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Evaluation of different tomato (*Lycopersicon esculentum* Mill.) lines for drought tolerance

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ABSTRACT

The experiment was conducted at Department of Horticulture, Marathwada Agricultural University, Parbhani during *kharif* 1997 in randomized block design with nine treatments and three replications. Seven selections and two varieties were tested for drought tolerance. The results indicated that Selection-14 was found better in giving high yield (312.23 q) besides it was also found suitable under rainfed conditions in comparison with other selections and check varieties.

Key words : Drought tolerance, Tomato

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is a member of family solanaceae is one of the most important vegetable grown world wide under field and controlled condition. It is adoptable to wide range of growing condition. In India, it is grown over almost all parts of the country.

Tomato plants are herbaceous, annual and sexually propagated. Growth habit both determinate and indeterminate. Branching pattern is sympodial. There are different species of tomato like *L. Pimpinellifolium* (resistant to *Fusarium* wilt), *L. peruvianum* (resistant to leaf curl virus), *L. hirsutum* (resistant to fruit borer), *L. cheemanji* (salt tolerance) and *L. pennellii* (drought tolerant).

In India, tomato is cultivated on 321000 hectares area with annual production of 50,29,000 metric tones (Anonymous, 1996). In Maharashtra State the area under this crop was 30,786 hectares with production of 6,42,700 MT in 1994-95.

MATERIALS AND METHODS

The present investigation was carried out at the Department of Horticulture, Marathwada Agricultural University, Parbhani during *kharif* 1997. The seed material was obtained from the Fruit Research Station, Himayatbagh, Aurangabad. Seedlings were raised on raised beds and transplanted in main field. The experiment was laid out in simple randomized block design with nine treatments and three replications. The row-to-row spacing was 60 cm. The plot size was 3 m x 2.4 m.

The five plants were selected from each plot and were labeled. The observation in respect of growth character recorded at an interval of 15 days from 30 days after transplanting.

The height of plant, number of primary branches per plant, days to 50 per cent flowering, number of flowering cluster per plant, number of fruits per plant, fruit weight (g), marketable yield per plant (kg), unmarketable yield per plant (kg), total yield per hectares (q), unmarketable yield per hectare (kg), total yield per hectare (q), soil moisture estimation by gravimetric method. The estimation of chlorophyll content was done by Arnon's method (Arnon, 1949). The measurement of root length was also recorded.

The statistical analysis of collected experimental data was done by the following standard procedure described by Panse and Sukhatme (1967). The analysis of variance was carried out according to simple randomized block design.

RESULTS AND DISCUSSION

As per the data shown in Table 1 there were significant differences in respect of plant height at different dates of observation amongst various varieties and selections. Similar results with same trend were obtained at 30, 45, 60 and 75 days after transplanting. Selection-14 produced significantly more height than check Pusa Ruby and Devgiri and rest of all selections, however, it was found at par with Selection-13. Selection-12 produced minimum height than rest of all selections and varieties.

Thus from initial to final growth stages, it was observed that Selection-14 produced significantly taller plant than the rest of the selections and both checks, whereas Selection-12 and Selection-1 produced significantly dwarf plants than other check varieties and selection.

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Table 1 : Mean height (cm) per plant

Treatments	Days after transplanting					
	30	45	60	75	90	105
Selection-1	23.07	32.12	42.00	59.87	79.07	79.10
Selection-4	26.30	35.69	44.92	64.00	75.90	82.43
Selection-5	24.35	32.80	42.81	61.01	75.55	85.50
Selection-7	26.30	33.06	42.79	62.65	75.57	89.91
Selection-12	18.43	28.55	38.26	56.01	71.45	77.33
Selection-13	32.30	43.31	52.00	69.85	83.00	97.16
Selection-14	35.87	47.10	59.92	73.86	84.67	98.00
Devgiri	29.30	41.42	51.35	69.65	82.05	90.50
Pusa ruby	26.95	38.81	51.04	64.94	79.07	94.30
S.E. ±	1.02	0.64	2.52	2.58	1.38	0.58
C.D. (P=0.05)	3.05	1.92	7.54	7.74	4.15	1.76

Prasad and Singh (1990) reported that the variety Pusa Ruby produced significantly more plant height (106.91) than all other varieties followed by Marglobe (88.78) and Punjab Chuuhara was dwarf one (68.86).

