

Ethnobotanical Survey of Tomato in Some Cultivated Regions in Southern Nigeria

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ABSTRACT *Tomato (Solanum lycopersicum (Lin.) Con., Solanaceae) has a wide record of domestication and consumption although it is not cultivated all over the world. The field of ethnobotany enumerates how humans interact with indigenous plants. In this study, an ethnobotanical survey of tomato in key cultivation areas of Delta and Edo states, Nigeria was conducted to document associated cultural interactions. One hundred and twenty questionnaires were distributed within the study areas as well as structured interviews and animated visits were conducted to assess farming systems. Respondents were mainly farmers (73.87 %). Dominant ethnic group of respondents was Ika-Ibo (37.84 %) in Delta and Esan (47.75%) in Edo state. Male respondents were higher (82.88%) than female respondents (17.12 %) with the dominant age range been 41 – 61 years (75.68 %). Tomato is mainly cultivated on ridges and tilled soil (74.77 %). Most respondents knew two types of tomatoes. Cultivation and importance of the crop are mainly for commercial purpose than subsistence. Food use dominates nonfood use of the crop and is preferred fresh. Source of seeds include previous collections/harvest, nearby market and from friends and relatives. Local methods of preservation are mostly practised. The plant is known by several vernacular names. Results suggest government support is needed to boost production and preserve ethnobotanical knowledge.*

Keywords: *Tomato, Ethnobotany, Traditional farming system, Plant Management practices, Southern Nigeria*

Introduction

Tomato (*Solanum lycopersicum* (Lin.) Con.) belongs to the family Solanaceae, which includes other well-known plant species such as Potato (*Solanum tuberosum* L.), Tobacco (*Nicotiana tabacum* L.), Pepper (*Piper nigrum* L.) and Eggplant (*Solanum melongena* L.). Chime et al. (2017a) attributed the late discovery of the plant to fear of its suitability for consumption. The exact date of its domestication is unclear but it has remained under cultivation since the 13th century. The Andes region of South America is the centre of origin of the plant from where early European visitors took it beyond the Americas (Ogwu et al., 2015; Chime et al., 2017a). Tomato is preferred for its fruits and leaves, although, the leave contain toxic alkaloids and often may not be consumed (Ogwu et al., 2016a). Fruit vegetables like tomatoes are considered important protective foods because they contain valuable

food nutrients that are beneficial for the maintenance of good health, prevention of diseases, and help to develop and restore the body (Ogwu et al., 2016b). The fruit is rich nutritionally because of its constituents especially vitamin C and minerals. The report of Priya et al. (2013) suggests that the consumption of tomato protect the liver from cirrhosis. Fruit colour ranges from yellow to red. Yellow coloured fruits have a higher the percentage of vitamin A whereas, the red tomatoes contain a high percentage of lycopene, an antioxidant that may contribute to protection against carcinogenic substances (Shankara, 2005). In Nigeria, tomatoes are cultivated both in most home gardens and in distant farms where they contribute significantly to livelihood (Tsado, 2014; Chime et al., 2017b). Tomato cultivation in the home garden is a good investment of gardening time and money with plenty of excitement (Page et al., 2011). Ugonna et al. (2015) estimated that about 50 % of the 1.8 Million tonnes of fresh tomato produced each year are lost due to the poor storage system, poor transportation and lack of processing enterprises.

Humans continue to interact with plants at different levels, which is the focus of ethnobotany. Ethnobotany is an evolving field of plant science (Osawaru and Ogwu, 2014). Ethnobotanical practices have existed since the origin of man but documentation is not popular. This relationship has implications on the traditional use and management of plant genetic resources and is a huge reservoir of knowledge (Ogwu et al., 2017). Traditional agriculture is highly associated with ethnobotany and the system functions as custodian, maintains and amplifies genetic variability and provided in situ conservation of economically important plant species hardly observed in modern agriculture (Osawaru and Ogwu, 2013). The relevance of the system is hinged upon its spread and is found in almost all developing countries (Greene et al., 2005). This study aims to record ethnobotanical practices associated with tomatoes in key cultivation regions of Edo and Delta States, Southern Nigeria. The study will seek to highlight traditional management and utilization practices associated with the crop.

