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TEPHROSIA PURPUREA (L.) PERS. (SHARPUNKHA): PHARMACOGNOSTICAL PROFILE, PHYTOCHEMICAL CONSTITUENTS AND PHARMACOLOGICAL USES - A REVIEW

Brahma Nand Jha[1]*, Hanshika Yadav[2], Anamika[3] and Mozammel Haque[1]

[1]Department of Pharmacology, Research Scholar, Nirwan University, Jaipur, Rajasthan-303305, India.
[2]Department of Pharmacology, Nantong University, Pincode-206019, China.
[3]Department of Pharmacology, Research Scholar, Sunrise University, Alwar, Rajasthan-301028, India.

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***Corresponding Author: Brahma Nand Jha**

Department of Pharmacology, Research Scholar, Nirwan University, Jaipur, Rajasthan-303305, India.

ABSTRACT

Tephrosia purpurea (L.) Pers. is a highly branched suberect herbaceous perennial which is a member of the tribe Millettieae, subfamily Faboideae, and family Fabaceae, popularly referred to as Sharpunkha, and is a well-established medicinal plant in Ayurvedic and Unani medicine. Along with a detailed examination of its phytochemical elements, including flavonoids, glycosides, alkaloids, and terpenoids, this review seeks to present a thorough pharmacognostical profile that includes both macroscopic and microscopic features. Hepatoprotective, antioxidant, antibacterial, anti-inflammatory, and anticancer properties are only a few of Tephrosia purpurea's therapeutic potentials. Overall, several properties appear to be the most promising pharmacological effect of TP. Its therapeutic importance, possible mechanisms of action, and pharmacological confirmation are highlighted. This study aims to encourage additional pharmacological investigation and development of Tephrosia purpurea-based therapeutic uses by combining traditional knowledge with current research.

KEYWORD: Tephrosia purpurea (L.) Pers, Flavonoids, Ethnopharmacology, Therapeutic Uses.

INTRODUCTION

Tephrosia purpurea (L.) Pers is a highly branched suberect herbaceous perennial which is a member of the tribe Millettieae, subfamily Faboideae, and family Fabaceae. The plant can grow up to 60 meters tall with spreading branches, its leaves are imparipinnate (a pinnately compound leaf with a single leaflet at the end of the rachis) and have narrow, oblanceolate leaflets and its extra-axillary racemes of red or purple flowers and its slightly curved, 3–4.5 cm long, smooth, grey pods that hold 5–10 seeds each.[1,2]

Taxonomic classification

Kingdom – Plantae
Division – Magnoliophyte
Class – Magnoliopsida
Subclass – Rosidae
Order – Fabales
Family- Fabaceae
Genus – Tephrosia
Species – Purpurea
Synonyms - Cracca purpurea, Tephrosia piscatorial

The herb Tephrosia purpurea, which is commonly used in traditional medicine, is known by many names in different languages and regions around the world.

Common names[3,4]

English - Wild indigo, Purple Tephrosia, Fish poison plant.
Hindi - Sarphonk, Sarpunkha.
Sanskrit – Usharika
Tamil - Kollukkai velai, kolunji, Kolinchi
Telugu – Vempali
Malayalam – Uzhinja
Kannada - Nayiagala, Kaggi
Bengali - Banmahua, Jangali neel
Marathi – Unhali
Gujarati – Unhali
Rajasthani – Masa
Maithili – Phulghass

Geographical distribution: The flowering plant Tephrosia purpurea, a common wasteland weed species, is a member of the pea family and is found throughout the tropics. It is grown as a crop for green manure in

various places. The worldwide distribution of T. purpurea is wide. It is native to the western Pacific, Africa, Southeast Asia, Australia, China, Sri Lanka, and India. It is found in the Indian regions of Andhra Pradesh, Haryana, Rajasthan, and Tamil Nadu.

Fig 1: Photograph of Tephrosia purpurea (L.) Pers.

