



PHYTOCHEMICAL SCREENING FOR VARIOUS PRIMARY AND SECONDARY METABOLITES OF *OXYSTELMA ESCULENTUM* R. BR.

Laxmi Sharma and Rajendra Prasad

Department of Botany
Government College Bundi (Rajasthan)

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ABSTRACT

Oxystelma esculentum is an annual climber that grows around water logged area so it is also known as water climber: 'Jal-lata' or 'Jaldudhi' in Hindi. It belongs to the family Apocynaceae. The current paper deals with the qualitative analysis of *O. esculentum* which was done using ethanolic extract. It determined the presence of different types of primary and secondary metabolites in which proteins, carbohydrates, alkaloids, phenols, tannins, flavonoids, terpenoids showed more presence while glycosides and saponins showed moderate presence.

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Keywords: Primary metabolites and secondary metabolites, *Oxystelma esculentum*, climber.

INTRODUCTION

Oxystelma esculentum is an annual climber. It grows around water logged area. Its common name is water climber while the vernacular name is 'Jal-lata' or 'Jaldudhi'. It belongs to the family Apocynaceae. It is an important medicinal plant that is used in the traditional system of medicine for its various ailments e.g., decoction and infusion of the plant are used to give treatment to mouth ulcers, sore throats, dysuria, chronic fever, and gonorrhoea, also as a hepatoprotective agent and blood purifier. These all-medicinal properties are due to the presence of different phytochemicals present in the plant. Phytochemicals are differentiated in primary metabolites and secondary metabolites based on their functions in plants. Primary metabolites contained carbohydrates amino-acids, proteins, and chlorophylls while secondary metabolites contained alkaloids, flavonoids, saponins, terpenoids, glycosides, tannins, and phenols etc. The current study has been performed to determine the phytochemical analysis of leaf, stem, and fruit of *Oxystelma esculentum*. The qualitative analysis is done using ethanolic extracts of the plant's samples.

MATERIALS AND METHODS

1. Collection of plant materials

The plant material selected for the current study is *Oxystelma esculentum* R.Br. belonging to the family Apocynaceae. It is commonly found in forests, thickets and open areas and thrive in various soil types with good drainage. It has white flowers with a yellow center, sometime tinged with pink or purple and are bell-shaped, nodding downwards. The flowers have pink or purple lines on the inside. The fruits are green, turning brown when ripe and contain small, dark brown seeds. It was collected in the month of September 2024 from the catchment area of Mangali river, Bundi district, Rajasthan (India). It categorized and identified by the Department of Botany and herbarium of this climber has been prepared and preserved in the Herbarium chamber of Department of Botany, Govt. College, Bundi.



Fig. 1: Flowers.

Fig. 2: Fruits *Oxystelma esculentum* R.Br

Fig. 3: Flowers and Leaves.

2. Preparation of Plant Extract

To prepare the extract the plant samples were washed with distilled water to remove the sediment particles. Then for drying the washed plant samples were absorbed on blotting paper and spread out in the shade at 25 to 26°C. A tissue blander was used to grind the dried plant parts and then the sample was preserved in refrigerator for future experimental use. Powered plant samples (60gm) were packed in thimble of Soxhlet apparatus and extracted with ethanol for 24 hours.

3. Phytochemical Analysis

The ethanolic plant extract of *Oxystelma esculentum* R.Br. were tested for primary metabolites such as proteins, carbohydrates, reducing sugars and fats & oils and secondary metabolites such as alkaloids, terpenoids, flavonoids, saponins, tannins, glycosides and phenolic groups etc. The phytochemical analysis of the plant extract was performed based on the standard methods.

Table 1: List of primary metabolites and secondary metabolite's test.

S. No.	Metabolites	Name of test
1.	Carbohydrates & reducing sugar	Molisch's test
		Benedict's test
2.	Proteins	Million's test
		Biuret test
3.	Fats and Fixed Oils	Saponification test
		Mayer's test
4.	Alkaloids	Wagner's test
		Hager's test
5.	Phenols & Tannins	Lead Acetate test
		Ferric Chloride test
6.	Flavonoids	Alkaline test
		Froth test
7.	Saponins	Horizon's test
8.	Terpenoids	
9.	Glycoside	Legal test

RESULTS AND DISCUSSION

The Qualitative phytochemical analysis of stem, fruits leaf, and root extracts of *Oxystelma esculentum* R.Br. in table no.2 summarized the presences of severable phytoconstituents. It reveals the presences of carbohydrates, proteins, fat & fixed oils, reducing sugar, alkaloids, flavonoids, glycosides, phenol, saponins, terpenoids, and tannins in the ethanolic plant extract in variable degree of precipitation such as copious, slight, and moderate in each tested plant extracts.

- **Carbohydrates and Reducing sugars:**

Presence of carbohydrates & reducing sugars has been analyzed through different tests (Molisch's test and Benedict's test). The results for carbohydrates and reducing sugars (Molisch's test and Benedict's test) revealed the high grade of precipitation (+++) in ethanolic plant extract of leaves and stems of *Oxystelma esculentum*, while, the same tests resulted in moderated degree of precipitation (++) in fruits extract.

