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Phytochemical analysis and therapeutic values of certain plant-based gums and resins found in Ranchi district

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Abstract- *Moringa oleifera* Lam., *Shorea robusta* Roxb. ex Gaertn.f., *Butea monosperma* (Lam.) Taub. are some of the documented plants whose excretory products are known for their potential in the indigenous systems of medicine. However, little is known about active compounds found within these plants, which could be responsible for their therapeutic potential. This paper deals with the phytochemical activity of these plants to decipher active chemical compounds present in them which will also provide credence to traditional medicine.

Key words:- Gums, Resins, *Moringa oleifera*, *Shorea robusta*, *Butea monosperma*, Phyto-chemical analysis, Therapeutic values

INTRODUCTION

For ages, plants have been a vital source of medicine. Plants are the source of many potent and powerful drugs. Different parts of the plant are traditionally used for the treatment of diverse diseases. The use of different parts of the plant like leaves, stems, roots, flowers, fruits, etc. and their excretory products such as gums, resins and gums-resins as a medicament for treatment of various conditions is well documented in literature.¹

Gums and resins are low volume, high value product. India is one of the biggest producers of gums and resins in the world. India is a rich centre of plant biodiversity having more than 45,000 plant species including about 120 gum and resin yielding plants. In India, resins and gums are sold to earn a living by the tribes. In the present day, the uses of natural gums are numerous and they are employed by a large number of manufacturing industries including

food and pharmaceutical industries. The use of gums and resins in India as medicine can be traced back to the ancient days of Acharya Charak who wrote Charak Samhita Granth.²

Several studies have been carried out on various plant secreting gums and resins but majority of the work has been done on *Boswellia serrata*, *Commiphora mukul*, *Gardenia resinifera* and *Shorea robusta* against some plant pathogenic fungi.³⁻⁷

Moringa oleifera Lam. is a deciduous-to-evergreen shrub or small tree, fast growing perennial tree which can reach a maximum height of 7 to 12 m and a diameter of 20-60 cm at chest height. The stem is normally straight that reaches a height of 1.5 - 2.0m before it begins branching and it can reach upto a height of 3.0m. Its leaves are alternate, twice or thrice pinnate leaves crowded at the end of the branches, long petiole with 8-10 pair of pinnate leaves each bearing two pairs of opposite, elliptic or obovate, rounded or emarginated, entire, dull green on both sides, at first shortly grey, pubescent, glabrous. This tree is widely

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cultivated and naturalized worldwide in the tropics and subtropical regions of the world.⁸

Shorea robusta Roxb. ex Gaertn.f. (Sal) belongs to family Dipterocarpacea, which is usually well-known as Shal, Sal in Hindi and Indian Dammer and Sal tree in English. It is a deciduous tree generally found in India, from Himachal to Orissa Eastern districts spreading to the Eastern Ghats of Andhra Pradesh. It is a plant drug having multi-therapeutic potential to cure a variety of human ailments.⁹⁻¹³

Butea monosperma (Lam.) Taub. commonly known as flame tree, belongs to the sub-family Caesalpinioideae, family Fabaceae (formerly Leguminosae). This plant is commonly called as Palash tree in India. It is a medium-sized deciduous tree. It grows about 10-15 meters in height. It looks like a small bush when its height is 1-2 meters due to more branching. Its flower is odourless and looks reddish in the flowering season during springs and leaves are trifoliolate.¹⁴

Various screening has been done for antimicrobial activity of plant secreting gums and resins, but most of the

studies have primarily been done on gram-positive and gram-negative bacteria.¹⁵⁻¹⁸

Similarly, various compounds have been isolated from plant secreting gums and resins in which it has been found that maximum of them possessed alkaloids, flavonoids, terpenoids, tannins, saponins and glycosides and many phenolic compounds but concluded that sesquiterpenes is present as a major constituent for the inhibition of bacterial growth.^{17,19-22}

However, the studies on phytochemical constituents and medicinal properties in the gums and resins of the documented plants found in Ranchi district are scanty.

Therefore, the present study has been undertaken to deal with the phytochemical screening of the documented excretory parts of the plants such as *Moringa oleifera* Lam., *Butea monosperma* (Lam.) Taub., *Shorea robusta* Roxb. ex Gaertn.f. in different extract and also focus on their therapeutic values.

