



## A Brief Review on *Sechium edule*

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### ABSTRACT

Medicinal plants play a key role in development of effective medicines for the variety of disease. The use and potency of medicinal plants remarkably contribute to the disclosure of their therapeutic properties. Nowadays the significance of plant-based medicines has gained importance all the world. Varieties of herbs are exposed for the phytochemical screening for the separation of bio-active molecules which are pharmacologically evaluated and has come up with the discovery of new drugs. *Sechium edule* is an herbaceous plant which belongs to family Cucurbitaceae, and commonly called as chayote, chow-chow, and mirliton. *Sechium edule* has acquired widespread consuming acceptance and appreciated by its nutritional, phytochemical and pharmacological properties. This herb has proven to treat variety of diseases including asthma, bronchitis, cancer, constipation, diabetes, jaundice etc. they are rich in several important amino acids and phytoconstituents such as alkaloids, flavonoids, saponins, sterols, minerals and vitamins.

**Keywords:** *Sechium edule*, chayote, chow-chow, phytoconstituents.

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### INTRODUCTION

Plants accommodate a large source of variety of phytochemicals for the treatment of many diseases. The primary as well as secondary metabolites produced by the plants have distinctive pharmacological action and therapeutic uses. Hence the plants or the products obtained from them have been used for treating health disorders or diseases.<sup>1</sup>

*Sechium edule* which is also known as Chayote or Chow-chow is a vegetable crop which belongs to family Cucurbitaceae. It is a unique food crop bearing a pear-shaped fleshy fruit with single soft seed. It is cultivated worldwide in tropical and subtropical climates.<sup>1</sup> Chayote is mainly cultivated as vegetable and its immature fruits, young leaves and shoots, tuberous roots are consumed. The fruits are viviparous in nature. The significance of Chayote is based on growing commercial demand of the fruit and has acquired large-scale production in Mexico, Brazil, Puerto, Rico, Algeria, India, New-Zealand and Australia. According to the most recent report Chayote stands in fourth place in most consumed imported products after Avocado, tomato and coffee.<sup>2</sup> Chayote is a self-sustained plant resistant to most diseases and pests mostly caused by fungi, nematodes and insects. The shelf

life of *Sechium edule* is about four to six weeks in favourable storage conditions at 7°C and 85-90% humidity level and in case of higher temperature, it can lose fruit weight per day.<sup>2</sup>

### SPECIES

Currently there are ten species accepted to exist, eight of which are wild (*S. chinantlense*, *S. compositum*, *S. hintonii*, *S. talamancense*, *S. panamense*, *S. pittieri*, *S. venosum* and *S. vilosum*) and two cultivated (*S. tabaco* and *S. edule*).<sup>3</sup>

### Vernacular Names for *Sechium edule*.<sup>4</sup>

**Table 1:** Vernacular names of *Sechium edule*.

Hindi	: Chow chow
Manipuri	: Daskush
Tamil	: Seema- katharikkai
Kannada	: Semme badanekaye
Bengali	: Quash
Nepali	: Ishkus
Telugu	: Seema vankaya

### Taxonomical Position *Sechium edule*.<sup>5</sup>

**Table 2:** Taxonomical Classification of *Sechium edule*.

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Magnoliopsida
Order	: Violales
Family	: Cucurbitaceae
Genus	: <i>Sechium</i>
Species	: <i>edule</i>



## PROPAGATION AND PLANTATION

Chayote (Figure 1) are cultivated depending upon the nature of the soil and climatic conditions. The most common and systematic way of propagating of Chayote is by the use of seeds or the fruit and the familiar way of planting consists of sowing one or more entire fruits once the seedling is germinated. Whereas in some places the seed is removed from the fruit and placed in the pot or some other places where they develop into young plants and they are carefully transplanted and allowed to grow.<sup>1,6</sup>

Traditional method of planting of seeds is carried out by digging a sufficient large hole of three feet deep in order to permit the roots to grow to their full extent without destruction. And in this plantation a frame of Branches, wood or some kind of trellis system (the type of system where wooden stakes or wires are used to guide and support climbing plants) is often used so that the plant has to climb. The distance between the plant varies from 5-10 meter and number of seeds or fruits is from one to four. Chayote grows well where summer temperature is warm to hot and it requires 120-150 days to reach the harvest.<sup>1,6</sup>

In India, chayote is widely grown in Tamil Nadu, Karnataka, West Bengal, Himachal Pradesh and in the entire north east hill region. Mizoram is the leading state with an estimated area of 845 ha and 10,985 metric tonnes of production. There are various varieties of chayote grown in the North East region, particularly in Meghalaya, Mizoram and Sikkim. Among the several cultivated types of chayote grown in the region are named locally and found locally. Common names used in Mizoram is ishkut, in Meghalaya known as piskot, sikot, in other places as chow-chow etc. In Mizoram and Meghalaya the main variety of crop grown is Monticello White and Florida Green.



