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## Comparative Studies on the Fungi and Bio-Chemical Characteristics of Snake Gourd (*Trichosanthes cucumerina* Linn) and Tomato (*Lycopersicon esculentus* Mill) in Rivers State, Nigeria

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**Abstract:** Comparative studies on the fungi and biochemical characteristics of Tomatoes (*Lycopersicon esculentus* Mill) and the Snake gourd (*Trichosanthes cucumerina* Linn) products were investigated in Rivers State using various analytical procedures. Results of the proximate analysis of fresh snake gourd and tomatoes show that the essential minerals such as protein, ash, fibre, lipid, phosphorus and niacin contents were higher in snake gourd but low in carbohydrate, calcium, iron, vitamins A and C when compared to the mineral fractions of tomatoes which has high values of calcium, iron, vitamins A and C. The mycoflora predominantly associated with the fruit rot of tomato were *Fusarium oxysporium*, *Fusarium moniliforme*, *Rhizopus stolonifer* and *Aspergillus niger*, while other fungi isolates from Snake gourd include *Rhizopus stolonifer*, *Aspergillus niger*, *Aspergillus tamari*, *Penicillium ita/icum* and *Neurospora crassa*. *Rhizopus stolonifer* and *Aspergillus niger* were common spoilage fungi to both the Tomato and Snake gourd. All the fungal isolates were found to be pathogenic. The duration for storage of the fruits at room temperature (28±1°C) showed that Tomato could store for 5 days while Snake gourd stored for as much as 7 days. Sensory evaluation shows that Snake gourd is preferred to Tomatoes because of its culinary and medicinal importance.

**Key words:** Tomatoes, snake gourds, fungi, storage, spoilage, essential minerals

### INTRODUCTION

Tomato (*Lycopersicon esculentus* Mill) belongs to the family Solanaceae. It is one of the most important vegetables in most regions of the world and constitutes an important source of food as well as cash in Nigeria. Although production figures are not available (Alao, 2000). Production is seasonal resulting in a glut during the season and scarcity at off seasons. Due to their soft textures they are easily bruised or wounded as a result of harvesting and other post harvest handling operation such packaging, transportation and storage (Sani and Alao, 2007). Tomato also ranks second in importance to potatoes (*Solanum tuberosum*) in many countries (Purseglove, 1977). The fruits are eaten raw or cooked. Large quantities of tomatoes are used to cook soup, juice, sauce, ketchup, puree, paste and powder. The seeds contain 24% oil and this is extracted from the pulp and residues of the canning industry.

This semi-drying oil is used as a salad oil and in the manufacture of margarine and soap (Purseglove, 1977). The residual press cake is used for livestock feed and

fertilizer. Tomatoes grown in the tropics are coarse and lacking in flavor compared to those grown in temperate countries. A great many cultivars have been developed, particularly in temperate countries, but good cultivars suited to the wetter tropics are required (Purseglove, 1977). Cultivars vary in colors, size, shape, flavor and vitamin content of the fruits, the degree of growth which may be prone to sprawling and resistant to diseases can be affected by different weather conditions. Tomato shows a wide range of climatic tolerance and can be grown in the open wherever there is more than three months frost free weather. They do better where there are long sunny periods with light evenly distributed, rainfall and night temperature between 50-68°F. Very wet weather in the tropics with low sunshine and high night temperatures results in excessive vegetative growth at the expense of fruiting and leads to an increase in disease. Propagation is usually by seed. Yields generally are higher in the dry season than in the rainy season. They can be grown at sea level in the tropics but do better at higher altitudes. Tomato also does well with pH range of 5-7 and a fertile loamy soil.

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Snake gourd (*Trichosanthes cucumerina* Linn.) belongs to the family Cucurbitaceae. It is an herbaceous annual climber with perennial root stock. Unlike their edible relatives such as melon, squashes, cucumber and pumpkins, gourds are mainly grown as ornamentals. They have tendril bearing vines that will sprawl if not supported. It grows best in soils that are well supplied with organic manures, fertile and well drained. Propagation is by seed. The young unripe fruits are eaten as vegetables, while the mature ripened ones are blended after extracting the seed and used to prepare stew and soups. The roots which are tuberous and white in color are usually dug up, washed, peeled and cut into pieces and dried in the sun for use as herbal remedies. The roots contain a wide range of proteins, enzymes and amino acids many of which have anti-inflammatory effects (Shen, 2001). The seeds are thick, brownish and sculptured and vary in sizes between 1-1.5 cm long. They are anthelmintic (Burkill, 1985) and also said to be cooling, but over dosage of the seed may cause gastric discomfort, nausea, vomiting, abdominal pain and diarrhea, likely due to the high oil content (Hson-Mou and Paul-Ru-Hay, 1986). In Nigeria, especially in Rivers State, tomatoes fruits are consumed in large quantity despite the climatic constraints on its production. The Snake gourd grows easily both during the dry and the rainy season in Rivers State without many problems even though it lacks general acceptability. This study therefore aims at determining the proximate composition of both snake gourd and tomato products grown in Rivers State and to identify the mycoflora associated with their spoilage.

