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Evaluation of Ethnopharmacological Potential of *Oenanthe javanica* DC.

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ABSTRACT

Oenanthe javanica (Apiaceae) is an aromatic perennial herb of the marshy wetlands which originated from the East Asia and distributed across the temperate and tropical Asia. It has food and medicinal values and can be a source of pharmacological agent against several health problems. Keeping the potential of *O. javanica* in mind, an attempt was made to evaluate its ethnopharmacological values as per the claims of Meitei community of Loktak Lake, Manipur, India. Loktak lake is a famous wetland of ecological importance with a unique ecosystem. Interviews were conducted by the local communities followed by phytochemical screening, antimicrobial and anthelmintic activities. Results showed that Meitei community consumed *O. javanica* for multiple purposes. Phytochemical screening exhibited the presence of phenolic compounds, flavonoids, tannins, terpenoids and saponins that could be responsible for the therapeutic potential of *O. javanica*. The antimicrobial activities revealed that the ethanolic extract showed good inhibitory activity against *S. typhii*. Both ethanolic and methanolic extract showed good inhibitory activity against *S. pyogenes*. The acetone extract showed good inhibitory activity against *V. cholerae*. Ethanolic extract showed good anthelmintic activity. The present study highlighted the importance of *O. javanica* of Loktak Lake that could be the source of future antimicrobial and anthelmintic agents.

Key words: Nutraceutical, secondary metabolites, antimicrobial activity, anthelmintic activity

INTRODUCTION

Nutraceuticals, a new era of traditional food as medicine, are emerging. The use of nutraceuticals is not new as the oldest scripture of Indian Ayurveda has mentioned several foods to be used for the treatment and prevention of diseases. The Chinese, Japanese old system of food medicine is not new which is still being used (Jha *et al.,* 2021). Over the last two decades, the use of nutraceuticals is increasing due to the information and awareness circulated among the people globally. Most of local plants as nutraceuticals are safe and provide health benefits, treatment and prevention of several diseases (Iyen *et al.,* 2019; Ruby *et al.,* 2021). The use of many such local plants and natural therapeutic knowledge are still unexplored and need to be documented to fight against food and health problems. Among such unexplored medicinal food plants, *O. javanica* is used for food and medicinal purposes by the Meitei community of Loktak Lake, Manipur, India. It is an important wetland with rich bioresources and ecosystem. The floating vegetation known as Phoomdi on the lake surface serves as a nutrient rich platform for the diverse wetland flora of highly important values. There are several medicinal and nutraceutical plants of the Phoomdi of Loktak Lake on which many livelihoods depend. However, depending on the ethnobotanical survey carried out in and around the Loktak Lake and the information gathered during the survey, *O. javanica* indicates that it is a high potential plant with rich nutrients as nutraceutical along with medicinal values. A wide array of medicinal uses of parts of this plant

