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Research Article

Evaluation of the Performance of Tomato (*Solanum esculentum*) Cultivars at Sekota, North Eastern Ethiopia

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Abstract

Background and Objective: Tomato is one of the major vegetable crops grown in Ethiopia and its production and productivity is very poor compared to the world average. Among its production bottlenecks, shortage of improved tomato cultivars is the major one. The objective of the experiment was to evaluate tomato cultivars and select high yielding cultivars. **Materials and Methods:** An experiment was conducted in dry land areas of Waghimra; Sekota during 2005/06 dry season under irrigated condition. Five tomato cultivars namely Melkashola, Melkasalsa, Marglobe improved, Roma-VF and Marglobe were tested in randomized complete block design with 3 replications. The mean values of all parameters were subjected to two way analysis of variance using the Proc GLM procedure of SAS. The statistical significance of the mean of each parameter was determined using F-test and Duncan multiple range test procedure was used to compare differences between treatment means at 5% probability level. **Results:** The analysis of variance showed statistically significant differences ($p \leq 0.05$) among cultivars in number of flowers/cluster, number of fruits/plant, fruit yield and fruit weight. However, the cultivars did not show statistical difference ($p \leq 0.05$) for days to 50% flowering. Among the tested tomato cultivars, Melkasalsa produced the largest fruit. The highest fruit yield was recorded by Melkasalsa followed by Melkashola. **Conclusion:** Melkasalsa and Melkashola cultivars were the most productive and gave larger fruit compared to others. Hence, these cultivars can be used by tomato growers under irrigated condition around Sekota.

Key words: Tomato cultivars, fruit size, fruit yield, RCBD, GLM

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Tomato (*Solanum lycopersicum*) is an annual herb which belongs to the family Solanaceae and grown for its fleshy berry fruit. As customarily used, the tomato is a vegetable. Botanically speaking, however, it is a fruit based on its plant parts. Technically it is a berry, being pulpy and containing one or more seeds¹. Tomato is a major vegetable crop, has gained in popularity over the last century and is now grown in almost every country of the world². Tomatoes are consumed as either fresh fruit by themselves, in salads, as ingredients in many recipes, or in the form of various processed products such as paste, whole peeled tomatoes, diced products and various forms of juices and soups³. It has major economic and dietary importance in all parts of the world. It is also one of the most important vegetable crops grown in Ethiopia. It is important cash crop grown by both small scale farmers and commercial growers for fresh market and processing industry⁴.

Tomato is also among the most important vegetable crops in Ethiopia and total production of this crop has shown a marked increase⁴. The area coverage, production and productivity of tomato in 2016 was 6,298.63, 28,364.83 and 4.503 t ha⁻¹, respectively⁵. This is very poor yield compared to the world average of 33.99 t ha⁻¹⁶. Various crop and cultural technique improvement activities are under way by national and regional agricultural research centers, in order to select varieties with high yield potential, resistant or tolerant to major disease and pests and recommend better crop management practices. As a result several improved tomato varieties and management practices have been recommended to the major production areas.

Sekota woreda is found in the Amhara Regional State, Wag Himira Zone, Ethiopia and is characterized by dryland agro-ecology⁷. Limited small scale peasant irrigation schemes are available in the zone. The availability of the choice for high valued crop in these schemes was very limited. Tomato produced in the area does not meet even local requirement. Shortage of improved tomato cultivars, use of unknown and poor quality seed, water shortage, poor soil fertility, disease and insect pests, poor agronomic practices are some of the bottlenecks for the production of tomato among farmers of the study area. This study, therefore, was initiated to evaluate performance of tomato cultivars and select relatively high yielding cultivars for farmers of the study area.

MATERIALS AND METHODS

Description of the study area: The study was conducted in Sekota Woreda, Woleh Kebele, North Eastern Ethiopia. The

experimental site is located at 12°35'24" N and 39°05'48" E with an altitude of 2126 m above sea level. The area has total annual rainfall of 830 mm, mean maximum temperature of 25°C and mean minimum temperature of 8°C. The soil of the experimental site was silt clay soil⁷.

Treatments and experimental design: The experiment consisted of five varieties of tomato namely, Melkashola, Melkasalsa, Marglob improved, Roma-VF and Marglob and they were tested for their adaptability in the study area on farmer's field in 2006 and 2007. The design of the experiment was randomized complete block with 3 replications. The experiment was conducted on a plot size of 5×3 m and the spacing was 100 and 30 cm between rows and plants, respectively. Nationally recommended rates of Urea and DAP was applied at a rate of 100 and 100 kg ha⁻¹, respectively. UREA was applied in split, half at transplanting time and the remaining 45 days after transplanting.

Data collection and statistical analysis: Data were recorded for days to flowering, number of fruits/cluster, average fruit weight, total fruits yield/hectare for 2 years. The mean value of each parameter was computed and subjected to analysis of variance (two way ANOVA) using generalized linear model (GLM model) and SAS version 9.0 statistical procedure⁸. The statistical significance of the mean of each parameter was determined using F-test and DMRT was employed to compare means at 5% probability level.

