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ASSESSMENT OF VARIETY PREFERENCE AMONG TOMATO FARMERS IN OYO STATE, NIGERIA

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ABSTRACT. Despite the great potential for the production of tomatoes in south-west Nigeria, the region still depends largely on the north for the supply of tomatoes. This is in spite of the introduction of varieties that adapt well to different environmental conditions. The study examined the knowledge level on tomato varieties, assessed the importance and satisfaction attached to each varietal attribute and identified the most preferred cultivar. Purposive and random sampling techniques produced 205 respondents on whom an interview schedule was administered. Descriptive statistics and Pearson's Product Moment Correlation were used to analyze the data. The majority of the respondents were males with a formal education, according to the study's findings. The mean age, years of farming experience, farm sizes and number of extension contacts were 47 years, 17 years, 3.24 acres and three times, respectively. The farmers' most preferred tomato varieties were Plum (Roma VF) and Grape. The result also shows that attributes that increase the yield and income of the farmers were accorded higher priority. The result further revealed that, at $p<0.05$, the number of years spent in school, number of extension contacts, farm size, years of experience in tomato farming, years of membership in tomato farmers' associations and annual income had significant relationships with the farmers' variety preference. The study concluded that the most preferred tomato varieties in Oyo State, Nigeria, were Plum and Grape. It is therefore recommended that plant breeders and other researchers involved in tomato growing should work to enhance the least preferred varieties. Also, tomato breeders should take note of the varietal attributes that farmers considered most important for their production.

Keywords: importance; cultivar; satisfaction; variety attribute.

INTRODUCTION

The tomato plant (*Lycopersicon esculentum* L.) belongs to the Solanaceae species and is cultivated in different agro-ecological zones in Nigeria, predominantly the northern part. It can also be found in wet and

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sub-humid areas in the south and middle belts respectively. The tomato is a fruit which is consumed in all households in the nation as part of the everyday diet, whether in fresh or processed form. Products that can be obtained from tomato processing are paste, juice, puree, ketchup, canned products, beauty products, etc., which add value to the fruit (Ajagbe *et al.*, 2014). Consumption of tomatoes reduces the risk of life-threatening diseases such as cancer, heart disease, bone malfunctions etc. (Onifade *et al.*, 2013).

Nigeria has the capacity to lead in world exports of tomato and tomato products, as it is ranked as the 11th largest producing country in the world (Food and Agricultural Organization, 2017). However, it was reported that Nigeria recorded over 45% (750,000 t) of the total tomato crop produced in the country as annual loss (FAO, 2010). Both traditional and improved varieties of tomato are cultivated in Nigeria. Traditional varieties, also known as "heirloom tomatoes", are those that are passed down from generation to generation, such as: Beefsteak, Brandy Wine, Big Rainbow, Cherry, etc. Tomato hybrids are genetically improved tomatoes created as a result of cross-pollination between two different varieties of tomato. These new varieties will have the characteristics of both parents and include Cherry, Better Boy, Grape, Early Girl, etc.

The differences in the attributes of tomato varieties are among the reasons why farmers' choice of variety differs. The preference for a variety depends on the yield, socio-economic characteristics, attitudes and behaviours of the farmers, risk perception and climatic factors (Hellyer *et al.*, 2012). Oye (2014) asserts that the most important prerequisite for good crop production is the availability of high-yielding varieties, adapted to the growing area, and preferred by the farmers. Some varieties of tomatoes cultivated in Oyo State are; *Lycopersicon esculentum* L. var. "Cherry" (*Omo-oko*), *Lycopersicon esculentum* L. var. "Beefsteak" (*Tyre*), *Lycopersicon esculentum* L. var. "Grape" (*Alahusa*), *Lycoperscion esculentum* L. var. "Plum" (*Kerewa*), *Lycopersicon esculentum* L. var. "Campari" (*Gbeske*), *Lycopersicon esculentum* L. var. "Better boy" (*UTC*), among others.

Despite the huge potential for the production of tomatoes in south-west Nigeria, the region still depends largely on the north for the supply of tomatoes. Most of the tomato fruits purchased in the local market are brought from the north, with implications for the price due to the cost of transportation. Also, their quality is affected as a result of greater handling and the long distances they are transported, hence reducing their nutritional content.

However, despite the introduction of hybrid varieties, most farmers still depend on local tomato varieties for production. It is therefore important to assess the varietal preference of farmers and the reasons surrounding farmers' choices in Oyo State. The study determined the level of farmers'

knowledge of tomato varieties and assessed the importance they attached to varietal attributes. The study also examined the level of satisfaction of farmers with tomato varieties and it identified the most preferred tomato variety in the research area. The following hypothesis was formulated and tested in null form (H0): **"**The farmers socioeconomic characteristics do not have a meaningful relationship with their varietal preference".

