



Ethnobotanical Leaflets



Taro (*Colocasia esculenta*)

By Wilfred Lee

Breakthrough improvements in the major grain crops have increased world food production dramatically during the last twenty seven years. The advancements in grain production, however, have not brought significant benefits to areas where root crops are the major staples. Therefore, more emphasis should be directed toward such root crops as taro, which is a staple food in many developing nations of Asia, Africa, and the Pacific.

Taro (*Colocasia esculenta* (L.) Schott), a member of the Araceae family, is an ancient crop grown throughout the humid tropics for its edible corms and leaves, as well as for its traditional uses.

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 Solomons, American Samoa, West Samoa, the Philippines, Fiji, Sri Lanka, India, Nigeria, Indonesia, New Hebrides, Tonga, Niue, Papua, New Guinea, Egypt, and others. In these areas many people depend heavily upon taro as a staple food. More recently, taro was introduced by the U. S. Department of Agriculture to the southern United States as a supplement to potatoes.

Taro constituted the staff of life for the Hawaiians when Captain Cook arrived in the islands in 1778. At that time an estimated three hundred thousand people in the islands lived chiefly on poi (a fermented or unfermented taro paste), sweet potato, fish, seaweed, and a few green vegetables and fruits. They used no grain or animal milk in their diet, and animal proteins were a rarity. Yet the good physique and excellent teeth of the Polynesian people testified to an adequate diet. Taro has played a similar role in the diet of the Melanesians and Micronesians, who ate boiled or baked corms and the leaves of taro. Young taro leaves are used as a main vegetable throughout Melanesia and Polynesia. They are boiled or covered with coconut cream, wrapped in banana or breadfruit leaves and cooked on hot stone. Thus, taro is one of the few major staple foods where both the leaf and the underground parts are equally important in the human diet.

Within the last sixty years, investigators have confirmed the superiority of taro over other starchy staples. The digestibility of taro starch has been estimated to be 98.8 percent. The size of the taro starch grain is one-tenth that of potato. Because of its ease of assimilation, taro can be used by person with digestive problems. Taro flour and other products have been used extensively for infant formulae in the United States and have formed an important constituent of proprietary canned baby foods. Taro is especially useful to persons allergic to cereals and can be consumed by children who are sensitive to milk. Poi can be used as a carbohydrate base to formulate milk substitutes. Sensitivity to taro occurs far less frequently than it does to other starches.

In an intensive survey of tooth decay among the Melanesian inhabitants of the Manus Islands, a comparison was made between people who ate only taro and those subsisting on sago (*Metroxylon* sp.). Those eating taro had better dental arches and showed a lower incidence of acute or subacute infection of the gums. This was ascribed to the higher vitamin content of taro. Similarly, a marked improvement in dental conditions and a reduced incidence of pneumonia, diarrhea, enteritis, and beriberi resulted among babies born on Hawaiian plantations who were fed poi and sweet potato in place of bread and rice.

In many ways taro is a unique crop. Its starch granules vary in size from 1 to 6.5 micrometers and it can be useful as an additive to render plastics biodegradable.

Taxonomy of the Genus Colocasia

The Araceae is a large family, comprising some hundred genera and more than fifteen-hundred species. Mostly tropical or subtropical plants, the aroids grow mainly in moist or shady habitats. Some are terrestrial plants while others are vines, creepers, or climbers. Many species of the Araceae are also epiphytes.

The major edible aroids are classified in two tribes and five genera; Lasioideae (*Cyrtosperma* and *Amorphophallus*) and Colocasiodeae (*Alocasia*, *Colocasia*, and *Xanthosoma*). Taro, *Colocasia esculenta* (L.) Schott is considered as a single polymorphic species.

Center of Origin and Geographic Distribution of Taro

Colocasia and *Xanthosoma* are the most important of the edible genera. *Colocasia* is thought-to have originated in the Indo-Malayan region, perhaps in eastern India and Bangladesh, and spread eastward into Southeast Asia, eastern Asia, and the Pacific islands; westward to Egypt and the eastern Mediterranean; and then southward and westward from there into East Africa and West Africa, from whence it spread to the Caribbean and America. *Xanthosoma* is a native of South and Central America.

Chromosome Number

There is evidence that the place where greatest variation in chromosome number occurs is India. The

"Polynesian taros" primarily all have twenty-eight chromosomes, while generally there is a greater concentration of 42-chromosome types in East Asia. It has been speculated that the 28-chromosome cultivars preceded the 42-chromosome types into the Pacific islands.

