

Nutritional and Therapeutic Benefits of Taro Leaves

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ABSTRACT

An overview of the herbaceous, healing taro plant is given in this article (*Colocasia esculenta*). Taro plants often have large leaves one or more petioles, flowers, and an underground corm. In traditional Indian cuisine, the leaves of this plant, also known as taro, are widely used as vegetables. Kochai in Chhattisgarhi, Aravi in Hindi, Alupam in Sanskrit, Alavi in Gujarati, Alu in Marathi, and Sempu in Tamil are some more names for taro. Taro leaves come in two colours: black and green. The leaves of *Colocasia esculenta* are a fantastic source of vitamins and quickly absorbed carbohydrates. According to some reports, taro leaves are a good source of Ca, P, and Fe as well as other vitamins and minerals. The taro leaf's contains high concentration of nutritional fibre. Compositions are 78.8 g of moisture, 6.8 g of protein, 2.0 g of fat, 8.1 g of carbohydrate, 1.8 g of crude fibre, 460 mg of calcium, 2.5 g of minerals, 0.98 mg of iron, 125 mg of phosphorus, and 77 KCL of energy are all present in the black form of taro leaves. According to this study, the green form of taro leaves has 56 Kcal of energy, 10.0 mg of iron, 82 mg of phosphorus, 3.9 g of protein, 1.5 g of fat, 6.8 g of carbohydrate, and 2.9 g of crude fibre. Moreover, it contains 3.9 g of protein, 2.2 g of minerals, 227 mg of calcium, and 82.7 g of moisture. It was frequently grown as a vegetable for both culinary and medicinal purposes. *Colocasia esculenta* leaves include oxalate, phenolic acids, antioxidants, anti-inflammatory, anti-cancer, and anti-bacterial substances, according to phytochemical study is frequently planted, generally with the assistance of farmers, in regions with high rainfall levels below flooded areas. The pH of the soils must be between 5.5 and 7.0 for its corps to form, which takes between 6 and 12 months. These leaves have very strong hydrophobic properties. They may be effective as a supplement or medicine in the management or treatment of many illnesses because of their potential to have a major healing influence. The extracts and distant components from herbal tablets or medicinal plants have created a wide range of organic actions. Raw consumption of its leaves and tubers is poisonous due to the presence of caustic calcium oxalate. It should first be heated or cooked to eliminate the acidic calcium oxalate that is present. Its leaves offer a variety of health advantages, including the reduction of bodily aches and fatigue as well as a healthy supply of carbohydrates and iron for expectant mothers.

Key-words: Taro leaves, therapeutic, phytochemical, nutritional and arbi.

INTRODUCTION

Taro's scientific name is *Colocasia esculenta*. Taro is an annual herbaceous and tuberous plant that is grown as a staple food for edible pits in tropical and subtropical regions of the world. Taro has a long history of usage as a traditional medicine. It has grown to a height of 1-2 metres and is made up of a core corm that is just below the soil's surface and from which the leaves and roots sprout. It has long petioles and heart-shaped green or purple leaves. (Rashmi *et al.*, 2018). Other names for taro include Kochai in Chhattisgarhi, Aravi in Hindi, Alupam in Sanskrit, Alavi in Gujarati, Alu in Marathi, and Sempu in Tamil. It began in India and has since moved south to Indonesia, east to Burma and China. After potatoes, sugar beets, cassava, sweet potatoes, and yams, taro was placed sixth among root crops (Lakhanpaul *et al.*, 2003). Micronutrients and easily absorbed carbohydrates are abundant in taro. Oxalate, phytate, and tannin are among the antinutrient components present in taro. The high carbohydrate content (87%) found in the plant's tuber portion may be a welcome complement to the taro leaves' high protein content (23%) as a source of food for people. According to reports, taro leaves are full of vitamins and minerals including Ca, P, and Fe. The high concentration of dietary fibre in taro leaves (Rashmi, *et al.*, 2018).



