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# Taro (*Colocasia esculenta*): A Crop of Importance in the Culture of Kumaon

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## Abstract

Colocasia esculenta, *generally known as taro in English, is an important vegetable crop that is used in Egypt, Pakistan, India, Nepal, Bhutan, China, Japan, Hawaii, and Indo-Malaysian and certain Pacific and Caribbean islands. In India it is found either wild or under cultivation in Jammu & Kashmir, Himachal Pradesh, Sikkim, Uttarakhand, West Bengal (Darjeeling), Assam, and Meghalaya. In this article, the importance of taro in Kumaon (Uttarakhand) is discussed. The local Indian names in different languages, its botany, distribution, origin of the species and the cultivated crop, chemoprofile of the corm and leaves, and the nutritional value of taro are presented. The folk taxonomy and folk varieties or cultivars cultivated in the Kumaon region are discussed. Uses of taro in Kumaoni cuisine and other parts of the world are described. The use of taro in Kumaoni proverbs and sayings and finally some suggestions for future work on the species are given.*

*Colocasia esculenta*, generally known as taro in English, occurs in Egypt, Pakistan, India, Nepal, Bhutan, China, Japan, Hawaii, and Indo-Malaysian and certain Pacific and Caribbean islands. In India it is found either wild or under cultivation in Jammu & Kashmir, Himachal Pradesh, Sikkim, Uttarakhand (Kumaon), West Bengal (Darjeeling), Assam, and Meghalaya, and also in South India. The corms are used as vegetable in many parts of the country with their various local names. In Kumaoni culture, taro is an important crop as the leaves (particularly young leaves), petioles, corms, and cormels are used as vegetable and are also used traditionally in different recipes. The crop is culturally associated with Kumaoni proverbs and sayings.

## Etymology and philology

In Sanskrit, *C. esculenta* is known as *aaluki*; in Hindi as *arvi, kachalu, ghuian*; in Tamil as *seppan-kizhangu, shama-khilangu, shana-dumpa*; in Telugu as *chamdumpa*; in Malayalam as *shembu, chembu*; in Kannada as *shamagadde*; in Gujarati as *alchi*; in Bengali as *kochu*; in Oriya as *sarue*; and in English as taro or elephant's ear.

In Kumaoni language, the central corm (stem) is known as *pinalu*, *pinau*, or *ganderi*; the cormels (tubers) as *ganderi chun*, *pinau*, *pinalu*, or *siyal*; the unopened young leaves are known as *gaba* or more specifically *pinau gaba* or *pinalu gaba*; and the leaf stalks or petioles are known as *papar* or *naul*. Generally, the crop of taro and the cormels are known as *pinalu* or with Kumaoni accent as *pinau*. The word *pinalu* is possibly from *pinda-aluk*, which is a Sanskrit word used for taro (*pind* = spherical; *aluk* = like potato). Potato was introduced in India after the Britishers came but there were many tuberous roots or rhizomes, which were used such as *pindalu*, *shankalu*, and *ratalu*.

## Botanical description

*Colocasia esculenta* L. (Schott) (syn. *C. antiquorum* Schott) (Araceae) is a tall herbaceous, tuberous plant with long stout petiole, dark green big leaves with ovate-triangular blades 40–66 cm across, attached in the middle to the leaf stalk (peltate). The petiole is 90–120 cm long, stout, green or dark violet in color, and looks like a stem.

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The plant is rarely seen in flowering. The center corm (stem) is spherical, 10–30 cm long, and 6–15 cm in diameter with 6–10 long and stout cormels (tubers) attached. The plant is propagated by these tubers or cormels.

