THERAPEUTIC PROPERTIES OF WATER CHESTNUT: A REVIEW

Shalini[1], Pramod K. Raghav[2], Pallavi Singh[3]

Research Scholar[1], Professor[2], Assistant Professor[3]

Department of Food and Biotechnology, Faculty of Agriculture and Veterinary Science, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan.

ABSTRACT

Waterchestnut *(Trapa natans L.*) is aquatic plant which used as a medicinal herb which belongs to family trapaceae. It is commonly known as Singhara or paniphal in India. Water chestnut kerenel is delicious to eat and contains many beneficial properties such as antimicrobial, intidiabetic, anti-inflammation and antiulcer having minerals (potassium, iron and calcium), carbohydrates and proteins. It is used in Ayurveda preparation as appetizer, astringent, coolant and tonic. Water chestnut stem useful in eye disorders and it contains many nutrients which help to cure from many diseases. Many food products are made from waterchestnut kernel and its flour to enhance their nutritional properties.

Keywords: Water chestnut, Nutritional value, Health benefits and Value addition.

INTRODUCTION

Waterchestnut (*T. natans L.*) is an aquatic free floating plant. Singhara or waterchestnut belongs to the Trapaceae family; It is cultivated in ponds or lakes **(Takano and Kadono, 2005)**. *T. natan*s fruits found with thick jet-black outer pericarp in water.

Figure (1): Fresh Water Chestnut and Kerenel of water chestnut **(Rani *et al*., 2016).**

The singhara or waterchestnut is mostly cultivated in all over the world included China, Africa, India. In India, waterchestnut is locally known as *Trapa bispinosa* **(Singh *et al*., 2011)**. It is most important fruit of aquatic system and is also used in human consumption in India and china. The various parts of waterchestnut are used as a medicine for cure of various diseases **(Rahman *et al*., 2001).** *T. natans* is consumed as a raw or boiled.

The dried waterchestnut converted into flour by grinding and the flour called as "*Singhare ka atta*" which is used for preparation of various products or "*Phalahar* diet" in fasting days **(Chandana *et al.*, 2013).** Waterchestnut contains nutrients like catechins and epicatechins antioxidants and it also consist 'puchin', which is penicillin like compound.

Besides the singhara also consist gallic acids, hydrocinnamic acids, vanillin and pcoumaric acids **(Ismail *et al.*, 2008).**

Nutrients	Percentage
Moisture	70.35
Energy (Kcal.)	115.52
Protein	4.40
Fat	0.65
Carbohydrates	22.30
Fibre	2.05
Ash content	2.30
Minerals	
Calcium (mg/100g)	32
Iron (mg/100g)	1.4
Phosphorus (mg/100g)	121
Potassium (%)	5.22
Sodium (%)	0.64
Sulpher (%)	0.38
Copper (ppm)	430
Zinc (ppm)	600
Manganese (ppm)	90
Vitamins	
Vitamin 'C' (mg)	1.1

Table (1): Nutritional Value of Water Chestnut **(Alfasane *et al.*, 2011 and Md. Faruk *et al.*, 2012).**

Water chestnuts flour has good quantity of potassium and fibre. The one cup of water chestnut slices contains about 130 calories. In India, during fasting days waterchestnut flour is used for consumption **(Singh, 2017)**. The fruit of water chestnut contains various nutrients like minerals (P, Ca, K, Fe, Zn etc.), vitamins (Vitamin B, C and D), acids (citric acid), lipids, carbohydrates, proteins which is present with confirming good quantity. **Adkar *et al.*, (2014)** reported the *T. bispinosa* fruits kerenel contains the crude fiber and total protein content and in their study revealed the nutritional, phytochemical, and pharmacological properties present in *T. bispinosa* which is used as a medicinal and nutraceutical food product, are reviewed.

HEALTH BENEFITS-

Water chestnut is good sources of calorie, carbohydrate, dietary fiber, vitamin B6 and also contain fair amount of calcium, potassium, iron and zinc. Waterchestnut is useful for therapeutic purposes such as for cough, jaundice, measles and summer heat **(Rahman *et al.*, 2001).** *T. bispinosa* is an important plant of Indian Ayurveda which is used in the problems of stomach, genitourinary system, liver, kidney and spleen. It is astringent, stomachic, bitter, diuretic, febrifuge and antiseptic.

The *Trapa natans L*. plant is used in menorrhagia, gonorrhea and other genital affections **(Adkar *et al.*, 2014).** Singhara used for treating thyroid problem, diarrhoea, dysentery, swelling and bronchitis. It is natural antioxidant, prevents wrinkles, protects from UV rays and helps to cure weakness.