Morphology of Taro

Plants of the genus *Colocasia* are herbaceous, often with large leaves and bearing one or more underground stems or corms. Taro, the principal edible species, has been described as a succulent, glabrous, perennial herb. The aboveground portion of a taro plant is composed of large leaf laminae on long erect petioles. The laminae are 25 to 85 cm long and 20 to 60 cm wide. Their shape is entire and ovate to sagittate with an acuminate apex and rounded basal lobes. The surface of the lamina is glabrous and marked by a pinnate venation pattern with three major veins extending through the length of the lamina and through the basal lobes. Laminae are 275 to 300 mm in thickness. Taro possesses enlarged, starchy, underground stems which are properly designated corms. These have been found to be highly variable with respect to hydration, size, color, and chemistry. The corm is composed, outwardly, of concentric rings of leaf scars and scales. It bears one or more smaller secondary cormels which arise from lateral buds present under each scale or leaf base. Anatomically, the corm is composed of a thick, brown outer covering and starchy ground parenchyma. Scattered through the ground tissue are numerous fibrovascular bundles, a few laticifers and raphide idioblasts. The association of large numbers of druse idioblasts with the vascular tissues of the developing corm has led to the suggestion that these represent a calcium storage mechanism. The root system of taro is adventitious and fibrous. The flower of taro is composed of a spathe 20 to 40 cm in length surrounding a spadix measuring 6-to 14 cm that contains unisexual flowers. It is borne on a stout pedicel which, at 15 to 30 cm, is somewhat shorter than the petioles. All parts of the taro plant contain acrid principles which are irritating to the mouth and esophagus. Farmers can feel the "sting" when they harvest the taro, but may gradually lose sensitivity to the irritant. The acidity can be destroyed by cooking or fermentation. Once the acidity is removed, both taro and the fermented taro and the leaf are excellent carbohydrate foods and sources of minerals and vitamins.

The acidity is due to the presence of the calcium oxalate crystals in the taro plant. Calcium oxalate crystals in taro exist in two forms: druses (80-95 percent of the total) and raphides. The density of crystals in corms may be as high as 120,000/cm³. In leaves the number of the crystals is even higher.

Nutritive Value of Taro

When a crop is being considered for food, nutritional value and consumer acceptance must be taken into consideration. The nutritional value of a food depends upon its nutritional contents and their digestibility and the presence or absence of antinutrients and toxic factors. As far as consumer acceptance is concerned, *Colocasia esculenta*, commonly known as taro or cocoyam, is an important food staple of developing countries in Africa, the West Indies, the Pacific region and Asia. The corms are generally used as the main starch in meals, however, snacks are prepared from taro in numerous countries and are either sweet or salty, moist or crisp. Hawaiians traditionally used taro to make poi. Human digestibility

of the raw taro starch is the same as raw potato starch. For supplying nutrients, the corms may be considered as a good source of carbohydrates and potassium. Large servings of taro corms become a significant source of dietary protein, especially if taken more than once a day. Although taro corms are a relatively poor source of ascorbic acid and carotene, the carotene content is equivalent to that of cabbage and twice that of potato. Taro also contains greater amounts of vitamin B-complex than whole milk. The cooked leaves has the same nutritional value of spinach.

Taro Cultivation

For every taro patch, there is a cycle of production activities, including soil preparation, planting, crop nurture, and harvest, but the individual cycles can be staggered so that a group of patches produce continuously throughout the year. This means that there is neither a planting nor a harvesting season. A taro planting set is prepared from the main plant or sucker. It consists of the upper 1 cm section of the corm or cormel and the first 20 to 25 cm of the petioles.

About fourteen to eighteen months after planting, the taro crop is harvested, a job still done today mainly by hand.

Conclusion

With the introduction of cash crops there is a tendency for the farmers to neglect subsistence gardens and to use the money earned to purchase store food. This trend can introduce serious nutritional problems among people whose primary diet is taro-based.

The policies of governments in developing nations are usually centered around reducing imports, increasing exports, and raising the standard of living and nutritional levels of the population. In most countries these policies have led to crop improvement programs centered on local staple crops. For the most part these have been grains such as wheat, corn, and rice. Root crops in general and taro in particular have been neglected because only 10 percent of the world population is using root crops as a major staple. The time has come, however, to increase the world production and utilization of root crops.

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