## Distribution

Taro is an Old World species. About 10 species have been found, of which five have been reported from India (Santapau and Henry, 1973). In the Pacific, the crop attained supreme importance in the diets of the inhabitants. Quantitatively it has become, and still remains, as the most important crop. Today the plant is widely used throughout the world, in Africa, Asia, the West Indies, and South America. Taro is of great importance in many places such as the Caribbean, Hawaii, the Solomon Islands, American Samoa, West Samoa, the Philippines, Fiji, Sri Lanka, India, Nigeria, Indonesia, New Hebrides, Tonga, Papua New Guinea, and Egypt. In these areas many people depend heavily upon taro as a staple food. Few years ago, taro was introduced by the US Department of Agriculture (USDA) to the southern United States as a supplement to potatoes.

## Origin

The great antiquity and widespread cultivation of taro has led to much discussion over the origin of the species. *Colocasia* originated in Indo-Malaya (Plucknett *et al.*, 1970 in Plucknett, 1979) but ethnobotanical evidence favors India as the place of origin (Spier, 1951 in Plucknett, 1979). The cultivated forms are believed to have

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originated in Assam (India) or Upper Burma (Myanmar) (Anderson, 1952 in Plowman, 1969). It was recorded as an important food crop in China about 100 BC (Plucknett, 1979).

## Chemoprofile and nutritional value

The corms (stems) and cormels (tubers) are rich in starch; the flesh is mealy to smooth and usually has a delicate nutty flavor. The starch grains are very small and consist of a mixture of two types, one 1–1.5 μ and the other 3–4 μ in diameter. Hence, taro is easily digested but unsuitable as a source of industrial starch. The tubers are rich in a mucilage, which on hydrolysis yields eight sugars, the predominant ones being d-galactose and l-arabinose in the ratio 8:1. The quality of corms and cormels depends on the acridity and presence of fibers. In Kumaoni language, acridity is termed as *kukail* and fiber as *jin.* Acridity is due to the presence of calcium oxalate crystals in the corms, cormels, and leaves. Calcium oxalate crystals in taro exist in two forms: druses and raphides. The density of crystals in acrid corms may be as high as 120,000 $cm^{-1}$. In leaves the number of crystals is even higher. A good quality of taro corms is without any raphides, is fiberless and soft like butter after cooking.

Most cultivars particularly contain oxalic acid (0.1–0.4% fresh weight) mainly in the form of raphides, i.e., bunches of needle-shaped crystals of calcium oxalate embedded in the tissues. An unidentified irritant(s) may also be present in the tissues; boiling reduces irritancy.

Chopra *et al.* (1956) reported that the corms contain amylase sapotoxin and leaves contain provitamin A and vitamin C. Taro also contains trypsin inhibitor and 2α-amylase inhibitor sterols (Asolkar *et al.*, 1992).

Leaves and petioles are used as vegetable and are useful sources of vitamins A and C. The nutritional chemical composition of the edible portion of the tubers and leaves are given in Table 1. The tubers also contain minerals and amino acids (Gopalan *et al.*, 1996).

Minerals (mg per 100 g): 28 magnesium, 9 sodium, 550 potassium, 0.18 copper, 0.28 manganese, 0.31 zinc

Total nitrogen (N) (g per 100 g): 0.48

Amino acids (mg per g N): 470 arginine, 110 histidine, 300 lysine, 110 tryptophan, 320 phenylalanine, 230 tyrosine, 80 methionine, 160 cystine, 280 threonine, 510 leucine, 270 isoleucine, 380 valine

Although taro is popular in China, Japan and other Asian countries throughout the tropics, it is a largely neglected plant. It is a good source of minerals, calcium, phosphorus, vitamin A, and vitamin B. It has rich carbohydrate food, high nutritive value, and superior keeping quality and thus has great unrealized potential (Anonymous, 1975).

