

Cultivation and health benefits of *Trapa natans*: A case study of Anjora Farmers, in Amgaon Tahsil, Gondia District (M.S.)

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Abstract: - The present investigation explores the cultivation practices, production & health benefits of *Trapa natans* (commonly known as water chestnut) by farmers in Anjora village. *Trapa natans* L. is an annual aquatic floating plant typically found in tropical freshwater wetlands such as rivers, ponds, lakes, and streams. It is highly nutritious, containing carbohydrates and minerals like calcium, phosphate, iron, copper, and manganese, in addition to being a rich source of vitamins. The economy of the tribal population in this region largely depends on farming, and many farmers in the Gondia district cultivate *Trapa natans* in ponds and lakes, as the district is well-known for its abundant water bodies. In this study, four ponds were selected, and comprehensive data were collected from farmers regarding cultivation practices, covering processes from seed germination to harvesting. Parameters such as the area of each pond, actual sampling numbers, production per hectare, and market values of *Trapa natans* were analyzed. The findings revealed that the approximate production of *Trapa natans* per hectare was 2 quintals, with a market value of around ₹2,000 per quintal. Furthermore, this study summarized the medicinal and health benefits of *Trapa natans* based on a review of various published literature, emphasizing its significance as a nutritious and economically valuable crop.

Keyword: *Trapa natus*, Economic Important, Cultivation practices, farmer.

INTRODUCTION

Trapa natans L., a member of the family Trapaceae under the order Myrtales, is commonly known as "Singhara" or "Simkhata" in Hindi, "Karimbolam" or "Vankottakk" in Malayalam, and "Water Chestnut" in English.^[1] This annual aquatic floating plant thrives in tropical freshwater wetlands, including rivers, lakes, ponds, and estuaries. It is a staple crop cultivated by villagers in the Gondia district of Maharashtra, particularly in the Amgaon tehsil, where it serves as an important source of nutrition and income. Water chestnuts are cholesterol-free, gluten-free, and are known for their cooling and detoxifying effects. They are also reputed for their role in aiding the treatment of jaundice. In addition to carbohydrates and proteins, water chestnuts are rich in flavonoids and antioxidants, making them a potential source of significant nutritional value.^[2] The edible nut has a knobby structure, reddish-black skin, and white crunchy flesh, resembling the taste and texture of boiled potatoes. The fruit is consumed raw or boiled, often after removing its skin, and has a slightly sweet and nutty flavor. The plant is native to several regions, including India, Southeast Asia, southern China, Taiwan, Australia, and parts of Africa. It is typically found in shallow lakes, paddy fields, and ponds, and has significant potential as a reliable food source, particularly in flood-prone areas.

Water chestnuts are rich in carbohydrates, minerals, and essential nutrients, including calcium, phosphate, iron, copper, manganese, magnesium, sodium, and potassium. They also contain vitamins such as thiamine, riboflavin, nicotinic acid, vitamin C, and vitamin A, along with enzymes like D-amylase and phosphorylases.^[3] Additionally, the seeds are rich in carbohydrates, saponins, phytosterols, fixed oils, and fats, while the pericarp contains tannins, flavonoids, and glycosides. The fruits of *Trapa natans* are recognized for their medicinal properties in traditional folklore medicine. They are known to be antidiarrheal, refrigerant, nutritive, and tonic, and are used in the treatment of bilious affections. The nuts, when consumed with milk, are beneficial for general debility, leucorrhoea, and seminal weakness. Dried seeds are used as cooling and stomachic agents. Moreover, stem juice is beneficial for eye diseases and, when applied as a poultice, aids in the resolution of tumors. The functional and nutritional properties of *Trapa natans* and its applications were investigated, with findings highlighting that *Trapa natans* is a valuable source of protein and other essential nutrients.^[4] The study explored *Trapa natans* as a green drug against pathogenic *Escherichia coli*, demonstrating its inhibitory effects on the growth of *E. coli*.^[5] The pharmacognostical evaluation and phytochemical studies of the Ayurvedic nutritional fruits of *Trapa natans*. & highlighted the ayurvedic importance of *Trapa natans*.^[6] The present study focuses on understanding the cultivation practices of *Trapa natans* by villagers in the Gondia district. It also examines its economic significance and health benefits, shedding light on its role as both a nutritious crop and a valuable medicinal resource.

