



Review Article

Snake Gourd: A Review of its Nutritional and Medicinal Efficacy

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Abstract

Trichosanthes is the largest genus of the family Cucurbitaceae. Snake gourd (*Trichosanthes cucumerina* L) is one of the cultivated specie of *Trichosanthes*. It is an annual climber commonly grown in Asian the plant is endowed with high level of nutritional values. In addition to nutritional values, the plant is pharmacologically and therapeutically active due to its rich source of functional constituents such as flavonoids, carotenoids, phenolic acids, and soluble and insoluble dietary fibers and essential minerals [1,2]. The unripe young fruits, fresh succulent leaves and stem are consumed as vegetable while the ripe fruit which is orange red in colour with very bright red pulp is used in making stew and soup. Snake gourd is used to substitute for tomatoes during tomato scarcity. Snake gourd is endowed with health benefits such as healing of burns, lowering blood sugar level in type 2 diabetes Miletus, reduce inflammation, lowers the risk of cancer and build immunity. The plant is commonly called snake gourd, viper gourd, snake tomato, or long tomato in many countries. This review deliberates on chemical composition, nutritional values as well as mass production of this economical plant for domestic and commercial purposes.

Keywords: Cucurbits; Snake gourd; Chemical composition; nutritional values; Health benefits

Introduction

Snake tomato (*Trichosanthes cucumerina*), has little or no attention in the several villages in Nigeria where it grows in the wild and fences of many families where it serve as hedges. Snake gourd is a member of pumpkin family (Cucurbitaceae). The plant does well in the humid low land tropics. Characteristically, snake tomatoes are annual tendril-climbers, which bear fruits 2-4 months after planting. It bears long, narrow and cylindrical fruits giving the shape of a snake. The fruit appears green when unripe but turns to orange-red on ripening. Snake gourd has high economic importance among vegetables in India and other countries of the world. In India and some other parts of the world, the plant is grown principally for the immature fruit that can be cooked and served as a vegetable [3]. Snake gourd or snake tomato locally known as “elojo tomato” grows mostly wild in southwestern Nigeria. It is found in States like, Lagos, Ogun, Oyo, Osun, Ekiti, Ondo Edo

and River [4]. In eastern part of Nigeria, it is only the ripe pulp that is assumed to be edible. The pulp is very reddish in colour and can be used to improve the appearance of food as it can be blended and used to produce a paste for stew which tastes like, and serves the role of tomatoes [5]. The fruit is usually consumed as a vegetable due to its high nutritional value. The plant contains proteins, fat, fiber, carbohydrates, minerals, and vitamins A and E in high levels. The plant is pharmacologically and therapeutically active due to its rich source of functional constituents in addition to its basic nutrients such as flavonoids, carotenoids, phenolic acids, and soluble and insoluble dietary fibers and essential minerals [1,2]. The predominant mineral elements are potassium (121.6 mg/100 g) and phosphorus (135 mg/100 g) and also sodium, magnesium, and zinc [6]. In Nigeria, the increase in price of fresh tomato and tomato products especially in rainy season is quite alarming. Snake gourd being a good source of minerals and vitamins with very bright red coloration serves as a substitute to tomatoes. This article discussed the agronomic practices, nutritional and medicinal values of this wonderful plant.

Origin

Trichosanthes L. is made up of 91 species in the family of Cucurbitaceae making it to be the largest genus [7-9]. However, Snake gourd is originally domesticated in India, the wild form of the species (*Trichosanthes cucumerina* var. *cucumerina*) is native to southern and eastern Asia as well as to Australia and the islands of the western Pacific. Recently, snake gourds (*Trichosanthes cucumerina* var. *anguina* (L)) are cultivated as a vegetable in different parts of Africa, Madagascar and other tropical and subtropical regions. Snake gourd has different name across the globe. In Nigeria is referred to as snake tomato, pathakaya in India, pakupis in Philippines, baup ngu in Thailand [3].

Botany

Snake gourd is a monoecious annual climber. It possesses tendrils which aid in climbing. Leaves are palmately lobed and measures up to 25 cm long. Snake gourd bears monoecious flowers that are pollinated by insects. Female flowers are solitary, sessile with long narrow ovaries and fimbriae corolla. Male flowers appear in clusters on long densely pubescent stalks of 10 to 20 cm long. Flowers normally bloom in the early hours of the night. The flower bud of a snake gourd slowly unfurls into a beautiful white and strongly scented flower fringed with long, lace-like tendrils (Figure 1). Their shape, colour and scent, as well as their nocturnal opening, clearly indicate that the snake gourd's flowers are pollinated by moth. Fruits at the harvest stage usually measure 12-30 cm in length and diameter 3-5 cm. The fruits are orange red at maturity with bloody red pulp, hanging below the vine (Figure 2).