The data presented in Table 2 indicated that there were significant differences at different dates of observations in respect of number of primary branches per plant amongst various varieties and selections. The 30, 45, 60, 75, 90 and 105 day after transplanting, Selecion-14 produced significantly more number of primary branches per plant followed by Selection-13 and check Pusa Ruby.

Table 2 : Number of primary branches per plant

Treatments	Days after transplanting					
	30	45	60	75	90	105
Selection-1	5.53	5.98	6.50	7.13	7.50	7.98
Selection-4	5.98	6.05	7.01	7.30	8.10	8.10
Selection-5	5.10	5.50	6.00	6.50	7.00	7.51
Selection-7	5.01	5.85	6.38	6.98	7.30	7.85
Selection-12	5.00	5.80	6.05	6.85	7.25	7.60
Selection-13	6.25	6.70	7.25	7.79	8.68	8.95
Selection-14	6.50	7.00	7.49	7.98	8.80	9.00
Devgiri	6.10	6.15	7.10	7.35	8.29	8.74
Pusa ruby	6.05	6.33	7.15	7.50	8.39	8.90
S.E. ±	0.081	0.208	0.141	0.200	0.152	0.100
C.D. (P=0.05)	0.243	0.624	0.424	0.600	0.458	0.300

However, remaining selections and check varieties had produced significantly less number of primary branches per plant. Selection-5 produced significantly less number of primary branches than rest of all the selections and check varieties. Biswas and Mallik (1989) also observed maximum number of primary branches in Pusa Ruby (12.33) than rest of cultivars.

The data presented in Table 3 indicated that number of days required for 50 per cent flowering in Selection-13 (32.66), which was significantly earlier than check Devgiri, Pusa Ruby and remaining selections, however, it was at par with Selection-5, Selection-7, Selection-12, Selection-14 and Pusa Ruby. Susila *et al*. (1990) studied ten tomato varieties and reported a strong positive association between days to 50 per cent flowering and days to maturity.

It was noticed that Selection-14 produced significantly more number of flowering clusters per plant (31.81) than check Devgiri, Pusa Ruby and rest of all Selections, however, it was at par with Selction-13 (Table 3).

It was observed that (Table 3) Selection-14 produced maximum number of fruits per plant (54.01) followed by Selection-4. Minimum number of fruits per plant as

Table 3 : Vegetative parameters of various varieties and selections of tomato

Treatments	Number of days for 50% flowering	Number of flowering clusters per plant	Number of fruits per plant	Weight of fruit (g)
Selection-1	39.23	24.24	43.67	40.65
Selection-4	38.35	23.96	53.65	4.334
Selection-5	34.01	22.55	35.30	45.65
Selection-7	33.33	28.78	52.00	40.00
Selection-12	36.38	18.70	50.00	35.00
Selection-13	32.66	30.85	48.65	38.39
Selection-14	33.33	31.81	54.01	46.35
Devgiri	40.65	25.45	32.31	56.31
Pusa Ruby	33.33	24.74	52.02	43.33
S.E. ±	1.46	1.74	2.02	0.873
C.D. (P=0.05)	4.39	5.22	6.07	2.61

observed on check Devgiri (32.31). Rana and Kalloo (1989) also observed the highest number of fruits per plant in Section-28 and Kin than Selection 5.

Selection-14 produced significantly highest marketable yield per hectare (312.23) than rest of all checks and selections followed by Selection-13 (302.30) (Table 4), which was significantly more than remaining checks and selections. The lowest marketable yield per hectare was found in Selection-12 (197.95) followed by Selection-7 (215.93). Anand (1977) observed that yield components indicated that more weight of fruit produces higher yield per plant.

It was also observed from Table 4 that Selection-14 produced highest unmarketable yield per hectare (72.77) which was significantly more than check and remaining all selections followed by selection-13 (56-20). Minimum unmarketable yield was noticed in check Devgiri (40.00). The Selection-14 produced significantly the highest total yield per hectare (385) than check Devgiri, Pusa Ruby and remaining all selections (Table 4) followed by Selection-13 (358-50) which was significantly more than check Pusa Ruby, Devgiri and remaining all selections. The lowest yield per hectare was noticed in Selection-12 (250.75) followed by Selection-7 (266.68). Singh *et al*. (1994) reported that variety Arka Vikas had highest mean yield per hectare and BT-14 had the lowest mean yield per hectare under rainfed condition.