Methodology

The present study was undertaken with the aim of providing a detailed account of the cultivation practices of *Trapa natans* by villagers in the Amgaon tehsil. The work was conducted between November 2023 and May 2024. During this period, several visits were made to selected ponds, namely Navtalav area, Karudivan, Boli, and Shingodi, where *Trapa natans* cultivation is practiced. Four ponds were selected from various areas of Anjora in Amgaon tehsil. Basic information was gathered from cultivators regarding plant seedling and germination, growth, habitat, diseases, nutritional requirements, and the effects of weeds on production. Data were collected using the interview method, and all information was documented in a field notebook. Photographs were taken during the interviews to support the findings. Herbarium sheets of *Trapa natans* were prepared using standard, universally accepted methods and were deposited in the Herbarium of the Department of Botany, Bhawabhuti Mahavidyalaya, Amgaon.

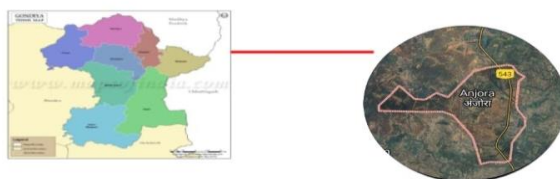
TOPOGRAPHY OF GONDIA DISTRICT

Amgaon Tahsil

Amgaon Tahsil (20039'0"N 79057'0"E) is one of the eight Tahsil of Gondia District which is situated East of Gondia district. Adjoining district of Amgaon on North side Balaghat district of Madhya Pradesh and on Eastern side is Salekasa Tahsil of Gondia district. To the West side is Gondia and Goregaon Tahsil of Gondia District. To the South side is Deori Tahsil of Gondia District. (Map 3 and 4) The Tahsil covers an area of 32112.21 sq. hectores of which 6266.144 sq. hectores fall under forest area. Out of the total forest area 597.100 sq. hectores under reserve forest area; 2718.594 sq. hectores fall under miscellaneous forest. Bagh River is the most important river.

The whole area of the district is rolling and opens at the average elevation of 320 m above sea level. There are no major dams are present in the Amgaon. Apart from this, more than 80 small tanks are present in the Amgaon Tahsil. These tanks are the vital source of irrigation of the Tahsil. The climate of the Tahsil is similar as district with a few variations. The average rain fall till 26th September 2016 is 1734.5 mm which at Lower side than district average (+1988.39 mm).

1) AMGAON TAHSIL



2) AREA UNDER INVESTIGATION



Morphological Studies on *Trapa natans*

Botanical Description

Trapa natans is an annual aquatic floating herb commonly found in lakes and ponds. Its floating leaves are rhomboid in shape, measuring 2–6.5 cm in diameter, with a dark green upper surface and a reddish-purple underside. The leaves are broader than they are long, with denticulate, serrate, or incised margins and an entire base. The apex is acute, red, and densely pubescent or villous on the underside. The reddish-green leaves, villous on the dorsal side, are about 5–8 cm long and are supported by hairy petioles measuring 10–15 cm in length. Submerged leaves are laterally dissected into capillary segments.^[7,8]

Flowers: The flowers of *Trapa natans* are axillary, white in color, and borne on solitary peduncles. They bloom above the water's surface, typically in the afternoon. After pollination, the flowers submerge to facilitate fruit formation. The flowers are small and have four petals.



Fruit:- The fruit is obovoid and triangular, with two horns, measuring about 2 cm in diameter. It contains a one-seeded nut with highly unequal cotyledons and a top-shaped drupe. The fleshy pericarp is green when fresh and covers a large, 2–4-horned, stony endocarp upon drying, the fruit turns blackish. The pulp is whitish, sweet, and enclosed in a long, spiny shell.

Stem:- The stem anchors the plant into the mud through numerous branched roots and extends upward to the water's surface. The cord-like stems are spongy and buoyant, capable of growing up to approximately five meters (16 feet) in length.

