Ceylon Journal of Science (*Bio. Sci.*) 44 (2): 101-103, 2015
DOI: http://dx.doi.org/10.4038/cjsbs.v44i2.7355

RESEARCH NOTE

Preliminary Phytochemical Screening of Some *Tephrosia* spp. (Family Fabaceae) in Sri Lanka

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Accepted November 02, 2015

ABSTRACT

Tephrosia is a genus of medicinally important perennial shrubs or herbs distributed in warm temperate and tropical regions, and belongs to Family Fabaceae. To study the phenetic and phytochemical variations of six *Tephrosia* species (*T. purpurea*, *T. villosa*, *T. noctiflora*, *T. tinctoria*, *T. maxima* and *T. pumila*), sixteen floral and vegetative characters of *Tephrosia* spp. were examined. Air dried leaves were subjected to sequential solvent extractions using solvents with different polarities such as hexane, chloroform and methanol. These extracts were subjected to preliminary phytochemical screening tests to detect the occurrence of carbohydrates, protein and amino acids, glycosides, alkaloids, saponins, flavonoids, tannins, phenolics, and phytosteroids. Further isolations and purifications are needed to elucidate the chemical constituents to assess the efficacy.

Keywords: floral and vegetative characters, phytochemicals.

INTRODUCTION

Tephrosia is a genus that belongs to family Fabaceae, subfamily Faboideae, tribe Millettieae and consists of about 300-400 species distributed in warm temperate and tropical areas. The genus is represented in Sri Lanka with 10 species (T. purpurea, *T. villosa, T. tinctoria, T. noctiflora, T. pumila, T. maxima, T. candida, T. vogelii, T. senticosa* and *T. spinosa*) and they are distribute throughout Sri Lanka. The genus is with perennial herbs or shrubs; stems erect; leaves imparipinnate, 3 to many foliate, stipulate; racemose inflorescence, axillary, few to many flowered, calyx 5, petals, white to purple or reddish, stamens free; fruit sessile, linear to oblong, 1 to many seeded (Dasanayake and Fosberg, 1991).

Several *Tephrosia* species are used extensively in traditional therapeutic systems in Sri Lanka as well as in some other countries. *Tephrosia purpurea* is a perennial herb that grows up to a height of about 30-60 cm and it is more common in both wet and dry zones of Sri Lanka. This plant is widely exploited as a medicinal plant in the Ayurvedic therapeutic systems and it is used for healing any type of wounds and also very effective in the treatment of inflammation and enlargement of spleen and liver (Abayasekara *et al.*, 2009). Whole plant of *T. purpurea* and *T. villosa* are commonly used in disorders in liver, spleen and kidney and also as an anthelmintic in children in Sri Lanka, India, Vietnam, Nigeria and West Africa. Antibiotic substance in the roots of *T. purpurea* indicated the possibility of using water and alcoholic extracts in preparation of decoctions for skin infections, dyspepsia, chronic diarrhoea (Rangama *et al.*, 2007). *Tephrosia purpurea* has been shown to possess significant activity against hepatotoxicity, pharmacological and physiological disorders and inhibits benzoyl peroxide-mediated cutaneous oxidative stress and toxicity. The animals pre-treated with *T. purpurea* have shown a decrease in both tumor incidence and tumor yield (Saleem *et al*., 2001). Antioxidant and antidiabetic activity of the different parts plant such as leaf, stem and root of *T. tinctoria* extracted with various solvents from nonpolar to polar basis (hexane, chloroform, ethyl acetate and ethanol). *Tephrosia* genus is richness in prenylated flavonoids and possesses insect repellent, larvicidal, pesticidal, antimicrobial and anticancer properties (Rajaram and Kumar, 2011).

Due to the increasing popularity of using *Tephrosia* spp. as an ingredient in traditional therapeutic systems, phenotypic characterization and phytochemical screening of different species is a timely requirement. The results of the preliminary questionnaire survey indicated the use of different *Tephrosia* spp. as substitutes to *T. purpurea*. Therefore the main aim of the present study was to infer the interspecific relationships of *Tephrosia* spp. using phenetic and phytochemical variations in order to determine the degree of efficacy in various *Tephrosia* spp. as ingredients in preparation of traditional medicines.