Methods

Field studies were conducted in 2015, in areas of Aniocha North and South, Ika-North and South Local Government Areas of Delta State (Longitude 5°00 and 6°.45'E and Latitude 5°00 and 6°.30'N). Also, Esan West, Esan Central, Esan north east, Esan south-east and Igueben local government area of Edo state (Latitude 050441N and 070341N and Longitude 060041E). The relief, climate and vegetation are diverse. The climate is affected by two opposing air masses. The tropical continental air mass from the Northeast originating from the Eurasia – Arabia high-pressure belt causing harmattan from October to March and the tropical maritime air mass, which originates from the Atlantic ocean and causes rain from April to September. The annual rainfall ranges from 2000 – 3000 mm with a bimodal pattern. This allows for two growing seasons. The relative humidity varies directly with the peaks of rainfall and is about 60 - 95 % (Omuta, 1980). Mean daily temperature ranges from 21 – 32 0C. The soils are slightly variable in composition and fertility. Alluvial, ferrallitic and ferruginous types are common. Radiation is fairly high and varies according to different periods of the year. However, above 1,600 hours per year has been reported (Onwueme and Sinha, 1991). The agro-ecological conditions of the study areas have been previously described in detail by Agbogidi and Egho (2012) and Ogwu and Osawaru (2015)

for Delta and Edo state respectively.

Bias sampling method was adopted to select tomato cultivation areas within the state. Within these areas, stratified sampling method was used to select respondents. The sampling areas in Delta state include Igbodo, Nkwooma, Nbiri, Owere, Ulubo, Akumazi, Ute - Ogbeje, Obior, while in Edo State; Afudah, Egvike, Udele. The methods outlined in Osawaru and Ogwu (2014) was adopted to collect ethnobotanical data on tomatoes within the sampling sites. With the assistance of the Extension Department in both state, preliminary information was obtained about farmers, size of farms and cultivation status of the plant with the study areas. Questionnaires were distributed within the areas and interview and visitation dates were scheduled.

Data Analysis

Of the 120 questionnaires distributed, 111 (92.5 %) returned completed copies which were analyzed. Data obtained were analyzed and expressed as percentages while others were discussed including vernacular and common names, their types, the extent of cultivation, planting, maintenance, harvesting and preservation methods, uses and parts used.

Results

The results are presented in Tables 1-3. Table 1 presents the demographic characteristics of respondents while Table 2 presents the degree of ethnobotanical knowledge of respondent on Tomato within the study areas and Table 3 shows the crop management techniques within the study areas.

Table 1 presents the demographic characteristics of respondents from the study areas. It suggests that most of the respondents were males and Christians, from diverse ethnic groups and farmers by occupation.

Table 1
Demographic Characteristics of Respondents

Characteristics	Frequency	%
Gender:		
Male	92	82.88
Female	19	17.12
Age Range:		
40 – 30	15	13.51
50 – 41	41	36.94
60 – 51	43	38.74
70 – 61	12	10.78
Religion:		
Christain	106	95.50
Muslim	00	00.00
Others	05	04.50
Occupation:		
Farming	82	73.87
Trading	14	12.61
Teaching	06	05.41
Carpentry	01	00.90
Civil Servant	02	01.80
Electrical Engineering	01	00.90
Auto - Mobile Mechanic		
	01	00.90
Driving	04	03.60
Ethnic Group:		
Ika – Ibo	42	37.84
Ibo	06	05.41
Aniocha – Ibo	02	01.80
Ishan	53	47.75
No response	08	07.21

Table 2 presents the degree of ethnobotanical knowledge of respondent on Tomato within the study areas. The Table indicates that the indigenous people know the crop by common name and by various local names. Cultivate it on a medium scale and use different parts in varied ways such as food, cash and others.

Table 2
Degree of Ethnobotanical knowledge on Tomato in the study area

Land Preparation for Propagation:		
Ridges and Tilled Soil	83.00	74.77
Untilled Soil	02.00	01.80
Tilled Soil	07.00	06.31
Ridges	19.00	17.12
Mould	00.00	00.00
Frequency Of Tomato In The Locality:		
Very Low	06.00	05.41
Medium	50.00	45.05
Very High	54.00	48.65
No response	01.00	00.90
Types Of Tomato Known:		
1	23.00	20.72
2	50.00	45.05
3	38.00	34.23
Extent Of Cultivation:		
Very Low	03.00	02.70
Low	03.00	02.70
Medium	69.00	62.16
Very High	12.00	10.81
High	24.00	21.62
Importance Of Tomato In The Locality:		
Cash	108.00	97.30
Subsistence	03.00	02.70
Others	00.00	00.00
Utility (locally):		
Food Usage	84.00	75.68
Non - Food Usage	00.00	00.00
Food And Non - Food Usage	26.00	23.42
No response	01.00	00.90
Part(s) Used:		
Fruits	84.00	75.68
Seeds	09.00	08.11
Leaves	00.00	00.00
Floral Parts	00.00	00.00

Stems	00.00	00.00
Fruits And Seeds	04.00	03.60
No Response	07.00	06.31
Others	07.00	06.31
Knowledge of the Crop:		
Yes	111.00	100.00
No	00.00	00.00

Table 3 present the management techniques of the crop within study areas. It suggests that they propagate the crop mainly by seeds. Source of planting materials varied. Hand was the best methods use in weeding. They use various ways to preserve.

