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## **YAM**

Yam is the common name for some plant species in the genus *Dioscorea* (family Dioscoreaceae) that form edible tubers. Yams are perennial herbaceous vines cultivated for the consumption of their starchy tubers in many temperate and tropical regions, especially in Latin America, Africa, Asia, and Oceania. The tubers themselves, also called "yams", come in a variety of forms owing to numerous cultivars and related species.

The name "yam" appears to derive from Portuguese inhamé or Canarian (Spain) ñame, which derived from West African languages during trade. The main derivations borrow from verbs meaning "to eat".

True yams have various common names across multiple world regions

### **Other uses of the term "yam"**

In some places, other (unrelated) root vegetables are sometimes referred to as "yams", including:

- 1- In the United States, sweet potatoes (*Ipomoea batatas*), especially those with orange flesh, are often referred to as "yams"
- 2- In Australia, the tubers of the *Microseris lanceolata*, or yam daisy, were a staple food of Aboriginal Australians in some regions.
- 3- In New Zealand, oca (*Oxalis tuberosa*) is typically referred to as "yam".
- 4- In Malaysia and Singapore, taro (*Colocasia esculenta*) is referred to as "yam".
- 5- In Africa, South and Southeast Asian as well as the tropical Pacific islands *Amorphophallus paeoniifolius* is grown and also known as elephant foot yam.

### **Description**

A monocot related to lilies and grasses, yams are vigorous herbaceous vines providing an edible tuber. They are native to Africa, Asia, and the Americas. Some yams are also invasive plants, often considered a "noxious weed", outside cultivated areas. Some 870 species of yams are known, and 95% of these crops are grown in Africa.

Yam plants can grow up to 15 m (49 ft) in length and 7.6 to 15.2 cm (3.0 to 6.0 in) high. The tuber may grow into the soil up to 1.5 metres (4.9 ft) deep. The plant disperses by seed.

The edible tuber has a rough skin that is difficult to peel but readily softened by heating. The skins vary in color from dark brown to light pink. The majority of the vegetable is composed of a much softer substance known as the "meat". This substance ranges in color from white or yellow to purple or pink in mature yams.

### **Cultivation**

Yam crop begins when whole seed tubers or tuber portions are planted into mounds or ridges, at the beginning of the rainy season. The crop yield depends on how and where the sets are planted, sizes of mounds, interplant spacing, provision of stakes for the resultant plants, yam species, and tuber sizes desired at harvest. Small-scale farmers in West and

Central Africa often intercrop yams with cereals and vegetables. The seed yams are perishable and bulky to transport. Farmers who do not buy new seed yams usually set aside up to 30% of their harvest for planting the next year. Yam crops face pressure from a range of insect pests and fungal and viral diseases, as well as nematode. Their growth and dormant phases correspond respectively to the wet season and the dry season. For maximum yield, the yams require a humid tropical environment, with an annual rainfall over 1500 mm distributed uniformly throughout the growing season. White, yellow, and water yams typically produce a single large tuber per year, generally weighing 5 to 10 kg (11 to 22 lb).

Despite the high labor requirements and production costs, consumer demand for yam is high in certain subregions of Africa, making yam cultivation quite profitable to certain farmers.

#### **Major cultivated species**

Many cultivated species of *Dioscorea* yams are found throughout the humid tropics. The most economically important are discussed below.

Non-*Dioscorea* tubers that were historically important in Africa include *Plectranthus rotundifolius* (the Hausa potato) and *Plectranthus esculentus* (the Livingstone potato); these two tuber crops have now been largely displaced by the introduction of cassava.

#### **D. rotundata and D. cayennensis**

*Dioscorea rotundata*, the white yam, and *D. cayennensis*, the yellow yam, are native to Africa. They are the most important cultivated yams. In the past, they were considered as two separate species, but most taxonomists now regard them as the same species. Over 200 varieties between them are cultivated.

White yam tuber is roughly cylindrical in shape, the skin is smooth and brown, and the flesh is usually white and firm. Yellow yam has yellow flesh, caused by the presence of carotenoids. It looks similar to the white yam in outer appearance; its tuber skin is usually a bit firmer and less extensively grooved. The yellow yam has a longer period of vegetation and a shorter dormancy than white yam.

The Kokoro variety is important in making dried yam chips.

They are large plants; the vines can be as long as 10 to 12 m (33 to 39 ft). The tubers most often weigh about 2.5 to 5 kg (5.5 to 11.0 lb) each, but can weigh as much as 25 kg (55 lb). After 7 to 12 months' growth, the tubers are harvested. In Africa, most are pounded into a paste to make the traditional dish of "pounded yam," known as *lyan*.