This study was grounded in the theory of behavioural change by Fishbein and Cappella (2006). Behaviour change theory states that a person's belief about a situation, his perception about other people's beliefs, and how well he can control his attitude are the criteria that will determine whether change will occur or not. Experiences that happened in the past, personality, environmental conditions and skills will determine the intention of an individual to change his way of doing things. Tomato farmers will cultivate a variety that adapts better to their local conditions and has better attributes than the previous varieties they cultivated.

MATERIALS AND METHODS

The Study Area

The study was conducted in Oyo State, Nigeria, which lies between latitudes 6.5^{o} and 9^{o} N and longitudes 3^{o} and 5^{o} E. The population projected from the 2006 census was about 8,210 million in 2020 and the land mass is 27,249 km^{2} (NBS, 2010). Agriculture is the main occupation of the inhabitants of the state and tomatoes are one of the key crops cultivated due to favorable climatic conditions for their growth.

Sampling Procedure and Sampling Size

The population for the study consisted of all the tomato farmers in Oyo State. The respondents for the study were chosen using a three-stage sampling procedure. The first stage was the purposive selection of the Ibadan/Ibarapa and Ogbomosho Agricultural Development Project Zones (ADP) out of the four Agricultural Development Project Zones in Oyo State, based on the prominence of tomato production there. The second stage involved the random selection of 20% of the major tomato producing communities in each selected zone. This gave four communities in the Ibadan/Ibarapa zone and eight communities in the Ogbomosho zone. The communities selected were: Odo-adi, Ibaponi, Abogunde, Okin-Apa, Abaalaye, Ladamu, Abede Ayete, Tapa, Igangan and Alaagba. The third stage involved the random selection of 30% of the registered tomato farmers drawn from the list compiled with the help of Agricultural Development Project extension agents. A total sample size of 208 was used for the study, of which 205 responses were found to be analysable, giving a response rate of 98.6%.

Data Collection and Analysis

Data collection was done with the aid of a structured interview schedule. Data collected from the field survey was analysed using both descriptive and inferential statistical tools. Simple descriptive statistics involving the use of frequency counts, percentages, mean and standard deviation were used to present the findings from the study. The varietal preference for tomatoes among farmers was measured using a varietal preference

index. Calculation of this index was done using two indicators, namely the level of importance attached to tomato attributes and the farmers' level of satisfaction with each varietal attribute (Sall *et al.*, 2000). The level of importance attached to tomato attributes was measured on a 4-point Likert Scale, whereby a list of attributes was drawn up and respondents were required to indicate the extent to which they considered the attributes important on a scale of one to four. The scale was graduated as follows: Not important =1, Less important = 2, Important = 3, Very Important = 4. To facilitate easy scoring, a benchmark was set, and mean scores (MS) above 2.0 were regarded as being important, while mean scores below 2.0 were regarded as not important.

A 4-point Likert-type scale was also used to measure the level of satisfaction with each varietal attribute. A list of tomato attributes was drawn up and respondents were asked to indicate the level of satisfaction with each attribute on a scale of one to four. To facilitate easy scoring, a benchmark was set and mean scores above 2.5 were considered as being satisfactory while mean scores below 2.5 were regarded as unsatisfactory. The scale was graduated as follows: Poor = 1, Fair = 2, Good = 3, Very Good = 4.

For calculating the Varietal Preference Index:

$$VPI = IS + SS \ldots (1)$$

where, VPI = varietal preference index, IS= importance score, SS= satisfaction score.

For finding the weighted score for IS and SS:

$$X_W = 4(F_4) + 3(F_3) + 2(F_2) + 1(F_1) \ldots (2)$$

where, X_W = weighted score, 4 – 1 = Likert rating scale, $F_4 - F_1$ = frequency of the respondents in each scale.

The values of the weighted score were used to rank the attributes according to their importance and farmers' satisfaction.

$$\text{Mean score} = \frac{\textit{total score of each attribute}}{\textit{total number of respondents}} \ldots (3)$$

The VPI therefore ranges from 2 to 8. The higher the varietal index, the higher the varietal preference and vice versa. The knowledge level of farmers was measured using a "Teacher-Made Test" (Omotesho *et al.*, 2017). The test involved the development of a comprehensive list of questions which, when put together, depicts the knowledge of farmers on tomato varieties. To facilitate easy scoring, the questions were dichotomous in nature as follows; 1 for each correct answer and 0 otherwise. A score of 70% was adopted as a cut-off point for the possession of a good knowledge level on tomato varieties. Scores between 50% and 69% were categorised as fair, while scores below 50% were categorised as a poor knowledge level of tomato varieties. Pearson's Product Moment Correlation (PPMC) was used to test the hypothesis (Gomez and Gomez, 1984; Kerlinger, 1992).