Fig 1: Taro plant



Fig 2: Taro leaves

Cooked and consumed as a vegetable, taro leaves are reported to include B-carotene, iron, and folic acid that fight anaemia (FAO, 1990; Sukamoto, 2003). Raw consumption of taro leaves and tubers is poisonous due to the presence of astringent calcium oxalate. It should first be heated or cooked to eliminate the acidic calcium oxalate that is present. In the world, taro is grown on 1.46 million hectares of land, yielding 10.11 million tonnes with an average productivity of 6.92 t/ha. The range of the world's average production is 1.25 to 41.00 t/ha (Jinimol and Byju 2018). It ranks as the fourteenth-most popular vegetable worldwide (Lebot and AradhyaIn 1991). West Bengal, Assam, Kerala, Tamil Nadu, Telegana, Uttar Pradesh, the Andaman & Nicobar Islands, Meghalaya, Manipur, and Jharkhand are among the states that cultivate a significant amount of India taro. It is grown in the state of Chhattisgarh over an area of 7008 acres, yielding 98931 tonnes on average per hectare (-1). Considering the significance of this crop, it is often grown as a subsistence or semi-commercial crop throughout India. 2018 (Anonymous). They can be helpful as a medicine or supplement in the management or treatment of numerous disorders due to their ability to provide significant therapeutic effects. Medicinal plants, herbal medications, and their isolated components have shown a variety of biological actions (Rashmi et al., 2018). Similar to many other tuber crops, taro has a relatively low protein (1.5%) and fat (0.2%) content in its corm. It is a good source of ash (1.2%), fibre (0.8%), and starch (70 to 80 g/100 g dried taro). A very rich source of vitamin B6, C, niacin, potassium, copper, and manganese, taro is also a high source of thiamine, riboflavin, iron, phosphorus, and zinc (Quach, 2003). Table 1 is showing botanical classification of taro.

Table 1: Botanical classification of Taro (*Colocasia esculenta*)

Rank	Scientific name
Kingdom	Plantae (Plants)
Sub-kingdom	Tracheobionta (Vascular plants)
Division	Magnoliophyta (Flowering plants)
Class	Liliopsida (Monocotyledons)
Subclass	Arecidae
Family	Araceae (Arum family)
Genus	Colocasia Schott (<i>Colocasia</i>)
Species	<i>Colocasia esculenta</i> (L.) Schott (Cocoyam)
Synonyms	Alocasia dussil Dammer Alocasia illustris W. Bul

Source: Rashmi *et al.* (2018)

NUTRITIONAL AND CHEMICAL COMPOSITION OF TARO LEAVES

According to reports, taro leaves are full of vitamins and minerals including Ca, P, and Fe. The high carbohydrate content (87%) found in the plant's tuber portion may be a welcome complement to the taro leaves' high protein content (23%) as a source of food for people. Like other root plants, taro leaves have a high carbohydrate content but a low protein and occasionally fat content in their diet. It has poor nutritional value for vitamins C and A. Table 2 (for black variety) and 3 (for green variety) showing the nutritional value of taro leaves.

Chemical Composition of Taro

The Chemical compositions of taro are taken from the book of Nutrition Value of Indian Foods which all the values of all parameter is said in 100 g. Two varieties are found in taro leaves.

- **Moisture**

According to nutrition value of Indian foods, black variety of taro leaves moisture 78.8 g and green variety of taro leaves moisture 82.7 g is given. Moisture content material of taro varies with variety, increase circumstance and harvest time.

- **Protein**

Concerning the leaf, like higher plant, taro leaf is rich in protein (Temesgen & Retta, 2015). The black variety of taro leaves protein 6.8 g and green variety of taro leaves protein 3.9 g is given.

- **Fat**

The black variety of taro leaves fat 2.0 and green variety of taro leaves fat 1.5 g is given.

- **Carbohydrate**

It can be seen from the table that carbohydrate value is 8.1 g and green variety of taro leaves carbohydrate value is 6.8 g, which is highest value out of all the values of parameters.

- **Crude fiber**

The black variety of taro leaves crude is 1.8 g and fiber green variety of taro leaves is 2.9 g.

- **Minerals**

The black variety of taro leaves is minerals 4.68 g and of green variety taro leaves minerals 2.2 g is given. The black variety iron 0.98 mg, phosphorus mg 125 mg, calcium 460 and green variety iron 10.0 mg, phosphorus 82 mg, calcium 227 mg have been told and energy is 77 kcl have been told.

- **Energy**

The black variety of taro leaves energy is given 77 Kcl and green variety of taro leaves 56 Kcl. There are two variety's taro leaves chemical composition are mentioned here.

