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Screening of Medicinal Plants for Secondary Metabolites

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Tirupati-517 502, Andhra Pradesh, India

Abstract: The traditional medicine involves the use of different plant extracts or the bioactive constituents. This type of study provides the health application at affordable cost. Secondary metabolites are responsible for medicinal activity of plants. Hence in the present study phytochemical screening of some important medicinal plants was carried out. Qualitative phytochemical analysis of these plants confirm the presence of various phytochemicals like saponins, terpenoids, steroids, anthocyanins, coumarins, fatty acids, tannins, leucoanthocyanins and emodins. The results suggest that the phytochemical properties for curing various ailments and possess potential antioxidant and leads to the isolation of new and novel compounds.

Key words: Phytochemical screening • Medicinal plants • Secondary metabolites • Tannins • Steroids • Coumarins

INTRODUCTION

Since ancient times, people have been exploring the nature particularly plants in search of new drugs. This has resulted in the use of large number of medicinal plants with curative properties to treat various diseases [1]. Nearly 80% of the world's population relies on traditional medicines for primary health care, most of which involve the use of plant extracts [2]. In India, almost 95% of the prescriptions were plant based in the traditional systems of Unani, Ayurveda, Homeopathy and Siddha [3]. The study of plants continues principally for the discovery of novel secondary metabolites. Around 80% of products were of plant origin and their sales exceeded US $65 billion in 2003 [4].

Annona reticulata (Annonaceae) is small tree. Fruits are astringent, sweet and useful in blood complaints. It is also used as anti-dysenteric and anti-helminthic [5]. Annona squamosa (Annonaceae) is small tree. Traditionally used for the treatment of epilepsy, dysentery, cardiac problems, fainting, worm infestation, constipation, hemorrhage, diarrhoea, fever, thirst, malignant tumours, ulcers [6]. Arhatobryx hexacarpalus (Annonaceae) is climbing or strangling shrub. Flower oil used in perfumes and Bixa orellana (Bixaceae) is a small evergreen tree. The pulp gives a beautiful flesh colour largely used in dyeing silks. Astringent and slightly purgative also a good remedy for dysentery and kidney diseases [7]. Cadaba indica (Capparaceae) is shrubs common in scrub jungles and wastelands. The leaves are used to eczema, swelling and constipation [8]. Capparis zeylanica (Brassicaceae) is thorny stout climbing shrub used as antidote to snake bite, to cure swelling of testicle, small pox, boils, cholera, colic, hemorrhage, neuralgia, sores, pneumatic and pleurisy [9]. Clematis gourtana (Ranunculaceae) is climbing glabrous shrub, Bruised leaves and stems are used for killing of lice [7]. Cleome viscosa (Cleomaceae) is erect viscous glandular herb. Seed paste taken orally with hot water in antihelminthic and liver complaints [10]. Cochlospermum religiosum (Cochlospermaceae) is deciduous tree. The oral administration of gum powder about 20g mixed with ghee works as an aphrodisiac [11]. Cocculus hirsutus (Menispermaccae) is a struggling scendent shrub with softly villous young parts. The leaves are useful in eczema, gonorrhoea, prurigo, impetigo cough, ophthalmia, cephalalgia and neuralgia [12]. Cyclea peltata (Menispermaccae) is a slender twining shrub. The roots and leaves are used in anti-inflammatory, cough, bronchitis, helminthiasis, diarrhoea, dropsy, painful swellings, skin diseases, leprosy, fever strangury, ulcers, wounds, vomiting, hyperdipsia and cardiac disorders [12]. Dillenia indica (Dilleniaceae) is evergreen trees. The leaves and fruits are used to astringent, laxative, fever and diarrhoea and Nymphaea neliuto (Nelumbonaceae) is wide spreading rhizomatous aquatic herbs.

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The whole plant used to haemorrhage, sterility, skin disease, ulcers and thirst [13]. *Polyalthia longifolia* and *Polyalthia pendula* (Annonaceae) are evergreen trees. The stem bark are used to febrifuge, rheumatism, menorrhagia, scorpion sting and diabetes; Rheumatism, constipation, worm infestation, polyuria, skin disorders and fever respectively [13]. *Tinospora cardifolia* (Menispermaceae) is woody climber. The stem bark and roots are used in diarrhoea and dysentery. Munda tribe use starch (extracted from stem) to woman after delivery since time immemorial. These can be derived from any part of the plant may contain active components.

Medicinal herbs have been use in one form or another under indigenous systems of medicine. [14] mentioned that the complete phytochemical investigations of medicinal plants of India should be carried out, because these secondary metabolites are responsible for medicinal activity of the plant. Number of plants were screened for secondary metabolites for their responsible for medicinal activity of the plant. Many workers [21] mentioned that the complete phytochemical screening of various plants is reported by many workers [24-26]. In the present work, qualitative phytochemical analysis was carried out in 18 plants.