Botanical Description: The tiny shrub Tephrosia purpurea can attain a height of 1.5 meters. Its leaves are bipinnate and have 7 to 15 leaflets, with a single terminal leaflet. The leaflets have dimensions of 5 to 11 mm in width and 10 to 32 mm in length. Pea-like blooms range in colour from white to purple and are grouped in up to 25 cm long inflorescences. The corolla parts of the individual flowers vary in length from 2 to 3 mm. The pods can vary in length from 20 to 45 mm and width from 3 to 5 mm. They are straight with a slight upward curved at their end. Upon drying, the pods break along two valves, exposing two to nine black rectangular seeds 2.5 to 5 mm long and 1.8 to 3 mm wide.[5,6]

Chemical Constituents: Flavonoids such as purpurin, purpuritenin, lanceolatin A, B, C, and purpurenone, as well as flavonoid glycosides like rutin and osyritin, sterols like b-sitosterol, and retenoids like deguelin, elliptone, rotenone, and tephrosin, were found in T. purpurea through phytochemical screening.[7,8]

The major constituents in TP are Rutin, quercetin, retenoids deguelin, elliptone, rotenone, tephrosin and lupeol, and minor are flavanones, lanceolatin A, B & C, isolonchocarpin, and purpurin from root and from entire plant is pongamol. An isoflavone 7, 4 - dimethoxy - 3, 5-dimethoxy isoflavone; a chalcone (+) - tephropurpurin, (+) - purpurin, pongamol, lanceolatin–B and pterocarpans.[5,9,10]

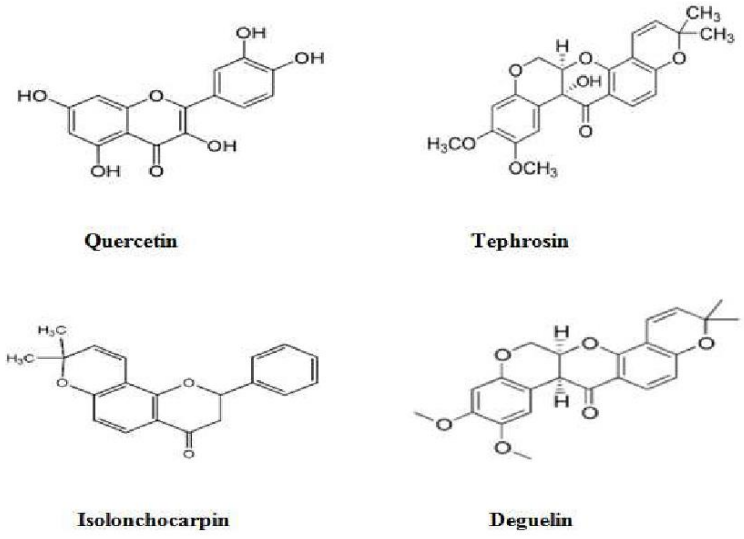

Fig 2: Chemical structure of important phytoconstituents present in Tephrosia Purpurea.[5]

Macroscopy: Macroscopic analysis revealed that the inner parts of the leaflets were silky-hairy. Pods are glabrous, flat, linear, straight, or slightly curved, and range in length from 1.5 to 3.8 cm. Blackish-brown, oblong, smooth, glabrous, and slightly compressed seeds 4-8. Blackish-gray roots with a rough, curving surface. The stems have a diameter of 0.2 to 0.5 mm and are light yellow in colour.[21]

Microscopy: Powder sample shows lignified border pitted, annular vessels, brown content, cork, simple, complex starch grains, xylem fibres, bundles of phloem

fibres, unicellular, simple horn-shaped trichomes with various size, and prismatic crystals of calcium oxalate.[21]

Table 1: Ethnopharmacological uses of Tephrosia purpurea.[5]

Part used	Chemical constituent	Uses
Leaves	Osyritin, 2% glycoside, rutin, rotenone, tephrosin, pongaglabol, semiglabrin	Useful in diseases of lungs and chest, tonic to intestines, improves the apetite, treatment of piles, syphilis, gonorrhea.
Roots	Tephrosin, diguelin, isotephrosin, rotenone, tannins, phytosterols, glycosides, purpurin, isolonchocarpin	Diuretic, blood-enriching, effective for bronchitis, wounds, boils, pimples, liver and spleen diseases, asthma, inflammation, antiulcer, hepatoprotective, used to treat snakebite poisoning, effective for spleen enlargement, antidiarrheal.
Seed	Tephrosin, diguelin, quercetin	Used in poisoning due to rat bite.

