine. 2015; 2(11): 918-924.
[10]. Wassel GM, Rizk AM, Abdel-Bary EF. Phytochemical investigation of Prosopis juliflora DCI Flavonoids and free sugars. Qualitas Plantarum et Materiae Vegetabiles. 1972; 22(1): 119–121.
[11]. Ibrahim M, Nadir M, Ali A, Ahmad VU, Rasheed M. Phytochemical analyses of Prosopis juliflora Swartz DC. Pakistan Journal of Botany. 2013; 45(6): 2101–2104.
[12]. Tewari JC, Harris PJC, Harsh LN, Ladoret K, Pasiecznik NM. Managing Prosopis juliflora (Vilazati Babul). Food and agriculture organisation. 2000; 1–20.
[13]. Shackleton RT, Le Maitre DC, Pasiecznik NM, Richardson DM. Prosopis: A global assessment of the biogeography, benefits, impacts and management of one of the world's worst woody invasive plant taxa. AoB Plants. 2014; 6: 1–18.
[14]. Shiferaw H, Teketay D, Nemomissa S, Assefa F. Some biological characteristics that foster the invasion of Prosopis juliflora (Sw.) DC. at Middle Awash Rift Valley Area, north-eastern Ethiopia. Journal of Arid Environments. 2004; 58(2): 135–154.
[15]. Dave PN, Bhandari J. Prosopis juliflora: A review. International Journal of Chemical Studies. 2013; 1(3): 181–196.
[16]. Pasiecznik N, Felker P, Harris P, Harsh L, Cruz G, et al. The'Prosopis juliflora'-'Prosopis pallida'complex: a monograph. Forest Trees and Livelihoods. 2002; 12: 229–229.
[17]. Shitanda D, Mukonyi K, Kagiri M, Gichua M, Simiyu L. Properties of Prosopis juliflora and Its Potential Uses in Asal Areas of Kenya. Journal of Agriculture, Science and Technology. 2013; 15(1), 15–27.
[18]. Asadollahi K, Abassi N, Afshar N, Alipour M, Asadollahi P. Investigation of the effects of Prosopis farcta plant extract on Rat's aorta. Journal of Medicinal Plants Research. 2010; 4(2): 142–147.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

[19]. Asoiro FU, Nwoke OA, Ezenne GI. Some engineering properties of Prosopis africana (Okpeye) seeds. Journal of Agricultural Engineering and Technology. 2013; 21(2): 66-79.

[20]. Marwat SK, Rehman FU. Medicinal folk recipes used as traditional phytotherapies in district Dera Ismail Khan, KPK, Pakistan. Pakistan Journal of Botany. 2011; 43(3): 1453–1462.

[21]. Garg A, Mittal SK. Review on Prosopis cineraria: A potential herb of Thar desert. Drug Invention Today. 2013; 5(1): 60–65.

[22]. Preeti K, Avatar SR, Mala A. Pharmacology and Therapeutic Application of Prosopis juliflora: A Review, Journal of Plant Sciences. 2015; 3(4): 234.

[23]. Singh S. Phytochemical analysis of different parts of Prosopis juliflora. International Journal of Pharmaceutical Research. 2012; 4(3): 59–61.

[24]. Raghavendra MP, Satish S, Raveesha KA. Alkaloids isolated from leaves of Prosopis juliflora against Xanthomonas pathovars. Archives of Phytopathololology and Plant Protection. 2009; 42(11): 1033–1041.

[25]. Ahmad VU, Qazi S. The absolute configuration of julifloridine. Zeitschrift Für Naturforschung B. 1983; 38(5): 660.

[26]. Ahmad VU, Basha A and Haque W. New alkaloids from Prosopis juliflora DC. Zeitschrift für Naturforschung B. 1978; 33(3): 347–348.

[27]. Ahmad VU, Sultana A, Qazi S. Alkaloids from the leaves of Prosopis juliflora. Journal of Natural Products. 1989; 52(3): 497–501.

[28]. Uddin Ahmad V, Sultana A. A terpenoid diketone from the leaves of Prosopis juliflora, Phytochemistry. 1989; 28(1): 278–279.

[29]. Tabosa IM, Cluintans-Júnior LJ, Pamplona FV, Almeida RN, Cunha EVL da, et al. Isolamento biomonitorado de alcalóides tóxicos de Prosopis juliflora (algaroba). Revista Brasileira de Farmacognosia. 2000; (1): 9-10.

[30]. Tapia A, Egly Feresin G, Bustos D, Astudillo L, Theoduloz C, et al. Biologically active alkaloids and a free radical scavenger from Prosopis species. Journal of Ethnopharmacology. 2000; 71(1–2): 241–246.