## MATERIALS AND METHODS

**Collection of tomato and snake gourd fruits:** One medium sized basket full of ripe tomatoes was bought from the fruit garden market in Port Harcourt. The fruits were sorted out and the soft ones were separated to avoid infection of the strong and fresh ones. The sorted fruits were washed in tap water and five fruits collected and taken to the Laboratory for analysis of their proximate composition. The rest of the fruits were placed in clean tray and stored in the refrigerator for future studies. Snake gourd fruits were obtained from the botanical garden of the Department of Applied and Environmental Biology. The elongated fruits were washed in tap water and two fruits also taken to the laboratory and parameters determined as in tomatoes. Some of the fruits were equally stored in the refrigerator for preservation at a temperature of 5°C.

**Chemical analyses:** Mineral elements of both fresh and rotten snake gourd and tomato products were determined. The composition of calcium, iron, phosphorus etc was measured by the atomic absorption spectrophotometer method. Estimation of the crude fibre, lipid and ash contents was also determined. All analysis was carried out by the standard methods of AOAC (1990).

**Isolation of fungi from tomatoes and snake gourd:** Tomato and Snake gourd fruits were collected from the refrigerator and washed in tap water and sterilized in 5% sodium hypochlorite. The sterile fruits were sliced into smaller pieces with sterile knife and placed in sterile damp Scottie tissue in Petri dishes and incubated for 7 days. Pure cultures were made from the growths by inoculating the isolates individually onto Potato dextrose agar plates and incubated at room temperature (29°C± 0.5) for 5 days. The fungi were identified based on color, spore morphology and the nature of the mycelia growth according to the schemes of Cheesebrough (1991) and Oids (1983).

**Pathogenicity studies:** To check if the fungal isolates of tomato and snake gourds were capable of causing rots of the fruits, fresh tomato and snake gourd fruits were collected from the refrigerator and washed in tap water after taken their weight. A sterile scalpel was used to create wound on the tomatoes and the snake gourd fruits, respectively. The fungal isolates were individually inoculated into the fruits through the wound and incubated for 7 days. All the inoculations were done in duplicate for each fungus. At the end of the 7th day the extent of rot was determined using the method of Kassim (1986).

$$\text{Rot (\%)} = \frac{W-w}{W} \times 100$$

Where:

W = Initial weight of fruit

w = Final weight of fruit

**Palatability test:** To test for palatability of the ripe tomato and Snake gourd fruits, ten ripe tomato fruits were blended and fried in oil after adding onions, pepper, crayfish, knorr cube and salt. Ripe Snake gourd fruits were also blended after extracting the seeds from the puree. This was prepared as was done in tomatoes and served with boiled rice. Five students were served with these menu and their comments noted and recorded. Hedonic scale which ranged from good (3), fair (2) to poor (1) was used for ranking.

**Storage duration:** To assess the storage duration of the ripe fruits of tomatoes and snake gourd at room temperature (28±1°C), 10 freshly harvested fruits of tomato and snake gourd were washed and put in sterile trays and placed on the laboratory bench where they were monitored for mold growth and spoilage.

**RESULTS AND DISCUSSION**

Results of the proximate compositions of fresh and infected tomato and Snake gourd products showed that Snake gourd possessed low moisture, increases in ash, protein, lipid and fibre contents with low carbohydrate when compared to tomatoes (Table 1). The low moisture content of Snake gourd is an indication of good storage quality which manifested in the number of days when the fruits were stored at room temperature. Ihekoronye and Ngoddy (1985) also stated that high moisture favors the spoilage of agricultural produce by fungi. Chuku *et al.* (2004) also reported that high moisture and relative humidity led to greater fungal growth and thus low storability of the seeds of *Irvingia gabonensis*. The calcium, iron and phosphorus content of fresh Snake gourd were low (3.2, 0.20 and 15.6) when compared to that of tomato (11.7, 0.4 and 9.5) which shows that tomato was richer in these minerals than the snake gourd. According to Nwanwusi *et al.* (2006), tomato is an important fruit vegetable which has a good source of vitamins A and C, the oil extracted from the pulp can be used in making salad and in the manufacture of margarine and soap as well as canning for making of various sources. This underscores its importance as a vital source of nutrients in foods and sauces. Because of its high moisture content, tomato has many diseases that may lead to its low yield of leaves and fruit production. The most severe disease is the fungal disease known as *Fusarium oxysporium* which is found mostly in the air, green houses (Nwanwusi and Osakwe, 2003). Even though the Snake gourd has not gained popularity in the diet of the people, the high dietary quality and its ease of cultivation will provide an alternative use for tomato which is difficult to cultivate in the soils of the Niger Delta area except under special agronomic conditions. A total of five fungi were isolated from Snake gourd while four fungi were isolated from Tomato fruits (Table 2). The isolation of *Fusarium oxysporium*, *F. moniliforme*, *A. niger* and *Rhizopus stolonifer* from the fruits of tomato is in line with the works of Purseglove (1977) and Markson *et al.* (2005) who reported that *Rhizopus stolonifer* and *Fusarium sp.* is responsible for tomato soft rot. Onyia *et al.* (2005) also

