INNSPUB

International Journal of Agronomy and Agricultural Research (IJAAR)
ISSN: 2223-7054 (Print) 2225-3610 (Online)
http://www.innspub.net
Vol. 3, No. 3, p. 1-5, 2013

RESEARCH PAPER OPEN ACCESS

Evaluation of tomato (*Lycopersicon lycopersicum* Mill.) for fruit yield and yield components in the southern Guinea Savanna ecology of Nigeria

G. O. S. Ojo[1*], E. E. Ekoja[2], O. P. Ukpoju[1]

[1]*Department of Crop Production, University of Agriculture, Makurdi, Nigeria*

[2]*Department of Crop and Environmental Protection, University of Agriculture, Makurdi, Nigeria*

Article published on March 28, 2013

Key words: Performance, southern Guinea Savanna.

Abstract

Field experiments were conducted at the Teaching and Research Farm of the University of Agriculture, Makurdi during the 2010 and 2011 rain fed cropping season with the objective of evaluating the performance of tomato varieties in the Southern Guinea Savanna ecology of Nigeria. The experimental design was a randomised complete block design with three replications while four varieties of tomato namely Roma Savanna VF (an improved variety), two hybrid varieties (F_1 Lindo and F_1 Jaguar) and a local variety (Local check) constituted the treatments. Highly significant variety effect was observed for all the traits (days to flowering, fruit length, fruit diameter, number of fruit s/plant, weight of fruits/plant and fruit yield) studied, indicating that the varieties evaluated are genetically diverse. The highest values for fruit length, fruit diameter, number of fruit s/plant, weight of fruits/plant and fruit yield observed for Roma Savanna VF is an indication that this variety has the potential for good performance in the southern guinea savanna ecology of Nigeria. Further studies on multi-locational evaluation of Roma savana VF along with more varieties including the local variety (local check) is required prior to the recommendation of Roma savana VF for adoption in the southern Guinea Savanna ecology of Nigeria.

* **Corresponding Author:** G. O. S. Ojo ✉ gosojo2001@yahoo.com

Introduction

Tomato is the most widely grown vegetable crop in the world (Villarea, 1980) and one of the most important vegetable crops in West Africa (Showemimo *et al*., 2006). Tomato is consumed fresh or processed into paste prior to its consumption. It is consumed principally due to its high concentrations of vitamins A, B and C, and fair concentrations of protein, calcium and niacin (Norman, 1992; Bodunde, 1999; Kaushik *et al,* 2011).Tomato has medicinal values and is used for blood purification and cure of digestive ailments (Kaushik *et al,* 2011).

The global production area for tomato in 2010 was estimated at 4,412,757 ha with world production quantity estimated at 151,699,405 tonnes (FAO, 2010). However, the yield of tomato in West Africa particularly Nigeria is not encouraging, especially when compared to developed countries. For instance, Nigeria production was estimated at 1,860,600 tonnes in 2010 while the United States of America estimate for the same year was 12,858,700 tonnes (FAO, 2010). Yield per hectare in Nigeria was estimated at 1/7th of that of the U.S.A (FAO, 2010). Many factors have been reported to be responsible for this poor yield performance (Sangoyomi, *et al*., 2011 Commercial production of tomato in Nigeria is concentrated in the guinea savanna due to optimum climatic condition for its production within the ecology. Unfortunately, some parts of the guinea savanna ecology, particularly Benue State, are unable to produce enough tomato for local consumption due to non-availability of improved planting materials. The available local variety in production has low fruit yield, with poor quality fruits, short shelf life due to very high water content of the fruits and high susceptibility to insect pest and diseases. Hence, tomato fruits are transported from neighbouring States at exorbitant prices to augment the supply deficit.