Chemical composition / Medicinal Values

Snake gourd is very rich source of mineral elements. According to Ilelaboye and Pikuda (2009), *T. cucumerina* seeds contain iron (187 mg/kg DM), zinc (37.5 mg/kg DM), calcium (1643 mg/kg DM), magnesium (1896 mg/kg DM), and potassium (8704 mg/kg DM). Osuagwu and Edeoga (2014) [10]; Ruvini et al., 2016 had positive results for total fiber content of *T. cucumerina* leaves as 12 g/100 g [11]. Snake gourd peel and flesh is an excellent source of soluble and insoluble fiber. Adequate dietary fiber helps in smooth bowel movements and offers protection against colon cancers by eliminating toxic compounds from the gut. Adebooye et al (2005) [12] reveal that the seed is richly endowed with crude protein (26.2-26.6 g 100 g⁻¹), fat(44.6-57.2 g 100 g⁻¹), phosphorus (78.0-81.5 g 100 g⁻¹)and calcium (41.0-46.7 g 100g⁻¹) (Table 2)while the fruit pulp contain high level of ascorbic acid (23.1-23.3 mg 100g⁻¹) The fruit is a good source of Vitamin A, Vitamin B and Vitamin C (Table 1). Snake gourd fruit also has less sodium but contains good amounts of potassium, an important intra-cellular electrolyte. Potassium is a heart-friendly electrolyte that helps in decreasing blood pressure and heart rates by

countering the pressing effects of sodium. The fruits of cultivated forms also have medicinal uses and are useful for people suffering from blood pressure, heart diseases, rheumatism and psoriasis. The fruit pulp extract is used in treating cough. Ademosun et al (2013) [13] showed that snake gourd has a higher inhibitory effect on α -amylase activity which delays the digestion of carbohydrate thereby reducing the glucose releasing rate and consequently lowers the increase in postprandial plasma glucose thus, help in reduction of blood sugar. Using hot water extract of aerial parts of snake gourd (*Trichosanthes cucurmerina*) has noted to improve glucose tolerance and tissue glycogen in non-insulin dependent diabetes mellitus induced rats. Study showed the drug possess antidiabetic activity with improvement in oral glucose tolerance and glucose uptake in peripheral tissues [14-16]. The hot aqueous extract of root tubers of snake gourd (*Trichosanthes cucurmerina*) have investigated against carrageen in induced mouse's hind paw oedema and it showed significant anti-inflammatory activity [17]. Snake gourd can be used to make a decoction for treatment of feverish condition. Snake gourd functions as an expectorant, loosening pus and phlegm in the sinuses and respiratory tracts so that they can be eliminated [18]. Snake gourd being rich in carotene content is helpful in hair growth.

Side Effect

Snake gourd consumption rarely exhibits allergic reactions. Oftentimes, a few snake gourd fruits can be bitter due to terpenoid toxic compounds such as cucurbitacin B, D, G, H, etc. Such fruits should not be consumed. In a case of discomfort after consumption (nausea, vomiting, diarrhea, or any feeling of uneasiness), one should seek immediate medical attention. Source: Medical disclaimer.

Climatic and soil requirement

Wild snake gourd is a plant of the moist tropics, where it is found at elevations from sea level to 1,500 meters. Snake gourd grows best in areas where annual daytime temperatures are within the range of 22 - 35°C, but it can tolerate 14 - 38°C. The plant does not tolerate frost and very low temperature. It prefers a mean annual rainfall in the range of 2,000 - 2,500mm, but can tolerate 700 - 4,200mm rainfall. The crop does well on well drained sandy loam and light clay soils [19].

Cultivation/ Cultural practices

In Nigeria Snake gourd can be grown at the onset of rainy season between April to July for early Plant spacing of one meter between rows and one meter within rows is adequate for snake gourd [12] growth and development. Two seeds per hole is the ideal seed rate and weeding should be done when necessary to avoid competition. Snake gourd respond positively to organic manure like poultry dropping and pig dung. In case of inorganic

fertilizer, avoidances of high dosage of nitrogenous fertilizer should be noted to avoid production of more leaves and stem at the expense of fruits. Snake gourd can be grown in pots, plastic containers and sacks provided it measures up to 50cm long and 45cm wide. The container should be filled with top soil, organic manure (poultry manure or pig dung) and river sand in the ration of 3: 2:1 that is topsoil 3, organic manure 2 and river sand 1 in volume basis. Irrigation is necessary in the areas of less rainfall and early season planting. Snake gourd matures at 4months after planting [19,20]. The plant requires proper staking with very strong staking material for optimum yield either planted in the field or container.