[31]. Rahman AA, Samoylenko V, Jacob MR, Sahu R, Jain SK, et al. Antiparasitic and antimicrobial indolizidines from the leaves of Prosopis glandulosa var. glandulosa. Planta Medica. 2011; 77(14): 1639–1643.

[32]. dos Santos ET, Pereira MLA, da Silva CFPG, Souza-Neta LC, Geris R, et al. Antibacterial activity of the alkaloid- enriched extract from Prosopis juliflora pods and its influence on in Vitro ruminal digestion. International Journal Molecular Sciences. 2013; 14(4): 8496–8516.

[33]. Shachi Singh, Swapnil SKV. Antibacterial properties of Alkaloid rich fractions obtained from various parts of Prosopis juliflora. International Journal of Pharmaceutical Sciences and Research. 2011; 2(3): 114–120.

[34]. Nakano H, Nakajima E, Hiradate S, Fujii Y, Yamada K, et al. Growth inhibitory alkaloids from mesquite (Prosopis juliflora (Sw.) DC.) leaves. Phytochemistry. 2004; 65(5): 587–591.

[35]. Sirmah P, Mburu F, Iaych K, Dumarçay S, Gérardin P. Potential antioxidant compounds from different parts of Prosopis juliflora. Journal of Tropical Forest Sciences. 2011; 23(2): 187–195.

[36]. Nakano H, Fujii Y, Suzuki T, Yamada K, Kosemura S, et al. A growth-inhibitory substance exuded from freeze- dried mesquite (Prosopis juliflora (Sw.) DC.) leaves. Plant Growth Regulation. 2011; 33(3): 165–168.

[37]. Nakano H, Fujii Y, Yamada K, Kosemura S, Yamamura S, et al. Isolation and identification of plant growth inhibitors as candidate(s) for allelopathic substance(s) from aqueous leachate from mesquite (Prosopis juliflora (Sw.) DC.) leaves. Plant Growth Regulation. 2002; 37(2): 113–117.

[38]. Azevedo G, Damasceno DB, & Giordani RB, Prosopis juliflora (SW) DC. An invasive species at the Brazilian Caatinga : phytochemical, pharmacological, toxicological and technological overview. Phytochemistry Reviews. 2017; 17: 309–331.

[39]. Astudillo L, Schmeda-Hirschmann G, Herrera JP, Cortés M. Proximate composition and biological activity of Chilean Prosopis species. Journal of the Science of Food and Agriculture. 2000; 80(5): 567–573.

[40]. Dewick PM. Medicinal natural products: a biosynthetic approach, (John Wiley & Sons). 2002.

[41]. Wink M, Schimmer O. Molecular modes of action of defensive secondary metabolites. Annual Plant Reviews online. 2018; 21–161.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 4, February 2024

[42]. Patel VJ, Safaya V. The Role of Prosopis in Wasteland Development. Jivrajbhai Patel Agrofor Center, Surendrabag, Gujarat, India. 1986.

[43]. Cruz G, Del Re B, Amado R. Contribución al estudio de la composición química de los frutos maduros del algarrobo. III Jornadas Peruanas Fitoquímica. 1987; 122.

[44]. Sáenz G, Serra JA, Escriche I. Composición química de la algarroba peruana (Prosopis sp.). In: Proc. 2nd Int. Carob Symp. Generalitat Valenciana, Valencia, Spain. 1987; 419–427.

[45]. Singh G, Abrol IP, Cheema SS. Effects of irrigation on Prosopis juliflora and soil properties of an alkali soil. International Tree Crops Journal. 1990; 6(2–3): 81–99.

[46]. Sharma BM. Chemical analysis of some desert trees. In: Proceedings. International Society for Tropical Ecology. 1968; (1): 248.

[47]. Ahmad A, Khan KA, Ahmad V. Immunomodulating effect of preliminary report. Immunology. 1992; (8): 189–193.

[48]. Choudhary MI, Nawaz SA, Azim MK, Ghayur MN, Lodhi MA, et al. Juliflorine: A potent natural peripheral anionic- site-binding inhibitor of acetylcholinesterase with calcium-channel blocking potential, a leading candidate for Alzheimer Õ s disease therapy, Biochemical and Biophysical Research Communication. 2005; 332: 1171–1179.

[49]. Almaraz-Abarca N, da Graça Campos M, Ávila-Reyes JA, Naranjo-Jiménez N, Herrera Corral J, et al. Antioxidant activity of polyphenolic extract of monofloral honeybee-collected pollen from mesquite (Prosopis juliflora, Leguminosae). Journal of Food Composition and Analalysis. 2007; 20(2): 119–124.

[50]. Ravikumar S, Inbaneson SJ, Suganthi P. In vitro antiplasmodial activity of ethanolic extracts of South Indian medicinal plants against Plasmodium falciparum. Asian Pacific Journal of Tropical Diseases. 2012; 2(3): 180–183.