Plantation Method of *Trapa natans*

Seed Production

Commercial cultivation of *Trapa natans* (water chestnut) begins with seed production. Fully ripe horned fruits are placed in pots or small ponds containing water to germinate during November to January. After a few days, the seeds sprout. The sprouted seeds are separated and transferred to water tanks in a nursery. Planting should be carried out at the beginning of the monsoon season or when water is available in the fields or ponds. For successful cultivation, knee-deep water in lakes or ponds is ideal.

Seeds should be planted at a spacing of 1×2 meters or 2×3 meters in knee-deep water. Fully grown vines can also be used as seeds for cultivation, making it a profitable venture. The seeds are formed from the horn-like structures and the vine itself.

Method of Planting *Trapa natans* Vines

Planting vines typically begins in April, May, or June. Before planting, ponds are thoroughly cleaned to remove waste materials. Cleaning is done by a team of 5–6 people to ensure no obstacles reduce fruit production. Two to three vines are tied into a knot and planted in ponds at a distance of 5–7 feet. Planting is done manually, with pits dug using feet.

For 1 hectare of cultivation, the process usually takes 2–3 days for three people. Medicinal sprays are applied at temperatures between 12–15°C to promote flowering. High summer temperatures and low winter temperatures both support good yields. Although soil is not essential for growth, well-drained, fertile, and nutrient-rich soil can improve yield. Nutrient management involves applying chicken manure mixed with 30–40 kg of urea per acre, followed by an additional application after 20 days.

Crop Maintenance

- **Weed Management:** Pond weeds, such as *Hydrilla* and water hyacinth, must be removed monthly to ensure proper growth.
- **Water Management:** Ponds should always remain filled during the growing season, with a water layer of 20–40 cm above the soil. Higher water levels are acceptable but may require drainage during fruit harvesting for ease of collection. Care should be taken to maintain adequate water levels during summer.

Harvesting

- If vines are planted in April, fruiting begins in September. Fruits planted in June–July are immature and can be plucked for other uses.
- *Trapa natans* typically yields a harvest within four months. For instance, seeds planted in February yield fruit by late June. Similarly, seeds planted in June during the rainy season are ready for harvest in September.
- Farmers use rafts or manually harvest the crop. The average yield is 200–300 quintals per hectare.

Fruit Development

Fruit growth begins in summer, with flowers located at the plant base near the roots. As the water changes color from green to purplish-brown, fruits swell and stick to sediment with their spines.

Transplanting Care

- Nursery-grown plants should reach a height of about 30 cm before transplanting, which typically occurs after 1–1.5 months.
- If the plants are too tall, additional shoots from the vines should be removed.
- During transplanting, ensure the plants remain moist and are not fully submerged in water.

This comprehensive process ensures the efficient and profitable cultivation of *Trapa natans*, benefiting farmers and contributing to food security.

Economic Importance of *Trapa natans*

The discharge from Agricultural waste often contaminates ponds maintained by villagers, which are used for various purposes, including the cultivation of *Trapa natans* (commonly known as water chestnut). This plant bears fruit during

the winter season. The edible fruits of *Trapa natans* are sold in local markets on a large scale, providing a significant source of income. In the present study, plants of *T. natans* were collected from four ponds in Anjora village, Amgaon Tahsil. Water chestnut (*Singhara*) is in high demand, especially during fasting periods. It is primarily cultivated in hot and temperate regions, including ponds, fields, and paddy fields. Farmers with access to water can cultivate this crop successfully, as it thrives in fresh water ecosystems. The fruits of *T. natans* possess numerous Ayurvedic properties and are in special demand during religious fasts. Cultivating this crop can be financially rewarding due to its high market value. Water chestnut is recognized for its excellent economic and medicinal properties. It is nutrient-rich, containing proteins and antioxidants, making it a valuable winter crop.