#### **D. alata**

*D. alata*, called "white yam", winged yam, water yam, and purple yam (not to be confused with the Okinawan purple "yam", which is a sweet potato), was first cultivated in Southeast Asia. Although not grown in the same quantities as the African yams, it has the largest distribution worldwide of any cultivated yam, being grown in Asia, the Pacific islands, Africa, and the West Indies. Even in Africa, the popularity of water yam is second only to white yam. The tuber shape is generally cylindrical, but can vary. Tuber flesh is white and watery in texture.

Uhi was brought to Hawaii by the early Polynesian settlers and became a major crop in the 19th century when the tubers were sold to visiting ships as an easily stored food supply for their voyages.

#### **D. polystachya**

*D. polystachya*, Chinese yam, is native to China. The Chinese yam plant is somewhat smaller than the African, with the vines about 3 m (9.8 ft) long. It is tolerant to frost and can be grown in much cooler conditions than other yams. It is also grown in Korea and Japan.

It was introduced to Europe in the 19th century, when the potato crop there was falling victim to disease, and is still grown in France for the Asian food market.

The tubers are harvested after about 6 months of growth. Some are eaten right after harvesting and some are used as ingredients for other dishes, including noodles, and for traditional medicines.

#### **D. bulbifera**

*D. bulbifera*, the air potato, is found in both Africa and Asia, with slight differences between those found in each place. It is a large vine, 6 m (20 ft) or more in length. It produces tubers, but the bulbils which grow at the base of its leaves are the more important food product. They are about the size of potatoes (hence the name "air potato"), weighing from 0.5 to 2.0 kg (1.1 to 4.4 lb).

Some varieties can be eaten raw, while some require soaking or boiling for detoxification before eating. It is not grown much commercially since the flavor of other yams is preferred by most people. However, it is popular in home vegetable gardens because it produces a crop after only four months of growth and continues producing for the life of the vine, as long as two years. Also, the bulbils are easy to harvest and cook.

In 1905, the air potato was introduced to Florida and has since become an invasive species in much of the state. Its rapid growth crowds out native vegetation and it is very difficult to remove since it can grow back from the tubers, and new vines can grow from the bulbils even after being cut down or burned.

#### **D. esculenta**

*D. esculenta*, the lesser yam, was one of the first yam species cultivated. It is native to Southeast Asia and is the third-most commonly cultivated species there, although it is cultivated very little in other parts of the world. Its vines seldom reach more than 3 m (9.8 ft) in length and the tubers are fairly small in most varieties.

The tubers are eaten baked, boiled, or fried much like potatoes. Because of the small size of the tubers, mechanical cultivation is possible, which along with its easy preparation and good flavor, could help the lesser yam to become more popular in the future.

#### **D. dumetorum**

*D. dumetorum*, the bitter yam, is popular as a vegetable in parts of West Africa, in part because their cultivation requires less labor than other yams. The wild forms are very toxic and are sometimes used to poison animals when mixed with bait. It is said[according to whom?] that they have also been used for criminal purposes.

#### **D. trifida**

D. trifida, the cush-cush yam, is native to the Guyana region of South America and is the most important cultivated New World yam. Since they originated in tropical rainforest conditions, their growth cycle is less related to seasonal changes than other yams. Because of their relative ease of cultivation and their good flavor, they are considered to have a great potential for increased production.

### **Harvesting**

Yams in West Africa are typically harvested by hand using sticks, spades, or diggers. Wood-based tools are preferred to metallic tools as they are less likely to damage the fragile tubers; however, wood tools need frequent replacement. Yam harvesting is labor-intensive and physically demanding. Tuber harvesting involves standing, bending, squatting, and sometimes sitting on the ground depending on the size of mound, size of tuber, or depth of tuber penetration. Care must be taken to avoid damage to the tuber, because damaged tubers do not store well and spoil rapidly. Some farmers use staking and mixed cropping, a practice that complicates harvesting in some cases.

In forested areas, tubers grow in areas where other tree roots are present. Harvesting the tuber then involves the additional step of freeing them from other roots. This often causes tuber damage.

Aerial tubers or bulbils are harvested by manual plucking from the vine.

Yields may improve and cost of yam production be lower if mechanization were to be developed and adopted. However, current crop production practices and species used pose considerable hurdles to successful mechanization of yam production, particularly for small-scale rural farmers. Extensive changes in traditional cultivation practices, such as mixed cropping, may be required. Modification of current tuber harvesting equipment is necessary given yam tuber architecture and its different physical properties.