RESULTS

The analysis of variance showed no statistical difference ($p \leq 0.05$) in days to 50% flowering (Table 1). Cultivars showed statistical difference ($p \leq 0.05$) in number of flowers/cluster (Table 1). The highest number of flower/cluster was recorded by Melkasalsa cultivar while the lowest was recorded by Marglob improved cultivar (Table 2). There was a 50% increment in number of flowers/cluster of Marglob improved over Melkasalsa cultivar. The analysis of variance showed that number of fruits/plant significantly ($p \leq 0.05$) varies among tomato cultivar (Table 1). The highest number of fruit/plant was recorded by Melkasalsa cultivar while the lowest was recorded by Roma-VF cultivar (Table 2). Cultivars also showed very highly significant ($p \leq 0.001$) variation on fruit weight (Table 1). The result showed that the largest fruit was recorded by Melkasalsa and the smallest fruit was recorded by Marglobe improved (Table 2). There was a 151.3% increment in fruit weight of Melkasalsa over Marglobe improved cultivar.

Table 1: Mean square of days to 50% flowering, number of flowers/cluster, number of fruits/plant, fruit yield and fruit weight

Source of variation	DF	Days to 50% flowering	Number of Flowers/cluster	Number of fruits/plant	Fruit yield (t ha ⁻¹)	Fruit weight (g)
Replication	2	0.28 ^{NS}	0.007 ^{NS}	45.03 ^{NS}	68.10 ^{NS}	47.71 ^{NS}
Cultivars	4	0.06 ^{NS}	0.029*	172.37*	19967.27***	710.85***
Error	8	5.95	0.57	36.80	337.57	37.53

*Significant at ($p \leq 0.05$), ***Significant at ($p \leq 0.001$), NS: Non significant

Table 2: Mean values of days to 50% flowering, number of flowers/cluster, number of fruits/plant, fruit yield and fruit weight

Cultivars	Days to flowering	Number of Flowers/cluster	Number of fruits/plant	Fruit yield (t ha ⁻¹)	Fruit weight (g)
Melkashola	38.667	6.93 ^a	22.77 ^{ab}	17.33 ^b	63.06 ^{ab}
Melkasalsa	39.667	7.20 ^a	31.32 ^a	22.44 ^a	68.50 ^a
Marglob improved	34.333	4.80 ^b	17.32 ^b	17.16 ^b	28.46 ^c
Roma-VF	34.667	6.57 ^a	11.49 ^b	4.86 ^c	53.92 ^b
Marglobe	34.333	6.03 ^{ab}	16.18 ^b	4.33 ^c	51.31 ^b
Mean	36.33	6.31	19.82	13.22	53.05
LSD (5%)	NS	*	*	***	***
CV (%)	6.71	11.97	30.61	13.89	11.55

Means followed by same letters in a column are not significantly different at $p \leq 0.05$. *Significant at ($p \leq 0.05$), ***Significant at ($p \leq 0.001$)

Tomato cultivars tested showed very highly significant ($p \leq 0.001$) variation on fruit yield per hectare (Table 1). The highest fruit yield was recorded by Melkasalsa followed by Melkashola while the lowest yield was recorded by Marglobe cultivar (Table 2).

DISCUSSION

The analysis of variance showed statistically significant ($p \leq 0.001$) variations for all parameters except days to 50% flowering. This indicates that the tomato cultivars tested had different genetic variability. The study revealed no variation in days to 50% flowering and other similar result was reported by Regassa *et al.*⁹. However, this result contradicts with the work of other researchers' findings^{10,11}. The study indicated that cultivars had genetic variation in producing flowers/cluster. This result was in accordance with the finding of Chernet and Zibelo¹¹, who reported statistical difference in number of flowers per cluster among cultivars.

Tomato cultivars showed variation in number of fruit/plant. This result was in accordance with the findings of Shiberu¹², who reported that Melkasalsa and Melkashola cultivars to have higher number of fruit/plant. Similar findings of variation in the number of fruits/plant had been reported^{11,10}. However, the findings of Regassa *et al.*⁹ did not show statistical variation in number of fruits/plant. Tomato cultivars showed difference in fruit weight and this result was in line with the findings of Regassa *et al.*⁹, who reported statistical difference in fruit weight. The study revealed the existence in variation of fruit yield among tomato cultivars.

This result was similar with the report of Shiberu¹², who found that cultivar Melkasalsa and Melkashola gave significantly higher total fresh fruit yield of (4.02) and (4.28) kg/plant, respectively than other cultivars tested. Variation in fruit yield of tomato with cultivars was also reported by Regassa *et al.*⁹, Spaldon and Hussain¹⁰, Chernet and Zibelo¹¹ and Balcha *et al.*¹³.

CONCLUSION

The tested cultivars showed statistical difference for number of flowers/cluster, number of fruits/plant, fruit yield and fruit weight while they did not show difference for days to 50% flowering. Among the tested tomato cultivars, Melkasalsa produced the largest fruit. The highest fruit yield was recorded by Melkasalsa followed by Melkashola. Melkasalsa and Melkashola cultivars can be used by tomato growers of Sekota and similar agro-ecological areas. However, the yield of the varieties in the area was lower than their yield potential. Thus, determining optimum level of organic and/or inorganic fertilizer is of a paramount importance in increasing tomato productivity in the area.

SIGNIFICANCE STATEMENTS

This study discovers the performance of different open pollinated tomato cultivars released by agricultural research centers of the country. This study will help the researchers to identify the best, adaptive and high yielding tomato cultivars for tomato growers of the study area. Thus, this field

experiment may come up with the recommendation of better tomato cultivars for the tomato growers of Sekota area which can boost the production and productivity of tomato.

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