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Research Article

# Tephrosia Purpurea: From Traditional Use to Scientific Assessment: A Review

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## Introduction

Medicinal plants play a crucial role in the lives of people for health care. From ancient times plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large condition to human health well-being. According to World Health Organization (WHO) more than 80% of the world's population uses of plants for the treatment of their diseases. Before the onset of the synthetic era, man is completely dependent on medicinal herbs for prevention and treatment of diseases. With introduction of scientific procedures, the researchers were able to understand toxic principle present in the green flora. The scientists isolated active constituents of medicinal herbs and after testing, some of them were found to be therapeutically active. Traditional system of medicine is prepared from single plant or combination of more than one plant .In India medicinal plants are widely used by all sections of people either directly as remedies or indirectly in the pharmaceutical preparation of modern medicines .Today there are at least 120 distinct chemical substance derived from plants. One such plant with high medicinal value is Tephrosia purprea, which has been used since ancient times for its medicinal properties.Tephrosia purpurea, belongs to the family Fabaceae, subfamily Faboideae, tribe Millettieae.

## Traditional Use

Tephrosia purpurea is used traditionally as folk medicine. According to Ayurveda, the plant is anthelmintic, alexiteric, restorative and antipyretic. It is used in the treatment of leprosy, ulcers, asthma and tumors, as well as diseases of the liver, spleen, heart and blood. A decoction of the roots is given in dyspepsia, diarrhea, rheumatism, asthma and urinary disorders. The root powder is salutary for brushing the teeth, where it is said to quickly relieve dental pains and stop bleeding. African sheperds use crushed plants to make an antidotal beverage for animals bitten by snakes. Tephrosia purpurea has been reported to provide fodder to animals such as goats. It makes also a good green manure in fields. In the Ayurvedic system of medicine, the whole plant has been used to cure tumours, ulcers, leprosy, allergic and inflammatory conditions such as rheumatism, asthma and bronchitis. T. purpurea is an important drug of indigenous systems of medicine and has been attributed a number of medicinal properties in ayurveda. Tephrosia purpurea Linn. (Leguminoseae), commonly known in Sanskrit as Sharapunkha is a highly branched, sub-erect, herbaceous perennial herb. The genus name Tephrosia derives from the Greek word "tephr (o)" meaning "ashes, ash colored, and gray" as the colour of the stems leaves and fruit of all the species are gray in colour [1]. Tephrosia purpurea is usually used to cure several type of external wound and gastroduodenal disorders. The plant has cure to kidney, liver and blood related disorders. The another use as dried herb are effective as tonic laxative, diuretics, deobstruent and as well as used in the treatment of bronchitis, febrile attack, boils, pimple while bleeding pulp an extract of pods is helpful as analgestics ,and inflammatory and their decoction is been reported as anticancer activity. More works have been done on some of the members of this family. Botany, Taxonomic status, Pharmacognosy studies on T. purpurea have been reviewed by Zafar and Mujeeb (2000) [2]. Based on the ethno botanical studies T. purpurea roots used as an ailment for fractures, gas troubles and gastritis. This drug is said to be useful in cough and in derangement of the kidneys. A decoction of the drug was administered in one-ounce doses to cases of Bright's disease with dropsy and found to possess diuretic properties in a mild degree. Powder is used for cough, asthma and respiratory diseases, as paste applied on belly to cure dyspepsia, powdered and boiled in milk is applied on leprosy and wounds. Tephrosia purpurea is tonic, laxative, anthelmintic to children given to purify the blood and as cordial,decoction is tonic. Root is bitter chewed to cure colic pain, used in asthma. Juice is mixed with molasses and given for stomach pain applied on skin eruptions. There is a traditional utilization of the plant to treat respiratory diseases.

