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Research Article

## Phytochemical and Therapeutic Potential of Bioenergetic plant: *Trapa bispinosa* Roxb.

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### ABSTRACT

The present study includes the determination of physicochemical property, qualitative phytochemical investigation, fluorescence analysis and organoleptic property of kernel of fruit of water chestnut (*Trapa bispinosa* Roxb) in different solvents. Maximum extractive value was obtained in aqueous solution (8.42%) followed by methanol (80%) (5.42%), ethanol (80%) (2.88%), ethanol (2.34%), methanol (2.02%), acetone (0.94%) and chloroform (0.74%). Total ash content (2.30%) and moisture content (10.22%) were recorded in dried kernel. Qualitative analysis showed presence of carbohydrate, reducing sugar, starch, protein, flavonoid while phenols, saponin and tannins were absent in dried kernel of fruit. Fluorescence characteristics of crude drug powder of dried kernel fruit treated with acids, benzene, ammonia and FeCl<sub>3</sub> showed different colour in UV light and ordinary visible light. Organoleptic property of kernel fruit was also recorded on the basis of colour, odor, taste and texture as off white, specific, sweet and powdery respectively. Present work suggests that kernel of fruits of *Trapa* has significant positive biomolecules to be used as industrial, pharmaceutical and nutraceuticals crop and can be further bioprospected for polyvalent utilization.

**Keywords:** Fluorescence, Organoleptic property, Physicochemical, Phytochemical.

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### INTRODUCTION

Nature itself is a complete store house of remedies to cure and prevent almost all ailments of humans. As the population is increasing rapidly inadequate supply of drugs, high cost of treatment, side effects along with drug resistance has been encountered in synthetic drug which has led to an elevated emphasis for the use of plants to treat human diseases. The healing powers of traditional herbs have been realized since antiquities<sup>1</sup>. It has been documented that most of the fruits, vegetables and natural plant products contain huge variety of phytochemical and are the major source of antioxidant in diet<sup>2</sup>. Plants are the potential source for providing natural antioxidants, carotenoids, flavonoids, tocopherols, cinnamic acid, folic acid, ascorbic acid etc. are the most prominent antioxidants produced by plants<sup>3</sup>. Phytochemicals play an important role in the pharmaceutical industry as raw materials or as a particular drug. Secondary metabolites obtained from the plants are found to be an important source of various phytochemicals that could be used for the production of pharmaceuticals. So the demand for herbal medicine is continuously increasing day by day in comparison to the synthetic drugs<sup>4</sup>. Aquatic plants are getting special attention of world with their unique property of medicine, food, fodder,

fiber and other bio functionally important products. An aquatic plant contains a great variety of bioactive chemical compounds which shows wide range of medicinal property. The important active secondary metabolites are terpenes, alkaloids, flavonoids and phenolic compounds. *Trapa bispinosa* Roxb. is commonly known as water chestnut belonging to family Trapaceae. It is one of the most important annual, aquatic, edible angiosperm warm seasonal fruit crop (1a). Water chestnut commercially cultivated in different parts of the country in low lands, ponds and pools (2a). Plant body has flexuous ascending photosynthetic stem reaches up to 5 meters, leaves are two type floating and submerged, floating leaves are crowded at the upper part of the stem, rosette type, rhomboidal, apex triangular and irregular. Submerged leaves are latterly dissected in to capillary segment, petioles are spongy about 10 to 15 cm. Flowers are auxiliary, white and solitary. After pollination, flowers are bend downward to facilitate formation of fruit. Fruit is about 2 cm in diameter. The fruit is bony, one seeded nut with unequal cotyledons (3a). The main bio functional part of the plant is fruit which has a folkloric reputation as a cure of various diseases. It has been used since ancient times in Ayurveda for the treatment of various ailments<sup>5</sup>. Fresh fruits are sweet, delicious and

farinaceous. In indigenous system of medicine, it is reported to treat a variety of ailments like leprosy, burning sensation, fatigue, inflammation, biliousness, strangury and making liniments. In addition to this in Yunani system of medicine, fruits are used as aphrodisiac, antipyretic and useful in

bilious affection, bronchitis and sore throat <sup>6</sup>. The tribes of Orissa used the fresh fruit in treatment of gastrointestinal disorder. The traditional knowledge of about the fruit of water chestnut have high nutritional value makes it a popular substitute of cereals in Indian subcontinent.



