



"The Healing Power of *Tephrosia purpurea*: Exploring *Ayurvedic* Insights into the Medicinal Marvels of *Sharpunkha*"

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ABSTRACT

This comprehensive *Ayurvedic* article delves into the fascinating realm of *Tephrosia purpurea*, commonly known as *Sharpunkha* or Purple Tephrosia. This article aims to explore the remarkable medicinal properties and therapeutic potential of this herb as documented in *Ayurvedic* texts.

This article provides an introduction to *Tephrosia purpurea*, discussing its botanical classification, habitat, and historical usage in *Ayurvedic* medicine. Drawing from ancient *Ayurvedic* texts, the unique qualities (*guna*), tastes (*rasa*), and post-digestive effects (*vipaka*) attributed to *Sharpunkha* are elucidated, along with its effects on the *doshas*, primarily *Kapha* and *Pitta*.

Furthermore, the article investigates the various parts of the *Tephrosia purpurea* plant used in *Ayurvedic* preparations, such as the leaves, roots, and seeds, highlighting their specific therapeutic indications and modes of administration. Specific focus is given to the plant's potent properties as an anti-inflammatory, diuretic, anthelmintic, and hepatoprotective agent, supported by relevant scientific studies and clinical evidence.

Moreover, the article presents a review of contemporary research studies investigating the bioactive constituents and pharmacological actions of *Tephrosia purpurea*.

Keywords : *Tephrosia purpurea*, *Sharpunkha*, Purple Tephrosia, *Ayurvedic* medicine, *Dravyaguna*, Medicinal properties, Therapeutic potential

INTRODUCTION

Tephrosia purpurea, popularly known as *Sharpunkha* or Purple Tephrosia, is an herb deeply rooted in the rich tradition of *Ayurvedic* medicine. Its therapeutic potential and medicinal properties have been extensively

documented in ancient *Ayurvedic* texts. *Tephrosia purpurea* belongs to the Fabaceae family and is native to tropical regions, particularly found in India. *Ayurvedic* texts such as *Bhavaprakasha nighantu*¹ and *raj nighantu*² have described this plant and its medicinal uses for centuries. These texts provide invaluable insights into the holistic approach of Ayurveda, which aims to restore balance and promote well-being through natural remedies.

The Ayurvedic understanding of *Tephrosia purpurea* emphasizes its diverse properties and effects on the human body. According to *Ayurveda*, plants possess specific qualities or *gunas*³, which influence their therapeutic actions. *Sharpunkha* is known for its *tikta* (bitter) and *kashaya* (astringent) tastes and its potency in pacifying the *Kapha* and *Vata doshas*.

The different parts of the *Tephrosia purpurea* plant, including leaves, roots, and seeds, have been traditionally used in *Ayurvedic* preparations. The plant is revered for its potent anti-inflammatory, diuretic, anthelmintic, and hepatoprotective properties⁴. Such versatile attributes have made it a sought-after ingredient in *Ayurvedic* formulations designed to treat a wide range of ailments.

Several studies have explored the bioactive constituents and pharmacological actions of this herb, providing scientific evidence that supports its traditional use. These studies have uncovered its antioxidant, anti-inflammatory, immunomodulatory, and antimicrobial activities, further validating its therapeutic potential.

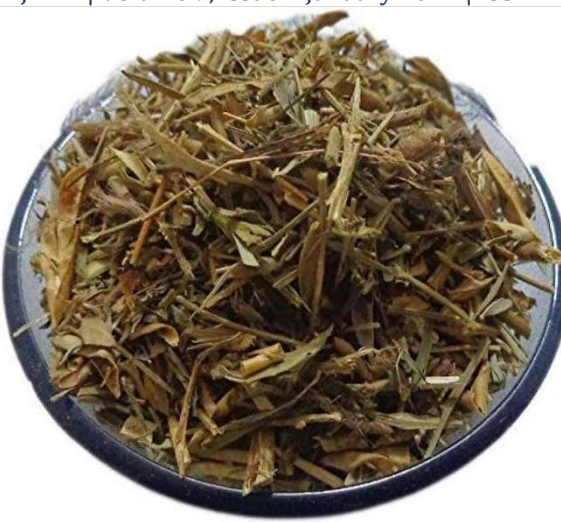
Synonym used for *Tephrosia purpurea*

1. *Galega purpurea* L.
2. *Galega purpurea* L.
3. *Cracca purpurea* (L.) Kuntze
4. *Tephrosia tuberosa* (Roxb.) DC.