Study Area: Ranchi District of Jharkhand

Plant samples/ gums were collected from different areas of Ranchi district (Figures:1 and 2).

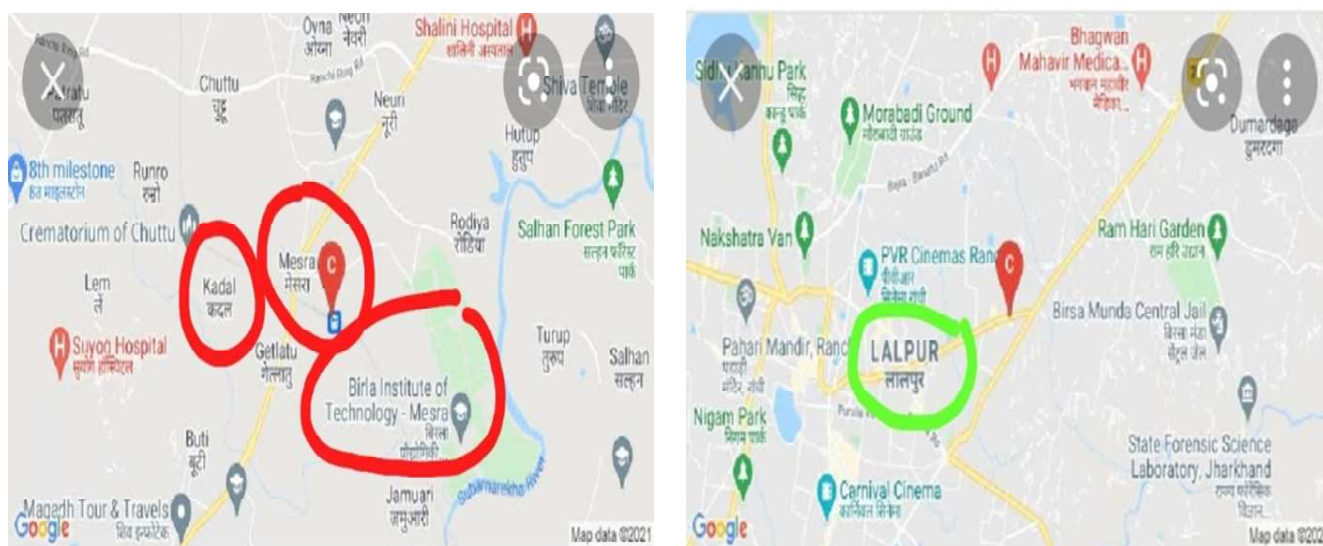








Fig. 1 & 2- Map of the different areas of Ranchi district from where plant samples have been collected.

The list of collected plant materials are as follows (Tables 1 and 2).

Table 1- List of plant-based gums and resins collected from different field of Ranchi district.

Sl. No.	Scientific Name	Common Name	Date of Collection	Place of collection
1.	<i>Moringa oleifera</i> Lam.	Sahjan	15th Sept., 2021	Lalpur, Ranchi
2.	<i>Shorea robusta</i> Roxb. ex Gaertn.f.	Sal, Sakhua, Sarai	18 th March, 2022	Namkum, Ranchi
3.	<i>Butea monosperma</i> (Lam.) Taub.	Palash	10 th April, 2022	Pithoria, Ranchi

Table 2- Images of plants in natural condition and their collected samples.

Sl. No.	Scientific Name	Plant in Natural Condition	Collected Gums and Resins
1.	<i>Moringa oleifera</i> Lam.		
2.	<i>Shorea robusta</i> Roxb. ex Gaertn.f.		
3.	<i>Butea monosperma</i> (Lam.) Taub.		

MATERIALS & METHODS

Collection of plant materials

Plant-based gums and resins were collected from different areas of Ranchi district in different seasons on the basis of their availability. Plant twigs were also collected and brought to the laboratory for identification by using 'The Botany of Bihar and Orissa', H. H. Haines (1922)²³. Collected plant twigs were also authenticated by the taxonomists of the University Department of Botany, Ranchi University, Ranchi and herbarium was prepared. Fully dried collected samples were stored in an air tight container.