**Figure 1:** *Trapa bispinosa* Roxb. (whole plant)



**Figure 2:** *Trapa bispinosa* Roxb. Pulverized Dried Kernel



**Figure 3:** *Trapa bispinosa* Roxb. Fresh fruit

The aim of the present study was therefore to carried out analysis of physicochemical, bio functional and phytochemical qualitative properties of fruit of *Trapa bispinosa* Roxb. The bioprospection were made with the analysis of bioactive chemical constituents with different parameters to increase its efficiency in promoting human health.

## MATERIAL AND METHOD

### Chemicals:

All the reagents and solvent used in this experiment were of quality grade.

### Collection and Extraction of Plant Material-

Fruits of *Trapa bispinosa* Roxb. were collected as well as purchased from the local market of Gorakhpur as per need of experiments. Fruits were cut into small pieces, remove its peel, wash thoroughly and dried in electric oven until fruits were properly dried, pulverized into fine powder form and stored in plastic airtight container for further experiments. Extractions were made by Soxhlet apparatus and cold maceration in different solvents.

### Analysis of Moisture Content:

Analysis of total moisture content was carried out by evenly mixed powdered sample of fruit 5.0 gram kept in preweighted Petri dish. Then Petri dish was heated at 105° C in hot air oven for 5 hr. and the sample was cooled in desiccator. The total loss in weight was recorded (w/w) as moisture content.

### Calculation

$$\text{Moisture \%} = \frac{W_1 - W_2}{W_1} \times 100$$

Where –

W<sub>1</sub> = Weight of the sample before drying

W<sub>2</sub> = Weight of sample after drying

### Analysis of Total Ash

Two gram of powdered plant material was weighed in a tared china dish, kept in furnace at the temperature 675±25° C for the duration until ash got free from carbon. Cool the dish in desiccator and percentage of total ash was calculated with reference to sample weight.

### Calculation

$$\text{Ash \%} = \frac{\text{Weight of the ash}}{\text{Weight of the sample}} \times 100$$

### Analysis of Extractive Value:

Five gram of crude sample of fruit was added to 100 gram of given solvent (absolute) followed with 80 % in a closed flask for 24 hours, shaking frequently at regular interval after this sample was filtered continuously and evaporated to dryness in a tarred flat bottomed shallow dish, dried at 105° C and weight. The percentage of soluble extractive value was calculated with reference to dried weight.

$$\% \text{ of Extraction} = \frac{\text{Weight of dried extract}}{\text{Weight of fresh material}} \times 100$$

## RESULT

### Physicochemical Studies:

Physicochemical properties of fruits of *Trapa* was estimated and recorded in table 1 done with different parameters that are total ash content, percentage extractability in different solvent and moisture content of fruit was determined physicochemical property.

### Qualitative Phytochemical Analysis:

Qualitative phytochemical analysis of fruit of *Trapa bispinosa* Roxb. revealed the presence of important bioactive chemical compounds with secondary metabolites. Qualitative phytochemical analysis gave positive result for carbohydrate (Molisch's test), reducing sugar (Fehling's test), starch (iodine test), protein (Biuret test), flavonoids (alkaline reagent test), and tannin (ferric chloride test) were present which shown in table no. 2

**Fluorescence Characteristics of Powdered Fruit:** It is an important parameter for parameter for Pharmacognostic studies. Ultra violet light produces fluorescence in crude natural drug of dried kernel of fruit with freshly prepared chemical reagent which do not visibly fluoresce in day light. By this method crude drugs are qualitatively analyzed easily, analysis of crude drug helps in identification and authentication of plant material. Fluorescence property of powder of fruit of *Trapa bispinosa* Roxb. were treated with different reagents under ultra-violet and compared with ordinary light, drug + H<sub>2</sub>SO<sub>4</sub>, drug + 50% H<sub>2</sub>SO<sub>4</sub>, drug + HCl, drug + 50% HCl, drug + Conc. HNO<sub>3</sub>, drug + 50% HNO<sub>3</sub>, drug + Benzene, drug + Acetic acid, drug + Ammonia and drug + FeCl<sub>3</sub>. Different colors were observed with different chemical reagent in both UV-light and day light, results are shown in table no. 3.