Harvesting and shelf life of Snake Gourd

Harvesting is done manually by picking only the ripped ones. The matured fruits are ready for harvesting three weeks after fruit emergence. The fruits are ready for harvest when the fruit colour changes from cream colour to orange red. In countries like Nigeria where matured fruits are used as soup additive, the fruits are harvested when they begin to change from green to orange or red colour. Snake gourds do not store very well after harvest. However, they can be stored for 10-14 days at a temperature of 16-17o C and a relative humidity of 85- 90% [21].

Uses of Snake Gourd

The young leaf and succulent stem are used as vegetable in Rivers state in Nigeria. In south east though the crop is new, the fruit is used to substitute for tomatoes especially during tomato scarcity. Enwere (1998) [5] reported that the red pulp is very good in improving food appearance as it can be blended and used to produce a paste for stew, which tastes like and serves the role of tomato . The use of snakegourd as a substitute for tomato is reported from Sierra Leone, Liberia, C^ote d’Ivoire, Ghana, Benin, and Nigeria [22]. The higher ascorbic acid content in snake gourd than that of tomato varieties suggest the possibility of utilizing snake gourd in the industrial production of tomato paste and puree. The seeds when dried are used as alternative medicine for treating anthelmintic and diarrhea. It has been reported that the seed contain anti-bacterial [2] which make it a potential insecticide.

Pests and Diseases of snake gourd

Pests of snake gourd include:

1. Melon Fly (*Dacus cucurbitae*). The female adult punctures the young ovary and lays eggs below the epidermis. The maggots bore into the fruit and feed, deteriorating the fruit, making it unfit for market. Control is through the use of pesticides such as methyl eugenol and Malathion.
2. Spotted Potato Beetle (*Epilachna vigintioctopunctata*). Grubs and adult cause serious damage to the leaves by feeding on the green tissue between the veins, living a lace-

like appearance. Control is through the use of pesticides such as Sevin 50 WP.

3. Red Pumpkin Beetle (*Aulacophora foveicollis*). The insect feeds on seedlings. Adults feed on the cotyledons. Control is through registered pesticides such as Sevin 50 WP.
4. Anthracnose (*Colletotrichum lagenarium*). Reddish brown Leaf spots are formed on the young infected leaves and veins. The center of leaf spots and falls off creating a shot-hole appearance on the leaf. At advanced stages, the leaf shriveled and dies. Affected fruit have brown to black water-soaked spots with ash-coloured centers. High humidity condition favours the spread of this disease. The pathogen is both soil- and seed borne. Destruction of the plant debris after harvest is recommended. Crop rotation with non-host crops helps in minimizing the disease incidence. Pesticides such as Dithane M-45 or Thiram (2 g kg1 seed) can control the disease [23].

Food class	Composition
Calories	86.2
Total Fat	3.9g
Saturated Fat	0.5
Polyunsaturated Fat	1.6 g
Monounsaturated Fat	1.6 g
Total Carbohydrate	12.5 g
Dietary Fiber	0.6 g
Sugars	0.6 g
Pantothenic Acid	3.0 %
Vitamin B ₁₂	0.0 %
Vitamin B ₆	11.3 %
Vitamin C	30.5 %
Vitamin D	0.0 %
Vitamin E	1.1 %
Calcium	5.1 %
Copper	4.4 %
Folate	5.6 %
Riboflavin	2.7 %
Selecniun	3.1 %
Thiamin	5.2%
Sodium	33.0mg

Source: Dr HealthBenefits.com in Idowu et al (2019) [21].

Table 1: Nutritional composition of snake Gourd.

Nutrients	Composition
Crude protein	26.2 – 26,6g/100g
Fat	44.6 – 57.2g/100g
Phosphorus	78.0 - 81.5mg/100g
Calcium	41.0 – 46.7g/100g
Source: Oloyede and Adebooye (2005) [12].	

Table 2: Nutritional composition of the seed.

Conclusion

Snake gourd is a crop with very high economical and health benefits. The invent and improvement of this important crop by the people of eastern part of Nigeria is at its juvenile stage, this made the crop to receive little or no attention in the areas of research and commerce in this region. This calls for the attention of researchers to work on the improvement and mass production of this wonderful crop to help bring down the menace of malnutrition in this region of the country. The current global food insecurity problem calls for an urgent incorporation of snake gourd and other important but neglected crops into research and commerce. This will help to solve food insecurity crisis, create job opportunity and provide foreign exchange for the nations of the world.

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