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**Review Article**

### A REVIEW ON THE PHARMACOLOGICAL PROFILE OF *TEPHROSIA CALOPHYLLA*

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**Abstract:**

*Tephrosia calophylla* is commonly known as *Adavivempali* and *dumpavempali*. This plant is usually grows in the form of shrubs. It is widely distributed in tropical, subtropical and arid regions of the world and it is specifically found in Andhra Pradesh. The different parts of the plant like leaves, seeds and root of this plant have been used in Ayurvedic medicine. The plant has been used in treatment of different disorders and it is having the various activities like hepatoprotective, antidiabetic, antioxidant, antibacterial, antifungal, antidiuretic, and hypolipidemic properties with a wide range of safety. It has various active compounds. The pharmacologically active compounds that have been identified are Calophione -A, B and C, Tephcalostan, Tephcalostan A, Tephcalostan C and Betulinic acid. The present objective of the study is to discuss about the various chemical constituents and their pharmacological activities of the plant against numerous disorders.

**Key words:** *Tephrosia calophylla, Betulinic acid, Tephcalostan A and Adavivempali.*

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### INTRODUCTION:

*Tephrosia calophylla* Pers belongs to family Fabaceae. About 400 species [1] are there in the genus of *Tephrosia* in which 37 species of *Tephrosia* were found in India [2] and specifically 13 species are found in Andhra Pradesh [3-9]. These are widely distributed in tropical, subtropical and arid regions of the world [10]. It is commonly known as Adavivempali, dumpavempali, gaddavempali, kommuvempali in Telugu. This plant is a perennial shrub, and is mainly available in the localities of hill slopes, rarely in shady locations.

This plant is usually available in the form of shrubs. The roots are rhizomatous or tuberous and the leaves are simple, coriaceous, oblanceolate, entire, mucronate, parallel. Petiole is winged, articulate at apex just below the lamina. Flowers are light pink in terminal racemes. Pods are compressed, mucronate and glabrous when mature [11].

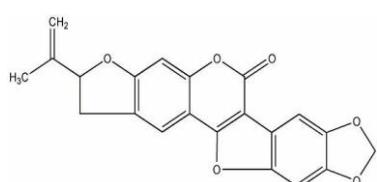
### Taxonomic classification:

Kingdom :	Plantae
Division :	Magnoliophyta
Class :	Dicotyledons
Subclass :	Polypetaceae
Order :	Rosales
Family :	Fabaceae
Genus :	Tephrosia
Species :	calophylla.



Fig 1: Whole plant of *Tephrosia calophylla*

### Structures of some important chemical constituents:



Tephcalostan

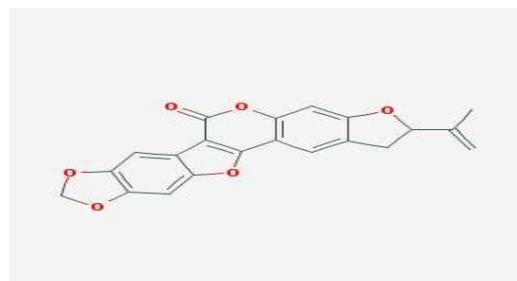
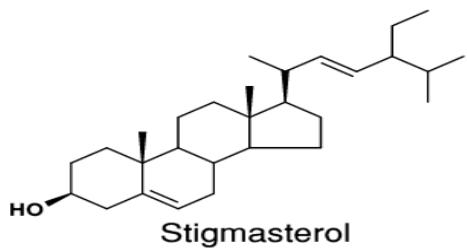


Fig 2: Leaves of *Tephrosia calophylla*

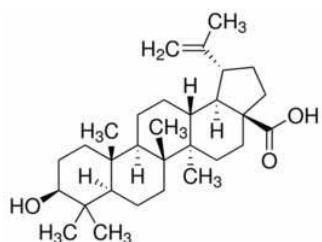
### CHEMICAL CONSTITUENTS:

The genus *Tephrosia* usually contains a wide variety of flavonoids and isoflavonoids. Investigation on *Tephrosia calophylla* revealed that the isolation of 23 different compounds of which 18 were known and 5 are new. *Tephrosia calophylla* contains flavonoids like (2S)-5-hydroxy-7, 4 -di-O- ( $\gamma,\gamma$ -dimethylallyl) flavonone and 6-hydroxy-E-3-(2,5-dimethoxy benzylidine)2',5'-dimethoxy flavonone [12]. Tephcalostan is a new coumestan derivative isolated from the whole plant of *Tephrosia calophylla* along with two known flavonoids, 7-O-methyl glabranin and kaempferol 3-O- $\beta$ -D-glucopyranoside [13]. Calophione -A (a benzyl derivative), 1-(6'-Hydroxy-1',3'-benzodioxol-5'-yl )-2-(6-hydroxy-2-isopropenyl-2,3-dihydro-benzofuran-5-yl)-ethane-1,2 dione and Tephcalostan -B, C, and D are three coumestan derivatives which were isolated from the roots of *Tephrosia calophylla* [14].

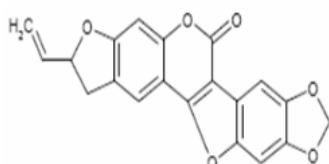
Betulinic acid is a chemical compound which has been isolated from the whole plant of *Tephrosia calophylla* [15]. Betulinic acid having anticancer and anti-HIV activity and it is therapeutically effective against cancerous and HIV-infected cells.