Fig. 1 (a) *Tephrosia purpurea* plant

Fig. 1 (b) *Tephrosia purpurea* plant

Fig.1(c) *Tephrosia purpurea* flowerFig.1(d) *Tephrosia purpurea* panchang**Botanical classification of *Tephrosia purpurea*:**

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Fabales
Family	Fabaceae
Subfamily	Faboideae
Genus	<i>Tephrosia</i>
Species	<i>Tephrosia purpurea</i>

Common names of *Tephrosia purpurea* :

Tephrosia purpurea, also known as "Wild Indigo" or "Purple Tephrosia," has several common names used in different regions. Here are some of the common names associated with *Tephrosia purpurea*:

1. (a) **Sarapunkha**: This common name is primarily used in India, where *Tephrosia purpurea* is native. It is derived from the *Hindi* word "sara," meaning essence or extract, and "punkha," meaning fan. The name alludes to the plant's traditional use in Ayurvedic medicine to cool and soothe the body.

(b) **Sharpunkha**: Another common name used in India, "Sharpunkha," is derived from the Sanskrit words "shara," meaning arrow, and "punkha," meaning fan. It refers to the plant's leaflets resemblance to arrowheads⁵.

2. **Wild Indigo**: This common name refers to the plant's resemblance to true indigo plants (genus *Indigofera*) and its use as a natural dye source⁶. The name "Wild Indigo" is widely used in English-speaking regions.

3. **Purple Tephrosia**: This name highlights the plant's characteristic purple flowers⁷ and is commonly used to differentiate it from other *Tephrosia* species.

4. **Purple Bush Bean**: This common name is sometimes used due to the plant's legume family (*Fabaceae*) and its bushy growth habit.

Vernacular names of *Tephrosia purpurea*

S. No.	Language	Names	References
1.	English	Wild indigo, Purple tephrosia, Fish poison bean	(USDA Plants Database - <i>Tephrosia purpurea</i>)
2.	Hindi	<i>Sarphoka, Chhincha, Ratti</i>	("Indian Medicinal Plants: An Illustrated Dictionary" by C.P. Khare)
3.	Bengali	<i>Ban-sarfuli</i>	("Dictionary of Indian Medicinal Plants" by Akhtar Husain et al.)
4.	Kannada	<i>Naagavalli, Chinnaravali</i>	("Medicinal Plants of India" by C.P. Khare)
5.	Tamil	<i>Vempatikutti</i>	("Medicinal Plants of India" by C.P. Khare)
6.	Telugu	<i>Vempali, Adavi-bullatiga</i>	("Indian Medicinal Plants: A Compendium of 500 Species" by P.K. Warrier et al.)
7.	Malayalam	<i>Uluva</i>	("Indian Medicinal Plants: A Compendium of 500 Species" by P.K. Warrier et al.)

8.	Marathi	<i>Ratti, Shivalingi</i>	("Indian Medicinal Plants: An Illustrated Dictionary" by C.P. Khare)
9.	Gujarati	<i>Ratti, Bhuiikumari</i>	"Indian Medicinal Plants: An Illustrated Dictionary" by C.P. Khare
10.	Punjabi	<i>Bhui nimba, Dhamasa</i>	"Indian Medicinal Plants: An Illustrated Dictionary" by C.P. Khare

Raspanchak

Rasa - *Tikta* (Bitter), *Kashaya* (Astringent)

Guna - *Laghu* (Light to digest), *Ruksha* (Dryness), *Tikshana* (Piercing)

Virya - *Ushna* (Hot potency)

Vipaka - *Katu* (Pungent)

Prabhava - *Plihaghna*

Karma - *Kaphavatashamaka, Vishagna, anuloman, pitsarak, krimighan, mutral, kusthagna, jwaraghana*

Classification Categorization

Bha. Pra. Ni. - *Guduchyadi Varga*

Ra. Ni. - *Shatahvadi varga*

Natural Habitat

Tephrosia purpurea, commonly known as "*sharpunkha*" or "*wild indigo*," is native to various regions in Asia, including India⁸, Nepal⁹, Bangladesh¹⁰, and Sri Lanka¹¹. It is a hardy plant that can thrive in diverse habitats.

Here are some details about the natural habitat of *Tephrosia purpurea*:

1. Ecological Range:

Tephrosia purpurea can be found growing in a wide range of habitats, including open forests, grasslands, wastelands, and rocky slopes. It is commonly seen along roadsides, in disturbed areas, and in dry or arid regions.

2. Climatic Conditions:

Tephrosia purpurea is adaptable to different climatic conditions. It can withstand both extreme heat and drought, as well as tolerate mild frost. It is typically found in regions with a tropical to subtropical climate.

