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STUDIES OF *BOSWELLIA OVALIFOLIOLATA* BAL. AND HENRY-AN ENDEMIC AND ENDANGERED MEDICINAL PLANT

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ABSTRACT
Boswellia ovalifoliolata Bal. & Henry is narrow endemic tree taxa on Tirumala hills of Eastern Ghats. The leaves, bark and gum which are highly medicated. The taxa are used by tribal and indigenous community to treat number of ailments. The studies revealed that the *Boswellia ovalifoliolata* synthesis a variety of secondary metabolites; and the gum and stem bark showed variation in the accumulation of individual amino acids, lipids, anthocyanins, phenols and flavonoids. Very little systematic and scientific investigations are available on the ethno-medico-botanical claims. Hence the present study was carried out on *Boswellia ovalifoliolata* as the basic source for the production of pharmaceutical drugs.

INTRODUCTION

Recently, considerable attention has been paid to utilized eco-friendly and bio-friendly based products for the prevention and cure of different human diseases (Dubey, 2004). India being a botanical garden of the world and a goldmine of well recorded and traditionally well practiced knowledge of herbal medicine. More than 6000 plants in India including endemics are in use in traditional folk and herbal medicine representing about 75% of the medicinal needs of the third world countries (Rajashekharan, 2002).

Boswellia ovalifoliolata an endemic, endangered and threatended medicinal tree taxa belongs to the Tirupati – Kadapa – Nallamali hotspot of India. This 11th hotspot is harbours large number of endemic, endangered, rare, threatended and key stone species due to its vivid geographical conditions and climatic factors are favourable for the distribution of unique endemic plant wealth. *Boswellia ovalifoliolata* is a deciduous medium sized tree taxa belongs to the family Burseraceae.

The plant is over exploited for its medicinal uses. The fresh leaf juice used to prevent throat ulcers (Savithramma and Sulochana, 1998). Decoction of the stem bark 10 – 25 mL per day reduces rheumatic pains (Nagaraju and Rao, 1990). The gum obtained from the trunk which is highly medicated. This gum is sold in the local market by the native tribals as Konda sambrani in Telugu language. Small lumps of fresh light yellow coloured liquid oozes out from the stem and hardens on exposure. Amyrins are the chief constituents of the gum together with resin acids and volatile acids. Shade dried gum is powdered dissolved in water and mixed with curd and given orally to cure amoebic dysentery (Sudhakar, 1998). Gum powder of *Boswellia ovalifoliolata* and *Boswellia serrata* and fruit powder of *Pedalium murex* mixed in equal parts and made into paste and apply externally on the affected part of the testicle to cure hydrocoel. Gum powder mixed with white precipitate of pounded stem of *Tinospora cardifolia* and honey given orally in small quantities (10 mL) two times a day to cure hydrocoel (Vedavathy *et al.,* 1995). Equal mixture of gum and stem bark in one tea spoonful given daily with sour milk on empty stomach for a month to cure stomach ulcers (Nagaraju and Rao, 1990). Tribals (Nakkala, Sugali and Chenchu) and local healers of surrounding villages making deep incisions on the main trunk to extract the gum but unknowingly causes damage to immature plants leading to depletion of this species in its natural habitat. Herbal medicines are crude plant drugs used by tribals and rural folk. It needs to be evaluated scientifically for their efficacy and safety. The search for the concerned active compounds has led to isolation of several primary and secondary metabolites.

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 drug; Phytochemical screening is very important in identifying new sources of therapeutically and industrially important compounds like alkaloids, flavonoids, phenolic compounds, saponins, steroids, tannins, terpenoids etc. Physico-chemical studies are one of the tool to determine the quality and purity of crude drug. 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 standardisation of crude drugs. Study of ash values is one of the important process. The study was under taken to screen the secondary metabolites in stem bark and gum of *Boswellia ovalifoliotata* to facilitate the research in drug discovery process.