**MATERIALS AND METHODS**

**Plant Material:** Fresh leaves of 18 different plant species free from diseases were collected during the month of December, 2010 from Tirumala hills and different locations of Chittoor District. Taxonomic identification of the plants were carried out with the help of Gamble. [27] and also compared with the herbarium present in Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh, India.

**Extraction:** The leaves were washed thoroughly 2-3 times with running tap water, leaf material was then air dried under shade after complete shade drying the plant material was grinded in mixer, the powder was kept in small plastic bags with paper labeling. The grinded leaves material of 5gm weighed using an electronic balance and were crushed in 25 ml of sterile water, boiled at 50-60°C for 30 minutes on water bath and it was filtered through Whatman No.1 filter paper. Then filtrate was centrifuged at 2500 rpm for 15 minutes and filtrate was stored in sterile bottles at 5°C for further use [28].

**Phytochemical Screening:** Preliminary qualitative phytochemical screening was carried out with the following methods.

**Steroids:** 1 ml of the extract was dissolved in 10 ml of chloroform and equal volume of concentrated sulphuric acid was added by sides of the test tube. The upper layer turns red and sulphuric acid layer showed yellow with green fluorescence. This indicated the presence of steroids [29].

**Terpenoids:** 2 ml of extract was added to 2 ml of acetic anhydride and concentration of H₂SO₄. Formation of blue, green rings indicate the presence of terpenoids [30].

**Fatty Acids:** 0.5 ml of extract was mixed with 5 ml of ether. These extract was allow it for evaporation on filter paper and dried the filter paper. The appearance of transparency on filter paper indicates the presence of fatty acids [30].

**Tannins:** 2 ml of extract was added to few drops of 1% lead acetate. A yellowish precipitate indicated the presence of tannins [31].

**Saponins:** 5 ml of extract was mixed with 20 ml of distilled water and then agitated in a graduated cylinder for 15 minutes. Formation of foam indicates the presence of saponins [32].

**Anthocyanins:** 2 ml of aqueous extract is added to 2 ml of 2N HCl and ammonia. The appearance of pink-red turns blue-violet indicates the presence of anthocyanins [33].

**Leucoanthocyanins:** 5 ml of aqueous extract added to 5 ml of isomyl alcohol. Upper layer appears red in colour indicates for presence of leucoanthocyanins [33].
Coumarins: 3 ml of 10% NaOH was added to 2 ml of aqueous extract formation of yellow colour indicates the presence of coumarins [34].

Emodins: 2 ml of NH₄OH and 3 ml of Benzene was added to the extract. Appearance of red colour indicates the presence of emodins [34].

RESULTS AND DISCUSSION

The phytochemical screening and qualitative estimation of 18 medicinal plants studied showed that the leaves were rich in anthocyanins, coumarins, fatty acids, emodins, leucoanthocyanins, tannins, terpinoids, steroids and saponins (Table 1). Anthocyanines are present only Cleome viscosa, anthocyanins helps 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 effect [35].

Coumarins are found in Cleome viscosa, Cochlospermum and Polyalthia longifolia. Various studies have been demonstrated that coumarin is a potential antioxidant and its antioxidant activity is due to its ability to scavenge free radicals and to chelate metal ions [36].

Fatty acids are present only Tinospora carduelia. Emodin compounds are present in Annona reticulata, Clematis gouriana and Polyalthia longifolia. Emodin isolated from a great deal of herbs is an effective constituent with many effects. Lots of pharmaceutical studies have demonstrated that emodin has many biological effects, such as anticancer, antimicrobial and anti-inflammatory effects [37].

Leucoanthocynine substances are found in Aridobrya hexapetala, Cappris zeylanica, Cleome viscosa, Cochlospermum and Cissampelos pareira. Tannin compounds are present in Cocculis hirsuta and Dillenia indica. The growth of many fungi, yeasts, bacteria and viruses was inhibited by tannins [38].

TERPENOIDS are found in 9 medicinal plants out of 18 plants selected. Terpenoids and tannins are attributed for analgesic and anti-inflammatory activities. Apart from this tannins contribute property of astringency i.e. faster the healing of wounds and inflamed mucous membrane [39].

Saponins are present in Aridobrya, Cadaba and Cocculis species. Traditionally saponins have been extensively used as detergents, as piscicides and molluscicides, in addition to their industrial applications as foaming and surface active agents and also have beneficial health effects [40].