## Phytochemical and Pharmacological Studies

Tephrosia purpurea can be useful in many chronic degenerative or mild to moderate functional ailment, can have an important role to play in recovery from serious illness [3]. The protective role of T. purpurea has been investigated by the alcohol extract of T. purpurea showed a significant hydroxyl radical scavenging activity in vitro. Using a Trypan blue exclusion assay, it was found that the extract markedly increased the percentage viability of the isolated rat kidney cortical cells in gentamicin-induced cell damage. By the evaluation of LDH activity and acid phosphatase content, it was established that the cell damage was minimized in the case of cells treated with the extract of T. purpurea. The hydroxyl radical scavenging effect of the extract was enhanced with increases in the concentration of drug, suggesting the role of free radical scavengers in minimizing kidney cell damage. The effect of T. purpurea pers on Gentamycin model of acute renel failure T.purpurea leaves were evaluated for protective & curative effects against gentamycin –induced acute renel injury in albino rats of both sexes. The finding suggested that the ethanol extract of T. purpurea leaves possessed marked nephroprotective and curative activity without any toxicity. The chemo preventive efficacy of T. purpurea against N-diethyl nitrosamine initiated & potassium bromate –mediated oxidative stress and toxicity in rat kidney was investigated data induced that T. purpurea besides a skin anti- oxidant can be potent chemo preventive agent against renel oxidative stress &carcinogenesis induced by N-diethylnitrosamine and kbro3 55.The activities of T. purpurea in radiation induced haemopoietic injury to total body irradiation. It induced significant increase in haemoglobin and total RBC count. After irradiation, there was no fall in RBC count and haemoglobin and Tephrosia has a selectively effective on erythroid compartment. Taraphdar et al (2002) [4] Root, stem and leaf of T. purpurea in tissue culture cultured successfully developed and maintained on Murashige and Skoog's medium supplemented with various plant growth regulators. The content of rotenoids and rutin in the callus cultures were estimated by spectrophotometric method. (Zafar and Mujeeb) (2002) Tephrosia purpurea (aerial parts) powder was administered orally, serum levels of transaminases (SGOT and SGPT) bilirubin, and histopathological changes in the liver were used asthe biochemical markers of hepatotoxicity. The administration of T. purpurea along with the hepatotoxins offered a protective action in both acute (D-galactosamine) and chronic ($CCl_4$) models. The fresh extract of T. purpurea root was treated for antibacterial and antifungal activity by agar well diffusion and R&B agar well diffusion method respectively. This extract shows antibacterial activity [5-13]. The seed extracts of the plant T. purpurea were tested for their antimicrobial and antifungal properties in various solvents against some human, animal and plant pathogenic bacteria. The

