

COMPARATIVE STUDIES ON PHYTOCHEMICAL CONSTITUENTS, MINERALS AND ANTIMICROBIAL ACTIVITIES OF BARK AND FRUITS OF *Oroxylum indicum* (L.) Vent.

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ABSTRACT

Oroxylum indicum (L.) Vent. belonging to the family Bignoniaceae is a species of flowering plant. Phytochemical screening and elemental analysis were performed on bark and fruits of *Oroxylum indicum* (L.) Vent. by using standard methods and Energy Dispersive X-ray Fluorescence (EDXRF) Spectrometer. And antimicrobial activities of ethanolic extract were tested by using agar well diffusion method on six selected organisms, such as *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bacillus pumilus*, *Candida albicans* and *Escherichia coli*.

Keywords: *Oroxylum indicum* (L.) Vent., bark and fruits, Phytochemical screening, elemental analysis and antimicrobial activities

1 INTRODUCTION

HERBAL medicine represents one of the most important fields of traditional medicine all over the world. Many countries in the world, that is, two-third of the world's population depends on herbal medicine for primary health care. Plants produce variety of compounds that can be divided into primary metabolites and secondary metabolites. From ancient time to modern world, it is not possible to manufacture the medicine without phytochemicals. Secondary metabolites are of human interest because they possess useful qualities such as being antibiotic, antimicrobial, antioxidant, anticancer, antiviral and anti-diabetes activities (Chevallier A, 2001).

The potential plant antimicrobial activities are due to the secondary metabolites such as alkaloids, steroids, resins, tannins, phenolics, flavonoids, and fatty acids which have a potential physiological rule on the body. (Ghulam Hussain *et al.*, 2018).

Among different medicinal plants, *Oroxylum indicum* (L.) Vent., a member of family, Bignoniaceae is a well known plant used for treatment of various diseases. It has about 120 genera and more than 750 species. It is widely distributed in tropical and subtropical regions. It is native to India, China and Malaysia commonly called midnight-horror flower. Flowering starts in the cold season, from January to March and fruits are developed in April to July (Joshi N *et al.*, 2014).

The bark tea of this plant is traditionally as a uterine tonic after childbirth. The roots and bark of this plant is used to treat skin diseases, vomiting, bronchitis, fevers, dysentery, diarrhea, asthma, leukoderma, dysentery and anal troubles. Powder of roots and bark with the sesame oil paste is used as a digestive tonic. The seeds of this plant are taken orally for curing throat infections. The fruits of this plant are effective in treating piles and otalgia. Flowers are used for treatment of ulcer and cholera. And fruits and flowers are consumed as vegetables. Leaves are used to treat to alleviate headaches. Leaves are also reported as prescribed medicine for snake bite. The root-bark and stem-bark are used in treating allergic diseases, jaundice, asthma, diarrhoea, dysentery and measles (Nazmul Hossain, 2016 and Dev *et al.*, 2010).

The root-bark contains chrysin, baicalein, dehydrobaicalein, and oroxylin. Stem-bark possesses flavonoids such as oroxylin, baicalein, scutellarin and 7-rutinoside, chrysin, and p-coumaric acid. Heartwood yields β -sitosterol and isoflavone-prunetin. Therefore, *Oroxylum indicum* (L.) Vent. possesses not only medicinal value but also economic value (Deka D C *et al.*, 2013).

Botanical Description of *Oroxylum indicum* (L.) Vent.

Scientific name : *Oroxylum indicum* (L.). Vent.
Family : Bignoniaceae
English name : Indian trumpet flower
Myanmar name : kyaung shar
Locality : Myitkyina, Kachin State
Habit : A small tree
Parts used : bark and fruits



Figure 1 Plant, the Bark, Flowers and Fruits of *Oroxylum indicum* (L.) Vent.

2. MATERIALS AND METHODS

2.1 Sample Collection and Preparation

The bark and fruits of *Oroxylum indicum* (L.) Vent. were collected from Myitkyina University campus, Kachin State, in October 2018. The bark and fruits of *Oroxylum indicum* (L.) Vent. were thoroughly washed with tap water, cut into small pieces and air dried for one month, and then stored in air tight glass bottles.



Preliminary Phytochemical Screening

The bark and fruits of *Oroxylum indicum* (L.) Vent. were subjected to preliminary phytochemical screening for the presence or absence of various primary or secondary metabolites by using standard methods (Harbone J.B.,1998).