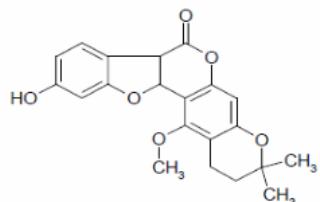
Tephcalostan B



Betulinic acid



Tephcalostan A



Tephcalostan C

#### PHARMACOLOGICAL ACTIVITIES:

The bioactivity of genus *Tephrosia* has been studied and it is proved that the chemical constituents and extracts of *Tephrosia* exhibit various biological activities like insecticidal [16], antiviral [17], antiprotozoal [18], antiplasmodial [19] and cytotoxic activities [20].

#### Hepatoprotective activity [21]:

*Tephrosia calophylla* having hepatoprotective activity against Carbon tetrachloride induced method. Carbon tetrachloride is a known chemical with high incidence of hepatotoxicity. The animals were pretreated with methanol extract of *Tephrosia calophylla* (150 and 300 mg/kg of body

weight) for 14 days. It is then treated with Ccl<sub>4</sub> (1.5 mL/kg body weight) in olive oil (1:1,v/v) on 14<sup>th</sup> day. The methanolic extract of *Tephrosia calophylla* reduces the elevated levels of SGPT, ALP and bilirubin but not SGOT. The extract of *Tephrosia calophylla* treated rats is then compared with standard drug Liv.52 treated group and there was no significant difference in biochemical parameters of the extract control group.

#### **Antimicrobial activity [22]:**

*Tephrosia calophylla* roots were extracted with chloroform and it was tested for antibacterial and antifungal activity. The antimicrobial activity of the chloroform root extract was tested at two dose levels. At 200 mg/ml dose, the extract shows a good amount of antibacterial activity. Presence of isoflavones like calo isoflavones is responsible for antibacterial activity. At 200 mg/ml dose, the extract shows good antifungal activity.

#### **Cytotoxicity [23]:**

The cytotoxicity was studied by using RAW & HT-29 cell lines with the help of MTT assay. *Tephrosia calophylla*, *Tephrosia maxima* and *Tephrosia purpurea* showed significant cytotoxic activity out of which *Tephrosia calophylla* showed the maximum activity.

#### **Antiprotozoal activity [24]:**

Different flavonoids isolated from *Tephrosia calophylla* are responsible for antiprotozoal activity on *Trypanosoma*, *Leishmania* and *Plasmodium* parasites.

#### **Anticancer and anti -HIV activity [25]:**

*Tephrosia calophylla* possess anticancer activity. Root extract inhibits the growth and induces apoptosis in human breast carcinoma. Betulinic acid is one of the important chemical constituent and has anticancer and anti-HIV activity [15] and has been proved to be therapeutically effective against cancerous and HIV- infected cell. Human serum albumin is the predominant protein in the blood. Most drugs that bind to HAS will be transported to other parts of the body. The betulinic acid isolated from *Tephrosia calophylla* binds to HSA. Finally, the binding constant of BA to HSA was calculated from fluorescence.

#### **Anthelmintic activity [26]:**

Ethanolic extract of *Tephrosia calophylla* roots were subjected for phytochemical analysis and found the presence of alkaloids, glycosides, saponins and flavonoids. The root extract of *Tephrosia calophylla* shows potent activity against helminthes, when compared to control and equipotent activity when compared to standard anthelmintic drug albendazole.

#### **Antiulcer activity [27]:**

The antiulcer activity of ethanolic extract of *Tephrosia calophylla* leaves were studied in pylorus ligation, ethanol induced and indomethacin

induced ulcers models by using Wistar rats. The ethanolic extract was administered at a dose of 50 and 100 mg/kg orally and it shows significant reduction in gastric volume, free acidity, total acidity and ulcer index as compared to control. The extract of *Tephrosia calophylla* leaves showed significant antiulcer and cytoprotective activity at doses of 50mg/kg and 100mg/kg.

#### **Antihyperlipidemic activity [28]:**

The antihyperlipidemic effect of *Tephrosia calophylla* has been studied in Wistar albino rats. The extract shows better antihyperlipidemic activity when compared to control group of animals.

#### **DISCUSSION AND CONCLUSION:**

*Tephrosia calophylla* Pers belongs to the family Fabaceae and it is a perennial shrub which exhibits greater diversity. It was found widely in Andhra Pradesh, south India. It is mainly available in localities of hill slopes, rarely in shady locations. It is usually found in Talakona forest of Andhra Pradesh.

This plant contains a wide variety of flavonoids and isoflavonoids. According to Ayurveda, this plant exhibits several medicinal properties such as antihelminthic, anti-pyretic, antiulcer, antimicrobial, anticancer and hepatoprotective activity. It is also active against leprosy, ulcers, and used as alternative cures for diseases of the liver, spleen, heart and blood. The roots having diuretic, enriches blood, cures diarrhea and is useful in bronchitis, inflammations, antidiabetic, boils and pimples. Leaves are tonic to intestines and a promising appetizer. The seeds can be used as substitute for coffee. Methanolic extract of *Tephrosia calophylla* was tested in mice, and it shows antidiabetic activity. The chloroform extract of *Tephrosia calophylla* show antimicrobial activity which is due to the presence of isoflavones like caloisoflavones. Ethanolic extract of *Tephrosia calophylla* show significant anthelmintic activity due to the presence of flavonoids. Future research on this plant should be useful for the treatment and control of various diseases for the welfare & service of mankind.

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