Steps involved in the preparation of plants extracts

At first, the air dried plant samples/ gums (2 gms in each beaker) were taken and ground with the help of mortar and pestle and then the powdered materials of different samples collected were each soaked in (20 ml) three different respective solvents namely methanol, ethanol and aqueous (taken in 1:10) at 37°C in closed containers for

24 hours. The next day, the plant extracts were filtered with the help of Whatmann filter paper no.1. The filtrate was further diluted using the respective solvent used for the phytochemical screening and the analysis was carried out.

The plant extracts were screened for the presence of biologically active compounds like alkaloids, flavonoids, cardiac glycosides, phenolics, saponins, steroids, tannins, terpenoids, proteins and resins.

RESULTS & DISCUSSION

This study seeks to help the indigenous people of Jharkhand to know their therapeutic values of studied plants and also make them aware with the phytochemical analysis such as alkaloids, flavonoids, glycosides, terpenoids, steroids, tannin and proteins for the documented plants secreting gums and resins in different solvents.

Phytochemical screening of methanol, ethanol and aqueous extracts of gums of *Moringa oleifera* Lam. as found in Ranchi district suggests the presence of alkaloids, flavonoids, cardiac glycosides, terpenoids, carbohydrates, proteins, tannins, etc. (Table 3 and photographs a to c).

Table 3- Phytochemical screening of Methanol (M), Ethanol (E), Aqueous (A) extracts of gums of *Moringa oleifera* Lam. in Ranchi district.

Sl. No.	Constituents	Chemical Tests	Methanol Extract (M)	Ethanol Extract (E)	Aqueous Extract (A)
1.	Alkaloids	Dragendorff's Test	+	+	+
2.	Flavonoids	Alkaline Reagent Test	+	+	+
3.	Cardiac Glycosides	Keller Kelliani's Test	+	+	+
4.	Terpenoids	Salkowski's Test	+	+	+
5.	Carbohydrates	Mollisch's Test	+	+	+
6.	Phenol	Ferric Chloride Test	+	+	--
7.	Saponin	Foam Test	--	--	+
8.	Tannins	Bromine Water Test	+	+	+
9.	Resins	HCl Test/ FeCl ₃ Test	--	--	--
10.	Steroids	Salkowaski Test	+	+	--
11.	Proteins	Biuret Test	+	+	+

Note: + = Indicates presence of the phytochemical, - = Indicates absence of the phytochemical.

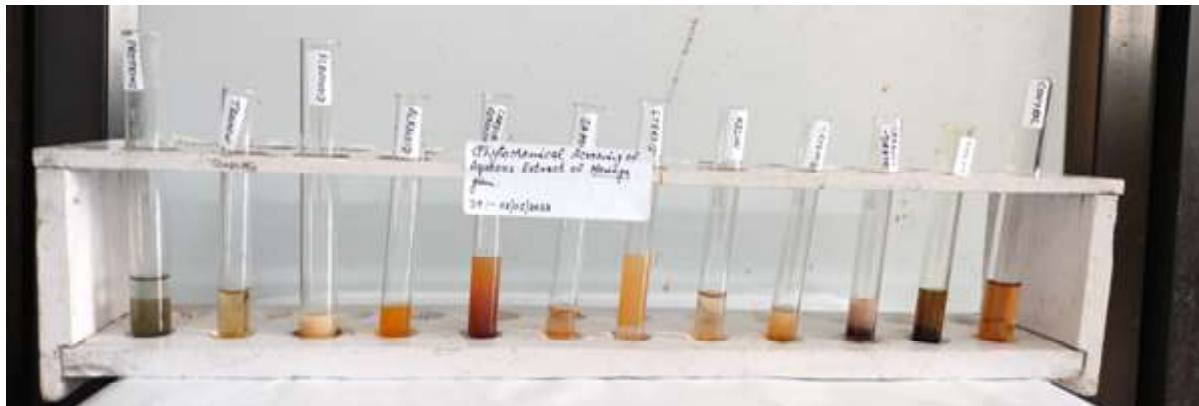


Photograph (a) of Phytochemical Screening of Methanolic Extract of gums of *Moringa oleifera* Lam.



Photograph (b) of Phytochemical Screening of Ethanolic Extract of gums of *Moringa oleifera* Lam.