2.2 Determination of Mineral Content in Bark and Fruits of *Oroxylum indicum* (L.) Vent.

Elemental compositions of the bark and fruits of *Oroxylum indicum* (L.) Vent. were measured at West Yangon University by Energy Dispersive X-ray Fluorescence Spectrometer (EDX-700), Shimadzu, Japan.

2.3 Ethanolic Extraction for Bark and Fruits

The powder of these parts of the plant (100 g) were percolated with 400 ml of ethanol at room temperature for one month, and then filtered. The filtrate obtained was concentrated at room temperature. The extract obtained was accurately weighed and then used for antimicrobial activity.

2.4 Determination of Antimicrobial Activities of Ethanolic extract of Bark and Fruits of *Oroxylum indicum* (L.) Vent.

The antimicrobial activities of ethanolic extract of bark and fruits of *Oroxylum indicum* (L.) Vent. were evaluated at Pharmaceutical Research Department, Yangon by using agar well diffusion method on six selected organisms that include three gram positive bacteria, *Bacillus subtilis*, *Bacillus pumilus* and *Staphylococcus aureus*, two gram negative bacteria, *Pseudomonas aeruginosa* and *Escherichia coli*, and fungi, *Candida albicans*.

3. RESULTS AND DISCUSSION

In this research work, phytochemical screening and elemental analysis of bark and fruits of *Oroxylum indicum* (L.) Vent. were carried out. And antimicrobial activities of ethanolic extract were also determined.

3.1 Phytochemical Screening of Bark and Fruits of *Oroxylum indicum* (L.) Vent.

Phytochemical screening of bark and fruits of *Oroxylum indicum* (L.) Vent. is shown in Figure 2 and 3, and Table 1.

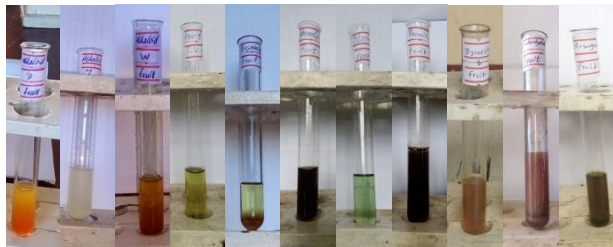


Figure 2 Phytochemical analysis of bark of *Oroxylum indicum* (L.) Vent.



Figure 3 Phytochemical analysis of fruit of *Oroxylum indicum* (L.) Vent.

Table 1 Preliminary Phytochemical Analysis of Bark and Fruits of *Oroxylum indicum* (L.) Vent.

No.	Tests	Extracts	Test reagents	Observation	Results	
					Bark	Fruits
1.	Alkaloids	1% HCl	Dragendroff's reagent	Orange ppt	+	+
			Wagner's reagent	Reddish brown ppt	+	+
			Mayer's reagent	Cream ppt	+	+
2.	Flavonoids	EtOH	Mg turning, conc: HCl	Orange color solution	+	+
3.	Terpenoids	EtOH	CHCl ₃ , conc: H ₂ SO ₄	Reddish brown ppt	+	+
4.	Phenolic compounds	EtOH	5% FeCl ₃	Black color solution	+	+
5.	Steroids	CHCl ₃	Acetic anhydride, conc: H ₂ SO ₄	Green color solution	+	+
6.	Saponins	H ₂ O	Distilled water	Frothing	+	+
7.	Tannins	H ₂ O	5% FeCl ₃	Dark brown color solution	+	+
8.	Glycosides	H ₂ O	10 % lead acetate	White ppt	+	+
9.	Carbohydrates	H ₂ O	10 % α -naphthol, conc: H ₂ SO ₄	Violet color ring of the interface of the two layers	+	+
10.	Reducing sugar	H ₂ O	Benedict's solution	Brick-red ppt	+	-

(+) = the presence of constituents

(-) = the absence of constituents

According to these results, both bark and fruits of *Oroxylum indicum* (L.) Vent. contained alkaloids, flavonoids, terpenoids, phenolic com-

pounds, steroids, saponins, tannins, glycosides and carbohydrates. But reducing sugars were observed in bark and were absent in fruits. These phytochemicals and their derivatives could be used as basic medical agents to prevent several diseases for humans.

Elemental Analysis of Bark and Fruits of *Oroxylum indicum* (L.) Vent.

The results of mineral content of the bark and fruits of *Oroxylum indicum* (L.) Vent. are shown in Figure 7 and Table 2.