Table 3
Crop management techniques within the study areas

Variables	Frequency	%
Methods of propagating the crop:		
Seed	111.00	100.00
Stem	00.00	00.00
Root	00.00	00.00
Others	00.00	00.00
Source of Planting Materials		
Previous collections	46.00	41.44
From market	22.00	19.82
From market and ministry of Agric/ADP	04.00	03.60
By selection from friends and relatives	36.00	32.43
By selection from friends, relatives and ministry of Agric/ADP	03.00	02.70
Origin of planting materials:		
Single Mother Plant	12.00	10.81
Already in Cultivation	41.00	36.94
Few Collection	09.00	08.11
Already selected planting materials	46.00	41.44
Anywhere taken from	00.00	00.00
No response	03.00	02.70
Methods of weeding:		
Hand	103.00	92.79
Chemical	00.00	00.00
Not done	00.00	00.00
No response	08.00	07.21
The condition of parts used		
Fresh/Matured	104.00	93.69
Fresh/Immatured	00.00	00.00

Dried/Matured	00.00	00.00
Dried/Immatured	00.00	00.00
Fresh/Matured and Dried	06.00	05.41
No response	01.00	00.90
Methods of preservation:		
Paste	11.00	09.91
Dried	35.00	31.53
Fresh	02.00	01.80
Dried and Paste	50.00	45.05
Fresh and Paste	10.00	09.00
No response	03.00	02.70
Storage of crop		
Fresh	48.00	43.24
Dried	37.00	33.33
Fresh and Dried	25.00	22.52
No response	01.00	00.90
Duration of crop storage:		
Fresh - very low	00.00	00.00
Fresh - low	32.00	28.83
Fresh - medium	00.00	00.00
Fresh - high	00.00	00.00
Fresh - very high	04.00	03.00
Dried -Very low	00.00	00.00
Dried - low	00.00	00.00
Dried - medium	00.00	00.00
Dried - high	23.00	20.72
Dried - very high	06.00	05.41
Fresh - low and Dried - very low	14.00	12.61
Fresh - low and Dried - medium	04.00	03.60
Fresh - very low, Dried - high and Paste - very high	01.00	00.90
Fresh - very low, Dried - high and Paste - very high	04.00	03.60
Fresh - very low and Dried - high	08.00	07.21
Fresh -low and Dried - very low	06.00	05.41
Fresh - very low and Dried - very high	06.00	05.41
Fresh -low and Dried - very high	02.00	01.80
Fresh - low, Dried - high and Paste - very high	01.00	00.90

Local / Vernacular Names

In Delta and Edo states, tomato is known by different names pending on the ethnic group and language spoken in the community. The following are some of the names recorded from respondents Gabon, Gboko, Pomo, Oporpor, Ife - Plum

and Ronita in areas such as Ika – Ibo, Ibo and Aniocha – Ibo. In Edo state, the names include Eyien, Tyre, Itomatose, Tomatos golden, Tomitomi, Hausa tomatos and native tomatos.

Similar known Crops

Most respondents admitted to having chanced upon similar crops, which could be other (undomesticated) varieties of the tomato plant. None of these similar crops (besides eggplant [*S. melongena*] and pepper [*Capsicum* species]) were sighted during animated visits. Names of these similar crops were the same as the vernacular names of Tomato. A few respondents could not distinguish eggplant, pepper and tomato except via usage. Thus, common names of the similar crop known to them were given as Eggplant and pepper.

Management Techniques;

1) Origin/Source of planting materials and methods of propagation: Response suggests that they cultivate the plant from seeds of the single mother plant, those already in cultivation or few collections and their source were from a previous collection, market, a selection from friend and relatives. Local methods were used to conserve seeds.

2) Storage of planting materials: Their response indicates that they store the seeds dried by keeping in cool, dry, airy bag or paper and can stay for long until another planting season, but there was no response from just one of them.