- **Proteins**

Presence of proteins was analyzed using Millon's test and Biuret's test. In the ethanolic leaf extract of *Oxystelma esculentum*, Millon's test showed a higher degree of precipitation (+++), whereas Biuret's test indicated a moderate degree (++) in the stem extract, Millon's test showed a moderate degree (++) while Biuret's test revealed a higher degree (+++) of precipitation. In the fruit extract, Millon's test showed a mild degree (+), whereas Biuret's test indicated a moderate degree (++) of precipitation.

- **Fats & Fixed Oils:**

Presence of fats & oils has been analyzed through the Saponification test. The results for fats & oils (Saponification test) revealed the moderated level of precipitation (++) in ethanolic plant extract of stems, whereas, the same test resulted in mild degree of precipitation (+) in ethanolic plant extract of leaves and fruits of *Oxystelma esculentum*.

- **Alkaloids:**

The presence of alkaloids was analysed using Mayer's test, Hager's test, and Wagner's test. In the ethanolic leaf extract of *Oxystelma esculentum*, all three tests indicated a higher degree of precipitation (+++). In the fruit extract, all three tests showed a moderate degree (++) of

precipitation. In the stem extract, Mayer's test and Wagner's test revealed a moderate degree (++) of precipitation, whereas Hager's test showed a mild degree (+) of precipitation.

- **Flavonoids:**

Presences of flavonoids contents have been analyzed through Alkaline reagent test. The results of Alkaline reagents test for flavonoids revealed higher degree of precipitation (+++) in ethanolic extract of leaves, moderate degree of precipitation (++) in stems and mild degree (+) of precipitation in fruits extract of *Oxystelma esculentum*.

- **Phenols and Tannins:**

Presences of Phenols and Tannins have been analysed through two tests (Lead acetate test and Ferric chloride test). These tests shared same results as the both tests ascertained the presence of phenols and tannins with higher degree of precipitation (+++) in ethanolic plant extract of leaves, while, the same test resulted in mild level of precipitation (+) in stem extract and moderate degree of precipitation (++) in fruit extract of *Oxystelma esculentum*.

- **Saponins:**

Saponins in ethanolic plant extract revealed higher degree of precipitation (+++) in leaves, while, the same resulted in moderated degree of precipitation (++) in ethanolic plant extract of fruit and stem, independently froth test.

- **Terpenoids:**

Presences of terpenoid contents have been analysed through Horizon test. The results of this test showed higher degree of precipitation (+++) in ethanolic plant extract of leaves, while, the similar test result in moderated degree of precipitation (++) in fruit extract and mild degree of precipitation (+) in stem extract of *Oxystelma esculentum*.

- **Glycosides:**

Presence of Glycoside has been analysed through Legal test. The results of this test showed higher degree of precipitation (+++) in ethanolic plant extract of leaves, while, the similar test result in moderated degree of precipitation (++) in fruit and stem extract of *Oxystelma esculentum*.

Present finding is supported similar research worked by Ananth *et al.* (2010); Baswal *et al.* (2022); Gahtori *et*

al. (2024); Khatun *et al.* (2012); Panda (2019); Pandya and Anand (2011); Prabhakar *et al.* (2018); Prasad and Sharma (2014, 2016, 2018, 2019, 2020, 2021); Rahman *et al.* (2015); Ranganathan and Chinnaiyan (2011); Saini and Chauhan (2015); Savitha and Balamurugan

(2014); Savithramma *et al.* (2011); Sharma (2022); Sivakumar and Kavitha (2014); Uma *et al.* (2023); Venkataswamy *et al.* (2010). They evaluated various climber species which also support current research work.

Table 2: Qualitative analysis for primary metabolites and secondary metabolites in alcoholic leaf, stem, fruit and roots extracts of *Oxystelma esculentum*.

S. No.	Name of Phytochemicals	Name of Test	Extracted Plant Part	Results
1.	Carbohydrates and Reducing sugar	Molisch's test	Leaf	+++
			Stem	+++
			Fruit	++
		Benedict's test	Leaf	+++
			Stem	+++
			Fruit	++
2.	Proteins	Million's test	Leaf	+++
			Stem	++
			Fruit	+
		Biuret test	Leaf	++
			Stem	+++
			Fruit	++
3.	Fats & Fixed Oils	Saponification test	Leaf	+
			Stem	++
			Fruit	+
4.	Alkaloids	Mayer's test	Leaf	+++
			Stem	++
			Fruit	++
		Wagner's test	Leaf	+++
			Stem	++
			Fruit	++
		Hager's test	Leaf	+++
			Stem	+
			Fruit	++
5.	Phenols and Tannins	Ferric Chloride test	Leaf	+++
			Stem	+
			Fruit	++
		Lead Acetate test	Leaf	+++
			Stem	+
			Fruit	++

6.	Flavonoids	Alkaline reagent test	Leaf	+++
			Stem	++
			Fruit	+
7	Saponins	Froth Test	Leaf	+++
			Stem	++
			Fruit	++

CONCLUSION

In the current study, the phytochemical screening of *Oxystelma esculentum* R.Br. revealed the presence of various primary and secondary metabolites, including proteins, carbohydrates, fats, flavonoids, alkaloids, saponins, terpenoids, tannins, phenols, and glycosides. It is annual climber which easily found around Mangli river catchment area. It is beneficial in treating various diseases. These findings suggest that the plant may possess medicinal properties, supporting its traditional uses. Further studies are recommended to isolate and characterize these bioactive compounds and explore their potential therapeutic applications.

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