### **Production**

Yam production - 2017

Country	Production
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(millions of tonnes)

Nigeria	
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47.9	
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Ghana	
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8.0	
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Ivory Coast	
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7.1	
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Benin	
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3.1	
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Ethiopia	
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1.4	
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Togo	
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0.8	
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Cameroon	
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0.6

World

73.0

Source: UN Food & Agriculture Organization

In 2017, worldwide production of yams was 73.0 million tonnes, led by Nigeria with 66% of the global total (table). Nigeria farmed yams on 5.9 million hectares, 70% of the world land area of 8.6 million hectares devoted to yam farming.

The world average annual yield of yams was 8.8 tonnes per hectare in 2017, with Ethiopia having the most productive farms of 29.2 tonnes per hectare.

### **Storage**

Roots and tubers such as yam are living organisms. When stored, they continue to respire, which results in the oxidation of the starch (a polymer of glucose) contained in the cells of the tuber, which converts it into water, carbon dioxide, and heat energy. During this transformation of the starch, the dry matter of the tuber is reduced.

Amongst the major roots and tubers, properly stored yam is considered to be the least perishable. Successful storage of yams requires:

initial selection of sound and healthy yams

proper curing, if possible combined with fungicide treatment

adequate ventilation to remove the heat generated by respiration of the tubers

regular inspection during storage and removal of rotting tubers and any sprouts that develop

protection from direct sunlight and rain

Storing yam at low temperature reduces the respiration rates. However, temperatures below 12 °C (54 °F) cause damage through chilling, causing a breakdown of internal tissues, increasing water loss and yam's susceptibility to decay. The symptoms of chilling injury are not always obvious when the tubers are still in cold storage. The injury becomes noticeable as soon as the tubers are restored to ambient temperatures.

The best temperature to store yams is between 14 and 16 °C (57 and 61 °F), with high-technology-controlled humidity and climatic conditions, after a process of curing. Most countries that grow yams as a staple food are too poor to afford high-technology storage systems.

Sprouting rapidly increases a tuber's respiration rates, and accelerates the rate at which its food value decreases.

Certain cultivars of yams store better than others. The easier to store yams are those adapted to arid climate, where they tend to stay in a dormant low-respiration stage much longer than yam breeds adapted to humid tropical lands, where they do not need dormancy. Yellow yam and cush-cush yam, by nature, have much shorter dormancy periods than water yam, white yam, or lesser yam.

Storage losses for yams are very high in Africa, with insects alone causing over 25% harvest loss within four months.

### **Nutritional value**

Yam, raw

Nutritional value per 100 g (3.5 oz)

Energy

494 kJ (118 kcal)

Carbohydrates

27.9 g

Sugars

0.5 g

Dietary fiber

4.1 g

Fat

0.17 g

Protein

1.5 g

Vitamins

Quantity%DV†

Vitamin A equiv.

1%7 µg

Thiamine (B1)

10%0.112 mg

Riboflavin (B2)

3%0.032 mg

Niacin (B3)

4%0.552 mg

Pantothenic acid (B5)

6%0.314 mg

Vitamin B6

23%0.293 mg

Folate (B9)

6%23 µg

Vitamin C

21%17.1 mg

Vitamin E

2%0.35 mg

Vitamin K

2%2.3 µg

Minerals

Quantity%DV†

Calcium

2%17 mg

Iron

4%0.54 mg

Magnesium  
6%21 mg  
Manganese  
19%0.397 mg  
Phosphorus  
8%55 mg  
Potassium  
17%816 mg  
Zinc  
3%0.24 mg

Raw yam has only moderate nutrient density, with appreciable content (10% or more of the Daily Value, DV) limited to potassium, vitamin B6, manganese, thiamin, dietary fiber, and vitamin C (table).[20] But raw yam has the highest potassium levels amongst the 10 major staple foods of the world (see nutritional chart). Yam supplies 118 calories per 100 grams. Yam generally has a lower glycemic index, about 54% of glucose per 150 gram serving, compared to potato products.

The protein content and quality of roots and tubers is lower than other food staples, with the content of yam and potato being around 2% on a fresh-weight basis. Yams, with cassava, provide a much greater proportion of the protein intake in Africa, ranging from 6% in East and South Africa to about 16% in humid West Africa.[citation needed]

As a relatively low-protein food, yam is not a good source of essential amino acids. Experts emphasize the need to supplement a yam-dominant diet with more protein-rich foods to support healthy growth in children

Yam is an important dietary element for Nigerian and West African people. It contributes more than 200 calories per person per day for more than 150 million people in West Africa, and is an important source of income. Yam is an attractive crop in poor farms with limited resources. It is rich in starch, and can be prepared in many ways. It is available all year round, unlike other, unreliable, seasonal crops. These characteristics make yam a preferred food and a culturally important food security crop in some sub-Saharan African countries.