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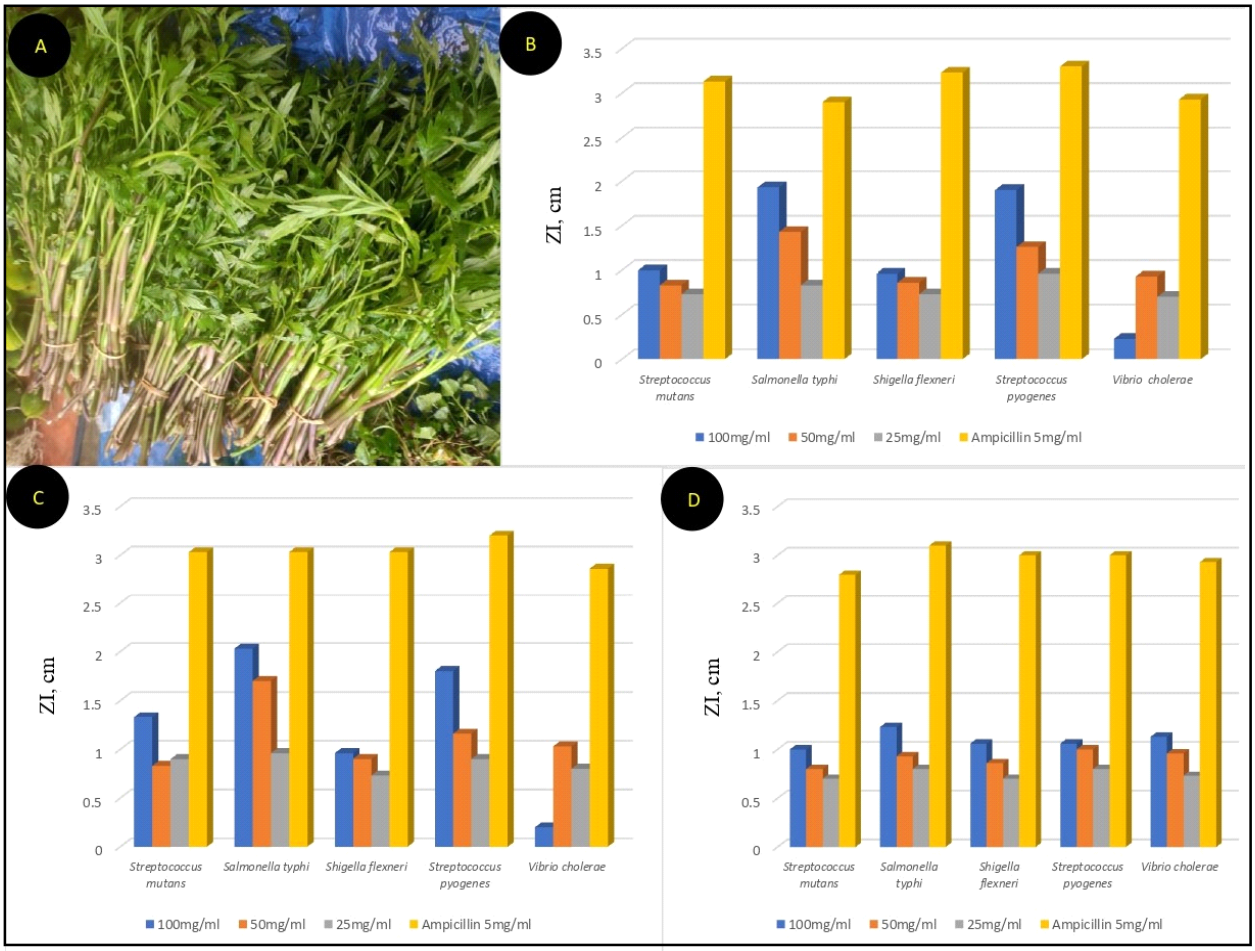
have been described in many literatures from different parts of the world (Devi *et al.,* 2016; Lu and Li, 2019). Keeping the potential of this plant in view, an attempt has been made to explore the local uses, phytochemistry, antimicrobial and anthelmintic activities of *O. javanica*.

MATERIALS AND METHODS

The plant parts of *O. javanica* (Plate 1) were collected by seniormost author, Rajkumari Supriya Devi from the Phoomdi (floating vegetation) of the Loktak Lake, Manipur and identified by Dr. Sanjeet Kumar. The collected plants were properly washed and cleaned and chopped into smaller pieces and spread out in shade for 12 days for complete drying. The dried plant parts were ground using an electric grinder. The grounded plant materials were further proceeded for extraction using standard methods (Banu and Catherine, 2015; Bhaigyabati *et al.,* 2017; Balamurugan *et al.,* 2019; Kancherla *et al.,* 2019; Shaik and Patil, 2020). Two solvents (methanol and ethanol) were taken for the antimicrobial activity against two Gram positive bacteria using Agar Well Diffusion assay i.e. *Streptococcus mutans* MTCC 497; *Streptococcus pyogenes* MTCC 1926 and three gram negative bacteria *Shigella flexneri* MTCC 1457 and *Salmonella typhi* MTCC 1252 (Balouiri *et al.,* 2016; Parvekar *et al.,* 2020; Owusu *et al.,* 2021) and *Vibrio cholerae* MTCC 3906. Anthelmintic activities were carried out using standard methods (Kumarasingha *et al.,* 2016; Karmakar *et al.,* 2018; Rahman *et al.,* 2019).