Table 2: Nutritional value of *Colocasia esculenta* leaves (black variety)

Nutrition Name	Amount
Moisture	78.8 g
Protein	6.8 g
Fat	2.0 g
Minerals	2.5 g
Crude fiber	1.8 g
Carbohydrates	8.1 g
Energy	77 Kcl
Calcium	460 mg
Phosphorus	125 mg
Iron	0.98 mg

Nutritive Value of Indian Foods (2012)

Table 3: Chemical Composition of *Colocasia esculenta* leaves (green variety)

Nutrition Name	Amount
Moisture	82.7 g
Protein	3.9 g
Fat	1.5 g
Minerals	2.2 g
Crude fiber	2.9 g
Carbohydrates	6.8 g
Energy	56 Kcl
Calcium	227 mg
Phosphorus	82 mg
Iron	10.0 mg

Nutritive Value of Indian Foods (2012)

MORPHOLOGY OF TARO PLANT

The Large leaves; one or more petioles, flowers, and an underground corm are frequently seen in taro plants. It has grown to a height of 1-2 metres and is made up of a core corm that is just below the soil's surface and from which the leaves and roots sprout. It has long petioles and heart-shaped green or purple leaves (Rashmi et al., 2018). Large leaf laminae on long, upright petioles make up the surface of taro plants. The laminae are 20 to 60 cm in width and 25 to 85 cm in length. They have an entire, ovate to sagittate form with rounded basal lobes and an acuminate apex. Laminae range in thickness from 275 to 300 mm. The taro flower is made up of a spathe that grows 20 to 40 cm long and a spadix that is 6 to 14 cm long and bears unisexual blooms. It is carried on a sturdy pedicel that is between 15 and 30 cm long, making it shorter than the petioles (Wilfred lee 1999). Drying can be most effective method of preservation in which food is preserved by lowering the moisture content of the product. (Yashwant Kumar et al., 2015)

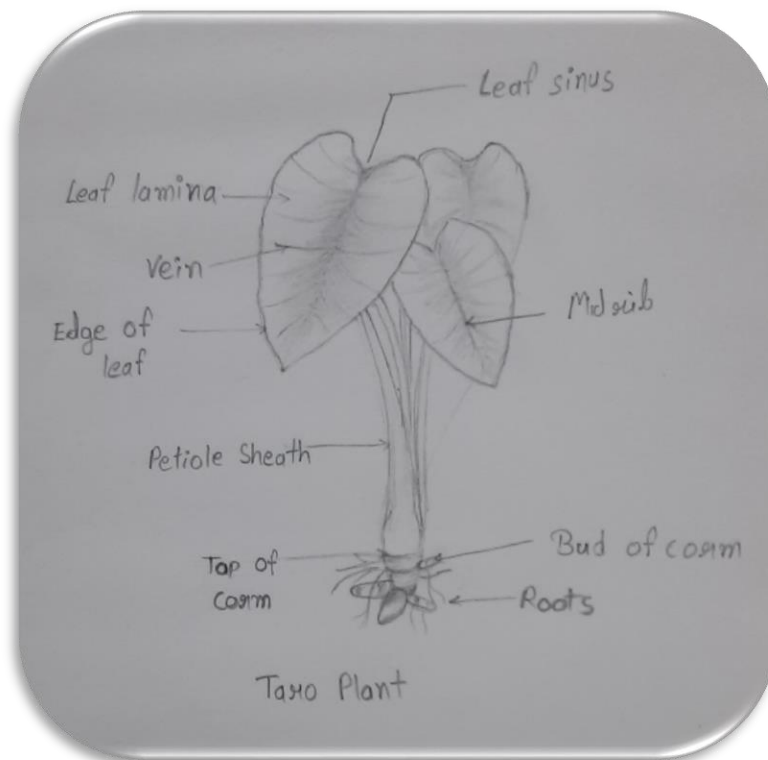


Fig 5: Diagram of taro plant

PHYTOCHEMICAL COMPONENT

Taros contain a high concentration of β -carotene in the corm, which will give the body vitamin A and antioxidant properties. The structure of β -carotene just slightly varies. They are abundant in carotenoids, antioxidants with other possible health advantages. (Nip, 1997).when compared to some plants like *cassia tora*, Taro also have many health benefits

✓ Antioxidant

Taro leaves have high levels of antioxidants, which significantly reduce harmful compounds to the body, especially free radicals. The two most common antioxidant molecules are vitamin C and polyphenols. Rootstock extract from taro is a significant source of free radicals. Due to some free radicals, herbal antioxidants plays a significant role in the prevention of diseases including cancer (Yashwant *et al.*,2022)

✓ Anti-inflammatory

Infectious microorganisms, often bacteria, viruses, or fungi, enter the body and settle in certain tissues or circulate in the blood, which results in the anti-inflammatory effect. Significant anti-inflammatory action is produced by the ethanol that is derived from taro leaves.

✓ Anti-cancer activity

One of the major causes of mortality worldwide, cancer is mostly linked to poor dietary habits and bad lifestyle choices. The nutritional components included in plant foods can be used to both prevent and lower the chance of developing cancer. The majority of the anti-cancer properties of taro pant are found in its corms. Taro pant has anti-cancer properties.