Before flowering, it is used as fodder in South Africa and India, although in Australia, it has been reported to livestock poisoning. Dry plants are collected for fuel in northern India. The plant has laxative and tonic properties. Bronchitis, bilious febrile attacks, and liver, spleen, and kidney blockages can all be treated using the dried plants. It is also recommended as a blood purifier, in the treatment of boils and pimples and is considered a cordial treatment.[1] Tephrosia species contains a large number of flavonoids with antioxidant and anticancer effects.[11]

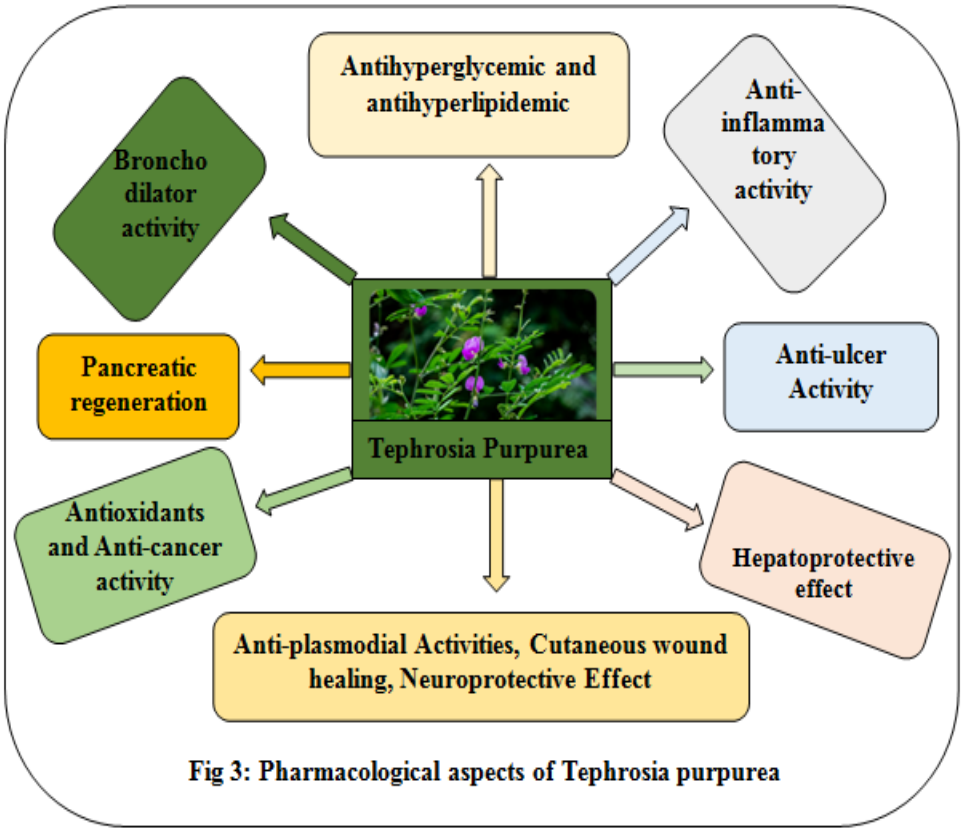

Fig 3: Pharmacological aspects of Tephrosia purpurea

Anti-inflammatory activity: Smita et.al showed the anti-inflammatory activity of orally administered ethanolic extract of Tephrosia purpurea in acute and subacute inflammation in rats. Paw oedema is induced by the irritant carrageenan. Rats with paw oedema caused by carrageenan are commonly used as models to examine a compound's anti-inflammatory effects in acute inflammation.[12]

Anti-ulcer Activity: Deshpande et.al observed that without influencing gastric secretion or pepsin activity, an aqueous extract of Tephrosia purpurea (AETP) roots dramatically and dose-dependently decreased the degree of stomach ulceration in rats with pylorus ligation. These results further point out to cytoprotection as the major mechanism responsible for the anti-ulcer activity of this drug as AETP produces significant anti-ulcer effect but not antisecretory effect.[13]

Hepatoprotective effect: Tephrosia purpurea as one of the ingredients protected the rats against progress of hepatic fibrosis after chronic CC14 intoxication. T.P

exerts hepatoprotective action in both acute (galactosamine) and chronic (CCl4) hepatotoxic models.[14]

Antihyperglycemic and antihyperlipidemic: Compared to control rats, streptozotocin-induced diabetic animals showed a significant decrease in plasma insulin levels and a significant increase in blood glucose levels. However, the above said parameters were significantly normalized in diabetic rats treated with Tephrosia purpurea leaf extract (TpALet) and glibenclamide. "TpALet" showed antihyperglycemic effect in a manner similar to that of glibenclamide in streptozotocin induced diabetic rats.[15]

Bronchodilator activity: The bronchodilator activity of Tephrosia purpurea whole extract (TPTE) has been evaluated using isolated guinea-pig tracheal strips, and the active components were identified using bioassay-guided fractions. Except EtOAc and Aqueous fractions, the TPTE, Petroleum Ether and CHCl3 fractions concentration-dependently inhibited carbachol (CCh) induced bronchospasms and the CHCl3 was identified as the most potent.[16]