The challenge therefore, is to identify promising genotypes with optimum yield of high quality fruits that could justify the return on investment in tomato production by farmers. Selecting an appropriate, high-yielding variety is one of the most important management decisions that crop producers make. Yield potential of a tomato variety is clearly important, but the decision is complicated by such factors as the cropping system, the need for insect pest and disease resistance, end-use quality goals, year-to-year climatic variation, and the need to select multiple varieties in order to reduce risk by spreading out flowering and maturity dates (VCE, 2011). However, the knowlege of the types of variety that will yield best in a given environment is important for good crop management decisions. The objective of the experiment was to identify a high yielding variety of tomato with a view of recommending it for adoption by farmers in the southern guinea savanna ecology of Nigeria.

Materials and methods

The experiment was conducted at the University Agriculture Teaching and Research Farm, Makurdi, Nigeria (Lat. 7°44`N, Long. 8°35`E) during the rainy season from early July to early November, 2010 and repeated within the same period in 2011.

The land was well tilled to a depth of 35cm and the nursery bed was neatly prepared. Four varieties (two hybrids (F_1 Lindo and F_1 Jaguar), one improved variety (Roma savana VF) and one local variety (Makurdi local)) of tomato were used for the experiment. The seeds of each of the four varieties were separately drilled into the soil, covered lightly with a film of loosed soil and mulched immediately using dry grasses. Seedlings emerged 5 – 8 days after sowing and mulch materials were removed after seedling emergence to harden the plants.

The tomato seedlings were transplanted at four (4) weeks after planting (4 WAP) into a previously harrowed and ridged field. The seedlings were removed singly with ball of earth to reduce damage to the roots. The 4 varieties of tomato constituted the treatments in a randomized complete block design (RCBD) replicated three (3) times giving a total of 12 plots. Each plot consisted of 4 rows of 5m length

spaced 75cm apart, giving a plot size of 15m². Intra – row spacing between seedlings was 50cm.

The plots were manually weeded at two (2) and six (6) weeks after transplanting (WAT). Compound fertilizer (NPK 15:15:15) was applied immediately after the first weeding at the rate of 15Kg N, 15Kg P_2O_5 and 15 KgK_2O/ha using the side dressing method.

Data on days to flowering was taken at 50% flowering while ripe fruits were harvested at 4 days intervals and data taken on fruit length, fruit diameter, number of fruits/plant, fruit weight/plant and fruit yield/ha. Data on number of fruits/plant, fruit weight/plant and fruit yield/ha were taken from the two centre rows (net plot) while data on all other parameters were taken from five randomly tagged plants on the two outer rows. Fruit yield/ha was estimated from fruit yield/plot (fruit yield from the net plot). Data were subjected to Analysis of variance (ANOVA) according to Gomez and Gomez (1984), while treatment means were separated using LSD as presented by Obi (1986).

Results and discussion

Data for 2010 and 2011 were combined for analysis due to homogeneity of error mean squares. Mean squares from analysis of variance for fruit yield and yield components of four varieties of tomato evaluated in a southern Guinea Savanna location of Nigeria during the 2010 and 2011 cropping seasons are presented in Table 1. No significant effects of years, rep. /years and years x variety interaction were observed for all the traits, namely days to flowering, fruit length, fruit diameter, number of fruits/plant, weight of fruits/plant and fruit yield. However, variety effect was highly significant for all the traits observed.

Table 1. Mean squares for fruit yield and yield components of tomato evaluated in the southern Guinea Savanna ecology of Nigeria during the 2010 and 2011 cropping season.