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

The socio-economic characteristics are presented in *Table 1*. The data reveals that the modal age of the respondents was between 41 and 60 years. The mean age of 46.84 indicates that the majority of the respondents were middle-aged, possibly with a risk

propensity and enthusiasm for carrying out the rigorous work required for tomato farming. This contradicts the findings of Haruna (2012), who reported that tomato farming was dominated by older farmers. There were more men (70%) involved in tomato farming than women (29.3%). This could be due to the strenuous nature of tomato farming and some social norms surrounding the roles of males and females.

Table 1 – Socio-economic characteristics of respondents (n=205)

Variables	Frequency	Percen-tages	Mean	S.D	Min	Max
Age (in years)			**46.84**	**11.61**	**25**	**77**
≤30	21	10.3				
31-40	46	22.4				
41-50	62	30.2				
51-60	54	26.3				
> 60	22	10.8				
Sex						
Male	145	70.7				
Female	60	29.3				
Marital Status						
Single	10	4.9				
Married	166	80.9				
Divorced	18	8.8				
Widowed	11	5.4				
Years of Formal Education			**7.34**	**5.44**	**0**	**18**
0	59	28.8				
6-Jan	37	18				
12-Jul	85	41.5				
> 12	24	11.7				
Household Size			**7.24**	**3.14**	**1**	**18**
≤ 3	17	8.3				
7-Apr	95	46.3				
11-Aug	75	36.6				
> 11	18	8.8				
Primary Occupation						
Tomato Farming	102	49.7				
Otherwise	103	50.3				
Number of Extension Contact (Past 6 months)			**2.45**	**1.47**	**0**	**5**
0	30	14.6				
2-Jan	71	34.6				
4-Mar	91	44.4				
> 4	13	6.3				

Tomato Farming Experience			**16.96**	**10.21**	**2**	**50**
≤ 10	77	37.6				
20-Nov	67	32.7				
21-30	42	20.5				
> 30	19	9.3				
Membership of Farmer Groups						
Yes						
No	128	62.4				
	77	37.6				
Size of Tomato Farm (Acres)			**3.24**	**1.99**	**1**	**15**
≤ 2	90	43.9				
2.01-5	90	43.9				
5.01-8	22	10.7				
> 8	3	1.5				
Annual Income from Tomato Farming			**385,229.27**	**47571**	**40,000**	**1,000,000**
≤ 100,000	40	19.5				
100,001-200,000	60	29.3				
200,001-300,000	29	14.1				
>300,000	76	37.1				

Source: Field Survey, 2020; SD = Standard Deviation, Min = Minimum, Max = Maximum.

This result agrees with Abimbola (2014), who reported that tomato farming is a male- dominated enterprise. Out of the total respondents, 81% were married men, and their families had, on average, 7 members. This implies that the majority of the respondents were likely to have family responsibilities. This corroborates the position of Oladoja *et al*. (2008), who reported that marriage bestows responsibilities and commitments on farmers. About 71.2% of the respondents had formal education. This implies that most of the farmers can read and follow instructions regarding tomato farming. This result corroborates the findings of Ajagbe *et al.* (2014), who reported that tomato farmers had one form of education or another. The results reveal that about half (50.3%) of the respondents had other economic activities as their primary occupation, earn about ₦385,229.27 annually, and have about 17 years' experience in tomato farming. This indicates that the majority of the respondents did not depend on tomato farming as their sole source of income, as they diversified into other sources of income to mitigate risks that might be associated with tomato farming. The study further reported low contacts with extension agents (Mean = 2.45), which could be influenced by constraints faced by extension organisations (Iwena, 2008).

Farmer's Knowledge of Tomato Varieties

This section presents the results of farmers' knowledge of tomato varieties. The results are summarized in *Table 2*. The results show that farmers were mostly knowledgeable about the spacing requirement for planting tomatoes. This is evident in their knowledge of spacing tomato plants between and within rows. This in turn enables a better yield for farmers as there is less competition of plants for space and nutrients.

Table 2 - Farmer's knowledge of tomato varieties n=205

Knowledge Items	True/ False	Frequency	Percentage
The spacing requirements of all tomato varieties range between 75×60 cm and 75×45 cm	True	197	96.1
Plum (Kerewa) tomato variety has the longest shelf life (does not spoil easily) of all the varieties grown in Oyo State	True	191	93.2
Cherry (Omo-oko) and Campari (Gbeske) are the round shape varieties among others that are grown in Oyo State	True	181	88.3
Grape tomatoes have thicker skins/flesh with less water content than cherry tomatoes	True	177	86.3
Plum (Kerewa) has the least market demand in Oyo state	False	173	84.4
The large size of a tomato variety is a determinant of its water content	False	170	82.9
Campari (Gbeske) variety is covered with white transparent polythene sheeting in hot weather	False	169	82.4
Better boy (UTC) and Plum (Kerewa) varieties do not need nursery preparation before transplanting	False	166	81.0
The maturity date for Beefsteak (Tyre) tomato is 75-85 days	True	158	77.1
Beefsteak (Tyre) variety has the best flavor	False	150	73.2
There are more seeds in Grape (Alahusa) variety compared to other varieties	True	141	68.8
Plum (Kerewa) is not the highest yielding tomato variety grown in Oyo State	False	137	66.8
All tomato varieties grow well with strong sunshine	False	127	62.0
The two largest-sized tomato varieties are Cherry (Omo-oko) and Plum (Kerewa)	False	111	54.1
Grape (Alahusa) tomato variety has high resistance to pest and diseases	False	110	53.7

Source: Survey, 2020; Knowledge Level = 76.69% (Mean Score = 76.69%).