RESULTS AND DISCUSSION

The survey work revealed that in Manipur, *O. javanica* is locally known as "Komprek". It is used as an important food and traditional



Experimental plant parts and antimicrobial activities Plate 1. (A) Fresh bundles of *O. javanica* from Loktak Lake sold in the local market, (B) Agar Well Diffusion Assay of methanol extract of *O. javanica,* (C) Agar Well Diffusion Assay of ethanol extract of *O. javanica* and (D) Agar Well Diffusion Assay of acetone extract of *O. javanica* (ZI=Zone of Inhibition).

medicine by the local communities around the Loktak Lake. The phytochemical analysis of whole plant of *O. javanica* in different solvent extracts showed the presence of different phytochemical constituents in each solvent. Chloroform, acetone, methanol and aqueous extracts showed a good number of secondary metabolites. However, the most common phytochemical constituents involved reducing sugars followed by phenolic compounds, alkaloids, saponins, tannins and the least being carbonyl compounds and terpenoids (Table 1). Agar Well Diffusion Assay was carried out for methanol, ethanol and acetone extract of *O. javanica.* The highest zone of inhibition for methanol extract 100 mg/ml of the *O. javanica* showed 1.93 cm for *S. typhi* MTCC 1252 and *S. pyogenes* MTCC 1926 followed by *S. mutans* MTCC 497, S. flexneri MTCC 1457 and *V. cholerae* MTCC 3906 Plate 1 (B). The highest zone of inhibition for ethanol extract 100 mg/ml showed 2.03 cm for *S. typhi* MTCC 1252 followed by *S. pyogenes* MTCC 1926, *S. mutans* MTCC 497, *S. flexneri* MTCC 1457 and *vibrio cholerae* MTCC 3906 Plate 1 (C). The highest zone of inhibition for acetone extract 100 mg/ml showed 1.23 cm for *S. typhi* MTCC 1252 followed by *V. cholerae* MTCC 3906, *S. flexneri* MTCC 1457, *S. pyogenes* MTCC 1926, *S. mutans* MTCC 497 Plate 1 (D). Broth Dilution Assay for methanol, ethanol and acetone extract of *O. javanica* for different concentrations i.e. 100, 25, 12.5, 6.25 and 3.125 mg/ml was carried out to get MIC. MIC of methanol extract against *S. mutans* MTCC 497, *S. typhi* MTCC 1252, *S. flexneri* MTCC 1457, *S. pyogenes* MTCC 1926 and *V. cholerae* MTCC 3906 was 50, 50, 100, 50 and 50 mg/ml, respectively. MIC of ethanol extract against *S. mutans* MTCC 497, *S. typhi* MTCC 1252, *S. flexneri* MTCC 1457, *S. pyogenes* MTCC 1926 and *V. cholerae* MTCC 3906 was 50, 50, 100, 100 and 100 mg/ml, respectively. MIC of acetone extract of *O.javanica* against *S. mutans* MTCC 497, *S. typhi* MTCC 1252, *S. flexneri* MTCC 1457, *S. pyogenes* MTCC 1926 and *V. cholerae* MTCC 3906 was 100, 100, 100, 50 and 50 mg/ml, respectively (Table 2). *In vitro* experiment of anthelmintic activity of ethanol, methanol and acetone extract of *O. javanica* (40, 20, 10 and 1.0 mg/ml) was carried out against *Asenia fatida.* The shortest paralysis and death time was shown by methanol extract

Table 1. Presence of phytochemical constituents in different solvent extracts of *O. javanica*

Plant solvent extracts	Secondary metabolites
n-Hexane	Alkaloids
Petroleum ether	Reducing sugars
Chloroform	Saponins, flavonoids and carbonyl compounds
Acetone	Alkaloids, flavonoids and terpenoids
Methanol	Phenolic compounds, reducing sugars and steroids
Ethanol	Tannins and reducing sugars
Aqueous	Tannins, saponins, phenolic compounds and reducing sugars

Table 2. Minimum inhibitory concentration for various extract of *O. javanica*

Organism used	Concentration						Inoculum control	Broth control
	100 mg/ml	50 mg/ml	25 mg/ml	12.5 mg/ml	6.25 mg/ml	3.125 mg/ml		
S. mutans MTCC 497	No growth	No Growth	Growth	Growth	Growth	Growth	Growth	No growth
S. typhi MTCC 1252	No growth	No Growth	Growth	Growth	Growth	Growth		
S. flexneri MTCC 1457	No growth	Growth	Growth	Growth	Growth	Growth		
S. pyogenes MTCC 1926	No growth	No Growth	Growth	Growth	Growth	Growth		
V. cholerae MTCC 3906	No growth	No Growth	Growth	Growth	Growth	Growth		
Concentration of ethanol extract of *O. javanica*								
S. mutans MTCC 497	No growth	No Growth	Growth	Growth	Growth	Growth		
S. typhi MTCC 1252	No growth	No Growth	Growth	Growth	Growth	Growth		
S. flexneri MTCC 1457	No growth	Growth	Growth	Growth	Growth	Growth		
S. pyogenes MTCC 1926	No growth	Growth	Growth	Growth	Growth	Growth		
V. cholerae MTCC 3906	No growth	Growth	Growth	Growth	Growth	Growth		
Concentration of acetone extract of *O. javanica*								
S. mutans MTCC 497	No growth	Growth	Growth	Growth	Growth	Growth		
S. typhi MTCC 1252	No growth	Growth	Growth	Growth	Growth	Growth		
S. flexneri MTCC 1457	No growth	Growth	Growth	Growth	Growth	Growth		
S. pyogenes MTCC 1926	No growth	No Growth	Growth	Growth	Growth	Growth		
V. cholerae MTCC 3906	No growth	No Growth	Growth	Growth	Growth	Growth		