Benefits of *Trapa natans*

Health and Medical Benefits

- **Treats various ailments:** Used for diarrhea, dysentery, thyroid problems, swelling, and bronchitis.
- **Antioxidant properties:** Prevents wrinkles, protects against UV rays, and combats weakness.^[9,10]
- **Disease prevention:** Helps prevent diabetes, ulcers, gout, and heart diseases.
- **Nutritional value:** Rich in carbohydrates (100 g provides 115 calories).^[11]
- **Thyroid support:** Aids proper thyroid functioning.^[12]
- **Medicinal uses:** Treats sore throat, anemia, fractures, urinary disorders, and leprosy. It is also effective against cough.^[13]
- **Detoxification:** Seeds have detoxifying effects and are beneficial for jaundice patients, helping remove toxins from the body.
- **Eczema relief:** Powdered dried *Singhara* mixed with water alleviates eczema infections.
- **Hydration:** Prevents dehydration during winters and serves as a natural coolant.

Benefits for Hair and Skin

- **Skin health:** Purifies blood, removing toxins, resulting in glowing and youthful skin. Boiled water chestnuts are beneficial for measles patients when consumed regularly for 6–9 days.
- **Swelling relief:** A paste made from powdered skins of water chestnuts can be applied to swollen areas for relief.^[14]
- **Eczema treatment:** Mixing water chestnut seed powder with lemon juice helps cure eczema when applied regularly.
- **Hair nourishment:** Nutrients such as potassium, zinc, B vitamins, and vitamin E contribute to healthy hair by eliminating toxins that could damage it.

Throat Benefits

Singhara alleviates throat problems due to its antioxidant properties. It helps relieve conditions such as sore throat, tonsillitis, and constipation. Mixing *Singhara* flour with milk and consuming it provides quick relief for throat issues.

Benefits for Pregnant Women

Pregnant women can benefit significantly from consuming *Singhara* with milk. It is particularly helpful for women who are more than a month into their pregnancy. It treats leucorrhea and helps prevent miscarriages. *Singhara* consumption nourishes the baby and supports the mother's health.

Jaundice Treatment *Singhara*'s detoxification properties make it highly beneficial for jaundice patients. Consuming it raw or as juice helps eliminate toxic substances from the body, aiding recovery from the condition. *Trapa natans* is a highly versatile crop with extensive economic, medicinal, and nutritional benefits, making it a valuable resource for farmers and consumers alike.

Disadvantages of Eating Singhada: While *Singhara* (water chestnut) has numerous health benefits, excessive consumption can lead to certain disadvantages:

- **Digestive Issues:** Overconsumption can harm the digestive system, leading to constipation, abdominal pain, and inflammation of the intestines.
- **Cold and Cough:** Drinking water immediately after consuming *Singhara* may cause cold and cough problems.
- **Excessive Consumption Problems:** Eating *Singhara* in large quantities can exacerbate cough-related issues. It is important to consume *Singhara* in moderation to avoid these potential health issues.