Table 4 : Yield per hectare (quintal)

Treatments	Marketable yield per hectare	Unmarketable yield per hectare	Total yield per hectare
Selection-1	242.82	45.16	287.98
Selection-4	267.29	52.31	319.60
Selection-5	235.34	43.66	279.00
Selection-7	215.93	50.75	266.68
Selection-12	197.95	52.80	250.75
Selection-13	302.30	56.20	358.50
Selection-14	312.23	72.77	385.00
Devgiri	285.75	40.00	325.75
Pusa Ruby	248.09	52.41	300.50
S.E. $\pm$	3.36	1.64	2.21
C.D. (P=0.05)	10.08	4.92	6.65

It was found that minimum chlorophyll content was found in Selection-14 (1.01) which was significantly lower than check Devgiri, Pusa Ruby and remaining all selections, however, it was at par with Selection-13. Maximum amount of chlorophyll content was found in Selection-12 (1.38). The chlorophyll content of Devgiri was (1.14) (Table 5). Decrease in the chlorophyll content may be due to enzymatic activities affected by moisture stress.

It is clear from Table 5 that the minimum soil moisture was noticed by Selection-14 (24.31) and was at par with Selection-13, check Devgiri and was significantly lower than check Pusa Ruby and rest of all Selections. Highest per cent of available soil moisture was noticed in Selction-12 (53.33).

Table 5 : Studies of chlorophyll content, soil moisture (%) and root length of tomato

Treatments	Chlorophyll content (mg/g)	Soil moisture (%)	Root length (cm)
Selection-1	1.15	37.66	37.01
Selection-4	1.25	35.92	35.42
Selection-5	1.19	39.32	40.05
Selection-7	1.28	42.45	39.61
Selection-12	1.38	53.33	36.80
Selection-13	1.07	25.03	45.98
Selection-14	1.01	24.31	49.03
Devgiri	1.14	3.513	41.06
Pusa Ruby	1.29	44.92	38.12
S.E. $\pm$	0.025	3.63	2.13
C.D. (P=0.05)	0.076	10.84	6.38

The data presented in Table 5 revealed that highest root length was observed in Selection-14 (49.03) and was at par with Selection-13, followed by Devgiri (41.06), which was at par with check Pusa Ruby and remaining all Selections. Anachanam (1984) studied tomato cultivars and reported the highest root length at low soil moisture level *i.e*. at 20 per cent available soil moisture.

REFERENCES

Anand, N. (1977). Diallel analysis of F1 and F2 generation in tomato. Ph.D. Thesis, Faculty of Horticulture, Tamil Nadu Agricultural University, Coimbtore (T.N.).

Anachanam Alagia Pillai, O. (1984). Studies on the effect of moisture stress on tomato. Ph.D. Thesis, Faculty of Horticulture, TNAU, Coimbtore.

Anonymous (1996). FAO Estimate Horticultural Information Services, **2** (1) : 111.

Biswas, J. and Mallik, S.C. (1989). Height of plant and number of primary branches in some tomato (*L.esculentum* Mill.) cultivars. *Environ. Eco.*, **7** (4) : 1023-1024.

Panse, S.B. and Sukhatme, P.V. (1978). *Statistical Methods for Agricultural Workers*. ICAR Publication, New Delhi, pp. 327-340.

Prasad, I. D. and Singh, R.K. (1990). Evaluation of tomato varieties in Diara area of Bihar. *Madras agric. J.*, **77** (5/6): 268-269.

Rana, M. K. and Kalloo (1989). Attributes for drought resistance in tomato. *Veg. Sci.*, **16** (1): 32-38.

Singh, D.N., Nandi, A. and Senapati, N. (1994). Performance of tomato varieties in autumn under rainfed condition. *Environ. Ecol.*, **12** (4): 949-951.

Susila, T., Pampapathy, K. and Ravishankar, C. (1990). Correlation studies of yield attributing characters in tomato. *South Indian Hort.*, **38** (4) : 189-190.

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