It helps to prevent sugar, ulcer, gout and heart diseases **(Rehman *et al.*, 2001)**. Singhara helps to cure fractures, urinary disorders, sore throat, anemia and in leprosy. It contains antioxidant and help to cure cough. The Singhara fruit peel grind and applied on swelling to get relief. Regular eating of singhara flour helps to gain weight.

For eczema treatment, singhara flour mixed with lemon juice and applied regularly on affected area **(Peng and Jiang, 2004)**. Waterchestnut is rich source of antioxidants, phenolic compounds and flavonoid and therefore possesses antiviral, anticancer, antibacterial and antioxidant properties. The waterchestnut fruit seed has a detoxifying effect on the body and is very useful to cure jaundice and helps in removing toxicants from the body.

This fruit treat dehydration in winters and work as a coolant **(Peng and Jiang, 2006)**. Anti-inflammatory Activity: The *T. natans* pericarp and seed extract both are used for anti-inflammatory activity. *T. natans* pericarp reported more potent action as compared to seed **(Patel et al., 2010).**

ANTI-DIABETIC ACTIVITY-

Das *et al.* (2011) revealed in their study methanolic extract of T. napans fruit peels (METN) was contained antidiabetic activity, this extract was applied in STZ induced diabetes in Wistar rats and results showed the dose of fruit peels dependently improved oral glucose tolerance, exhibited hypo-glycaemic effect in normal rats and antidiabetic activity in STZ-induced diabetic rats by decreasing and normalizing the elevated fasting blood glucose levels in comparison to those of STZ control group.

ANTI-MICROBIAL ACTIVITY:

Trapa natan showed antibacterial properties. Waterchestnut fruit extract rind by agar disc diffusion method and found the maximum antibacterial activity of this fruit was observed against Gram negative bacteria. **(Parekh and Chanda, 2007) Razvy (2011)** studied the antibacterial activity of two varieties (Green and red) of waterchestnut fruit extract by the disc diffusion method from methanol extract by using kanamycin as standard. In the red variety of water chestnut extract (600g) showed high antibacterial potential (31mm) against Bacillus subtilis on the other hand, green variety (600g) of waterchestnut found highest antibacterial activity (12mm) against both *Staphylococcus aureus* and *Shigella sonnei*.

ANTI ULCER ACTIVITY:

The 50% ethanolic extract of the fruits of *T. bispinosa* was used for tp treat antiulcer activity on wistar rats by using pyloric ligation and aspirin plus pyloric ligation models by **Kar (2010).**

NEURO-PROTECTIVE EFFECT:

Vyawahare (2010) studied that hydroalcoholic extract (500 mg/kg, po) of *T. bispinosa* reduced the fluorescence product and increase in lipid peroxidation and restored glutathione peroxidase and catalase activity in cerebral cortex in the brain of female albino mice.

VALUE ADDITION WITH WATER CHESTNUT

Malnutrition is a well-known problem in developing countries like India. It is a widespread problem eradicated by extensive scientific work and different attempts prepared by several workers on the field to diet enrichment of people with new formulations in food using various nutritional sources **(Melogorzata, 2004).**

Water chestnut (Singhara) is rich source of calcium, potassium and iron content it becomes an ideal food supplement **(Faruk et al., 2012).** Singhara is mainly grown in India for human consumption. It is commonly consumed as vegetable, flour (dried), various sweet dishes according to individual's taste.

The waterchestnut fruit kerenel is delicious and consist carbohydrates, proteins and essential minerals. Waterchestnut is one of the most popular starchy sweet dish desserts in Asian countries because of tenderness, sweetness and good taste of its fruit. **Singh *et al.*, (2009)** found that water chestnut starch has lower syneresis as compared to corn starch.

It can easily replace the corn and potato starch in preparation of frozen products. **Singh (2017)** studied that the present research work was conducted the process for the development of Pudding using Water Chestnut and Honey. Pudding prepared from different levels of *T. natans* flour i.e. 20%, 30%, 40%, 50% and different levels of Honey i.e. 20%, 25%, 30%, 35% respectively.

Among the different Combination of Honey and Singhara (*T. natans*) treatment W1H3 where as water chestnut flour 20% and honey 30% was best in terms of overall acceptability, Flavor and Taste, Color and Flavor. **Singh et al. (2017)** prepared bun by addition of different levels of wheat flour and waterchestnut flour and soya flour.

Quality parameters were evaluated such as carbohydrate, protein, fat, ash, moisture and total solid. Control made by addition of 100% wheat flour. treatments were prepared by addition of various percentages of wheat flour, waterchestnut flour and soya flour respectively like 85%, 10% and 5% (T_1); 80%, 10% and 10% (T_2). T_3 was prepared by addition of 75% wheat flour, 10% water chestnut flour and 15% soya flour. T_2 was showed to be the best with average score of (10.51%) for Protein, (8.14%) for fat, (56.55%) for carbohydrate, (22.24%) for moisture, (2.57%) for ash and (77.76%) for total solid.