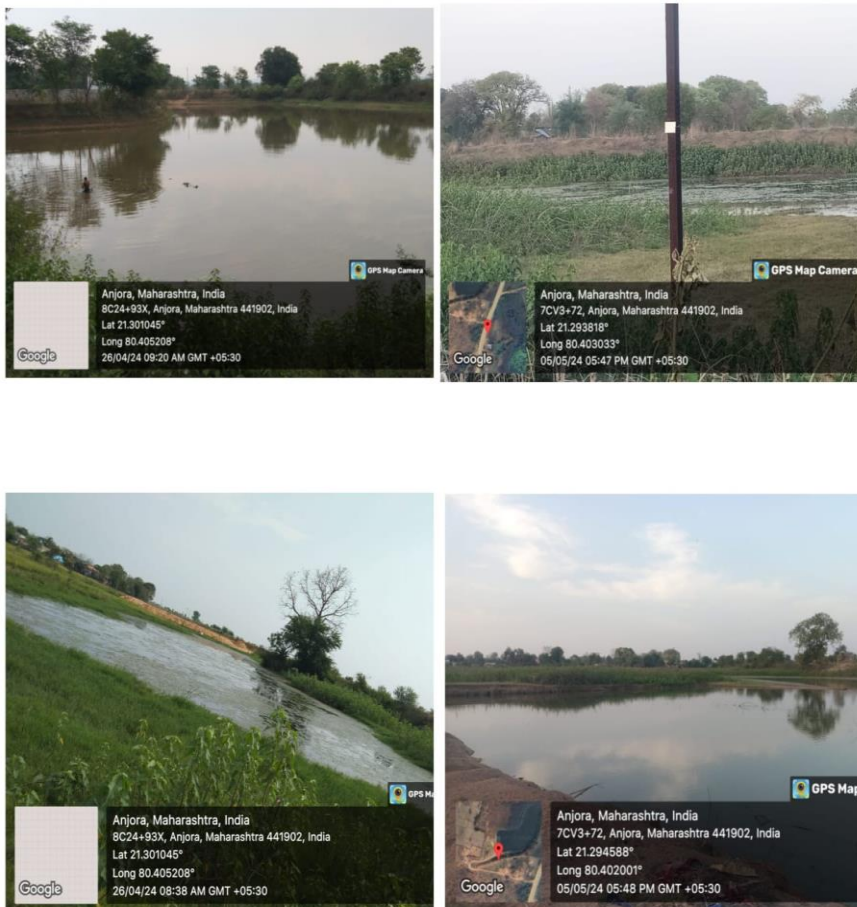
Sr No.	Pond Name	Pond Area	Cultivation Area	Production In Tone/Kg	Approximately Market value per kg
1.	Karudivan	2.8100 hect. sq.m.	1.6740 hect. sq. m.	4.30 q	60 Rs.
2.	Boli	1.2900 hect. sq. m.	1.1500 hect. sq. m.	3.709 q	60 Rs.
3.	Shingoli	4.4300 hectr. sq. m.	3.2300 hect. sq. m.	5.759 q	60 Rs.
4.	Navtalav	2.0900 hect. sq. m.	1.9000 hect. sq. m.	2.90 q	60 Rs.

