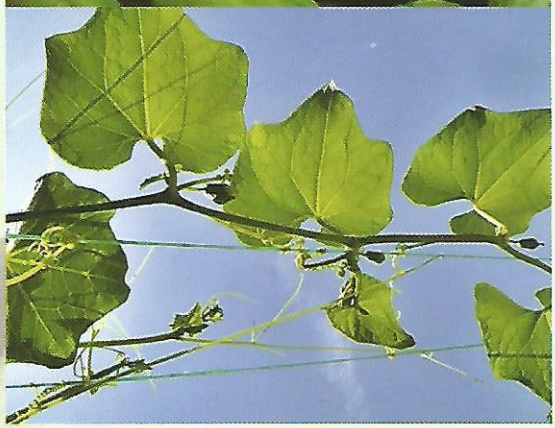
Chayote
Package of Practices



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PACKAGE OF PRACTICES

Botanical name : *Sechium edule*

Family : Cucurbitaceae

Common names : English: Chayote
Khasi: Piskot
Garo: Sikot
Other Names: Chow-Chow, Cho-Cho, Ishkus, Bengaluru venkaaya

Chow-chow or Chayote (*Sechium edule*), an interesting single seeded vegetable crop in the gourd family (Cucurbitaceae), is typically cooked and eaten as a vegetable. Unlike most members of the gourd family with many seeds embedded in the fleshy endocarp tissue, the fruit of chayote contains a single seed. The large seed has the unusual property of germinating while still inside the pear-shaped fruit. The plant of chow-chow is a hairy climber, making a growth of about 15-20m in one season from May to December on rich well drained soils in moist conditions.

Origin and Distribution:

Chow-chow is originated in the cool mountains of Central America where it was first domesticated by the Aztecs (Singh, 1990). Today, chayote is grown throughout the tropical and subtropical world for the edible fruits and tubers. Unlike other crops, there is no archaeological evidence to indicate how long *S. edule* has been cultivated. Its fleshy fruit which has a single seed with a smooth testa, does not allow it to be preserved and, as far as is known, no pollen grains or other structure of this species have been identified on archaeological sites.

Chronicles of the time of the conquest recorded that, in Mexico, Chayote has been cultivated since pre Columbian times. As regards linguistic references the common names of native origin are concentrated mainly in Mexico and Central America (Newstorm, 1990).

In India, chow-chow is widely grown in Madurai and Nilgiri district of Tamil Nadu, Karnataka, West Bengal, Mandi district of Himachal Pradesh and entire north-eastern hills region. Mizoram is the leading state with an estimated area of 845 ha and 10,985 metric tonnes production. Though, it is a native of Mexico but considerable diversity is found in NEH region particularly, Meghalaya, Mizoram and Sikkim (Rai *et al.*, 2005, Yadav *et al.*, 2005).

Composition and Uses:

The fruit of chow-chow are rich source of carbohydrates, proteins, fat, minerals and vitamins, particularly vitamin A and vitamin C (Sanwal *et al.,* 2007). It is the cheapest vegetable of north eastern region. The pear-shaped fruit has a delicate squash like flavour when cooked and are considered to be important items of daily diet among the people of hilly areas. Sometimes this vegetable is used as a substitute of potato and is cooked in many ways. Owing to carbohydrate and minerals, chow-chow fruits can also be used for preparation of pickles, candy and flour products. The fruit and particularly the seeds are rich in amino acids such as aspartic acid, glutamic acid, alanine, arginine, cysteine, phenylalanine, glycine, histidine, isoleucine, leucine, methionine (only in the fruit), proline, serine, tyrosine, threonine and valine. The woody stems furnish a fine fibre. Fruits, vines and tubers are also excellent fodder for livestock. Considerable variations are found in chow-chow in respect of fruit size, shape, colour, presence of spines and fibre content of the fruits.