This result agrees with the findings of Samuel *et al*. (2011). The result also reveals that the farmers were knowledgeable in the identification and storage ability of tomato varieties. This knowledge is very important in distinguishing between tomato varieties, as well as making decisions on varieties that meet market demand. A short shelf life has been reported by authors to be one of the major constraints to tomato farming, so knowledge of how long it takes for a tomato variety to spoil is important to mitigate this constraint. However, farmers had less knowledge on varieties with resistance to pests and diseases. Incidences of pests and diseases on tomato farms have been a threat not only to farmers' productivity, but also to the nation's self-reliance on tomato production. Knowledge of varieties that are resistant to pests and diseases is therefore important to mitigate this menace (*Fig. 1*).

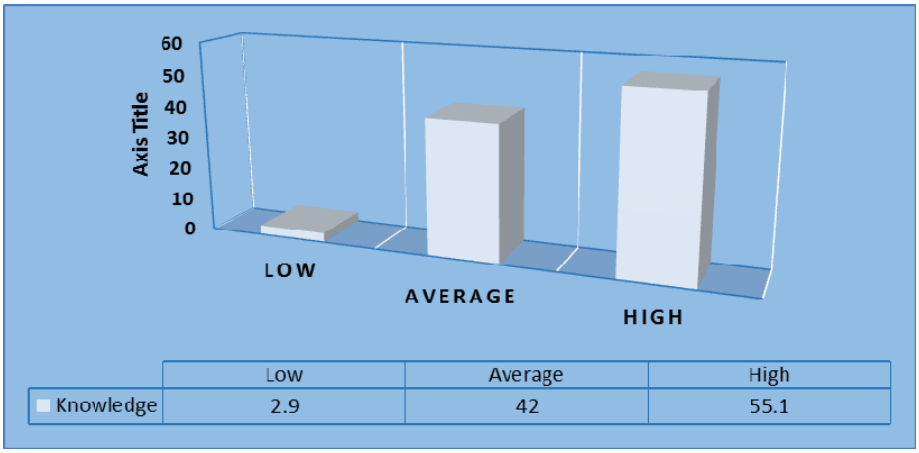

Figure 1 - Respondents' knowledge level of tomato varieties

The results reveal that the knowledge level of the respondents on tomato varieties had a mean score of 76.9%. This indicates that tomato farmers in the study area had a good knowledge of tomato varieties in terms of identification, agronomic practices, shelf life, and market demand among other characteristics. Knowledge of tomato varieties could influence farmers' preferences. In addition, contact with extension agents could contribute to the knowledge level of farmers on tomato varietal attributes. This corroborates the findings of Samuel *et al*. (2011), who reported that contact with extension agents provides information about crop varieties to farmers and guides them in choosing the best.

Importance Attached to Tomato Varietal Attributes by Farmers

This section presents the results of the importance attached to tomato varieties by farmers in the study area. The results are as presented in *Table 3*.

These results show that all the varietal attributes under consideration were important. However, it is important to note that though all varietal attributes were important, the level of importance attached to each attribute differs. The result shows that high yield, early maturity, good productivity, high market demand and resistance to pests and diseases were considered the most important attributes of tomato varieties.

Table 3 - Importance attached to tomato varietal attributes by farmers (n=205)

Tomato attributes	NI F (%)	LI F (%)	I F (%)	VI F (%)	MS
Water content	13(6.3)	68(33.2)	87(42.4)	37(18)	2.72
Sweet flavor	7(3.4)	52(25.4)	122(59.5)	24(11.7)	2.80
Good productivity	2(1)	14(6.8)	89(43.4)	100(48.8)	3.40
High market demand	0(0)	26(12.7)	91(44.4)	88(42.9)	3.30
Resistance to pest and diseases	2(1)	17(8.3)	83(40.5)	103(50.2)	3.40
Colour	16(7.8)	56(27.3)	106(51.7)	27(13.2)	2.70
Size	12(5.9)	51(24.9)	110(53.7)	32(15.6)	2.79
Shape	19(9.3)	71(34.6)	93(45.4)	22(10.7)	2.58
High yield	1(0.5)	10(4.9)	91(44.4)	103(50.2)	3.44
Thick flesh	26(12.7)	99(48.3)	56(27.3)	24(11.7)	2.38
Plenty seeds	28(13.7)	54(26.3)	104(50.7)	19(9.3)	2.56
Require high sunshine	49(23.9)	77(37.6)	73(35.6)	6(2.9)	2.18
Smooth skin	22(10.7)	59(28.8)	101(49.3)	71(34.6)	3.55
Early maturity	4(2)	29(14.1)	101(49.3)	71(34.6)	3.17
Number of leaves	18(8.8)	43(21)	127(62)	17(8.3)	2.70

Source: Survey, 2020; NI: Not Important, LI: Less Important, I: Important, VI: Very Important
MS: Mean Score. Benchmark: MS above 2.0 = Important, MS below 2.0 = Less important.