3. Soil Preference:

Tephrosia purpurea can grow in various soil types, including sandy, loamy, and clay soils. However, it prefers well-drained soils with a slightly acidic to neutral pH.

Edible Uses

Tephrosia purpurea, commonly known as "wild indigo" or "*sharpunkha*," has been used by folk peoples for various edible purposes. It is important to note that while some parts of the plant may have traditional culinary uses, caution should be exercised, as the plant contains toxic compounds and should not be consumed without proper preparation or guidance. Here are some reported edible uses¹² of *Tephrosia purpurea*:

- 1. Seeds:** The seeds of *Tephrosia purpurea* have been traditionally used in some regions as a food source after proper processing. They are often soaked, boiled, or roasted to remove the toxic compounds.
- 2. Young Leaves:** In certain cultures, the young leaves of *Tephrosia purpurea* are consumed as a leafy vegetable¹³. However, it is crucial to ensure that the leaves are properly prepared to eliminate any potential toxins.
- 3. Flowers:** The flowers of *Tephrosia purpurea* have been used in some traditional cuisines as an edible component, often incorporated into salads or cooked dishes. Again, proper preparation is necessary to eliminate any toxic substances.

It is important to emphasize that *Tephrosia purpurea* contains toxic compounds, including alkaloids and rotenoids, which can be harmful if consumed in large quantities or without appropriate preparation. These traditional uses should be approached with caution and should be verified by local knowledge or experienced practitioners.

Chemical Composition

Tephrosia purpurea (wild indigo) contains various chemical compounds, including alkaloids, flavonoids, terpenoids, and phenolic compounds¹⁴. Here are some of the major chemical compounds reported in *Tephrosia purpurea*¹⁵:

- 1. Rotenoids:** Tephrosin, rotenone, deguelin, sumatrol, and others. Rotenoids are a class of compounds known for their insecticidal and pesticidal properties.

2. **Alkaloids:** Purpurin, purpureine, tephrosinamine, and others. Alkaloids are a diverse group of nitrogen-containing compounds with potential pharmacological activities.

3. **Flavonoids:** Genistein, apigenin, kaempferol, quercetin, and others. Flavonoids are plant pigments known for their antioxidant and anti-inflammatory properties.

4. **Phenolic compounds:** Gallic acid, ellagic acid, and others. Phenolic compounds possess antioxidant and antimicrobial activities.

5. **Terpenoids:** Beta-sitosterol, stigmasterol, and others. Terpenoids are a large class of compounds with diverse biological activities.

Pharmacological actions

1. Anti-Inflammatory activity :

Tephrosia purpurea (wild indigo) has been studied for its anti-inflammatory activity, which is attributed to its bioactive compounds such as flavonoids, rotenoids, and alkaloids. Here is a detailed overview of the anti-inflammatory activity of *Tephrosia purpurea*:

A) **Inhibition of Pro-inflammatory Mediators:** *Tephrosia purpurea* extracts have shown the ability to inhibit the production of pro-inflammatory mediators, such as cytokines and chemokines. These include tumor necrosis factor-alpha¹⁶ (TNF- α), interleukin-1 beta (IL-1 β), interleukin-6 (IL-6), and prostaglandin E2 (PGE2). These mediators play a crucial role in the inflammatory response, and their inhibition can help reduce inflammation.

B) **Modulation of Inflammatory Enzymes:** *Tephrosia purpurea* extracts have shown inhibitory effects on enzymes involved in the inflammatory process. They can inhibit the activity of cyclooxygenase-2 (COX-2) and lipoxygenase¹⁶ (LOX), which are responsible for the production of pro-inflammatory molecules like prostaglandins and leukotrienes.

C) **Antioxidant Activity:** The anti-inflammatory activity of *Tephrosia purpurea* may be linked to its antioxidant properties. The plant contains flavonoids and phenolic compounds that act as antioxidants and scavenge free radicals¹⁷. By reducing oxidative stress, *Tephrosia purpurea* can help mitigate inflammation associated with oxidative damage.

D) **Inhibition of Inflammatory Cell Infiltration:** *Tephrosia purpurea* has been found to inhibit the infiltration of inflammatory cells, such as neutrophils and macrophages, into the inflamed tissues. This reduces the release of pro-inflammatory¹⁸ molecules and helps control the inflammatory response.

E) **Modulation of Nuclear Factor-kappa B (NF- κ B):** *Tephrosia purpurea* extracts have shown the ability to modulate the activity of NF- κ B, a transcription factor that plays a central role in the regulation of

inflammation¹⁹. By inhibiting NF- κ B, *Tephrosia purpurea* can suppress the expression of pro-inflammatory genes.