TABLE 1 : COMPOSITION OF CHOW-CHOW FRUIT:

Components	Avg. amount in 100 gram
Water	94.240
Energy	19,000 kcal
Energy	80,000 kJ
Protein	0.820
Total Lipid	0.134 g
Ash	0.300 g
Carbohydrates (by difference)	4.510 g

Dietary fiber	1.700 g
Sugars (total)	1.660 g
Calcium	17,000 mg
Iron Fe^{++}	0.340 g
Magnesium	12.0 mg
Phosphorus	18.0 mg
Potassium	125.0 mg
Sodium	2.0 mg
Zinc	0.740 mg
Copper	0.123 mg
Manganese	0.189 mg
Selenium	0.200 mcg
Vitamin C (total ascorbic acid)	7.7 mg
Thaimin	0.25 mg
Riboflavin	0.029 mg
Niacin	0.470 mg
Pantothenic acid	0.249 mg
Vitamin B_6	0.076 mcg
Total Folate	93,000 mcg
Folic acid	-
Folate food	93,000 mcg
Folate DFE	93,000 mcg DFE
Choline (total)	9.200 mcg
Vitamin B_{12}	-
Vitamin B_{12} (added)	-
Vitamin A IU	-
Vitamin A	-
Vitamin E (alfa tocopherol)	0.120 mcg
Vitamin K (phylloquinone)	4.100 mcg
Fatty acids saturated	0.028 g
Saturated fatty acids 16.0	0.024 g
Saturated Fatty acids 18.0	0.003 g
Fatty acids total monosaturated	0.010 g
monosaturated fatty acids 18:1 undifferentiated	0.009 g
Fatty acid total polyunsaturated	0.057 g

Poly unsaturated fatty acids 18:2 undifferentiated	0.021 g
Poly unsaturated fatty acids 18:3 undifferentiated 0.036 g	0.036 g
Tryptophan	0.011 g
Threonine	0.040 g
Isoleucine	0.044 g
Leucine	0.077 g
Lysine	0.039 g
Methionine	0.001 g
Phenylalanine	0.047 g
Tyrosine	0.032 g
Valine	0.063 g
Arginine	0.035 g
Histidine	0.015 g
Alanine	0.051 g
Aspartic acid	0.092 g
Glutamic acid	0.125 g
Glycine	0.041 g
Proline	0.044 g
Serine	0.047 g

The chayote is used mainly for human consumption. The fruit, stems and young leaves as well as the tuberized portions of the roots are eaten as a vegetable, both alone and plain boiled, and as an ingredient of numerous stews. Because of its softness, the fruit has been used for children's food, juices, sauces and pasta dishes. In Mexico, an attempt has been made to increase the life of the fruit by drying it. The results have been positive and have enabled jams and other sweets to be prepared while also producing dried fruit, which can be used as a vegetable after a certain time. Because of their flexibility and strength, the stems have been used in the craft manufacture of baskets and hats. In India, the fruits and roots are not only used as human food but also as fodder.

The chayote also has medicinal uses, infusions of the leaves are used to dissolve kidney stones and to assist in the treatment of

arteriosclerosis and hypertension; infusions of the fruit are used to alleviate urine retention. The cardiovascular properties of the infusions of leaves have been tested in modern studies, while their great effectiveness in curing kidney diseases have been known since colonial times on the Yucatan peninsula, where these ailments are very common.

BOTANICAL DESCRPTION

Cultivars

In India, there is no variety yet released. The few varieties released outside India are Florida Green and Monticello White. ICAR Research Complex for NEH Region. Umiam, Meghalaya collected about 60 genotypes from different states of NEH region, evaluated them for yield and quality characters. Some of the genotypes produce up to 40 kg fruits/ plant (Sanwal *et al.*, 2008).

Climate And Soil

Sechium edule is grown traditionally in many regions of the world preferably between 800 to 2000 m altitudes (Rai *et al.*, 2002). It is a warm season crop grown mainly in sub-tropical regions. It requires moderate climate with good humidity as prevalent in Bangalore, lower hills of Darjeeling, Northeast India, Koraput region in Orissa, etc. It does not stand extreme dry wind during summer and frost in winter. Optimum conditions for growth and fruiting are 30°C daytime and >15°C night time temperatures. It requires 12 to 12.5 hr day length for flowering. The plant can grow under full sun to mild shaded conditions. Fruits exposed to full sun are light yellow, while plants grown in shade produce darker green fruit.

Squashes are warm season plants that are somewhat adapted to cool conditions. They tolerate monthly mean temperatures from 18 to 27°C (64 to 80°F), but grow best when temperatures are between 75° and 85°F (24 and 29°C) during the day and between 60 and 70°F (16 and 21°C) at night. Temperatures below 40°F (4.4°C) for several days can severely injure the plant, and temperatures above 85°F (29°C) will result in blossom drop and the production of small fruit.