Steroids compounds are found in 14 plants out of 18 medicinal plants. It should be noted that steroid compounds are of importance and of interest in pharmacy due to their relationship with sex hormones [21]. Steroids and terpinoids are found to be rich in most of the medicinal plants for the present study: the presence of bioactive compounds indicate the medicinal value of the plants. Antioxidants and antimicrobial properties of various extracts from many plants have recently been of great interest in both research and the food industry, because their possible use as natural additives emerged from a growing tendency to replace synthetic antioxidants and

<table>
<thead>
<tr>
<th>Table 1 Secondary metabolites of medicinal plants used to treat different ailments. No.</th>
<th>Name of the Species</th>
<th>Name of the secondary metabolites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ageratum conyzoides L.</td>
<td>Coumarin</td>
<td>Fatty acids</td>
</tr>
<tr>
<td>2. Ardisia spicata L.</td>
<td>-</td>
<td></td>
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<tr>
<td>3. Aridobrya hexapetala (L. f.) Bhutan</td>
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<tr>
<td>4. Bixa orellane L.</td>
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<td></td>
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<tr>
<td>5. Catharanthus roseus L.</td>
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<td></td>
</tr>
<tr>
<td>6. Cappris zeylanica L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Cleome viscosa (Hook. ex DC)</td>
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<tr>
<td>8. Cleome viscosa L.</td>
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<tr>
<td>9. Cleome viscosa (L.) Alain.</td>
<td></td>
<td></td>
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<tr>
<td>12. Dillenia indica L.</td>
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<td></td>
</tr>
<tr>
<td>14. Neurosperma aestivum L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Polyalthia longifolia (Sriv. et Thoms.)</td>
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<tr>
<td>16. Polyalthia longifolia (Sriv. et Thoms.)</td>
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<tr>
<td>17. Comperis persica L.</td>
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<tr>
<td>18. Tinospora carduelia (Wild.) ex Hook. f. and Thoms.</td>
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</tbody>
</table>

Note: " indicates presence and " indicates absence.
antimicrobials with natural ones [41]. Preliminary qualitative test according to [42] is useful in the detection of bioactive principles and subsequently may lead to drug discovery and development. [43] analyzed 53 medicinal plants for phytochemical characterization. According to previous studies, roots of Strychnos potatorum [42], leaves of Bauhinia recemosa [44], methanolic extract of roots and leaves of Hyptis suaveolens [45], ethanolic extract of Thymus fontanetisii and Laurus nobilis [46] and Rumex vesicarius [47], aqueous extracts of Echiumpynanthum pommel [48], Cardiosporum halicacabrum [49], root tuber of Cercisilge [50], leaves of Nerium and Monodora [21] and leaves, bark, root and galls of Pistacia [51].

In order to promote Indian herbal drugs, there is an urgent need to evaluate the therapeutic potentials of the drugs as per WHO guidelines [52]. [4] 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. [53] stated that the bioactive extract should be standardized on the basis of phytochemical compounds. Phytochemical screening of medicinal plants is very important in identifying new sources of therapeutically and industrially important compounds. It is imperative to initiate an urgent steps for screening of plants for secondary metabolites. The present communication attempt to assess the status of phytochemical properties in leaves of medicinal plants to improve the health status of people and also to use in pharmaceutical and nutraceutical products of commercial importance.

CONCLUSION

The medicinal plants appear to be rich in secondary metabolites, widely used in traditional medicine to combat and cure various ailments. The anti-inflammatory, antispasmodic, antianalgesic and antidiuretic can be attributed to their high steroids, tannins, terpenoids and saponins. Exploitation of these pharmacological properties involves further investigation of these active ingredients by implementation techniques of extraction, purification, separation, crystallization and identification.

REFERENCES


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

N. SAVITHRAMMA*, P. VENKATESWARLU, D.SUHRULATHA, S.K.M. BASHA AND CH. VENKATA RAMANA DEVI

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KEY WORDS
Boswellia ovalifoliolata
Endemic
Medicinal plants

ABSTRACT
Boswellia ovalifoliolata Bal. & Henry is a 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-medical-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 (Dudley, 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 (Rajasekharan, 2002).

Boswellia ovalifoliolata an endemic, endangered and threatened medicinal tree taxa belongs to the Tirupati – Kadapa – Nallamali hotspot of India. This 11th hotspot is harbours large number of endemic, endangered, rare, threatened 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 Bursaraceae.

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 Kowda vambrani 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 Pedatium 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 cordifolia 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. Phytochemical-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 ovalifoliolata* 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, values comparing the R, values of authentic samples. Anthocyanidins were extracted as per the method of Harborne and Gibbs (1973) and identified on Thin Layer Chromatography by spraying reagents and by comparing the R, values of authentic samples. The physical constants like ash and extractive values were determined by the method of Anonymous (1985) and Kokate (1991).