**Table 1. Nutritive value of taro.**[1]

| Constituent | Tubers | Leaves with green petiole | Leaves with black petiole |
|---|---|---|---|
| Moisture (%) | 73.1 | 82.7 | 78.8 |
| Protein (N × 6.25) (g) | 3.0 | 3.9 | 6.8 |
| Fat (g) | 0.1 | 1.5 | 2.0 |
| Minerals (g) | 1.7 | 2.2 | 2.5 |
| Fiber (g) | 1.0 | 2.9 | 1.8 |
| Carbohydrates (g) | 21.1 | 6.8 | 8.1 |
| Energy (kcal) | 97 | 56 | 77 |
| Calcium (mg) | 40 | 227 | 460 |
| Phosphorus (mg) | 140 | 82 | 125 |
| Iron (mg) | 0.42 | 10 | 0.98 |
| Carotene (μg) | 24 | 10,278 | 12,000 |
| Thiamine (mg) | 0.09 | 0.22 | 0.06 |
| Riboflavin (mg) | 0.03 | 0.26 | 0.45 |
| Niacin (mg) | 0.4 | 1.1 | 1.9 |
| Vitamin C (mg) | – | 12 | 63 |
| Folic acid (free) (μg) | 16 | – | – |
| Folic acid (total) (μg) | 54 | – | – |

1. All the values are per 100 g of edible portion.

Source: Gopalan *et al.* (1996).

## Pharmacology

Ethyl alcohol extract of the rhizome is hypotensive and leaves are hypocholesterolemic in mice (Asolkar *et al.*, 1992). The corm and tubers contain a mucilage and its emulsifying properties have been studied (Gaind *et al.*, 1969).

## Folk taxonomy

Taro in Kumaon is classified under folk taxonomy according to color of the petiole, shape, size, and color of the corms, etc. and possibly, these are either varieties or cultivars. Locally, four types of *pinalu* are recognized according to color of the petioles and morphological characters, i.e., shape, color, and size of corms and cormels (Bhatt and Chauhan, 1999). These are: *Ganderi, Puryansi, Rarwa,* and *Kuchia.*

*Ganderi*: The petioles are violet or dark in color. The corms are of different shape but mostly red with dark red streaks. Sometimes at the apex of the corms there are black buds.

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*Puryansi*: The petioles are green and the corms are red and sweet.

*Rarwa*: The petioles are dark in color and the corms are stout, big, and long but white in color. The corms are acrid in taste and contain fibers, but the petiole and leaves are tasty.

*Kuchian*: The petioles are green and often preferred for making curry. The curry prepared from the petioles and leaves are tasty and sweet. The corms are spherically long and often come out of the ground.

Taro or *pinalu* from Totam (near Ramnagar), Dwarahat (near Ranikhet), and Bageshwar are regarded as the best quality as these are tasty (Fig. 1). The people of Kumaon produce it for their own consumption and as a commercial crop and sell it to the nearest developing or developed towns, where these are available in the market from December to June. Wild taro are known as *rakalu* and these are very acrid in taste and are poisonous.

## Kumaoni cuisine

Taro corms, cormels, leaves, and petioles are used in various food preparations in Kumaon.

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### Nuggets or *papar-bari*

The outer skin of the petiole (*naul* or *papar*) is peeled off, cut finely into very small pieces and then washed thoroughly with water and decanted. After the water is drained off, the petiole pieces are mixed thoroughly by hand with the ground paste of *Vigna mungo* (black gram; locally known as *mansha* or *urada*) until the mixture becomes very spongy. Nuggets are then prepared by hand and spread over the stony roof of the house or on a clean tin sheet for drying during October–November, when the sky is absolutely clear and the days are sunny. The dry nuggets are known as *bari*, precisely as *papar-bari*. The nuggets or *bari* are also prepared from other vegetables like *Cucumis sativa* (cucumber; *khira* or *kakar*) and *Lagenaria siceraria* (bottle gourd; *lauki*) (Shah, 1987). However, the nuggets prepared from petioles of taro are light and tasty and much preferred.

### *Papar* or *naul* curry

The petioles or leaf stalks (known as *papar* or *naul*) are collected and cut into small pieces and dried in the sun and these are used in making curries in winter when very few vegetables are available in colder regions (Bhargava, 1959). These are also cooked like green vegetables and taste like spinach. The unopened young leaf and leaf stalk are cooked as green vegetable.