A well drained soil is preferred by chow-chow. It is necessary that soil should be fertile and rich in organic matter. All the cucurbits are sensitive to acidic soils below pH 5.5, but Chow-Chow is slightly tolerant to acidic soil. Depth of soil is an important aspect because in perennial Chow-Chow plant, the soil has to support the vines up to 3 years. Pit planting for growing Chow-Chow on pandals (bower) or trellis is adopted which supports the vines for a long period.

CULTIVATION

Propagation

The normal and most effective form of propagation is from seed and usually the whole fruit is planted as a seed. Each fruit has a large seed that sprouts as soon as the fruit reaches maturity. However, sprouting of seed can be delayed when kept in cool storage conditions. Fruits stored at 10°C remain in good condition for planting for as much as 6-8 weeks.

Planting

The most common sowing practice is of planting one or more whole fruits. In commercial plantations, sowing is carried out using rooted cuttings or selected seed. The plants are sown on permanent beds with pandal / trellises and are laid out at distances that allow the easiest possible harvesting, transport to cold-storage rooms and packaging. On the commercial type of plantations, chemical and foliar fertilizers are generally used as well as herbicides and nematicides. In hilly regions it generally takes place at the beginning of the rainy season. Planting is done in pits which are treated with 10-15 kg of FYM before planting. During planting, place the fruit at a 45 degree angle with the shoot downward and the narrow stem-end base slightly protruding from the soil line. Deep planting will lead to fruit rot.

Spacing

Planting is done at a spacing of 3×2 m distance in pits of 0.5 m × 0.5 m × 0.5 m size.

Irrigation

Chayote needs ample soil moisture for good growth. Irrigation is necessary during dry spells in the growing cycle. Do not however, allow the soil to waterlog. Sprinkler irrigation may disrupt bee activity during pollination resulting in flower abscission.

Manures and Fertilizers

Chow-chow responds well to manuring and fertilizer application. The dose of fertilizer depends upon soil, climate and system of cultivation. Well decomposed farm yard manure at the rate of 15-20 tonnes per hectare is applied to the field at the time of land preparation. NPK @ 120:80:80 kg/ha is to be added with full doses of phosphorus and potash applied before sowing, half dose of nitrogen at the time of vining and the other half of N should be applied before flowering.

Bower/Pergola

Some types of support for the climbing vines is required. Most pergolas in North-east India are constructed by bamboo, about head height to facilitate walking underneath the vines for harvesting and other operations. Pandal, Bower or Pergola can be prepared at a height of 5 feet placing bamboo poles followed by criss cross wire netting. Training on bower should start just after 30 cm vine length once the crop anchors and branches spread vigorously.

Harvesting and Yield

A well grown plant of about one year yields 200-300 fruits. The fruit weight is 200-450 gm. In North East India fruits are slightly bigger. The yield of 80-100 quintals per acre has been recorded in Meghalaya. The crop is semi-perennial lasting 2-3 years.

Postharvest handling

Fruits must be harvested and handled carefully to prevent cuts, bruises, and spread of diseases. It is normally pre-cooled in cold rooms or through forced air. In the market, it is packaged in fibre board boxes with dividers, each piece in a film bag, single layer,

During handling the fruits are sensitive to chilling at <41°F (5°C), to moisture loss, and are sensitive to ethylene. Chilling injury results in swollen, watery looking spots formed on the periderm. Chayote can be stored for 4-6 weeks at 45°F and 85-90 %RH. Sprouting is promoted at >78°F (25°C).

At home, place them in paper bag and store inside the vegetable compartment of the refrigerator set with adequate moisture. They can be stored for up to 2-3 weeks. Old and large Chow-Chow fruits tend to sprout quite early, so use them as soon as possible.

DISEASES

Powdery mildew

This is a fungal disease (caused by Erysiphe sp) which damages the crop. It becomes often very severe. Symptoms first appear as half or full white circular patches or spots which appear on the undersurface of leaves (Jeffrey, 1978). In severe cases, the patches coalesce and cover both the surface of leaves and defoliation occurs

To control powdery mildew, spraying of Bavistin @ 1 g per litre of water, at least thrice, at 5-6 days interval is done.

Downy mildew

This is a fungal disease caused by Pseudopernospora sp. It is prevalent in areas of high humidity.The disease is characterised by formation of yellow angular spots on upper surface of leaves. The disease spreads rapidly killing the plant quickly through rapid defoliation. Application of fungicidal spray such as Dithane M-45 (0.2%) once a week is effective in controlling this disease.