Source of variation	Df	Days to flowering	Fruit length	Fruit diameter	Number of fruits /plant	Weight of fresh fruits/ Plant	Fruit yield
Years	1	0.0417	0.0104	0.0038	0.0266	0.0002	0.1053
Reps/Years	4	0.0833	0.0568	0.0118	0.0417	0.0008	0.5514
Variety	3	7.6944**	6.7626**	2.6204**	890.7478**	1.1391**	810.1409**
Years x Variety	3	0.1250	0.0327	0.0004	0.0300	0.0001	0.0828
Error	12	0.3472	0.0238	0.0072	0.0472	0.0008	0.5609

**: significant at P < 0.01

The improved variety, Roma savana VF was earlier than all the other varieties and took the least number of days to flowering, followed by F_1 Jaguar and F_1 Lindo. The local variety took longer days to flower compared to the other varieties. The narrow range in the number of days to flowering observed in the current work is consistent with the narrow range reported by Mehta and Asati (2008) and within the range reported by Kaushik *et al.* (2011). The fruit length ranged from 6.83cm for the Local variety to 9.40cm for Roma savana VF with a mean of 8.13cm. Similarly, fruit diameter, number of fruits/plant, weight of fruits/plant and fruit yield were lowest in the local variety and highest in Roma savana VF. The fruit length and diameter of tomato observed in the current work is within the range previously reported (Marsic *et al.,* 2005; Muhammed and Singh, 2006), but exceeded the range of fruit length reported by Kaushik *et al,,* 2011. Such differences could be attributed to differences in the varieties evaluated and the environments they were evaluated. While the previous study (Kaushik *et al.*, 2011) was carried out in India, the current work was carried out in a completely tropical environment using tropically adapted varieties.

Table 2. Character means for fruit yield and yield components of tomato evaluated in the southern Guinea Savanna ecology of Nigeria during the 2010 and 2011 cropping season.

Variety	Days to flowering	Fruit length (cm)	Fruit diameter (cm)	Number of fruits/ plant	Weight of fruits/ plant(g)	Fruit yield (t/ha)
F_1 Lindo	40.83 ± 1.53	8.35 ± 0.10	4.42 ± 0.31	31.73 ± 2.81	0.60 ± 0.19	16.09 ± 0.01
F_1 Jaguar	40.92 ± 1.16	7.93 ± 0.06	4.3 ± 0.31	31.28 ±6.20	0.59 ± 0.15	15.83 ± 0.10
Roma Savanna VF	39.75 ± 0.00	9.40 ± 0.47	4.8 ± 0.03	49.77 ± 4.97	1.26 ± 0.13	33.56 ± 0.04
Local variety	42.50 ± 0.58	6.83 ± 0.02	3.25 ± 0.02	20.35 ±1.89	0.21 ± 0.02	5.56 ± 0.05
Mean	41.00	8.13	4.18	33.28	0.67	17.76
$LSD_{.05}$	1.05	0.27	0.15	0.39	0.05	1.33
CV (%)	1.44	1.90	2.03	0.65	4.22	4.22

Values are means of three replications presented as mean ± Standard deviation of the mean.

CV = Coefficient of variation.

LSD.05 = Least Significant Difference at 5% level of probability

The highest CV observed for fruit yield is an indication that progress in selection will be faster by concentrating on this trait in a selection programme. The superior performance of Roma savana VF in terms of fruit yield and number of fruits/plant in the present work had been previously observed in the northern guinea savanna of Nigeria (Alegbejo, 2006), and is an indication that Roma savanna VF is an adapted variety for the guinea savanna ecology of Nigeria. The significant difference between the Roma savana VF and the hybrids in terms of fruit yield/number of fruits/plant is an indication that the development of hybrid varieties for the southern guinea savanna of Nigeria may not be of any economic advantage over improved varieties and further studies is needed on this. This observation is in agreement with previous findings for maize (Kim and Ajala, 1996; Ojo *et al.*, 2007). Kim and Ajala (1996) and Ojo *et al.*, (2007), who in their separate studies on combining ability in maize, observed a low grain yield of < 5t/ha for hybrids in the southern guinea savanna and the rain forest ecology compared to the > 8t/ha in the northern guinea savanna of Nigeria. The highest fruit yield of 27.33t/ha obtained for Roma savana VF is consistent with the world average of 26.9t/ha (Shankara *et al.,* 2005) and significantly higher than the 7.0t/ha reported for Nigeria (De Lannoy, 2001), indicating that this tomato variety (Roma savana VF) has the ability to yield optimally in the southern Guinea Savanna ecology of Nigeria.