seed extract showed a good inhibition effect against the entire tested microorganism. Wound healing potential of T. purpurea L. was experimented by some scientists by using ethanolic extract of aerial parts in the form of simple ointment using three types of wound models in rats as incision wound, excision wound and dead space wound. Histopathological study showed significant (Pless than 0.05) increase in fibroblast cells, collagen fibres and blood vessels formatio [14].The ethanolic extract T. purpurea exhibits antioxidant activity in vivo and the ethyl acetate soluble fraction has improved antioxidant potential than the extract. The anticarcinogenic and anti-lipid peroxidative effects of T. purpurea linn pers in 7, 12 dimethylbenz(A)Anthracene (DMBA) induced hamster buccal pouch carcinoma .The chemopreventive potential and antilipid peroxidative effect of root extract of TpET was studied on DMBA induced hamster buccal pouch carcinoma . T. purpurea ET showed potent antilipid per oxidative effect, as well as enhanced the antioxidant status in DMBA-painted animal's .The study concluded that TpET has potent chemopreventive efficacy and significant antilipid-peroxidative effect in DMBA-induced oral carcinogenesis. From the methanolic extracts of leaves of T. purpurea(+)– Tephrosin has been derived by (±)–Tephrosin has been shown as insecticide against silkworm through bioassay and also shown activity as inhibitor against phrobol mouse 308 epidermal cells and as cancer chemopreventive agent last tephrosin shown as fish poison against gold fish (Cyprinus carpio). DPPH free radical scavenging and nitric oxide scavenging methods investigated the in vitro antioxidant activity of ethanolic extract of leaves of T. purpurea. The ethanol extract showed good antioxidant activity in these above methods. This activity may be due to the presence of flavonoids [14]. Roots of crude drug of T. purpurea extracted successively using various solvents [Pet-Ether (60-800C), 95% ethanol and aqueous alcohol (60% water + 40% ethanol). Single dose administration of all the extracts of T. purpurea did not showed any hypoglycemic or anti-diabetic activity. Repeated dose administration of alcoholic and hydro-alcoholic extract showed significant hypoglycemic and antidiabetic activity at the end of 7thday. These results suggest that aqueous and hydro-alcoholic extract possess antidiabetic activity. The chemical investigations of aerial parts of T. purpurea yielded the rare prenylated flavonoids, tephropurpulin A and isoglabratephrin in addition to previously identified flavonoids glabratephrin. Structures were established by 1D and 2D NMR spectroscopy, as well as by HR-MS analysis; for compounds 2 and 3, structures were confirmed by X-ray analysis. T. purpurea leaves possesses marked nephro -protective and curative activities without any toxicity. The proposed mechanisms of activities are antioxidant activity and inhibition of overproduction of NO and Cox-2 expression and it may be attributed to phenolic and flavonoidal compounds like quercetin. The ethanolic extract of Tephrosia purpurea has been studied for its in vitro-The studied revealed that the ethanolic extract of Tephrosia purpurea may inhibit degranulation of mast cells by a mechanism other than membrane stabilization.The Flavonoid Fraction of Tephrosia purpurea was studies for its effect on cellular and humoral function& the result shown the ability of flavonoidal fraction of Tephrosia purpurea to modulate both cell mediated & humoral component of immune system (Damre As , est al,2003) [13]. N+butanol fraction of Tephrosia purpurea extract at dose of 50 mg/kg for 5 days treatment exhibited significant antileishmanial activity against Leishmania donovani infection in hamsters. Tephrosia purpurea is a perennial herb found throughout India .It is commonly cultivated as a green manure in pady fields. The seeds leaves aerial part &roots useful for medicinal purposes. The seed extract of Tephrosia purpurea plant were tested for their antimicrobial and antifungal properties in various solvents against some human &plant pathogenic bacteria .The seed extract showed a good inhibition effect against all the tested microorganism. Pulverized roots smoked for relief from asthama and cough, decoction of pords used as a vermifuge and to stop vomiting. Tephrosia Purpurea leaves posseses marked nephro protective and curative activity without anytoxicity. In vitro antioxidants activity of aqueous and etanolic extract. The result revealedthe leaves of this plant have antioxidant potential. Tephrosia purpurea leaves possess the antioxidant substance which may be potential responsible for treatment of jaundice and other oxidative stress related disease It is considered as a beneficial remedy for various disorders such as inflammation ,fever,bronchitis kidney disorders ,and diabetesmellitus. Tephrosia purpurea demonstrated antitumour and antiulcer effect. There was a traditional utilization of the plant to treat respiratory diseases. Root powder consumed with milk has diuretic and cures liver&spleen diseases.The antiulcer activity of aqueous extract of Tephrosia purpurea was studied in rats in which gasric ulcers were induced by oral administration of ethanol.The antiglycemic and antilipidperooxidative effect of ethanolic seed extract of Tephrosia purpurea in streptozotocin induced diabetic rats .The primary phytochemical screening and in vitro antioxidant activity was performed on hydroalcoholic extract was prepared and evaluated for its primary phytochemical analysis for total phenolic conten [4]. Tephrosia purpurea root extracts (petroleum ether, ethanol, and aqueous alcohol) for antidiabetic activity. Single dose administration of all extract did not exhibit any hypoglycemic effect. The genotypic variability among twelve species of the genus Tephrosia, distributed in Andhra Pradesh, through DNA fingerprinting using RAPD technique. Twenty OPC primers were used. The cluster analysis based on the similarity matrix was performed using the PHYLIP software ver.3.65 pooled from all the six primers. It has justified largely co-relating with the classification based on the morphological traits. It represents the first approach in using nuclear DNA finger print markers as a tool to study molecular systematic of the genus Tephrosia. T. purpurea leaves possesses marked nephroprotective and curative activities without any toxicity. The proposed mechanisms of activities are antioxidant activity and inhibition of overproduction of NO and Cox-2 expression and it may be attributed to phenolic and flavonoidal compounds like quercetin. The