3) Method of planting and maintenance: Response suggests that for good crop yield and effective harvest, before transplanting the crop from their nursery bed to the farm, they weed with chemical and after transplanting, they weed regularly using hand, hoe and cutlass. In addition, they apply fertilizer like 15: 15: 15 NPK, they carry out mulching, use insecticides and practice irrigation.

4) Who does the planting and when: According to their response, the planting is carried out by the farmers alongside his / her family members and sometimes paid labourers. The planting period is in two phases; early planting which is between March / April and late planting between August / September. The plant is sun-loving for growth and maturity but also require water

5) Method of harvesting: Their response indicates that they do so by handpicking the ripe and even the unripe to avoid cracking the fruits for an interval of 3 – 4 days. No technology is applied but respondents opined that it would be a welcome development for them.

6) Storage of harvested materials and shelf life: Their response indicates that tomatoes can be harvested from two – four months after planting. Fleshly harvested tomato is normally taken to the market which must be sold earlier enough, or are left exposed in air-filled basket or even sun-dried. The sun-dried ones can be stored for a long period.

7) Methods of preservation for use: According to their response for use, tomatoes

get spoils quickly due to heat and handling process and so they can dry, grind or steam to make into a paste. The leaves are medicinal. Fresh fruits are used to make soup, stew and sauce.

Discussion

Ethnobotanical survey of tomato in cultivated regions of Edo and Delta States, Southern Nigeria was conducted. The study has shown that tomato is cultivated in the region at varied scales. Aigbokhan (2014) has previously reported the presence of the germplasm within the study area. This report highlight different ethnobotanical response on tomato within the study area. The study indicates that both male and female are involved in the cultivation of tomato although males dominate. The ethnobotanical survey of cocoyam conducted by Osawaru and Ogwu (2014) suggest that females cultivate cocoyam more than males. A similar result was also recorded okra species in parts of southern Nigeria (Osawaru and Ogwu, 2013). These studies suggest that crops may be gender specific depending on varied conditions. This may include most especially economic benefits. Humans rely on plants to solve their basic needs, relying on innate curiosity to evolve new roles for plants (Ogwu et al., 2017). The results from this study are in agreement with those of Ugonna et al. (2015) that there are good varieties of tomatoes in Nigeria, but only a few are suitable for industrial processing with regard to quantity and quality. No information on the industrial use of the plant was available. More so, despite the high production of fresh tomatoes, Nigeria is still not an exporter of either fresh or processed tomato products due to an inadequate supply of good quality seeds, storage facilities, poor disease and pest management, and poor processing facilities (Ugonna et al., 2015).

This results obtained for the age distribution is similar to that obtained is similar to the earlier report of Idu et al. (2011) on the ethnobotanical study of plants from the families Euphorbiaceae and Zingiberaceae. It indicate that the ethnobotanical knowledge lies in the middle age range, thus support for these germplasm holders will encourage them to make a living off it. This also emphasizes the crucial need for appropriate documentation. The occupation of respondents and might be responsible for the differences in ethnobotanical knowledge of Tomato within the study area. These categories include frequency of tomato in the locality, types of Tomato known, the extent of cultivation, the importance of tomato in the locality, utility (locally), part(s) used and knowledge of the crop. There is a need to provide credit facilities to farmers within the region. This will promote yield and the potential use of the plant whilst encouraging research and additional documentation of crop plant (Idu et al., 2008). The indigenous people surveyed in this study know the plant but have limited knowledge of the varieties, other species within the family and related plants. State extension officers should conduct regular visits to enlighten these communities. Research carried out in traditional communities of underdeveloped countries; reveal the importance of such knowledge (Macdonald and Turkur, 2015). This study shows that the indigenous people also use it for traditional medicine but only a small percentage. The species have been used in traditional medicine to cure human diseases including cancer diseases such as lung, prostate, stomach, cervical, breast, oral, colorectal, oesophageal, pancreatic,

and many other types of cancer, high blood pressure, treat oedema, kidney and liver problems, antioxidant cathartic (Priya et al., 2013).

In conclusion, this study has contributed to emphasize the relevance of traditional practices in the management and utilization of tomato germplasm within key cultivation areas in Delta and Edo states, Nigeria. These indigenous people hold a significant portion of tomato germplasm and require support to improve production, storage and transportation of the crop. More so, results suggest that tomato is cultivated within the study area although not at commercial quantities. Considering the associated benefits of the crop, government and non-governmental agencies need to support local production.

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