✓ Antibacterial

The capacity of taro leaf ethanol extract to suppress the development of harmful bacteria has been demonstrated to have antibacterial action. *E. coli*, *Bacillus cereus*, *Bacillus subtilis*, and *Staphylococcus aureus* can all be slowed down in growth by an ethanol extract of taro leaves. Inhibiting *Bacillus cereus* growth is the best antibacterial action (Pulungan *et al.*, 2018)

✓ Oxalate

The presence of oxalates, which give taro its bitter flavour or cause inflammation when consumed as raw or unprocessed food, is one of the main factors that limit its use. This acidity is caused by calcium oxalate crystals and raphides, which have the potential to pierce delicate skin. The taro leaves of the examined cultivars had total oxalate concentrations that varied from 433.8 to 856.1 mg/100 g WM, and the soluble oxalate contents ranged from 27.8% to 40.7% of the total oxalate contents. According to the findings, the leaves' total calcium content ranged from 31.7% to 57.4%. (Du Thanh *et al.*, 2017). Cooking or heating is required to eliminate the oxalate content.

✓ Phenolic acids

They are straightforward phenolic acids that are abundantly found in plant cell walls and hence have a substantial role in the human diet. They have mostly been investigated in connection to antioxidant activity, however these studies have generally been conducted *in vitro*, and further research into the *in vivo* effects on humans is required before any health advantages can be asserted. Taro cultivars with yellow flesh have higher levels of total phenolic compounds (Temesgen & Retta, 2015).

✓ Super-hydrophobic

These leaves have extremely hydrophobic characteristics. The last two decades have seen a significant increase in interest in superhydrophobic and hydrophobic surfaces because of the possible technological uses for creating functional surfaces with characteristics like self-cleaning, reduced drag, antifouling, water harvesting, anti-icing, etc (Kumar & Bhardwaj, 2020).

GENETIC DIVERSITY OF TARO

Mace and Godwin identified diploids ($2n=2x=28$) and triploids ($2n=3x=42$) chromosomes in taro conducting diversity investigation utilising simple cytological procedures (Mace and Godwin, 2002). In India, the taro has chromosomal numbers of $2n=14$, 28, 42, and 36 and 48. It has been hypothesised that the genetic instability may be caused by long-term farming near the centre of diversity (Dastidar, 2009). According to Quero-Garcia *et al.* (2006), taro is an allogamous, protogynous species that is extremely polymorphic (Rashmi *et al.*, 2018).

CULTIVATION

Fast-growing taro takes between 6 and 12 months to reach maturity, depending on the range and growing circumstances. Taro may be grown in lowland, wetland, and highland environments. The best seasons for cultivation are from June to July and from February to March. It grows best on loamy soils with a pH range of 5.5 to 7.0 and a mix of a warm, humid climate with a mean temperature of 21 to 27 C. It works well in areas with high rainfall during floods and is frequently carried out with the assistance of tiny formers.

HEALTH BENEFITS

1. Herbs are mostly used to treat digestive, metabolic, cardiovascular, hepatic, and central nervous system diseases because taro leaves are high in fibre.
2. The plant's leaves are very rich in vitamin C.
3. This herb is also capable of lowering pain and fever.
4. Pharmacological research indicates that the plant has a wide range of pharmacological effects, including those on the central nervous system, as well as antioxidant, anti-inflammatory, analgesic, anti-lipid peroxidation, anti-diabetic, anti-hepatotoxic, and antibacterial activities.
4. These leaves can provide pregnant women with a healthy dose of carbs and iron.
5. Colocasia leaf juice extract works well as an otalgic, expectorant, stimulant, and astringent (Keerthy and Joshi, 2019).

CONCLUSION

According to the results of this investigation, taro (*Colocasia esculenta*) is a herbaceous, medicinal plant with tufts of long, heart- or arrow-shaped leaves that develop on erect, ground-facing stems and can be green, maroon, or a different colour. This might increase over the span of the universe. There are many review suggesting the intake of powder of leafy vegetables have proven beneficial for health in every way, it has been observed that sweet-potato leave heaps us to manifestation of immune response (Yashwant *et al.*,2022b). The short growth season for taro lasts between six and twelve months. Taro leaves have health benefits for people. Many beneficial nutritional and physiological benefits are offered, including antioxidant, anti-inflammatory, analgesic, anti-lipid peroxidation, anti-diabetic, and anti-hepatotoxic properties Uncooked taro leaves are dangerous because they contain astringent calcium oxalate, which is abrasive. It must first be heated or cooked in some way to eliminate the acidic calcium oxalate that is present. Taro leaves are a good source of vitamins, minerals, protein, and carbs.

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