Table 1: Proximate composition of fresh Snake gourd and tomatoes

Parameters	Snake gourds		Tomatoes	
	Fresh	Spoiled/Infected	Fresh	Spoiled/Infected
Moisture (%)	90.50	91.65	92.00	93.60
Ash (%)	2.50	2.05	0.60	0.66
Fiber (%)	0.88	6.76	0.60	2.44
Protein (%)	2.50	0.95	1.00	2.20
Carbohydrate (%)	2.73	3.56	4.30	0.85
Lipid	0.89	0.51	0.10	0.30
Calcium (mg)	3.20	2.90	11.70	11.50
Iron (mg)	0.20	0.09	0.40	0.35
Phosphorus (mg)	15.60	6.50	9.50	8.31
Vitamin A (mg)	93.00	91.00	250.00	101.00
Thiamin (mg)	0.003	0.002	0.002	0.012
Riboflavin (mg)	0.004	0.003	0.003	0.03
Niacin (mg)	0.06	0.05	0.004	0.00
Vitamin C (mg)	3.50	2.10	25.00	21.00

Table 2: Fungal isolates of tomatoes and Snake gourd and their Ok incidence and rot

Fungal isolates	Tomatoes		Fungal isolates	Snake gourd	
	Incidence (%)	Rot (%)		Incidence (%)	Rot (%)
<i>Fusarium oxysporium</i>	60	27	<i>Penicillium italicum</i>	30	33
<i>Fusarium moniliforme</i>	50	20	<i>Rhizopus stolonifer</i>	50	37
<i>Aspergillus niger</i>	30	11	<i>Aspergillus niger</i>	66	54
<i>Rhizopus stolonifer</i>	70	47	<i>Aspergillus tamari</i>	53	44
			<i>Neurospora crassa</i>	45	40

Table 3: Sensory evaluation of the preparation

Tomatoes	Palatability index	Snake gourd	Palatability index
A	3	A	2
B	3	B	2
C	3	C	1
D	3	D	2
E	3	E	2
	E = 15		E = 9
	X = 3		X = 1.8

reported that the severity of *Fusarium* wilt on tomato was reduced in the no mulch plots than in plots that were mulched with different materials. Onuegbu (2002) similarly reported that *Fusarium moniliforme*, *Aspergillus niger* and *Rhizopus stolonifer* were isolated from rotted tomato fruits. However, the isolation of *Aspergillus flavus*, *A. tamari*, *Penicillium italicum*, *Rhizopus stolonifer* and *Neurospora crassa* from Snake gourd is pioneering since not much research has been done on this crop in Rivers State. Results on the percentage incidence and rot (Table 3) also showed that *Rhizopus stolonifer* caused the greatest rot on tomato fruits while *Aspergillus niger* caused the greatest rot on Snake gourd. A lot of breeding works have been carried out on tomato up to the point where we now have tomato hybrids that could stand

adverse environmental condition and resistant to diseases and pests. Following series of breeding works on tomato, some fruits, are so strong that a particular tomato is referred to as iron tomato and can store for up to ten days if kept in a conducive environment. A well planned breeding program for Snake gourd will improve the crop and bring it up to a level of general acceptability. The Snake gourd and tomato belong to different plant families but both of them appeared to serve the same purpose as food condiments. Other than the culinary uses of the Snake gourd and tomato, they are also useful in many ways. The roots of Snake gourd contain a wide range of enzymes and amino acids, many of which have an anti-inflammatory effect. The roots also contain sugars such as glucose, fructose, cerebrose, mannose and xylose which make it an abundant source of source of calories. The root of *Trichosanthes* has unique medicinal properties, such as improves the immune systems, clears the lungs, reduces toxicity of infections by expelling the pus (Shen, 2001). The drug Q trichosanthin obtained from the root of the plants helps to fight HIV/AIDS (Zhang, 1990) as it helps to improve the relative taste formation of antibodies that attacks various kinds of inflammations in the body system (Shen, 2001).

The seeds of tomato contain 24% oil which is extracted from the pulp and it is used as residues for the canning industries. The semi-drying oil is used as a salad oil and in margarine and soap making. The residual press cake is used for stock feed and fertilizers (Purseglove, 1977).

### CONCLUSION

The results from this study have shown that tomato and Snake gourd are very important crops that have high dietary qualities. Its use as condiments for food preparation offers it an excellent source of major nutrients and method of utilization. These fruits compares favorably with other reported Nigerian condiments. Therefore, further studies need to be carried out in the area of process optimization and utilization as seasoning agents, so as to eliminate the usual variability of product quality that normally occurs in other food products. The high prevalence of some fungi demand that appropriate control measures against the disease should be employed if farmers expect good performance of their tomato plants, otherwise, the high moisture of the fruit will be a serious limiting factor in its preservation. Public awareness of the importance of this crop should also be carried out by the extension agents.

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