

EVALUATION OF SECONDARY METABOLITES OF *SHOREA TUMBUGGAIA* ROXB. A GLOBALLY THREATENED MEDICINAL TREE TAXA OF SHESHACHALAM BIOSPHERE RESERVE

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ABSTRACT

Shorea tumbergaia Roxb. a globally threatened medicinal tree taxa is valued for its timber and pharmaceutical properties. The present work is aimed to screen secondary metabolites from root, stem, stembark and leaves of *S. tumbergaia*. The results revealed that the plant is source for different secondary metabolites like anthocyanins, emodins, triterpenoids, tannins, saponins, leucoanthocyanins, reducing sugars, flavonoids, lignins, anthroquinones, phenols and glycosides. But steroids, coumarins, fatty acids and alkaloids are absent. The number of secondary metabolites varied in different parts the order is stembark > stem > leaf > root. The stembark proved an excellent source for maximum number of secondary metabolites among the selected plant parts. The findings of the present study will be helpful to the phytochemists and pharmacologists for identification of new active compounds.

Keywords: Medicinal plants, Secondary metabolities, *Shorea tumbergaia*, Aqueous extract.

INTRODUCTION

Nearly 80% of the world's population relies on traditional medicines for primary health care, most of which involve the use of plant extracts¹. In India, almost 95% of the prescriptions were plant based in the traditional systems of Unani, Ayurveda, Homeopathy and Siddha². The study on plants continued for the discovery of novel secondary metabolites. Around 80% of medicinal products were of plant origin and their sales exceeded US \$65 billion in 2003³. Phytochemical constituents are the basic source for the establishment of several pharmaceutical industries. The constituents present in the plant play a significant role in the identification of crude drugs. Phytochemical screening is very important in identifying new sources of therapeutically and industrially important compounds like alkaloids, flavonoids, phenols, saponins, steroids, tannins, terpenoids etc⁴. Previously the crude drugs were identified by comparison only with the standard descriptions available, but recently due to advancement in the field of pharmacognosy various techniques have been following for the standardization of crude drugs⁵.

In order to promote Indian herbal drugs, there is an urgent need to evaluate the therapeutic potentials of the drugs as per WHO guidelines⁶. Patwardhan *et al.*³ mentioned that 30% of the world wide sales of drugs is based on natural products. Traditional indigenous medicine is limited to small tribal and geographical areas called "little traditions" are an excellent repository of knowledge about medicinal properties of botanical sources. Kamboj⁷ stated that the bioactive extracts should be standardized on the basis of phytochemical compounds. It is imperative to initiate an urgent step for screening of plants for secondary metabolites. The present communication attempt to assess the status of phytochemical properties in different parts of *Shorea tumbergaia* to improve the health status of people and also to use in pharmaceutical and nutraceutical products of commercial importance.

S. tumbergaia is a tree taxa with economic and medicinal values. The heart wood is similar to sal but much smoother and better for carpentry. Plant parts are to be used as an external stimulant. The plant extracts used to cure ear-aches. Leaf juice is used as ear drops for children⁸. The bark having anti ulcer activity⁹. The stem is a source of resin, which is used as incense. The resin used to cure duodenal ulcers and amoebic dysentery. It is also used in indigenous medicine as an external stimulant and a substitute for arbutus¹⁰.

MATERIAL AND METHODS

Plant Materials

The fully matured healthy plant materials i.e. root, stem, stembark and leaves of *Shorea tumbergaia* were collected from Tirumala hills,

Chittoor District of Andhra Pradesh, India during December 2010. The materials were washed thoroughly and shade dried.

Extraction of Plant Material

Aqueous extraction: 10 g of air dried powder was added to 100 ml distilled water and boiled for 2 hours. The supernatant was collected and this procedure was repeated twice. The collected supernatant at an interval of every 2 hours were pooled together and concentrated to make the final volume into one-fourth of the original volume. It was then autoclaved at 121°C and at 15 lbs pressure and stored at 4°C¹¹.

Preliminary Phytochemical Screening

The condensed extracts were used for preliminary screening of phytochemicals such as flavonoids¹²; steroids, alkaloids and phenols¹³; terpenoids and glycosides¹⁴; tannins, anthroquinones, leucoanthocyanins and emodins¹⁵; saponins¹⁶; and reducing sugars and anthocyanins¹⁷.