Pancreatic regeneration: Morphometric study and histological investigation of the islet Morphometric analysis was used in histological investigations to confirm that pancreatic cells had been restored. Compared to the control group, the b-cell granulation of the islets improved after treatments with TPLBS fraction and TPLE extract. Comparing the islets to control animals, the nucleus's architecture appeared normal, indicating that the TPLE and TPLBS fraction protected the b-cells from damage. However, treatments with TPLCS fraction for 21 days resulted in partial improvement in pancreatic tissue integrity.[15]

Anti-plasmodial Activities: The isolated flavones were tested for anti-plasmodial activity against the D6 strain of Plasmodium falciparum, using a non-radioactive assay technique Among these, (E)-5-hydroxytephrostachin showed good activity.[17]

Antioxidants and Anti-cancer activity: Gulecha et.al showed that sharp inhibition in the cancer cell lines while neither decrease nor increase in the log cell count. It can be interpreted as the drug scaffold having inhibitory activity against the breast cancer cell lines i.e. MCF-7 but in case of normal cell line drug was ineffective. The drug neither allowed the cell growth nor killed the existing cell. antioxidant activity of T. purpurea subsp. apollinea methanolic extract was investigated using DPPH and ABTS radical scavenging assays.[18,11]

Table 2: List of phenolic compounds and their biological activity.[11]

S.No.	Compounds	M.Wt.	M.F.	Category	Biological Activities
1	Gallic acid	170	C7H6O5	Phenolic acids	Antioxidant and Anticancer
2	Chlorogenic acid	354	C16H18O9	Phenolic compound	Antioxidant and Anticancer
3	Coffeic acid	180	C9H8O4	Polyphenol	Antioxidant and Anticancer
4	Vanillin	152	C8H8O3	Phenolic aldehyde	Antioxidant and Anticancer
5	Quercetin	302	C15H10O7	Flavonoid	Antioxidant and Anticancer
6	Cinnamic acid	148	C9H8O2	Monocarboxylic acid	Antioxidant and Anticancer
7	Daidzein	254	C15H10O4	Isoflavone	Antioxidant and Anticancer

Cutaneous wound healing: Lodhi et al. showed that ethyl acetate fraction of T. purpurea (TPF-A) and methanol-soluble fraction of M. annua (MAF-C) possess a definite healing action. TPF-A and MAF-C fractions containing pongamol and luteolin, respectively also have been found to promote wound healing at the concentration of 0.5% w/w.[19]

Neuroprotective Effect: Kesh et.al showed that the neuroprotective potential of T. purpurea extract against Parkinsonism using an oxidopamine model (6-OHDA)-induced toxicity in in vivo and in vitro models. This study thus highlights Tephrosia purpurea as a potential source to identify and isolate neuroprotective compounds against mitochondrial dysfunction in neurodegenerative conditions. Oxidative stress is a vital factor that influences mitochondrial functioning and the progression of neurodegenerative diseases such as PD. Parkinson disease (PD) is a neurodegenerative disease characterized by loss of neurons in the brain causing dementia and involuntary movements such as tremors, bradykinesia, and loss of rigidity.[20]

CONCLUSION

The objective of this review paper is to explore the study of Tephrosia purpurea (wild indigo) exhibits a diverse range of pharmacological activities, making it a plant of significant interest. Studies have demonstrated its Anti-inflammatory activity, Anti-ulcer Activity, Hepatoprotective effect, Anti-plasmodial Activities, Cutaneous wound healing, Neuroprotective Effect, Antihyperglycemic and antihyperlipidemic, Bronchodilator activity, Pancreatic regeneration, Antioxidants and Anti-cancer activity.

REFERENCE

1. Ali K. Khalafalah, Afifi H. Yousef, Abeer M. Esmail, Mohamed H. Abdelrazik1, Mohamed E. F. Hegazy1, Abou-El-Hamd H. Mohamed, Chemical constituents of Tephrosia purpurea, Pharmacognosy Research, March 2010; DOI:10.4103/0974-8490.62951