MATERIALS AND METHODS

A field survey was conducted to locate the *Boswellia ovalifoliolata* on the Seshachalam hill range. The soil characters were studied phytochemical screening was carried out following the methods of Herborne (1973) and Gibbs (1974). The amino acids were extracted and separated on Whatman No. 1 chromatographic filter paper and individual amino acids were identified with different spray reagents and R_f values comparing with authentic samples as per the method of Das Chowdary *et al.,* (1967).

Lipids were extracted following the methods of Hoppe and Heitefus (1974). The individual phospho and glycolipids were identified on Thin Layer Chromatography by spraying reagents and by comparing the R_f values of authentic samples. Anthocyanidins were extracted as per the method of Harborne (1973) and identified on Whatman No. 1 chromatographic filterpaper. Phenols and flavonoids were extracted as per the method of Markham (1982); Ibrahim and Towers (1960) respectively. Identification of individual phenols and flavonoids on Whatman No. 1 chromatographic filterpaper by spraying different reagents and comparing the R_f values of authentic samples. The physical constants like ash and extractive values were determined by the method of Anonymous (1985) and Kokate (1991).

Table 1: Secondary metabolites of *Boswellia ovalifoliolata*

S.N.	Compound	Stem bark	Gum
1.	Alkaloids	-	+
2.	Flavonoids	+	+
3.	Indoles	+	-
4.	Leucoanthocyanins	+	-
5.	Steroids	+	-
6.	Phenols	+	+
7.	Saponins	+	+
8.	Tannins	+	+
9.	Lignins	+	+

Table 2: Phenols of *Boswellia ovalifoliolata*

S.N.	Compound	Stem bark	Gum
1.	Digallic acid	-	-
2.	Gallic acid	+	+
3.	Ellagic acid	-	-
4.	Aesculetin	-	-
5.	Cis-p-coumaric acid	-	-
6.	Iso-chlorogenic acid	-	-
7.	Chlorogenic acid	+	+
8.	Caffeic acid	-	-
9.	Protocatechnic acid	+	-
10.	Gentisic acid	+	+
11.	Scopoletin	+	-
12.	Phloretic acid	+	+
13.	p-hydroxy benzoic acid	+	+
14.	α - Resorcyclic acid	-	-
15.	β - Resocyclic acid	+	-
16.	Tran-p-coumaric acid	+	-
17.	Vanillic acid	+	+
18.	p-coumarylquinic acid	-	-
19.	Cis-p-coumaric acid	+	-
20.	Melilotic acid	+	+
21.	Cis- Ferulic acid	+	-
22.	Coumarin	+	+
23.	Salycylic acid	+	+
24.	Cinnamic acid	+	+
25.	Syringic acid	-	-

RESULTS AND DISCUSSION

Table 1 showed that the alkaloids are absent in stem bark where as indoles, leuco anthocyanins and steroids are not found in the gum. Among individual phenols galic acid, cholorogenic acid, gentisic acid, phloretic acid, vanillic acid, melilotic acid, coumarin, salicylic acid and cinnamic acid are found to be common in both parts (Table 2). The flavonoids like myricetin and apigenin are absent in bark and gum (Table 3). Table 4 showed that the anthocyanidins are not found in

Table 3: Flavonoids of *Boswellia ovalifoliolata*

S.N.	Compound	Stem bark	Gum
1.	Quercetin	+	+
2.	Rutin	+	+
3.	Myricetin	-	-
4.	Luteolin	+	-
5.	Apigenin	-	-
6.	Gorientin	+	-
7.	Vitexin	+	+

Table 4: Anthocyanidins of *Boswellia ovalifoliolata*

S.N.	Compound	Stem bark	Gum
1.	Cyanidin	+	-
2.	Petunidin	+	-
3.	Delphinidin	-	-

Table 5: Amino acids of *Boswellia ovalifoliolata*

S.N.	Compound	Stem bark	Gum
1.	Aspartic acid	+	-
2.	Arginine	+	-
3	Asparagine	+	+
4.	α-Alanine	+	+
5.	β- Alanine	+	+
6.	2- Amino butyric acid	-	+
7.	Cysteine	+	+
8.	Cystine	+	+
9.	Glutamic acid	+	-
10.	Glutamine	+	-
11.	Glycine	+	-
12.	Histidine	+	+
13.	Isoleucine	+	-
14.	Leucine	+	+
15.	Lysine	+	+
16.	γ-methylene glutamic acid	-	-
17.	γ-methylene glutamine	-	+
18.	Norleucine	-	+
19.	Ornithine	+	-
20.	Phenyl alanine	-	-
21.	Proline	+	+
22.	Serine	+	+
23.	Threonine	+	+
24.	Tryptophan	-	-
25.	Valine	+	+
26.	Tyrosine	-	-