CONCLUSION:

Singhara (*T. natans*) was an aquatic plant and it contains kernel which is delicious and many beneficial properties such as antimicrobial, pharmacological and medicinal also. The flaur of water chestnut kernel were rich source of nutrients and having binding properties. Being these properties of water chestnut, the researchers are interested in water chestnut. Waterchestnut have good medicinal properties according to researchers that is the reason in this fruit increasing the global interest and the singhara is safe for human consumption. According to this study, the Singhara flour was used for preparation for various food products. Singhara flaur incorporated food product medicinally beneficial for health.

REFERENCES

1. Singh, G.D., Singh, S., Bawa, A.S., Saxena, D.C (2009). Physicochemical, pasting, thermal and morphological characteristics of Indian Water Chestnut (*Trapa natans*) starch. *Starch Starke*, **61:**35-42.

2. Alfasane, M.A., Khondken, M., Rahman, M.M (2011). Biochemical composition of the fruits of water chestnut (*Trapa bispinosa robx*.). *Dhaka Univ. J. Biol. Sci*. **20(1)**: 9598.

3. M. O. Faruk, M. Z. Amin, N. K. Sana, R. K. Shaha, and K. K. Biswas,(2012) "Biochemical analysis of two varieties of water chestnuts (*Trapa sp.),*" *Pakistan Journal of Biological Sciences*, **15 (21)**, pp. 1019–1026.

4. Melogorzata. (2004); Application of white wheat whole flour in technology of bread making *Food world journal Department of international food research.*

5. Singh S. (2017); Efficacy of water chestnut (*Trapa bispinosa*) powder for development of functional Pudding with Honey as sweetening agent; Ph. D. Thesis, *Warner College of Dairy Technology Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad*, 1-218.

6. Patel S., Banji D., Banji O. J. F., Pate lM. M., Shah K. K. (2010) Scrutinizing the role of aqueous extract of *Trapa bispinosa* as animmuno modulator in experimental animals. *Int. J. Res. Pharm. Sci*., **1(1)**, 13-19.

7. Parekh J, Chanda S. (2007), In vitro antimicrobial activity of Trapa natans L. fruit rind extracted in different solvents, *African Journal of Biotechnology*, **6(6)**: 766-770.

8. Das P. K., Bhattacharya S., Pandey J. N. and Biswas M. (2011), Antidiabetic Activity of Trapanatans fruit peel extract against streptozotocin induced diabetic Rats, *Global Journal of Pharmacology*, **5(3)**: 186-190

9. RazvyM. A., FarukM. O., HoqueM. A. (2011). Environment friendly antibacterial activity of water chestnut fruits. *Journal of Biodiversity and Environmental Sciences* (JBES), **1(1)**, p. 26-34.

10. Kar D. M., Maharana L., Si S. C., Kar M. K. and Sasmal D. (2010). Anti ulcer activity of ethanolic extract of fruit of *Trapa bispinosa Roxb* in Animals.Scholars Research Library. *Der Pharmacia Lettre*, **2(2):** 190-197.

11. Ambikar D. B., Harle U. N., Khandare R. A., BoreV. V. and VyawahareN. S.(2010) Neuroprotective Effect of Hydroalcoholic Extract of Dried fruits of Trapa bispinosa Roxb on lipofuscinogensis and fluorescence product in brain of D-galactose induced ageing accelerated mice, *Indian Journal of Experimental Biology*, **48**, pp. 378-382.

12. Peng L, Jiang Y (2004). Effect of heat treatment on the quality of fresh-cut Chinese water chestnut. *Inter J. Food Sci. Tech*., **39**:143-148.

13. Peng L, Jiang Y (2006). Exogenous salicylic acid inhibits browning of fresh-cut Chinese water chestnut. *Food Chem* **94: 4**: 535-540.

14. Rahman MM, Wahed MI, Biswas MH, Sadik GM, Haque ME. (2001) In vitro antibacterial activity of *Trapa bispinosa Roxb*, *Science*, **1**:214-246.

15. Singh H., Thakur S. N., Wilson I., Kishor K. and Rai B. S. (2017); Studies on quality parameters of bun incorporated with wheat flour water chestnut flour and soya flour; *The Pharma Innovation Journal*; **6(8):** 119-124.

16. Ismail B, Haffar I, Baalbaki R, Henry J (2008). Physico-chemical characteristics and sensory quality of two date varieties under commercial and industrial storage conditions. *LWT*, **41**: 896–904.

17. M. Chandana, R. Mazumder, and G. S. Chakraborthy, (2013)"A review on potential of plants under Trapa species," *International Journal of Research in Pharmacy and Chemistry*, **3(2)**, pp. 502–508.