RESULTS AND DISCUSSION

The phytochemical screening of various parts of *Shorea tumbergaia* showed that they are rich in emodins and phenols. All the parts are lacking alkaloids, coumarins, fatty acids and steroids (Table 1). Anthocyanins are present in stembark and absent in root, stem and leaf. Anthocyanins may help the human immune system to work more efficiently to protect against viral infections. It is little bit more complex, specific types of anthocyanins may have a direct effect in decreasing influenza viruses infectivity by decreasing the ability of the virus itself to get into the human cell or to be related from infected cells or by having a viricide effect¹⁸. The stem and stembark consist anthroquinones and lignins, whereas these are not found in root and leaf. Anthroquinones are used as better stomachic and in the treatment of diarrhoea¹⁹. Lignin is a significant component in the global carbon cycle, the resistance of lignin to microbial degradation enhances its persistence in soils²⁰. Flavonoids leucoanthocyanins and reducing sugars are found to be present in stem, stembark and leaves. Flavonoids have been reported to possess many useful properties, including anti-inflammatory, oestrogenic, antimicrobial and enzyme inhibition²¹; and antiallergic, antioxidant, cytotoxic antitumour and vascular activities²². Leucoanthocyanins are occupy an important position among the water soluble organic compounds. They have been implicated as being responsible for the astringent taste of unripe fruit they are responsible for the chill haze that develops in beer and for the browning of white wine. They influence the storage stability of wines and juice²³. Glycosides are found in root and stembark. Glycosides, flavonoids and alkaloids have hypoglycemic activities²⁴. Tannins and triterpenoids are available from root, stem and stembark. The growth of many fungi, yeasts,

bacteria and viruses was inhibited by tannins²⁵ and terpenoids have the property of astringent activity i.e. faster the healing of wounds and inflamed mucous membrane²⁶. Saponins are found in leaves only. Traditionally saponins have been extensively used as detergents, pesticides and molluscicides, in addition to their industrial applications as foaming and surface active agents and also have beneficial health effects²⁷. All parts showed positive results towards emodins and phenolic tests. Emodin is one of the natural

anticancer drug, an active ingredient of the traditional Chinese medicine – rhubarb²⁸. Primarily phenolic compounds are of great importance as cellular support material because they form the integral part of cell wall structure by polymeric phenolics²⁹. Bioactive polyphenols have attracted special attention because they can protect the human body from the oxidative stress which may cause many diseases, including cancer, cardiovascular problems and ageing³⁰.

Table 1: Secondary metabolites of *Shorea tumbergaia*

S. No.	Name of the secondary metabolites	Root	Stem	Stembark	Leaf
1.	Alkaloids	-	-	-	-
2.	Anthocyanins	-	-	+	-
3.	Anthroquinons	-	+	+	-
4.	Coumarins	-	-	-	-
5.	Emodins	+	+	+	+
6.	Fatty acids	-	-	-	-
7.	Flavonoids	-	+	+	+
8.	Glycosides	+	-	+	-
9.	Lignins	-	+	+	-
10.	Lueco anthocyanins	-	+	+	+
11.	Phenols	+	+	+	+
12.	Reducing sugars	-	+	+	+
13.	Saponins	-	-	-	+
14.	Steroids	-	-	-	-
15.	Tannins	+	+	+	-
16.	Triterpenoids	+	+	+	-

Note: '+' indicates presence '-' indicates absence

According to previous studies, roots of *Strychnos potatorum*³¹; root tuber of *Curculigo*³²; roots and leaves of *Hyptis suaveolens*³³, *Echiumpycnanthum pomme*³⁴, leaves of *Bauhinia racemosa*³⁵, *Thymus fontanesii* and *Laurus nobilis*³⁶, *Nerium* and *Momordica*³⁷, *Andrographis paniculata* and *Murraya koenigii*³⁸, *Pterospermum canescens*³⁹, *Svensonia hyderabadensis*⁴⁰ and *Rumex vesicarius*⁴¹; stem of *Cardiospermum halicacabum*⁴²; and leaves, bark, root and galls of *Pistacia*⁴³, *Boswellia ovalifoliolata*⁵ and *Jatropha*⁴⁴ are rich in secondary metabolites.

The presence of bioactive compounds indicate the medicinal values of the plant. Antioxidant and antimicrobial properties of various extracts from many plants have recently been of great interest in both research and in food industry, because their possible use as natural additives emerged from a growing tendency to replace synthetic antioxidants and antimicrobial products with natural ones⁴⁵. According to Mallikharjuna *et al.*,³¹ preliminary qualitative test is useful in the detection of bioactive principles and subsequently may lead to drug discovery and development. Therefore the present study was undertaken and results revealed that the plant parts of *Shorea tumbergaia* are having anti-inflammatory, antitumorous and wound healing properties. Moreover the plant parts may be used to protect the human body from the oxidative stress including cancer.

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