It is expected that a higher output means a higher the income for farmers and this subsequently leads to the improved livelihood of the farming household as a whole. This corroborates the findings of Samuel *et al*. (2011), who reported that tomato farmers were interested in varieties that cover a large area with little investment, have high yield and earn a profitable income. The attributes that the respondents considered as the least important were shape, thick flesh and sunshine requirements. This could be because shape and thick flesh were not criteria that affect the yield of tomato. The reason for this could be that the edaphic and climatic factors needed for tomato development have nothing to do with the shape and fleshy nature of the tomato. The results further show that too much sunshine can damage the plant tissues, thus causing the seedlings to experience water stress. This finding is in line with the position of Martin *et al*. (2019), who reported that flowering will be affected and tissue will be damaged if the temperature is above 38°C, thus reducing the yield.

Farmers' Satisfaction with Tomato Varietal Attributes

This section presents the results of the satisfaction of farmers with attributes of tomato varieties in the study area. The results are as presented in *Table 4*.

Table 4 - Farmers' satisfaction with tomato varietal attributes (n=205)

Cherry (*Omo-oko*)	**Poor F (%)**	**Fair F (%)**	**Good F (%)**	**Very Good F (%)**	**MS**
Water content	58(28.3)	76(37.1)	59(28.8)	12(5.9)	2.12
Sweet flavour	20(9.8)	98(47.8)	79(38.5)	8(3.9)	2.39
Good productivity	20(9.8)	84(41)	90(43.9)	11(5.4)	2.45
High market demand	57(27.8)	95(46.3)	42(20.5)	11(5.4)	2.03
Resistance to pest and diseases	43(21)	81(39.5)	68(33.2)	13(6.3)	2.25
Colour	18(8.8)	81(39.5)	95(46.3)	11(5.4)	2.48
Size	69(33.7)	68(33.2)	59(28.8)	9(4.4)	2.04
Shape	40(19.5)	116(56.6)	41(20)	8(3.9)	2.08
High yield	29(14.1)	92(44.9)	68(33.2)	16(7.8)	2.35
Thick flesh	111(54.1)	67(32.7)	22(10.7)	5(2.4)	1.61
Plenty seeds	34(16.6)	91(44.4)	65(31.7)	15(7.3)	2.29
Require high sunshine	45(22)	107(52.2)	46(22.4)	7(3.4)	2.07
Smooth skin	37(18)	53(25.9)	75(36.6)	40(19.5)	2.58
Early maturity	29(14.1)	98(47.8)	67(32.7)	11(5.4)	2.29
Number of leaves	30(14.6)	110(53.7)	61(29.8)	4(2)	2.19
Campari (*Gbeske*)	**Poor F (%)**	**Fair F (%)**	**Good F (%)**	**Very Good F (%)**	**MS**
Water content	40(19.5)	76(37.1)	82(40)	7(3.4)	2.27
Sweet flavour	20(9.8)	86(42)	87(42.4)	12(5.9)	2.44
Good productivity	27(13.2)	63(30.7)	97(47.3)	18(8.8)	2.52
High market demand	28(13.7)	72(35.1)	86(42)	19(9.3)	2.47
Resistance to pest and diseases	31(15.1)	78(38)	75(36.6)	21(10.2)	2.42
Colour	24(11.7)	50(24.4)	114(55.6)	17(8.3)	2.60
Size	25(12.2)	55(26.8)	92(44.9)	33(16.1)	2.65
Shape	24(11.7)	69(33.7)	82(40)	30(14.6)	2.58
High yield	26(12.7)	92(44.9)	62(30.2)	25(12.2)	2.42
Thick flesh	40(19.5)	73(35.6)	82(40)	10(4.9)	2.30
Plenty seeds	38(18.5)	87(42.4)	72(35.1)	8(3.9)	2.24
Require high sunshine	42(20.5)	70(34.1)	88(42.9)	5(2.4)	2.27
Smooth skin	29(14.1)	40(19.5)	91(44.4)	45(22)	2.74
Early maturity	29(14.1)	70(34.1)	85(41.5)	21(10.2)	2.48
Number of leaves	32(15.6)	81(39.5)	70(34.1)	22(10.7)	2.40
Grape (*Alahusa*)	**Poor F (%)**	**Fair F (%)**	**Good F (%)**	**Very Good F (%)**	**MS**
Water content	41(20)	51(24.9)	98(47.8)	15(7.3)	2.42