### *Gaba*

The young unopened leaves (*pinalu-gaba*) are opened and cut into flat portions, pasted

**Figure 1. Taro varieties from different regions of Kumaon: (*from left to right*) Totam (Ranikhet) (two tubers); Kutani (Bhimtal); Takula (Bageshwar); Dunagiri (Ranikhet); and Vinta (Ranikhet). (Note: Dunagiri and Vinta taro are very soft while Totam is fibrous.)**

with chickpea flour mixed with ground condiments and then rolled and fried. The preparation looks like a flat cigar and is known as *gaba*. *Gaba* are also prepared from young leaves of other plants, particularly *Phytolacca acinosa*, locally known as *zarak*. Those who might have visited Badrinath, may have observed that on the way beyond Joshimath there are many wayside vendors, who sell freshly cooked *P. acinosa* under the name of *pakora*. Young leaves of *Vitis vinifera* (grape; *angoor*), which are also planted in the houses in Kumaon are also used for preparation of *gaba.*

## *Papar-bari* curry

*Papar-bari* (nuggets) are cooked like any vegetable curry. First, little wheat flour is toasted in a pan until it becomes semi-brown. It is taken out. Then, some oil is kept in the pan and the *papar-bari* are fried and taken out. In the heated oil, sliced onion and garlic are fried and then paste of coriander, turmeric, and chili is mixed and fried until it leaves oil in the pan and then water is added with the toasted flour and the fried *papar-bari*. Finally, salt is added according to taste and cooked for about 10 minutes. The preparation is garnished with coriander leaves.

### *Ganderi* preparations

The central corm is known as *ganderi*, which is used to prepare various dishes of vegetable curry. A few important ones are described.

***Ganderi-methi bhang hali sag.*** Cannabis or hemp seeds (*bhanga-beej*) are lightly toasted until they become semi-brown and then finely ground to make a fine paste and mixed with water and strained to remove the unground seed coat particles. Water is added to the mixture and kept aside. Oil is heated and cumin (*Cuminum cyminum*; *jira*) seeds are added; then the washed cut pieces of *ganderi* and finely cut fenugreek (*Trigonella foenum-graecum*; *methi*) leaves are added and stirred for some time. Then the paste of coriander, chili, and turmeric is added and again stirred well. Then the mixture of *bhanga-beej* is added and boiled for some time on slow fire. When it is cooked, it is seasoned with *jambu* (*Allium stracheii*) leaves and then served (Shah, 2004). *Bhanga-beej* and *jambu* are available in the bazaar in important towns of Kumaon.

***Ganderi gutuk.*** *Ganderi* or the central corm is skinned off and cut into medium-size pieces and washed. In a cooking utensil generally with a lid or in pressure cooker, *sarson* (mustard) oil is heated. Whole red chilies are fried and taken out. Then in the heated oil, cumin seeds are added and then cut pieces of taro are added along with paste of coriander, turmeric, and chili. The mixture is stirred for some time; then salt is added as per taste and finally water is added, measuring about one fourth the quantity of the mixture (i.e., 250 ml of water for 1 kg of the mixture). The mixture is stirred again and again. Then the utensil is covered with the lid and cooked on slow fire until the pieces become soft and are easy to cut. When cooked these are seasoned with *jambu* leaves and dressed with whole fried chilies and served as dry curry.

***Ganderi dahi hali.*** *Ganderi gutuk* is prepared and then *dahi* (curd) thinned with water is added and cooked on slow fire for some time. The curry is dressed with coriander leaves and served.

***Ganderi gauht dal.*** *Kulthi* or *gahot* or horse gram (*Dolichos uniflorus*) dhal is prepared like other dhals including lentil and it is added with washed and cut pieces of *ganderi*. It is seasoned with *jambu* leaves as above.