**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 gallic acid, chlorogenic 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 myricitin and apigenin are absent in bark and gum (Table 3). Table 4 showed that the anthocyanidins are not found in

**Table 1: Secondary metabolites of *Boswellia ovalifoliolata***

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Compound</th>
<th>Stem bark</th>
<th>Gum</th>
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<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Indoles</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Leucoanthocyanins</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Steroids</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Phenols</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Tannins</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Lignins</td>
<td>+</td>
<td>+</td>
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**Table 2: Phenols of *Boswellia ovalifoliolata***

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Compound</th>
<th>Stem bark</th>
<th>Gum</th>
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<tbody>
<tr>
<td>1.</td>
<td>Digallic acid</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Gallic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Flagic acid</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Aesculetin</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Cis-p-coumaric acid</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Iso-chlorogenic acid</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Chlorogenic acid</td>
<td>+</td>
<td>+</td>
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<tr>
<td>8.</td>
<td>Cafloric acid</td>
<td>-</td>
<td>-</td>
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<tr>
<td>9.</td>
<td>Protocatecholic acid</td>
<td>+</td>
<td>+</td>
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<td>10.</td>
<td>Gentisic acid</td>
<td>+</td>
<td>+</td>
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<tr>
<td>11.</td>
<td>Scooiletin</td>
<td>+</td>
<td>-</td>
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<tr>
<td>12.</td>
<td>Phenolic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>13.</td>
<td>p-Hydroxy benzoic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>14.</td>
<td>α - Resorcylic acid</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15.</td>
<td>β - Resorcylic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td>Tran-p-coumaric acid</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>17.</td>
<td>Vanillic acid</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td>p-coumaroylquinic acid</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td>Cis-p-coumaric acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td>Melilotic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>21.</td>
<td>Cis-Ferulic acid</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>22.</td>
<td>Coumarin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>23.</td>
<td>Salicylic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>24.</td>
<td>Cinnamic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>25.</td>
<td>Syringic acid</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 3: Flavonoids of *Boswellia ovalifoliolata***

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Compound</th>
<th>Stem bark</th>
<th>Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Quercetin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Rutin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Myricetin</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Luteolin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Apigenin</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Gentisic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Vitexin</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Table 4: Anthocyanidins of *Boswellia ovalifoliolata***

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Compound</th>
<th>Stem bark</th>
<th>Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cyanidin</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Petunidin</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Delphinidin</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 5: Amino acids of *Boswellia ovalifoliolata***

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Compound</th>
<th>Stem bark</th>
<th>Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Aspartic acid</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Arginine</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Asparagine</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>α-Alanine</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>β-Alanine</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>2- Amino butyric acid</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>Cysteine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Cystine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9.</td>
<td>Glutamic acid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10.</td>
<td>Glutamine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Glycine</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Histidine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>13.</td>
<td>Isoleucine</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>14.</td>
<td>Leucine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>15.</td>
<td>Lysine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>16.</td>
<td>γ-methylene glutamic acid</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>17.</td>
<td>γ-methylene glutamine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18.</td>
<td>Norleucine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>19.</td>
<td>Ornithine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>20.</td>
<td>Phenyl alanine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21.</td>
<td>Proline</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>22.</td>
<td>Serine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>23.</td>
<td>Threonine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>24.</td>
<td>Tryptophan</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25.</td>
<td>Valine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>26.</td>
<td>Tyrosine</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
the gum. The amino acids like y-methylene glutamic acid, phenyl alanine and tyrosine are absent in bark and gum (Table 5), and the two parts are lacking 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 jatamansi (Rani and Naidu, 1998), Thymus vulgaris (Bazylko and Strzelecka, 2007), Allium giganteum (Stainer 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.

### Table 6: Lipid contents of Boswellia ovalifoliolata

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Compound</th>
<th>Stem bark</th>
<th>Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phosphatidyl serine</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Phosphatidyl inositol</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Phosphatidyl choline</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Phosphatidyl ethanol amine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Digalactosyl diglyceride</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Phosphatidyl glycerol</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Sulphoquinoinosydi glyceride</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Monogalactosyl diglyceride</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Seryl glycoside</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Total ash</th>
<th>Acid insoluble</th>
<th>Water insoluble</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem bark</td>
<td>13.5</td>
<td>2.50</td>
<td>2.00</td>
</tr>
<tr>
<td>Gum</td>
<td>6.0</td>
<td>1.60</td>
<td>1.50</td>
</tr>
</tbody>
</table>

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 status of local people and also to use in pharmaceutical and nutraceutical products of commercial importance.

### REFERENCES