activities of T. purpurea in radiation induced haemopoietic injury to total body irradiation. It induced significant increase in haemoglobin and total RBC count. After irradiation, there was no fall in RBC count and haemoglobin and Tephrosia has a selectively effective on erythroid compartment. The flavonoid fraction of T. purpurea (FFTP) was studied for its effect on cellular and humoral functions and on macrophage phagocytosis in mice. Oral administration of FFTP (10–40 mg/Kg) significantly inhibited sheep red blood cells (SRBC)-induced delayed-type hypersensitivity reactions. It also produced a significant, dose-related decrease in sheep erythrocyte-specific haemagglutination antibody titre. Scientist studied germination of T. purpurea seeds. The mechanical treatment i.e., removal of seed coat at one end of the seed and its subsequent treatment with Ethrel (1000ppm) gave 100 percent germination within 5 days while the seeds without this treatment took 12-20 days to germinate and the rate of germination observed was 10 percent [1]. Some Scientist studied column chromatography of the benzene extract of seeds resulted in the isolation of the new flavanone, named as purpurin. Identication was done by 1H NMR and Mass spectral analysis and the results suggested the structure as two, 3+ dihydrosemiglabrin8. Saxena V.K and Choubey A (1997) were isolated a novel neoflavon glycosides serratin7+O+[beta+D+glucopyranosyl+(1+4)+O+beta+D+galactopyranoside] from the CHCl3 soluble fraction of the T. purpurea stem and the structure confirmed by chemical and spectral analysis. Discovery of new benzopyrone derivative (TP) from the alcoholic extract of aerial parts of Tephrosia purpurea by normal phase column chromatography using toluene: ethyl acetate (70:30) as mobile phase and structure was elucidated by spectroscopic methods. Results suggest that the Compound TP was found to be 3+hydroxy, 6+methoxy, 2+oxy (3+butanone), 7 (dioxolane+4+one), 2, 3,+dihydrobenzopyrone. The aerial parts of Tephrosia purpurea yielded the rare prenylated flavonoids, tephropurpulin A and isoglabratephrin, in addition to a previously identified flavonoid, glabratephrin. By 1H NMR, 13C NMR, DEPT, 1H–1H COSY, 1H–13C COSY, HMBC, EIMS and REIMS data analysis compounds were assigned the name tephropurpulin A, isoglabratephrin and glabratephrin: and structures were confirmed by X+ray analysis, 3, +dihydrobenzopyrone. The seed extract of the plant Tephrosia purpurea for their antimicrobial and antifungal properties against some human, animal and plant pathogenic organisms. The study revealed that the seed extract showed a good inhibition effect against all the tested microorganisms. Kumar GS et al (2007) were evaluated antimicrobial activity of ethanolic extract of Tephrosia purpurea roots by disc diffusion and broth dilution methods. The results generated from the study revealed the significant antimicrobial activity of test extract. Later extracts of leaves, pods and roots of Tephrosia purpurea for antimicrobial activity was performed by 'disc diffusion bioassay' and'well method'. The root extract of T. purpurea showed considerable inhibition of the three Pseudomonas isolates i.e. P. aeruginosa [NCTC 10662] Pseudomonas strain 1 and 2 and two of the coli form strains i.e. Coli form strain 6 and coli form strain 9. No inhibition was shown by the leaf extract on any of the isolates tested Methanolic extract of Tephrosia purpurea and two of its relatively less polar fractions showed potent anti + Helicobacter pylori activity against clinical as well as standard strains. purpurea for in-vitro antimicrobial activity against pathogens namely Staph. Aureus, E. coli, P. Aeruginosa and B. subtitils by disc diffusion method compared with standard antibiotic. The ethanoic extract of plant showed better antibacterial activity than aqueous extract against all organisms. The phytochemical analysis revealed the presence of flavanoids, glycosides, phenols, tannins, saponins and alkaloids. The observed antibacterial activity of the plant extracts was linked to the presence of Tannins in the test extract. purpurea leaves possesses marked nephroprotective and curative activities without any toxicity. The proposed mechanism of activities are antioxidant activity and inhibition of overproduction of NO and COX+2 expression and it may be attributed to phenolic and flavonoidal compounds like quercetin. Root powder consumed with milk has diuretic action and cures liver and spleen diseases. This plant act as a laxative. These facts suggest that some active principles from Tephrosia purpurea had been acting on the smooth muscles of the bowel and the smooth muscles of urinary bladder. This apart some active principle in Tephrosia purpurea might have gain access to the central nervous system to cross the blood brain barrier and influence the feeding and satiety center located in hypothalamus. Due to presence of several biologically active compounds, T. purpurea has great antioxidant activity [15-19]. Ethanolic extract of this plant showed potential against lipid peroxidative effect as well as enhanced antioxidant potential in DMBA (7, 12-dimethyl benz(a)anthracene) painted animals. Leaves of T. purpurea has antioxidant potential. Its ethanolic extract and ethyl acetate extract were studied for $CCl_4$ (Carbon tetrachloride) induced lipid and superoxide generation among which ethyl acetate has improved antioxidant activity. Roots extract of T. purpurea showed free

radical scavenging activity with oxidative stress and xanthine oxidase activity. The green synthesis of silver nanoparticles (AgNPs) using Tephrosia purprea leaf extract the biomolecule present are responsible for the formation of AgNPs and found to play dual role of both reducing as well as capping agents.Gold nanoparticles was synthesized by using leaf extract of T. purpurea which was rapid synthesis. Within few hours, gold ion makes contact with the leaf extract of T. purpurea and reduces $AUCL_4$ in to fine gold nanoparticles. These nanoparticles potentially inhibit the growth of test organisms, which were Escherichia coli, E. faecalis, S. aureus and K. pneumoniae. The gold nanoparticle conjugated with the Tetracycline antibiotics shows the high zone of inhibition in all the test organisms.

## Conclusion

The paper reviewed on Tephrosia purprea is a promising medicinal plant, which has been used traditionally, and the assessment of the plant parts with wide range of pharmacological activities could be utilized in several medical applications because of its efficacy and safety.

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