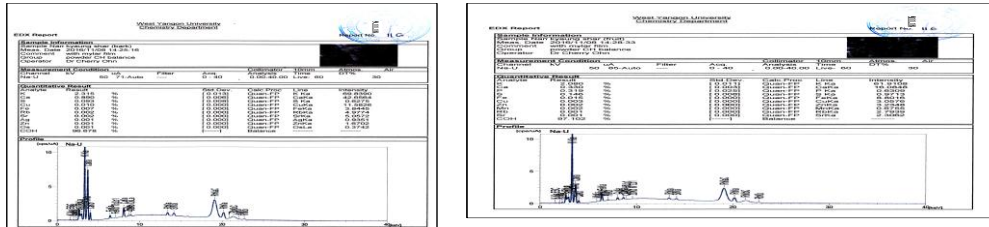


Figure 4 EDXRF spectra of bark and fruits of *Oroxylum indicum* (L.) Vent.

Table 2 Qualitative Analysis of Mineral Content in Bark and Fruits of *Oroxylum indicum* (L.) Vent.

No	Analysis	Relative abundance (%) of bark	Relative abundance (%) of the fruits
1.	Potassium (K)	2.315	2.080
2.	Calcium (Ca)	0.890	0.330
3.	Sulfur (S)	0.093	0.146
4.	Copper (Cu)	0.010	0.003
5.	Iron (Fe)	0.007	0.015
6.	Rubidium (Rb)	0.002	0.001
7.	Strontium (Sr)	0.002	0.001
8.	Silver (Ag)	0.001	-
9.	Zinc (Zn)	0.001	0.002
10.	Osmium (Os)	0.001	-
11.	Phosphorus(P)	-	0.319
12.	Manganese (Mn)	-	0.002

The results of mineral analysis showed the presence of potassium, calcium, sulfur, copper, iron, rubidium, strontium and zinc in both bark and fruits of *Oroxylum indicum* (L.) Vent. But, silver and osmium were found in bark and phosphorus and manganese were found in fruits. It was found that potassium is richer than other minerals. However, the different minerals are required in different amounts for human health. These minerals are essential because they could play key roles in several body functions.

Antimicrobial Activities of Ethanolic Extract From Bark and Fruits of *Oroxylum indicum* (L.) Vent.

The results of antimicrobial activities of ethanolic extracted from bark and fruits of *Oroxylum indicum* (L.) Vent. are shown in Figure 5 and Table 3 and, in Figure 6 and Table 4.



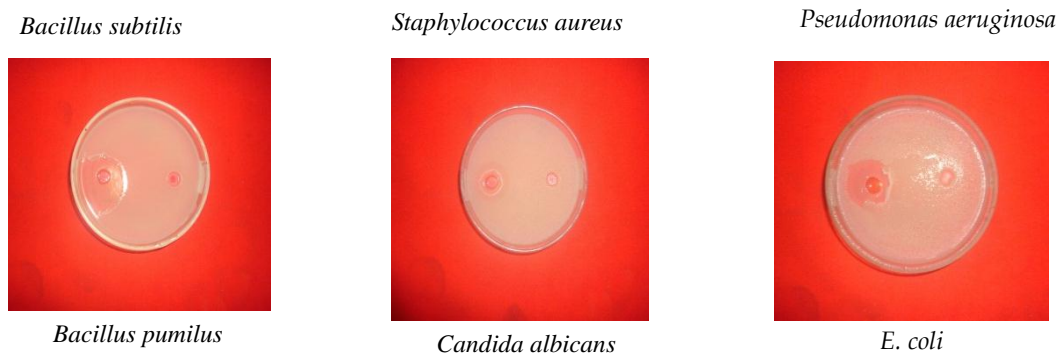


Figure 5 Antimicrobial Activities of Ethanolic Extract of bark

Table 3 Antimicrobial Activities of Ethanolic Extract from bark of *Oroxylum indicum* (L.) Vent.

Sample	Inhibition zone diameters of crude alkaloids against six microorganisms (mm)					
	I	II	III	IV	V	VI
Ethanolic extract	25mm (+++)	18mm (++)	20 mm (+++)	22 mm (+++)	18mm (++)	22 mm (+++)

Agar well – 10 mm	Organisms	
10 mm ~ 14 mm (+)	(I) <i>Bacillus subtilis</i>	(IV) <i>Bacillus pumilus</i>
15 mm ~ 19 mm (++)	(II) <i>Staphylococcus aureus</i>	(V) <i>Candida albicans</i>
20 mm above (+++)	(III) <i>Pseudomonas aeruginosa</i>	(VI) <i>Escherichia coli</i>

According to these results, the antimicrobial activities of ethanolic extract of bark showed high activities on four tested organisms and medium activity on *Staphylococcus aureus* and *Candida albicans*.