**Table 1: Physicochemical Analysis of Dried Kernel Fruit of *Trapa bispinosa* Roxb.**

Sr. no.	Physicochemical test	Yield (%)
1	Moisture content	10.22% w/w
2	Total ash content	2.30% w/w
3.0	<b>Extractive yield of Dried Kernel Fruit in different solvent</b>	.....
3.1	Aqueous % yield	8.42% w/v
3.2	Methanolic 80 % yield	5.42% w/v
3.3	Ethanol 80 % yield	2.88% w/v
3.4	Ethanol % yield	2.34% w/v
3.4	Methanolic % yield	2.02% w/v
3.5	Acetone % yield	0.94% w/v
3.6	Chloroform % yield	0.74% w/v

All the physicochemical activities were carried out in triplicates.

**Table 2: Qualitative Phytochemical Analysis of Fruit of *Trapa bispinosa* Roxb.**

Sr.No.	Pytochemicals	Method	Result
1-	Carbohydrate	Molisch's Test	+++
2-	Reducing Sugar	Fehling's Test	+++
3-	Starch	Iodine Test	+++
4-	Phenol	Ferric Chloride Test	-
5-	Saponin	Foam Test	-
6-	Protein	Biuret Test	++
7-	Flavonoid	Alkaline Reagent Test	+
8-	Tannin	Ferric Chloride Test	-

+ = Presence, - = Absence



**Table3: Fluorescence Characteristics of Fruit of *Trapa bispinosa* Roxb.**

Sr.No.	Chemical treatment of crude drug+Reagent	UV Light (Observation)	Ordinary Light (Observation)
1-	Drug + H <sub>2</sub> SO <sub>4</sub>	Light brown(wine)	Mustered yellow
2-	Drug + 50% H <sub>2</sub> SO <sub>4</sub>	White	Creamy white
3-	Drug + HCl	Light brown	Green
4-	Drug + 50% HCl	Off white	White
5-	Drug + Conc.HNO <sub>3</sub>	Yellow	Peach colour
6-	Drug + 50% HNO <sub>3</sub>	Light purple	Greenish yellow
7-	Drug + Benzene	Sea green	Light brown
8-	Drug + Acetic Acid	Milky white	White
9-	Drug + Ammonia	Earthy Brown	Yellow
10-	Drug + FeCl <sub>3</sub>	Brown	Yellowish green

Drug: Crude Pulverized Dried Kernel

**Organoleptic Property of Fruit:**

Organoleptic Property of fruit of *Trapa bispinosa* Roxb. was estimated by different parameters. viz. colour, odor, taste and texture were evaluated. Organoleptic characters provide the simple as well as quick technique to establish the identity and purity to ensure the quality of a particular drug.

**Table 4: Organoleptic property of Fruit of *Trapa bispinosa* Roxb.**

Sr. No.	Parameter	Result
1.	Color	Off white
2.	Odor	Specific
3	Taste	Sweet
4	Texture	Powdery

**DISCUSSION**

Present study was useful in determining and identifying of the importance of the fruit of the plant. Physicochemical quality includes moisture content (10.22%), total ash (2.30), aqueous extractive value (8.42%), ethanol extractive value (2.34%), extractive value of 80% ethanol, methanolic extractive value (2.02%), extractive value of 80% methanol (5.42%) followed by extractive value of acetone (0.94%) and chloroform (0.74%). Qualitative phytochemical analysis of the fruit showed the positive result for presence of carbohydrate high amount followed by reducing sugar and starch. Presence of protein was carried out by biuret test showed positive result; presence of flavonoid by alkaline reagent test gave positive result whereas phenol, saponin and tannin gave negative response. Fluorescence characteristics of fruit of dried kernel of the plant recorded in presence of UV-light compared with ordinary day light which provide important qualities of fruit followed by organoleptic study of fruit studied as colour off white, odor specific (sweet), taste sweet and texture powdery.

**CONCLUSION**

In this paper we focused on the thoroughly investigation for their physicochemical property, phytochemical and organoleptic properties of fruit to analyze their quality, safety and standardization for their use. Aqueous, ethanolic, chloroform and acetone extracts, physicochemical test and organoleptic properties of fruit showed positive results which support its traditional use against diseases and responsible for their therapeutic effects. *Trapa bispinosa* has

immense potential in the treatment of conditions such as diarrhea, strangury, dysuria, polyuria, sexual debility, general debility, sore throat, lumbago etc. This plant contains medicinally important bioactive compounds that justify their use in the traditional medicines for the treatment of various ailments as well as for nutritive purposes. Further research work will be focused on the progress of the work on the nutraceutical characterization of the therapeutic potent biomolecules from the fruit extract with special reference to biological active chemical compound responsible for pharmacological properties of the plant.

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