Observation table

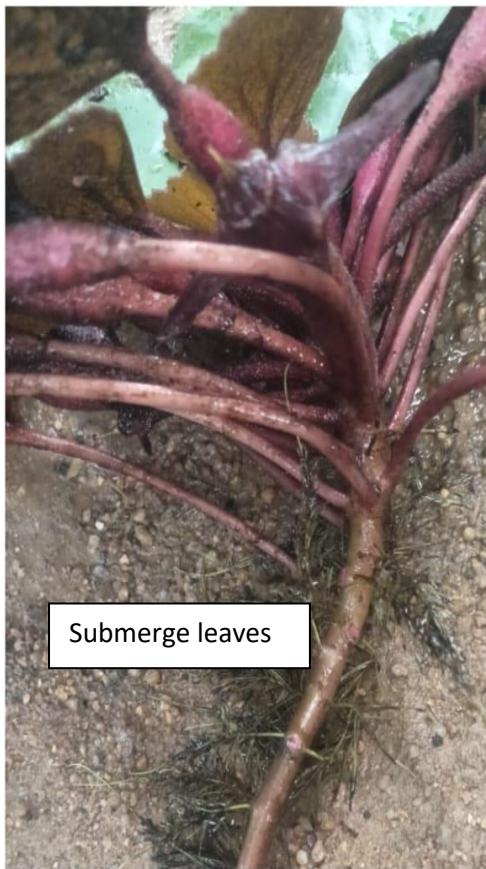
DISCUSSION & CONCLUSION

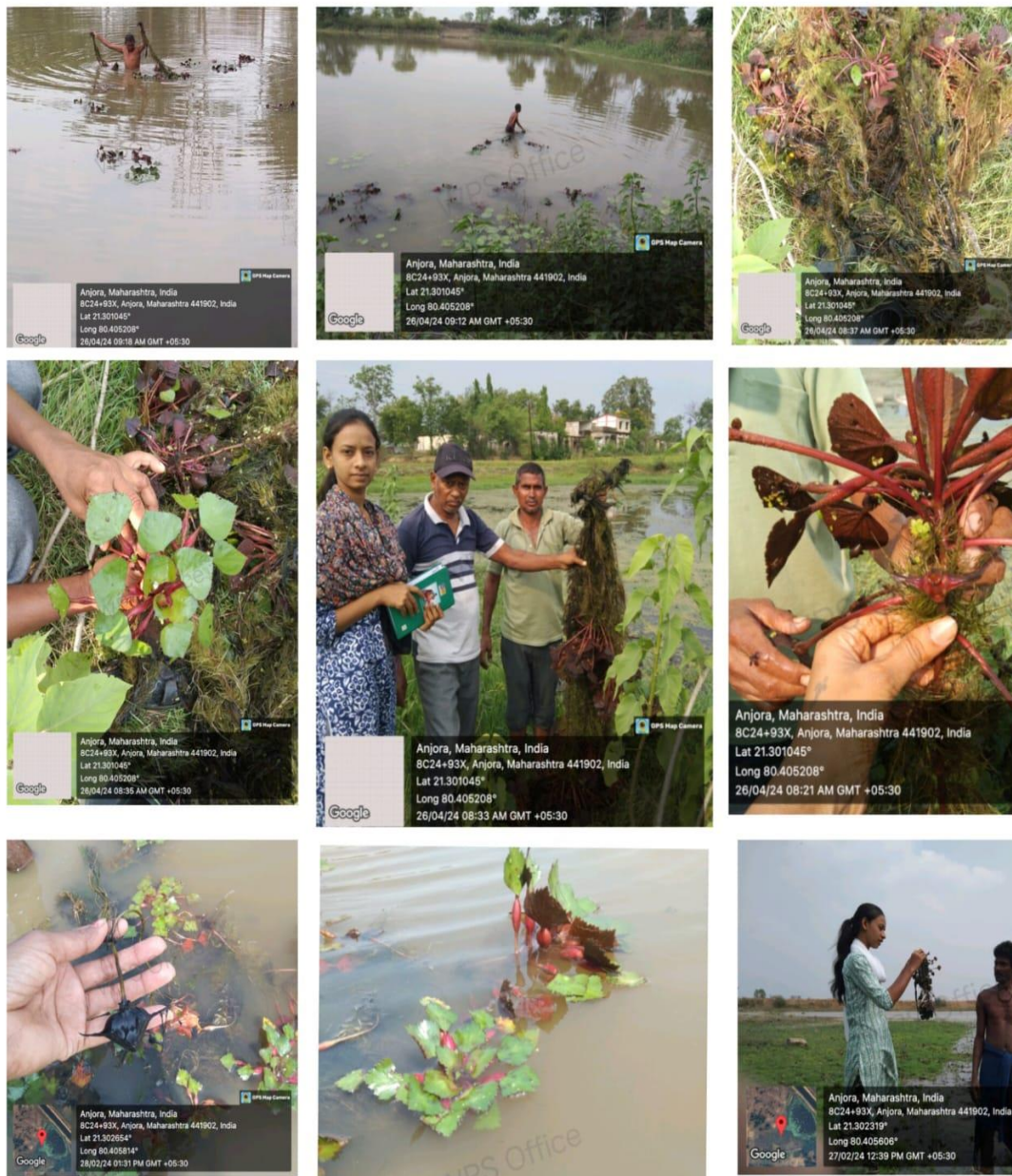
The present study was undertaken to learn about the cultivation practices and economic and health benefits of *Trapa natans* (L) from Anjora village in Amgaon Tahsil. Anjora is a rural place, and most of the people are economically poor. But Gondia District . is famous for ponds and lakes. The people of Anjora mostly depended on farming. Few people are doing farming of trappa natans; they started farming in November and harvested in September. A total of 10 to 11 months are required for the entire crop, starting from seed showing to harvesting. The total cultivated area was noted in the observation table. It is seen that about 4 to 5 quintals of trapa natans per pond per year are obtained by farmers. Market value per quintal mature, ripend Trapa natans 20000 thousand. This information was carried out by personnel interviewing farmers. In this study, the health benefits and nutritional value of *Trapa natans* (L) show significance in the human diet.

Photo plate



1. Selected ponds A. Boli B.Karu Diwan C.Singholi D.Navtalav



Photograph with *trapa natans* cultivators (farmers)**REFERENCES**

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