***Pinalu sag.*** The cormels are cooked like other usual vegetables either dry or with gravy.

## Uses in other parts of the world

The flour produced from the corm is similar to potato flour and is used to make soups, biscuits, bread, beverages, and puddings. Taro starch is easily digested and is used in baby foods, hypoallergenic foods, and as a cereal substitute in diets for victims of celiac disease. In Hawaii, taro is sliced and fried as chips (Anonymous, 1975). It is a symbol of cultural, historical, physical, and economical significance. Taro festival is celebrated each year at least in three islands

of Hawaii and fresh and cooked 'tar' is sold in the market (Matthews, 1998).

Preparation of foods and medicines from corms and cormels in different parts of the world are described by Plowman (1969).

## Kumaoni proverbs

Taro is much used in Uttarakhand (particularly in Kumaon); hence, it has been referred in proverbs and sayings (Pandey and Pande, 1999).

*Eke khãr kã pinao chan.*

The taro of the same *khar* (field where taro is grown). Generally, if taro of the same stock growing in the same field are acrid then the whole lot would be acrid and of bad taste. It usually means that bad persons belong to the same family.

*Khãr kã pinao khare sar.*

Wild taro growing in *khar* or waste field finally decay there; i.e., no one uses the wild taros and they die there. Likewise, no one likes uncultured people and they remain there where they are born and do not progress just as a frog in a well.

*Ghar pinau, ban pinau, mama yan gayun nau hãth lambã pinau.*

Taro in the house, taro in the forest and when maternal uncle's house was visited there was a nine-hand long taro. This means that the same situation and conditions occur everywhere.

*Na miar pinau, na miki kukel.*

Taro are not mine then how can I get the acrid taste. This means that when my kith and kin have not done anything wrong then why I should I bother.

*Pinau ja pat pani.*

Like water drops on the surface of taro leaf. This means that a very unstable (unreliable) person slips like the water drops on the taro leaves.

## Concluding remarks

For supplying nutrients, the corms may be considered as a good source of carbohydrates and potassium. Large servings of taro corms are a significant source of dietary protein, especially if taken more than once a day. Taro corms are relatively a poor source of ascorbic acid and carotene. Taro contains greater amounts of vitamin B-complex than whole milk. The cooked leaves have the same nutritional value as that of spinach and cabbage. Besides starch, the corms are rich in amylase, an enzyme. Amylase is also called diastase and has physiological, commercial, and historical significance. It hydrolyzes starch, glycogen, and dextrin to form in all three instances glucose, maltose, and the limit-dextrins. It is concluded from the Kumaoni cuisine and uses in proverbs and sayings that taro has long been associated with Kumaoni people as vegetable and also a nutritional vegetable crop but how and from where it was introduced remains still to be investigated.

Further, in the world, it is reported that there are about 1000 cultivars or horticultural varieties. It is required to assess scientifically

the number of cultivars being cultivated in Kumaon and collate these with the folk varieties under cultivation. The nutritional values of taro corms, cormels, and the unopened and opened leaves need to be estimated. Gopalan *et al.* (1996) has given the nutritional value but has not recorded the location from where the material had been taken for analyses.

Further, Hanelt *et al.* (1991) reviewed the isozyme variation in 1417 cultivars of taro from Asia and Oceania and in the seven enzyme systems, 143 zymotypes have been found. Most of the Indonesian cultivars differ from Philippine and Oceanian ones. The greatest genetic variability for taro exists in Indonesia, whereas the genetic basis of taro in Oceania is narrow. The ploidy level of 105 cultivars of taro from different parts of China was studied and it was found that only diploids were present in Hainan province, whereas in central, northern, and eastern parts only triploids and in the southern part diploids and triploids were present. At higher altitudes a greater percentage of triploid cultivars are grown while at lower altitudes diploids prevail. Such type of isoenzyme study is required to be undertaken in Kumaon where these are prominently cultivated to be used for future records and information.

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