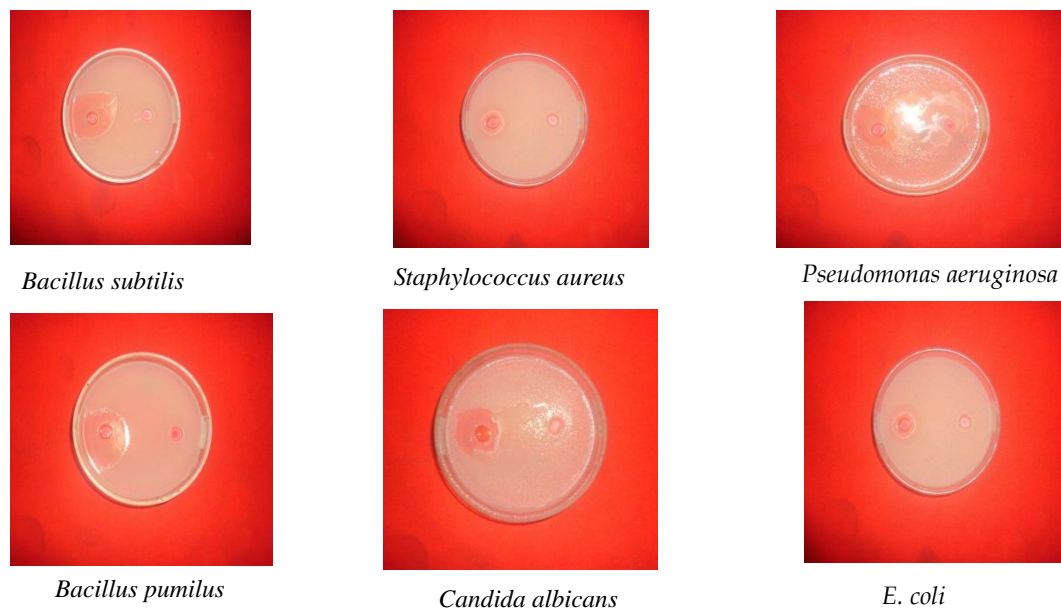


Figure 6 Antimicrobial Activities of Ethanolic Extract of Fruits

Table 4 Results of Antimicrobial Activities of Ethanolic Extract from fruits of *Oroxylum indicum* (L.) Vent

Sample	Inhibition zone diameters of crude alkaloids against six					
	I	II	III	IV	V	VI
crude alka-	30mm	25mm	30 mm	25mm	30mm	18mm

Agar well – 10 mm	Organisms	
10 mm ~ 14 mm (+)	(I) <i>Bacillus subtilis</i>	(IV) <i>Bacillus pumilus</i>
15 mm ~ 19 mm (++)	(II) <i>Staphylococcus aureus</i>	(V) <i>Candida albicans</i>
20 mm above (+++)	(III) <i>Pseudomonas aeruginosa</i>	(VI) <i>Escherichia coli</i>

According to these results, ethanolic extract of fruits showed high activities on five tested organisms and medium activity on *Escherichia coli*. These preliminary results appear to indicate that bark and fruits of *Oroxylum indicum* (L.) Vent. have potential source of medicinal activities.

4. CONCLUSION

The bark and fruits of *Oroxylum Indicum* (L.) Vent. showed the presence of alkaloids, flavonoids, terpenoids, phenolic compounds, steroids, saponins, tannins, glycosides and carbohydrates. However, reducing sugars were present in bark and absent in fruits. Both bark and fruits contained potassium, calcium, sulfur, copper, iron, rubidium, strontium and zinc. And silver and osmium were found in bark and phosphorus and manganese were found in fruits. Antimicrobial activities of ethanolic extract of bark showed high activities on four tested organisms and medium activity on *Staphylococcus aureus* and *Candida albicans* and that of fruits showed high activities on five tested organisms and medium activity on *Escherichia coli*. Therefore, bark and fruits of *Oroxylum Indicum* (L.) Vent. could be used as a potential source of phytochemicals and antimicrobial compounds. The presence of these secondary metabolites are of great importance as a source of new useful drugs. Further works are needed to isolate, characterize and elucidate the structures of the bioactive compounds in bark and fruits of *Oroxylum Indicum* (L.) Vent. for curing chronic and infectious diseases.

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