2. Anti-Oxidating activity:

Tephrosia purpurea (wild indigo) exhibits significant antioxidant activity, which is attributed to its content of flavonoids, phenolic compounds, and other bioactive constituents. Here is a detailed overview of the antioxidant activity of *Tephrosia purpurea*:

A) Scavenging of Free Radicals: *Tephrosia purpurea* extracts possess strong free radical scavenging abilities. The plant's bioactive compounds, such as flavonoids and phenolic compounds, act as antioxidants by donating electrons or hydrogen atoms to neutralize free radicals, thus preventing oxidative damage to cells and tissues.

B) Inhibition of Lipid Peroxidation: *Tephrosia purpurea* has been shown to inhibit lipid peroxidation, which is the process of oxidative damage to cell membranes and lipids. The plant's antioxidant compounds protect against lipid peroxidation by neutralizing lipid peroxyl radicals and preventing the propagation of oxidative reactions.

C) Enhancement of Antioxidant Enzymes: *Tephrosia purpurea* extracts have been found to enhance the activity of endogenous antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx). These enzymes play a crucial role in neutralizing reactive oxygen species (ROS) and maintaining cellular redox balance.

D) Protection Against Oxidative Stress: *Tephrosia purpurea* exhibits protective effects against oxidative stress-induced damage²⁰. The plant's antioxidant activity helps prevent cellular damage caused by ROS, reducing the risk of various oxidative stress-related conditions.

E) Anti-Aging Potential: The potent antioxidant activity of *Tephrosia purpurea* may contribute to its anti-aging properties. By reducing oxidative stress and preventing cellular damage, the plant's constituents help maintain cellular integrity and promote healthy aging.

3. Hepatoprotective Activity:

Tephrosia purpurea (wild indigo) has been studied for its hepatoprotective activity, which refers to its ability to protect the liver from various insults and promote liver health. Here is a detailed overview of the anti-hepatotoxic activity of *Tephrosia purpurea*:

A) Protection of Liver from Oxidative stress: *Tephrosia purpurea* exhibits potent antioxidant activity, which helps protect the liver from oxidative stress and damage²¹. The plant's bioactive compounds, such as flavonoids and phenolic compounds, scavenge free radicals and reduce lipid peroxidation, thereby preventing cellular damage and maintaining liver function.

B) Detoxification and Anti-inflammatory Effects: *Tephrosia purpurea* has been found to possess detoxifying properties, assisting in the elimination of toxins from the liver. Additionally, it exhibits anti-inflammatory effects, reducing inflammation in the liver. These actions contribute to the hepatoprotective activity of *Tephrosia purpurea*.

C) Modulation of Liver Enzymes: *Tephrosia purpurea* extracts have been shown to regulate liver enzymes, including alanine transaminase (ALT), aspartate transaminase (AST), and alkaline phosphatase (ALP)²². Abnormal levels of these enzymes are indicative of liver damage, and the modulation of their activity suggests the protective effect of *Tephrosia purpurea* on liver function.

D) Restoration of Liver Function: *Tephrosia purpurea* has shown the potential to restore liver function by promoting the regeneration of hepatocytes²³ and improving liver metabolism. It aids in the recovery of liver damage and contributes to overall liver health.

E) Antifibrotic Effects: *Tephrosia purpurea* has demonstrated antifibrotic properties, which help prevent the formation and progression of liver fibrosis²⁴. It inhibits the activation of hepatic stellate cells and reduces collagen deposition in the liver, thereby protecting against fibrosis.

4. Anti-Diabetic Activity:

Tephrosia purpurea (wild indigo) has been investigated for its potential anti-diabetic activity and its ability to manage diabetes mellitus. Here is a detailed overview of the anti-diabetic activity of *Tephrosia purpurea*:

A) Hypoglycemic Effects: *Tephrosia purpurea* extracts have shown hypoglycemic effects, meaning they can lower blood glucose levels. This activity is attributed to various bioactive compounds present in the plant, such as flavonoids, rotenoids, and alkaloids. These compounds may stimulate glucose uptake by cells or enhance insulin secretion and sensitivity.

B) Insulin-Mimetic Effects: *Tephrosia purpurea* extracts have been found to exhibit insulin-mimetic effects, meaning they can mimic the actions of insulin²⁵ in the body. This can help improve glucose metabolism, reduce insulin resistance, and regulate blood glucose levels.