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MATERIALS AND METHODS

Socio-economic survey, authentication and collection of samples

A structured questionnaire survey was carried out to identify the medical uses of various *Tephrosia* spp. in Sri Lanka using a population sample of hundred people including ayurvedic practitioners, general public, drug manufactures and ayurvedic drug dealers in Colombo, Gampaha, Kandy, Anuradhapura, Polonnaruwa, Puttalam, Kurunegala, Hambanthota and Ratnapura Districts of Sri Lanka. Sixteen floral and vegetative characters (the stem height, erect or creaping nature, presences/absecnce of a compound leaf, features of leaflets, shape of fruits, pubescent nature of the fruit, fruit length and width and the features of the flowers and the inflorescence) of *T. purpurea, T. villosa, T. noctiflora, T. tinctoria, T. pumila* and *T. maxima* were observed in ten replicates in each species. The healthy plant leaves of study species were collected from their natural habitats in different regions.

Preliminary phytochemical screening of leaf extracts

The leaf samples were air-dried for two weeks and then milled into fine powder using motor and pestle. The method of cold maceration was used in the extraction. The extracts of the leaves were prepared by soaking 1g of each in 2.5 ml hexane for 24 hours. The resulting mixtures were filtered using Whatman No.1 filter papers and filtrate was concentrated evaporation in a water bath (50 °C). The procedure was repeated on the residues using the following solvents: chloroform and methanol. The extracts were subjected to preliminary phytochemical screening of carbohydrates, proteins/amino acids, glycosides, alkaloids, phyto steroids, flavonoids, saponins and tannins/phenolics.

RESULTS AND DISCUSSION

Socio-economic survey

Questionnaire survey revealed that only a few people were aware about the existence of ten *Tephrosia* spp. in Sri Lanka. Most of them knew only *T. purpurea* (67%), but few people knew about *T. villosa* (31%), *T. noctiflora* (7%) and *T. tinctoria* (3%). According to Flora of Ceylon (Dasanayake and Fosberg, 1991), there are ten different *Tephrosia* spp. in Sri Lanka. However, only six different species were found in different locations during the field surveys. *T. purpurea* is distributed throughout Sri Lanka whereas most of the other species inhabit in dry zone compared to wet zone.

Qualitative phytochemical screening of leaf extracts of *Tephrosia* species

Phytochemical screening did not show significant difference in various *Tephrosia* spp (Table 1). Methanol leaf extracts have shown high amount of different phytochemicals compared to the other extracts and it indicated that more polar phytochemicals are present in leaves compared to non-polar compounds.

Table 1. Qualitative phytochemical screening of different leaf extracts of *Tephrosia* spp. (M= Methanol extract, C= Chloroform extract, H= Hexane extract, + = present and - = absent)

		Carbohydr -ates	Protein and amino acids	Glycosides	Alkaloids	Saponins	Flavonoids	Tannins and Phenolics	Phytostero -ids
T. purpurea	M	+	-	+	+	-	+	+	+
	C	-	-	-	-	-	-	-	+
	H	-	-	-	-	-	-	-	+
T. tinctoria	M	+	-	+	+	-	+	+	+
	C	-	-	-	-	-	-	-	+
	H	-	-	-	-	-	-	-	+
T. villosa	M	+	-	+	+	-	+	+	+
	C	-	-	-	-	-	-	-	+
	H	-	-	-	-	-	-	-	+
T. pumila	M	+	-	+	+	-	+	+	+
	C	-	-	-	-	-	-	-	+
	H	-	-	-	-	-	-	-	+
T. noctiflora	M	+	-	+	+	-	+	+	+
	C	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-
T. maxima	M	+	-	+	+	-	+	+	+
	C	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-

CONCLUSION

Interspecific phenetic relationships of *Tephrosia* spp. in Sri Lanka are clearly identified by the cluster analysis of phenetic characters. Multi-access key constructed using DELTA package in this study have provided useful information for accurate identification and authentication of the species for future diagnostic purposes. Preliminary phytochemical screening of the different *Tephrosia* spp. indicated a close relationship in species level and further isolations and purifications are needed to elucidate the chemical constituents and to assess the efficacy. These findings would lead to the effective use of different *Tephrosia* spp. in preparation of traditional therapeutic systems for various ailments.

ACKNOLEDGEMENTS

We acknowledge the financial assistance provided by the National Science Foundation, Sri Lanka (Research grant: NSF RG/2011/NRB/06).

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