Sweet flavour	14(6.8)	68(33.2)	94(45.9)	29(14.1)	2.67
Good productivity	12(5.9)	73(35.6)	89(43.4)	31(15.1)	2.68
High market demand	23(11.2)	76(37.1)	83(40.5)	23(11.2)	2.52
Resistance to pest and diseases	51(24.9)	90(43.9)	47(22.9)	17(8.3)	2.15
Colour	19(9.3)	68(33.2)	88(42.9)	30(14.6)	2.63
Size	22(10.7)	69(33.7)	87(42.4)	27(13.2)	2.58
Shape	18(8.8)	77(37.6)	86(42)	24(11.7)	2.57
High yield	25(12.2)	82(40)	80(39)	18(8.8)	2.44
Thick flesh	41(20)	79(38.5)	68(33.2)	17(8.3)	2.29
Plenty seeds	26(12.7)	66(32.2)	62(30.2)	51(24.9)	2.61
Require high sunshine	23(11.2)	101(49.3)	73(35.6)	8(3.9)	2.32
Smooth skin	20(9.8)	68(33.2)	95(46.3)	22(10.7)	2.58
Early maturity	16(7.8)	90(43.9)	88(42.9)	11(5.4)	2.46
Number of leaves	25(12.2)	99(48.3)	74(36.1)	7(3.4)	2.31
Plum (*Kerewa)*	**Poor F (%)**	**Fair F (%)**	**Good F (%)**	**Very Good F (%)**	**MS**
Water content	3(1.5)	30(14.6)	120(58.5)	52(25.4)	3.08
Sweet flavour	1(0.5)	11(5.4)	122(59.5)	71(34.6)	3.28
Good productivity	0(0)	6(2.9)	84(41)	115(56.1)	3.53
High market demand	3(1.5)	8(3.9)	66(32.2)	128(62.4)	3.56
Resistance to pest and diseases	1(0.5)	27(13.2)	68(33.2)	109(53.2)	3.39
Colour	2(1)	45(22)	107(52.2)	51(24.9)	3.01
Size	2(1)	16(7.8)	102(49.8)	85(41.5)	3.32
Shape	1(0.5)	14(6.8)	114(55.6)	76(37.1)	3.29
High yield	3(1.5)	7(3.4)	72(35.1)	123(60)	3.54
Thick flesh	12(5.9)	51(24.9)	86(42)	56(27.3)	2.91
Plenty seeds	1(0.5)	50(24.4)	94(45.9)	60(29.3)	3.04
Require high sunshine	4(2)	57(27.8)	103(50.2)	41(20)	2.88
Smooth skin	1(0.5)	21(10.2)	110(53.7)	73(35.6)	3.24
Early maturity	5(2.4)	11(5.4)	95(46.3)	94(45.9)	3.36
Number of leaves	6(2.9)	17(8.3)	121(59)	61(29.8)	3.16
Better boy *(UTC*)	**Poor F (%)**	**Fair F (%)**	**Good F (%)**	**Very Good F (%)**	**MS**
Water content	61(29.8)	28(13.7)	94(45.9)	22(10.7)	2.38
Sweet flavour	62(30.2)	33(16.1)	78(38)	32(15.6)	2.39
Good productivity	59(28.8)	43(21)	79(38.5)	24(11.7)	2.33
High market demand	61(29.8)	49(23.9)	64(31.2)	31(15.1)	2.32
Resistance to pest and diseases	62(30.2)	67(32.7)	56(27.3)	20(9.8)	2.17
Colour	60(29.3)	47(22.9)	71(34.6)	27(13.2)	2.32
Size	60(29.3)	29(14.1)	60(29.3)	56(27.3)	2.55
Shape	58(28.3)	44(21.5)	66(32.2)	37(18)	2.40
High yield	59(28.8)	63(30.7)	60(29.3)	23(11.2)	2.23