C) Lipid Profile Improvement: *Tephrosia purpurea* extracts have demonstrated the ability to improve lipid profiles in diabetic animals by reducing total cholesterol, triglycerides, and low-density lipoprotein (LDL) cholesterol levels²⁶. This can be beneficial in managing dyslipidemia, which is often associated with diabetes.

D) Antioxidant Effects: *Tephrosia purpurea* possesses antioxidant properties that can help reduce oxidative stress associated with diabetes. The plant's antioxidant compounds scavenge free radicals and protect pancreatic beta cells, which are responsible for insulin production, from oxidative damage²⁷.

E) **Renoprotective Effects:** *Tephrosia purpurea* has shown renoprotective effects in diabetic animals by preserving renal function and reducing markers of kidney damage. This suggests its potential in preventing or mitigating diabetic nephropathy, a common complication of diabetes.

5. Anti-Microbial activity:

Tephrosia purpurea (wild indigo) has been investigated for its antimicrobial activity against various bacterial and fungal pathogens. Here is a detailed overview of the antimicrobial activity of *Tephrosia purpurea*:

A) **Antibacterial Activity:** *Tephrosia purpurea* extracts have demonstrated significant antibacterial activity against both Gram-positive and Gram-negative bacteria. The plant's bioactive compounds, such as flavonoids and alkaloids²⁸, play a crucial role in inhibiting the growth and proliferation of bacterial pathogens.

B) **Antifungal Activity:** *Tephrosia purpurea* extracts have also exhibited antifungal activity against various fungal strains, including *Candida albicans* and *Aspergillus niger*. These antifungal properties suggest its potential use in the management of fungal infections.

C) **Antimycobacterial Activity:** *Tephrosia purpurea* extracts have shown promising antimycobacterial activity against *Mycobacterium tuberculosis*, the causative agent of tuberculosis. The plant's bioactive compounds, including rotenoids, have demonstrated inhibitory effects against this bacterial pathogen.

D) **Antiviral Activity:** Some studies have suggested the potential antiviral activity of *Tephrosia purpurea* extracts. The plant has shown inhibitory effects against certain viruses, such as herpes simplex virus (HSV)²⁹, through mechanisms that interfere with viral replication and proliferation.

E) **Antiparasitic Activity:** *Tephrosia purpurea* extracts have exhibited antiparasitic activity against various parasites, including *Leishmania donovani*, *Plasmodium berghei*, and *Trypanosoma brucei*³⁰. These findings suggest its potential as a natural remedy for parasitic infections.

These studies highlight the antimicrobial potential of *Tephrosia purpurea* against bacterial, fungal, and parasitic pathogens.

6. Inhibition of activity of M^{pro} of SARS-CoV-2 :

Tephrosia purpurea plant can be repurposed for the treatment of COVID-19 infection by targeting the M^{pro} which is responsible for the viral genome replication and also a potential target for drug discovery. Two phytochemicals namely tephrosin B and deguelin of *Tephrosia purpurea*³¹ are found having the potential to act as inhibitors against the M^{pro} of SARS-CoV-2 when analysed by molecular docking, drug-likeness prediction, binding free energy calculation and molecular dynamics simulation approach .

Conclusion

Tephrosia purpurea (wild indigo) exhibits a diverse range of pharmacological activities, making it a plant of significant interest. Studies have demonstrated its anti-inflammatory, antioxidant, hepatoprotective, anti-diabetic, and antimicrobial properties. The plant's bioactive compounds, including flavonoids, rotenoids, alkaloids, and phenolic compounds, contribute to its therapeutic potential.

Tephrosia purpurea shows promising anti-inflammatory activity by inhibiting pro-inflammatory mediators, modulating inflammatory enzymes, and reducing oxidative stress. Its potent antioxidant effects help protect cells from oxidative damage and maintain overall cellular health. Furthermore, its hepatoprotective activity aids in liver detoxification, promotes liver function, and mitigates liver damage.

In terms of anti-diabetic activity, *Tephrosia purpurea* exhibits hypoglycemic effects, insulin-mimetic activity, and lipid profile improvement, potentially providing benefits in managing diabetes and its associated complications. Additionally, the plant's antimicrobial activity against bacteria, fungi, and parasites showcases its potential as a natural remedy for various microbial infections.

While these findings highlight the therapeutic potential of *Tephrosia purpurea*, it is important to note that further research, including clinical trials, is required to fully establish its efficacy and safety in humans. Additionally, it is crucial to consult healthcare professionals for appropriate guidance and treatment options regarding the use of *Tephrosia purpurea* for specific conditions.

Overall, *Tephrosia purpurea* holds promise as a valuable medicinal plant, and continued research may help harness its therapeutic benefits for various health conditions.

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