Table 3. Anthelmintic activity of ethanol extract of *O. javanica*

Treatment	Concentration (mg/ml)	Paralysis time			Mean paralysis time± Standard deviation	Death time			Mean death time± standard deviation
		(n=1) Hours	(n=2) Hours	(n=3) Hours		(n=1) Hours	(n=2) Hours	(n=3) Hours	
Saline	-	-	-	-		-	-	-	
Albendazole	20	2	2.25	2	2.16±0.23	2.5	2.50	2.75	2.58±0.11
EEOV	40	6	5.75	5.90	5.88±0.10	10	9.75	10.2	9.98±0.18
EEOV	20	8	8.00	7.5	7.83±0.23	12	12.00	11.50	11.83±0.23
EEOV	10	12	10.9	11.5	11.46±0.44	16	15.5	16.00	15.83±0.23
EEOV	1	12	11.5	11.9	11.8±0.21	18	17.8	18.50	18.1±0.29

EEOV: Ethanol extract of *O. javanica.*

Table 4. Anthelmintic activity of methanol extract of *O. javanica*

Treatment	Concentration (mg/ml)	Paralysis time			Mean paralysis time± Standard deviation	Death time			Mean death time± standard deviation
		(n=1) Hours	(n=2) Hours	(n=3) Hours		(n=1) Hours	(n=2) Hours	(n=3) Hours	
Saline	-	-	-	-		-	-	-	
Albendazole	20	2.0	2.10	2.5	2.2±0.21	2.5	2.75	2.75	2.66±0.11
MEOV	40	2.0	2.00	2.25	2.16±0.23	2.5	3.00	3.00	2.83±0.23
MEOV	20	2.5	2.75	2.00	2.41±0.31	3.0	2.75	3.00	2.91±0.11
MEOV	10	3.0	3.10	3.50	3.2±0.21	4.5	5.00	4.75	4.75±0.20
MEOV	1	4.5	5.00	4.75	4.75±0.20	5.0	5.25	5.50	5.25±0.20

MEOV: Methanol extract of *O. javanica.*

Table 5. Anthelmintic activity of acetone extract of *O. javanica*

Treatment	Concentration (mg/ml)	Paralysis time			Mean paralysis time± Standard deviation	Death time			Mean death time± standard deviation
		(n=1) Hours	(n=2) Hours	(n=3) Hours		(n=1) Hours	(n=2) Hours	(n=3) Hours	
Saline	-	-	-	-		-	-	-	
Albendazole	20	2.0	2.00	2.00	2±0.00	2.5	2.50	2.6	2.53±0.04
AEOV	40	2.0	2.25	2.25	2.16±0.11	2.5	2.75	3.0	2.75±0.20
AEOV	20	2.0	1.90	2.00	1.96±0.04	3.0	3.50	3.0	3.16±0.23
AEOV	10	2.0	2.25	2.50	2.25±0.20	3.0	3.35	3.5	3.28±0.20
AEOV	1	2.5	3.00	3.00	2.83±0.23	3.5	3.75	4.0	3.75±0.20

AEOV: Acetone extract of *O. javanica.*

(40 mg/ml) and acetone extract (40 mg/ml) of *O. javanica* (Tables 3, 4 and 5).

The ethnobotanical survey of the medicinal plants of Loktak Lake revealed that *O. javanica* has a high potential in terms of food, medicine, or as a nutraceutical. The experimental work on the phytochemical analysis of it revealed the presence of diverse secondary metabolites. The antimicrobial and anthelmintic activities showed their ethnopharmacological potential. Therefore, it could be used as a nutraceutical agent for value addition in terms of providing good health and livelihood to local communities in Loktak Lake, Manipur.

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