Figure 1: Plantation of *Sechium edule*

## BOTANICAL DESCRIPTION

The chayote is an herb which is perennial, monoecious, climbing creeper with tendrils which grows from a single thick root and produces adventitious tuberous roots. *Sechium edule* covers one of the major genera of angiosperm with wide variation regarding in the form and colour of the fruits. The most acceptable average temperature is 13°-21°C.<sup>7</sup>

**Stem:** The stems of Chayote are angular-grooved and glabrous, and grows simultaneously from a single root, in the cultivated plants.<sup>5</sup>

**Leaf:** Leaves are simple and spirally arranged, thin, broad and heart-shaped which is approximately 10-25cm wide. The petiole is 3.25cm long, leaf-blade is broadly ovate-circular in outline ranging 7.25cm in diameter. They are angular or lobate (with three or five lobes) and have minutely denticulate margins and three to five divided tendrils. (Figure 1)<sup>7</sup>

**Fruit:** Pendulous, light green, roughly pear-shaped and flattened with coarse wrinkles, ranging from 10 to 20cm in length. They are fleshy or fleshy-fibrous in nature and have longitudinal ridges or furrows, and they usually come in different shapes (globose, ovoid, sub-ovoid, pyriform). The flesh of the fruit has a fairly bland taste. (Figure 2)<sup>7</sup>



Figure 2: *Sechium edule* leaf

**Flower:** Flowers are unisexual and staminate, yellowish to pale green, in long racemes. The ovary is inferior and Pistillate flowers are solitary, corolla 12 to 17 mm. (Figure 3)<sup>5</sup>



Figure 3: *Sechium edule* fruit

**Seed:** The *S. edule* consists of single large seed with smooth testa. The seed is cordate, flat, and is embedded centrally in the mature fruit. The seed-coat is obsolete, before germination and They have the ability to germinate while they are still inside the fruit. (Figure 4)<sup>5</sup>



Figure 4: *Sechium edule* flower

**Roots:** The roots of the plant are tuberous in nature.<sup>7</sup>



**Figure 5:** *Sechium edule* seed

### PHYTOCHEMISTRY

Phytochemical analysis of fruit (pulp and seeds) revealed bioactive compounds such as alkaloids, flavonoids, carotenoids, triterpenoids, saponins, phenolic acids, peroxidases and several minerals including potassium, calcium, phosphorus and magnesium. The seeds also reported presence of essential amino acids leucine, arginine, phenylalanine, valine, lysine isoleucine, threonine and histidine. The other valuable ingredients are total carotenes, calcium, tannins, protein, glycolipid, and phospholipid.<sup>8</sup>

### PHARMACOLOGICAL ACTIONS

#### Anti-hyperlipidaemic properties

Flavonoids present in Chayote shoots were shown to decrease serum lipids, cholesterol content, preventing atherosclerosis and fatty liver.<sup>9</sup>

#### Anti-epileptic activity

Ethanol extract of fruits evaluated for anti-epileptic and CNS depressant effect in a rat. From the results it was revealed that there was significant reduction of duration of various phases of convulsion in MES and PTZ- induced convulsion. There was dose-dependent reduction of locomotor activity in the CNS depressant model.<sup>10</sup>

#### Anti-diabetic activity

The oral administration of high and low dose of Chayote fruit extract (100 and 200mg/kg bw) to alloxan-induced diabetic rats promoted the body weight loss and significant decreased the blood glucose levels.<sup>11</sup>

#### Anti-microbial effect

Aqueous and Ethanolic extracts of Chayote leaf exhibited anti-microbial activity against strains of multi-resistant staphylococci and enterococci.<sup>12</sup>

#### Anti-ulcer activity

The oral administration of ethanolic of Chayote fruit (500mg/kg bw) showed a significant anti-ulcer in Aspirin induced gastric ulceration in rats.<sup>13</sup>

### Hepatoprotective properties

The oral administration of Chayote ethanolic fruit extracts in high and low dose exhibited a significant hepatoprotective activity against Tetrachloromethane induced hepatotoxicity in rats.<sup>14</sup>

### Anti-hypertensive effect

Hydroalcoholic extract from roots, including fractions and subfraction on different hypertension models induced with angiotensin.<sup>15</sup>

### Anti-obesity properties

Shoot extract of *Sechium edule* enhanced the activation of AMP-activated protein kinase (AMPK) and decreased numerous lipogenic-related enzymes such as sterol regulator element-binding proteins and HMG-CoA reductase proteins which are critical regulators of hepatic lipid metabolism.<sup>16</sup>

### Antioxidant properties

Ethanolic extracts of Chayote leaves and aqueous seed extracts were reported to exhibit a strong inhibitory activity by  $\beta$ -carotene bleaching and a strong reducing effect by a linoleate model. The main flavonoid responsible for this antioxidant effect was flavonol.<sup>17</sup>

### MEDICINAL BENEFITS

*Sechium edule* is widely recognized and used in different parts of the world for the treatment of several diseases. The fruit is used as a laxative and as a therapeutic agent against to dissolve kidney stones and also in the treatment of arteriosclerosis, hypertension *Sechium edule* flowers are reported to be good nectar sources for bees and Chayote stem fibres due to its flexibility and strength, have been used in craft manufacture of baskets, hats and shade fish ponds and in the paper industry. The herb is also used for treating symptoms of severe headaches, nervousness and anxiety. Since Chayote is a rich source of several enzymes it is also been used in biotechnological processes. Apart from that Chayote has found an extensive application in the cosmetic and toiletry industries, such as moisturizers, cleansers, sun lotions, toothpastes, mouthwashes, shaving creams, deodorants and shampoos.<sup>18,19</sup>

### CONCLUSION

The *Sechium edule* plant is a predominant source of various bioactive compounds with its potential pharmacological activities and in addition to that its fruit, roots and leaves have also shown various health benefits. Extracts and Phytoconstituents isolated from this herb have shown to cause different Pharmacological response which includes antioxidant, antidiabetic, antiepileptic, anti-microbial, anti-ulcer, anti-hypertensive and many more effects. Considering all the above medicinal importance of *Sechium edule*, it can be concluded that further studies on this plant may helpful for future researchers to investigate more medicinal uses.

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