Further studies on multi-locational evaluation of Roma savana VF along with more varieties including the local variety (local check) is required prior to the recommendation of Roma savana VF for adoption in the southern guinea savanna ecology of Nigeria.

References

Alegbejo MD. 2006. Moderate resistance to tomato leaf curl virus Genus *Begomovirus* among commercial tomato cultivars in Northern Nigeria. Proceedings of the 24th Annual Conference of Horticultural Society of Nigeria. **24,** 37-41.

Bodunde JG. 2003. Seasonal variation effects on flower formation and fruit set in tomato (*Lycopersicon esculentum* Mill.). ASSET Journal, series A, **3**, 69-77.

De Lannoy G. 2001. Vegetables. In: Remain, H.R. (ed.) Crop Production in Tropical Africa. DGIC Belguim. 466-475.

Food and Agricultural Organization. 2010. FAO production year Book, Rome.

Gomez KA, Gomez AA. 1984. Statistical Procedure for Agricultural Research. 2nd Edition. John Willey and Sons, New York. 1 – 240.

Kaushik SK, Tomar DS, Dixit AK. 2011. Genetics of fruit yield and it's contributing characters in tomato (*Solanum lycopersicom*). Journal of Agricultural Biotechnology and Sustainable Development **3,** 209 -213.

Kim SK, Ajala SO. 1996. Combining ability of tropical maize germplasm in West Africa II. Tropical Vs Temperate X Tropical origins. Maydica **41**, 135-141.

Marsic NK, Osvald J, Jakse M. 2005. Evaluation of ten cultivars of determinate tomato(*Lycopersicum esculentum* Mill.), grown under different climatic conditions. Acta agriculturae Slovenica **85**, 321 – 328.

Mehta N, Asati BS. 2008. Genetic Relationship of Growth and Development Traits with Fruit Yield in Tomato (*Lycopersicon esculentum* Mill). Karnataka Journal of Agricultural Science **21,** 92-96.

Muhammed A, Singh A. 2006. Effect of intra-row spacing and pruning on the yield of tomato (*Lycopersicon lycopersicum Mill.*) variety 'Roma VFN' in the Sudan Savanna of Nigeria. Proceedings of the 24th Annual Conference of Horticultural Society of Nigeria. **24**, 51-56.

Norman JC. 1992. Tropical Vegetable Crops. IIfracombe Devon Publishers. 52-77

Obi IU. 1986. Statistical methods of detecting differences between treatment means. Snapp Press (Nig) Ltd., Nigeria. 45.

Ojo GOS, Adedzwa DK, Bello LL. 2007. Combining ability estimates and heterosis for grain yield and yield components in maize (*Zea Mays* (L.). Journal of Sustainable Development in Agriculture and Environment. **3**, 50-57.

Sangoyomi TE, Owoseni AA, Adebayo OS, Omilani OA. 2011. Evaluation of some botanicals against bacterial wilt of tomatoes. International Research Journal of Microbiology. **2**, 365-369

Shankara N, De Jeude J. Goffface MH, Van Dam B. 2005. Cultivation of Tomato, Production, Processing and Marketing. Agromisa/CTA Netherlands. Series 17.

Showemimo FA, Olarewaju JD, Buah JN, Asare-Bediako E. 2006. Genetic estimates of water stress in tomato (*Lycopersicon esculentum*). Proceedings of the 24th Annual Conference of Horticultural Society of Nigeria. **24**, 45 – 50.

Villarea RL. 1980. Tomato in the Tropics Bulletin. Colorado West Press Incorporated. 194 – 196.

Virginia Cooperative Extension. 2011. Tips for Profitable Variety Selection: How toUse Data From Different Types of Variety Trials. Virginia State University Publication. 424-040.