Table 6: Lipid contents of *Boswellia ovalifoliolata*

S.N.	Compound	Stem bark	Gum
1.	Phosphatidyl serine	+	+
2.	Phosphatidyl inositol	+	-
3	Phosphatidyl choline	-	-
4.	Phosphatidyl ethanol amine	-	-
5.	Digalactosyl diglyceride	+	-
6.	Phosphatidyl glycerol	+	+
7.	Sulphoquinovosyl di glyceride	+	+
8.	Monogalactosyl diglyceride	+	+
9.	Steryl glycoside	+	+

Table 7: Ash values of *Boswellia ovalifoliolata* (%)

Plant part	Total ash	Acid insoluble	Water insoluble
Stem bark	13.5	2.50	2.00
Gum	6.0	1.60	1.50

It is imperative to initiate urgent steps for screening of plants for secondary metabolites. The present communication attempts to assess the status of phytochemical properties in stem bark and gum of *Boswellia ovalifoliolata* to improve the health states of local people and also to use in pharmaceutical and nutraceutical products of commercial importance.

Table 8: Extractive values of *Boswellia ovalifoliolata*

Plant Part	90% alcohol soluble extract (% w/w)	Water soluble extract (% w/w)	Chloroform soluble (% w/w)	Petroleum ether soluble (% w/w)
Stem bark	17.6	22.4	4.8	3.4
Gum	10.5	9.2	1.5	1.0

the gum. The amino acids like γ-methylene glutamic acid, phenyl alanine and tyrosine are absent in bark and gum (Table 5), and the two parts are lacking of phosphatidyl choline and phosphatidyl ethanol amine (Table 6). The stems contain higher levels of ash content and extractive values than that of the gum (Table 7 and 8).

Medicinal herbs have been in use in one form or another under indigenous systems of medicine. Dubey (2004) mentioned that the complete phytochemical investigations of medicinal plants of India should be carried out, because these secondary metabolites are responsible for medical activity of the plant. Screening of phytochemicals like phenols, flavonoids, alkaloids etc. from stem bark and gum of *Boswellia ovalifoliolata* are listed in Table (1 to 7). Number of plants were screened for secondary metabolites for their medicinal value like *Artemisia annua* (Bhakuni *et al.,* 2001), *Nardostachys jatamamsi* (Rani and Naidu., 1998), *Thymus vulgaris* (Bazylko and Strzelecka, 2007), *Allium giganteum* (Stajner *et al.,* 2006), *Cephalotaxus koreana* (KiHwan Bae *et al.,* 2007) etc.

Identification of biologically active compounds is an essential requirement for quality control and dose determination of plant based drugs. A medicinal herb can be viewed as a synthetic laboratory as it produces and contains a number of chemical compounds. Those compounds, responsible for medical activity of the herb, are secondary metabolites (Dubey, 2004). Alkaloids which are nitrogenous principles of organic compounds combine with acids to form crystalline salts. Complete phytochemical investigations of most of the medicinally important herbs of India have not been carried out so far. This would be beneficial in standardization and dose determination of herbal drugs (Dubey, 2004).

In order to promote Indian herbal drugs, there is an urgent need to evaluate the therapeutic potentials of the drugs as per WHO guidelines (WHO, 2000). Patwardhan *et al.,*(2004) mentioned that 30% of the world wide sales of drugs are 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. Kamboj (2000) stated that the bioactive extract should be standardized on the basis of phytochemical compounds.

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