2. Orwa C, Mutua A, Kindt R, Jamnadass R, Anthony S. a tree reference and selection guide. Agroforestree database, 2009.
3. Gamble J. S; Fischer: Flora of Presidency of Madras, Botanical Survey of India- Howrah-India, 1918; 7: 95-102.
4. Change L.C; Gerhauser C; Song L; Farnsworth N. R; Pezzuto J.M; Kinghorn A. D: J. Nat.Prod; 1997; 60: 869-873.
5. Nitisha Negi 1, Ajudhia N. Kalia 2, Seema Brar1 and Vinod K. Gauttam, Therapeutic potential of Tephrosia purpurea, Journal of Chemical and Pharmaceutical Research, 2015; 7(2): 574-580. ISSN: 0975-7384 CODEN(USA): JCPRC5.
6. R. Praveena, S. Amarnath Pandian and M. Jegadeesan, Physico-Chemical properties of Tephrosia purpurea L. Root, Plant Archives, 2011; 11(2): 707-709. ISSN 0972-5210.
7. Sumit K. Arora, Prashant R. Verma, Prakash R. Itankar, Satyendra K. Prasad, Kartik T. Nakhate, Evaluation of pancreatic regeneration activity of Tephrosia purpurea leaves in rats with streptozotocin-induced diabetes, Journal of Traditional and Complementary Medicine, https://doi.org/10.1016/j.jtcme.2021.03.001.
8. The British Pharmacopoeia. Published by the Stationary Office on Behalf of the Medicines and Health Care Products. Regulatory agency (MHRA); 2009; 8: 1456-1460.
9. Poonam K; Singh G. S. J Ethnopharmacol, 2009; 123(1): 167-76.
10. Akkol E. K; Koca U; Pesin I; Yilmazer D; Toker G; Yesilada E. Journal of Ethnopharmacology, 2009; 124: 137-141.
11. Ahmed M. M. Youssef, Doaa A. M. Maaty and Yousef M. Al-Saraireh, Phytochemical Analysis and Profiling of Antioxidants and Anticancer Compounds from Tephrosia purpurea (L.) subsp. apollinea Family Fabaceae, Molecules, 2023; 28: 3939. https://doi.org/10.3390/molecules28093939.
12. Shenoy Smita1, Shwetha K, Prabhu K, Maradi R, Bairy KL, Shanbhag T, Evaluation of anti-inflammatory activity of Tephrosia purpurea in rats, Asian Pacific Journal of Tropical Medicine, 2010; 193-195.
13. S.S. Deshpande, G.B. Shah, N.S. Parmar, Antiulcer Activity of Tephrosia purpurea in rats, Indian Journal of Pharmacology, 2003; 35: 168-172.
14. M. Sree Rama Murthy, M. Srinivasan, Hepatoprotective effect of Tephrosia purpurea in experimental animals, Indian Journal of Pharmacology, 1993; 25: 34 –36.
15. P. Pavana, S. Manoharan, G. L. Renju and S. Sethupathy, Antihyperglycemic and antihyperlipidemic effects of Tephrosia purpurea leaf extract in streptozotocin induced diabetic rats, Journal of Environmental Biology October, 2007.
16. Maged S. Abdel-Kader, Abdulaziz S. Saeedan, Najeeb U. Rehman, Hayder M. Faqihi, Gamal A. Soliman, New flavonoids with multiple bronchodilator activity pathways from Tephrosia purpurea L. (Pers.) growing in Saudi Arabia, Saudi Pharmaceutical Journal https://doi.org/10.1016/j.jsps.2024.101992.
17. Yoseph et.al, Four Prenylflavone Derivatives with Anti-plasmodial Activities from the Stem of Tephrosia purpurea subsp. Leptostachya, Molecules, 2017; 22: 1514. doi: 10.3390/molecules22091514.
18. Vishal Gulecha, Thangavel Sivakuma, Anticancer activity of Tephrosia purpurea and Ficus religiosa using MCF 7 cell lines, Asian Pacific Journal of Tropical Medicine, 2011; 526-529.
19. Lodhi S, Jain A, Jain AP, Pawar RS, Singhai AK. Effects of flavonoids from Martynia annua and Tephrosia purpurea on cutaneous wound healing. Avicenna J Phytomed, 2016; 6(5): 578-591.
20. Swathi Kesh, Rajaretinam Rajesh Kannan, Neuroprotective Effect of Tephrosia purpurea Against Mitochondrial Dysfunction by Regulation of the Caspase 3/9 and Pink1/Parkin Complexes, International Journal of Nutrition, Pharmacology, Neurological Diseases DOI: 10.4103/ijnpnd.ijnpnd_1_21.
21. Sahu Dipsundar et al. Pharmacognostical profiling on whole plant Tephrosia purpurea (L.) Pers (Sarpunkha). Int. J. Res. Ayurveda Pharm, 2018; 9(4): 38-41. http://dx.doi.org/10.7897/2277-4343.094106.