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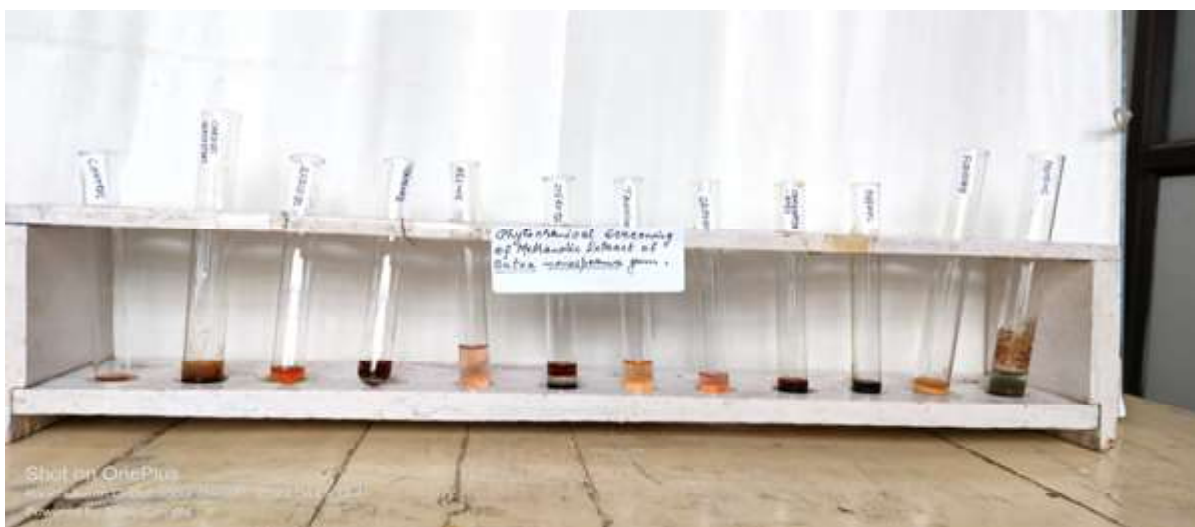
Photograph (c) of Phytochemical Screening of Aqueous Extract of gums of *Moringa oleifera* Lam.

Phytochemical screening of methanol, ethanol and aqueous extracts of gums of *Butea monosperma* (Lam.) Taub. as found in Ranchi district suggests the presence of alkaloids, flavonoids, cardiac glycosides, terpenoids, carbohydrates, proteins, tannins, etc. (Table 4 and photographs d to f).

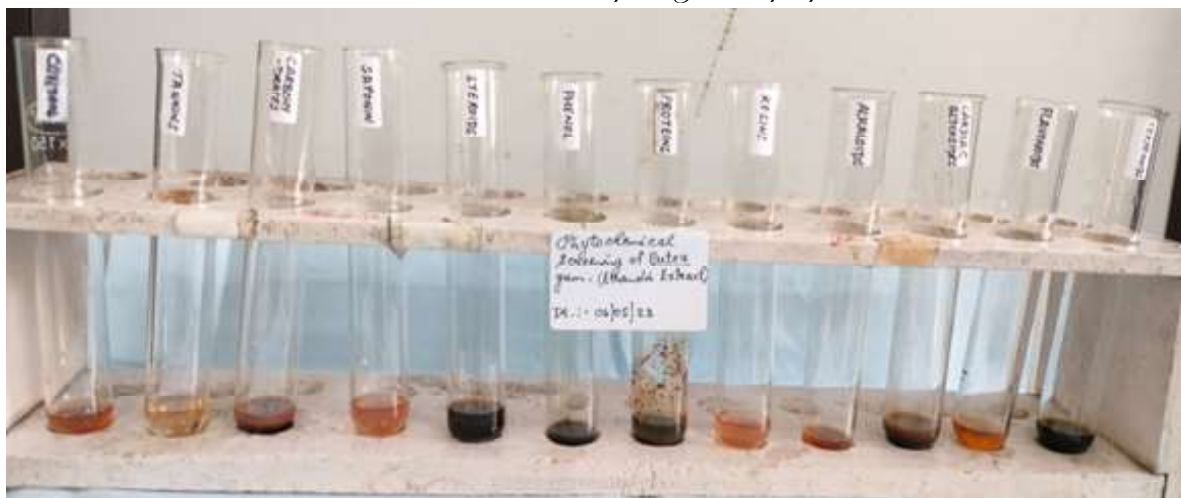
Table 4- Phytochemical Screening of Methanol (M), Ethanol (E), Aqueous (A) extracts of gums of *Butea monosperma* (Lam.) Taub. in Ranchi district.