Thick flesh	71(34.6)	56(27.3)	52(25.4)	26(12.7)	2.16
Plenty seeds	66(32.2)	72(35.1)	43(21)	24(11.7)	2.12
Require high sunshine	65(31.7)	80(39)	53(25.9)	7(3.4)	2.01
Smooth skin	59(28.8)	54(26.3)	68(33.2)	24(11.7)	2.28
Early maturity	61(29.8)	56(27.3)	71(34.6)	17(8.3)	2.21
Number of leaves	64(31.2)	74(36.1)	57(27.8)	10(4.9)	2.06
Beefsteak (*Tyre*)	**Poor F (%)**	**Fair F (%)**	**Good F (%)**	**Very Good F (%)**	**MS**
Water content	120(58.5)	65(31.7)	19(9.3)	1(0.5)	1.52
Sweet flavour	106(51.7)	65(31.7)	33(16.1)	1(0.5)	1.65
Good productivity	86(42)	81(39.5)	33(16.1)	5(2.4)	1.71
High market demand	112(54.6)	75(36.6)	11(5.4)	7(3.4)	1.58
Resistance to pest and diseases	111(54.1)	74(36.1)	15(7.3)	5(2.4)	1.58
Colour	78(38)	82(40)	42(20.5)	3(1.5)	1.85
Size	68(33.2)	69(33.7)	54(26.3)	14(6.8)	2.07
Shape	104(50.7)	63(30.7)	35(17.7)	3(1.5)	1.69
High yield	83(40.5)	78(38)	41(20)	3(1.5)	1.82
Thick flesh	85(41.5)	59(28.8)	36(17.5)	25(12.2)	2.00
Plenty seeds	84(41)	84(41)	34(16.6)	3(1.5)	1.79
Require high sunshine	107(52.2)	82(40)	15(7.3)	1(0.5)	1.56
Smooth skin	120(58.5)	68(33.2)	16(7.8)	1(0.5)	1.50
Early maturity	101(49.3)	86(42)	16(7.8)	2(1)	1.60
Number of leaves	93(45.4)	89(43.4)	19(9.3)	4(2)	1.68

Source: Survey, 2020
Benchmark: MS above 2.5 = Satisfied, MS below 2.5 = Not satisfied.

The results show that out of the six tomato varieties grown in the study area, the farmers were satisfied with the yield of the Campari, Grape and Plum varieties. The yield of these varieties might be attributed to the fact that they thrive well in the local conditions, they give high quality outputs despite the constraints encountered by the farmers and their seeds are durable for further cultivation. The results further show that the respondents were satisfied with only Plum in respect to disease resistance and the ability to thrive well in a hot climate. Harel *et al.* (2014) reported a positive relationship between the temperature, maturity period and yield of tomato. This explains the reason why Plum is the only variety that met the farmers' satisfaction level regarding the attributes under consideration.

The results further reveal that tomato farmers were satisfied with the market demand for the Plum and Grape varieties. The plausible reasons for this could be their sweetness, water level and flavour. Fernqvist (2014) reported that the most important attribute in fruits and vegetables (horticultural crops) for the consumer is the taste. It was also reported by Samuel *et al.* (2011) that round shaped varieties (Beefsteak, Cherry, Campari) thrived well and gave a better yield

during the rainy season. In summary, the farmers were most satisfied with the varietal attributes of Plum, Grape and Campari tomatoes.

This section presents the results of the preferences attached to each tomato variety by the farmers in the research area. *Table 5* summarizes and presents the findings.

Farmers' variety preference

Table 5 - Farmers' preference for tomato varieties (n=205)

Tomato varieties	Scientific name	Importance	Satisfaction	Preference score	Rank
Cherry (*Omo-oko*)	L*ycopersion esculentum* L var."Cherry"	2.91	2.21	5.12	5th
Campari (*Gbeske*)	L*ycopersion esculentum* L var."Campari"	2.91	2.45	5.36	3rd
Grape (*Alahusa*)	L*ycopersion esculentum* L var."Alahusa"	2.91	2.48	5.39	2nd
Plum (*Kerewa*)	L*ycopersion esculentum* L var."Kerewa"	2.91	3.24	6.15	1st
Better boy (*UTC*)	L*ycopersion esculentum L var.* "Better boy"	2.91	2.26	5.17	4th
Beefsteak (*Tyre*)	L*ycopersion esculentum* L var. "Beefsteak"	2.91	1.71	4.62	6th

Source: Survey, 2020

The results show that the Plum (*Kerewa*) variety was the most preferred by the tomato farmers in the study area, which could be attributed to its high productivity, resistance against pests and diseases, long shelf life and high market demand (Madeh, 2011). The Grape variety (*Alahusa*) has appealing attributes to the consumer (fine skin and good flavour). These attributes increase the income of the farmers, as consumers are willing to pay more for tomatoes that meet their sensory demands. Cherry (*Omo-oko*) and Beefsteak (*Tyre*) were the two varieties preferred least by the farmers in the study area. The small size and quantity of their seeds could be the reason why farmers did not favour them for cultivation. Smaller varieties are labour-intensive and incur higher costs for harvesting (Coker *et al.*, 2018). In addition, Mele *et al.* (2018) reported that the Cherry tomato has less weight, a short shelf life and reduced market value. The Beefsteak (*Tyre*) variety has an irregular shape, rough skin, high water content, soft skin and short shelf life. Abimbola (2014) reported that farmers could not keep highly perishable tomatoes for a long period and these attributes could be why they are among the least preferred by the farmers. It is pertinent to note that the respondents' preference level was based on attributes that were considered important and satisfactory.