Sl. No.	Constituents	Tests	Methanol Extract (M)	Ethanol Extract (E)	Aqueous Extract (A)
1.	Alkaloids	Dragendorff's Test	+	+	+
2.	Flavonoids	Alkaline Reagent Test	+	+	+
3.	Cardiac Glycosides	Keller Kelliani's Test	+	+	+
4.	Terpenoids	Salkowski's Test	+	+	+
5.	Carbohydrates	Mollisch's Test	+	+	+
6.	Phenol	Ferric Chloride Test	+	+	--
7.	Saponin	Foam Test	--	--	+
8.	Tannins	Bromine Water Test	+	+	+
9.	Resins	HCl / FeCl ₃ Test	--	--	--
10.	Steroids	Salkowaski Test	+	+	--
11.	Proteins	Biuret Test	+	+	+

Note: + = Indicates presence of the phytochemical, - = Indicates absence of the phytochemical.



Photograph (d) of phytochemical screening of Methanolic Extract of gums of *Butea monosperma*.



Photograph (e) of phytochemical screening of Ethanolic Extract of gums of *Butea monosperma*.



Photograph (f) of phytochemical screening of Aqueous Extract of gums of *Butea monosperma*.

Phytochemical screening of methanol and ethanol extracts of oleoresins of *Shorea robusta* Roxb. ex Gaertn. f. as found in Ranchi district suggests the presence of alkaloids, flavonoids, cardiac glycosides, terpenoids, carbohydrates, saponins, proteins, resins, tannins and steroids (Table 5 and photographs g to h).

Table 5- Phytochemical Screening of Methanol (M), Ethanol (E) extracts of oleoresins of *Shorea robusta* Roxb. ex Gaertn.f. in Ranchi district.

Sl. No.	Constituents	Tests	Methanol Extract (M)	Ethanol Extract (E)
1.	Alkaloids	Dragendorff's Test	+	+
2.	Flavonoids	Alkaline Reagent Test	+	+
3.	Cardiac Glycosides	Keller Kelliani's Test	+	+
4.	Terpenoids	Salkowski's Test	+	+
5.	Carbohydrates	Mollisch's Test	+	+
6.	Phenol	Ferric Chloride Test	--	+
7.	Saponin	Foam Test	+	+
8.	Tannins	Bromine Water Test	+	+
9.	Resins	HCl/ FeCl ₃ Test	+	+
10.	Steroids	Salkowaski Test	+	+
11.	Proteins	Biuret Test	+	+

Note: + = Indicates presence of the phytochemical, - = Indicates absence of the phytochemical

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Photograph (g) of Methanolic extract of oleoresins of *Shorea robusta* Roxb. ex Gaertn.f.



Photograph (h) of Ethanolic extract of oleoresins of *Shorea robusta* Roxb. ex Gaertn.f.

Medicinal uses or economic importance of the gums and resins of these plants are well documented in literature as follows (Table 6).

Table 6- List of some plant-based gums and resins which exhibit their medicinal values.

Scientific Name	Medicinal uses / Economic importance
<i>Moringa oleifera</i> Lam.	Gelling agent, binder, release retardant in tablet formulations, used in herbal medicine, diuretic, astringent, fever, dysentery, asthma, intestinal cancer. ^{8,24-30}
<i>Shorea robusta</i> Roxb. ex Gaertn.f.	Used as an ingredient of ointments to heal wounds, burns, pains, skin diseases and to control diarrhoea and dysentery. ^{12,13,31-34}
<i>Butea monosperma</i> (Lam.) Taub.	Used as medicine, food, fibre and for other miscellaneous purposes such as fish poison, dye, fodder, utensils, etc. ²¹

CONCLUSION

The phytochemical screening of gums of *Moringa oleifera* Lam. and *Butea monosperma* (Lam.) Taub. indicated the presence of alkaloids, flavonoids, cardiac glycosides, terpenoids, carbohydrates, phenol, tannins, steroids and proteins in the methanolic and ethanolic extracts whereas saponin and resins were not found to be present in the both extracts whereas in aqueous extract,

all the active constituents were found to be present except phenol, resins and steroids. In the case of oleoresins of *Shorea robusta* Roxb. ex Gaertn.f., all the active constituents were present in both methanolic and ethanolic extracts but only phenol was not present in methanolic extract.

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