The results from *Table 6* show the Pearson's Product Moment Correlation between some selected socio-economic characteristics and farmers' varietal preferences. At $p<0.05$, education, extension contacts,

years of experience in tomato farming, years of membership in farmer groups, farm size and annual income had a significant relationship with farmers' varietal preference. The inverse relationship between years of formal education and preference for the Campari and Better boy varieties of tomato implies that farmers with fewer years of education preferred these two varieties and vice versa. The number of extension contacts had an inverse relationship with the preference for the Beefsteak variety, while it had a positive relationship with the preference for Campari, Grape and Plum varieties. This implies that the more contact the farmers had with extension personnel, the less they preferred the older tomato variety (Beefsteak) and more they preferred the newer varieties (Campari, Grape and Plum). Contact with extension is important not only in providing information about newer varieties of crops, but also in guiding the farmers in choosing them (Samuel *et al*., 2011). The positive significant relationship between years of experience in tomato farming and Cherry implies that farmers with fewer years of experience in tomato farming did not prefer Cherry. Akudugu (2012) opined that farmers' varietal preference could be influenced by their level of experience. Years of membership in farmers' groups had a positive significant relationship with the preference for Plum and an inverse relationship with preference for Cherry. This implies that an increase in years of membership in a farmers' group increases the preference for Plum and reduces the preference for Cherry and vice versa. A farmer group is an avenue that gives information to the farmers on tomato varieties and their attributes. This result corroborates Rahmadanih *et al.* (2015), who reported that farmer groups are institutions that play a major role in contributing to improved farming methods among their members. Furthermore, income had a positive influence on the preference for the Plum variety. This implies that, as the level of income increases, the preference for Plum increases. A plausible reason for this could be that consumers pay more for Plum than other varieties, thus increasing the farmers' income. This is in tandem with the findings of Martin *et al*. (2019) that farmers prefer to cultivate high-yielding varieties that generate more income for them. Farm size had a positive significant relationship with the preference for Cherry and Better boy, meaning that farmers with larger farms preferred Cherry and Better boy. This is in line with Neil *et al.* (2014), who reported that farmers prefer varieties that can serve commercial and domestic purposes, hence ensuring year-round food availability. However, the age of the farmers, as well as their household size did not have any significant relationship with their preference for tomato varieties. Based on the findings of the study, the null hypothesis was rejected.

Table 6 - Result of the Pearson's Product Correlation analysis showing the relationship between socio-economic characteristics of farmers and their varietal preference

Variables		Cherry	Campari	Grape	Plum	Better boy	Beef steak
Age	Pearson Correlation	0.083	0.094	0.025	-0.008	0.084	0.037
	Sig. (2-tailed)	0.235	0.178	0.719	0.904	0.232	0.599
Years in school	Pearson Correlation	0.025	**-0.173****	-0.102	0.097	**-0.228*****	-0.045
	Sig. (2-tailed)	0.721	**0.013**	0.146	0.165	**0.001**	0.518
Household size	Pearson Correlation	0.129	-0.053	-0.080	-0.105	-0.094	-0.046
	Sig. (2-tailed)	0.066	0.447	0.257	0.132	0.178	0.510
Number of extension contacts	Pearson Correlation	0.101	**0.184*****	**0.146****	**0.203*****	0.022	**-0.199*****
	Sig. (2-tailed)	0.151	**0.008**	**0.036**	**0.003**	0.757	**0.004**
Years of experience in tomato farming	Pearson Correlation	**0.178****	0.058	0.035	-0.104	-0.053	-0.101
	Sig. (2-tailed)	**0.011**	0.407	0.614	0.137	0.448	0.151
Years of membership	Pearson Correlation	**-0.181****	-0.053	-0.055	**0.194****	-0.017	-0.027
	Sig. (2-tailed)	**0.041**	0.551	0.540	**0.029**	0.847	0.761
Farm size	Pearson Correlation	**0.140****	-0.044	-0.084	-0.098	**0.305*****	-0.116
	Sig. (2-tailed)	**0.046**	0.529	0.231	0.161	**0.000**	0.097
Annual income	Pearson Correlation	-0.109	-0.004	0.057	**0.182*****	-0.095	-0.101
	Sig. (2-tailed)	0.121	0.953	0.419	**0.009**	0.176	0.149

Source: Survey, 2020; ***Correlation is significant at the 0.05 level (2-tailed).

CONCLUSION

The study concluded that the most preferred tomato varieties among farmers in Oyo State were Plum and Grape. This was because the farmers regard their attributes as being important and are fully satisfied with them. The attributes favoured by the farmers are high yield, resistance

against pest and diseases, good productivity, high market demand and early maturity.

Based on the findings and conclusions of the study, the following recommendations are made: Plant breeders and other researchers involved in studying tomato should work to enhance the least preferred varieties (Beefsteak and Cherry) in order to improve their qualities in line with farmers' preferences. Tomato breeders should take note of the varietal attributes of most importance to farmers in order to improve their qualities in line with farmers' preferences. Planting materials of the most preferred varieties should made readily available to farmers.

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