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Performance of tomato genotypes in the western undulating zone of India

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ABSTRACT

An experiment was conducted to evaluate the comparative performance of 10 tomato cultivars in the western undulating zone of Odisha during 2010-11 and 2011-12. The tallest plant was manifested by BT-106 (78.6 cm) followed by Utkal Pragyan (73.6 cm) and Swarna Lalima (69.5 cm) while shortest plant height (39.6 cm) was recorded in Utkal Urvashi. Maximum number of branches was found in BT-106 (10.8) followed by Utkal Pragyan (9.4) and minimum in Utkal Urvashi (5.7). The period required between transplanting and harvesting of first mature fruit varied between 73 to 90 days. The diameter of the fruit ranged between 3.3 cm in Utkal Pallavi to 4.9 cm in Utkal Raja. Similarly the length of fruit was highest in Utkal Urvashi (4.8 cm) and lowest in BT-106 (3.1 cm). Swarna Lalima produced the highest individual fruit weight (57.0 g) followed by Utkal Urvashi (50 g) and BT-10 (41.7 g) while lowest mean fruit weight was recorded in Utkal Dipti (23.3 g). The variety BT-106 recorded the highest fruit yield (2.2 kg/plant) followed by Utkal Pragyan (2.1 kg/plant) while minimum fruit yield of 1.5 kg/plant was notice in variety Utkal Urvashi (BT-12). Likewise the per hectare yield was highest in BT-106 (49.7 ton/ha) followed by Utkal Pragyan (45.8 ton/ha), Swarna Lalima (42 ton/ha) and Utkal Raja (40.4 ton/ha). Lowest fruit yield of 31.8 ton/ha was recorded in BT-12 ie Utkal Urvashi.

Keywords: Genotypes; performance; transplanting; seedlings

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill) belonging to the family Solanaceae is one of the major commercial vegetable crops and widely grown throughout Odisha. It can be eaten afresh or processed into different products like sauce, ketchup, chutney etc. It is good source of vitamins A, B and C (Baloch 1994). Successful cultivation of tomato is based upon choice of suitable cultivars for a particular locality. The same cultivar which performs better in one locality may

not behave identically in another locality. Kallo et al (1998) evaluated twenty cultivars of tomato for yield and yield attributing characters and found DVRT-1, DVRT-2, Sel-1, H-36 and Sel-10 as promising with stable performance for yield and other characters like plant height, number of fruits per plant, fruit size and fruit weight etc. Rida et al (2002) evaluated thirteen open pollinated varieties and 3 hybrids of tomato and reported that marketable yield ranged from 76.07 ton/ha (Rio Grande) to 37.07 ton/ha (Money Maker). Many of the cultivars are capable of adoption in certain areas while others provide a valuable source of variation for the breeding programme. Bacterial wilt has been identified as one of the major bottlenecks in tomato production (Tiwari 1999). The tomato varieties cultivated by vegetable growers in the western undulating area are very low in yield having poor quality and do not compete with cultivars grown in the potential parts of the country. Besides the farmers has to depend upon the seed available in the market. Hence the current experiment was undertaken to select the best suited tomato cultivars/ genotypes for yield and yield attributing characters under prevailing climatic condition in the area (western undulating zone) and to recommend the promising varieties for commercial cultivation.

MATERIAL and METHODS

The experiment was laid out in a randomized block design with three replications at Regional Research and Technology Transfer Station, Orissa University of Agriculture and Technology, Bhawanipatna during the years 2010-11 and 2011-12. The soil of the experimental site was black clayey having pH 5.96, organic carbon 0.46 per cent, available N 127.3 kg/ha, P_2O_5 52.4 kg/ha and available K_2O 44.7 kg/ha. The average normal rainfall of the area is around 1330.5 mm. During cropping season 39 mm rainfall was received and there was complete cessation of rain from 2nd week of October to 1st week of January.

Ten tomato genotypes collected from various sources like Vegetable Improvement Project, Orissa University of Agriculture and Technology viz BT-1 (Utkal Pallavi), BT-2 (Utkal Dipti), BT-10 (Utkal Kumari), BT-12 (Utkal Urvashi), Utkal Raja, Utkal Pragyan, BT-106 and BT-317; Swarna Lalima from ICAR Research Complex for Eastern Region, Ranchi and Pusa Ruby from IARI, New Delhi were evaluated at RRTTS, Bhawanipatna. Tomato seedlings were raised in seed beds of the size of the 3 m x 1 m. The seeds of each variety were sown in 3rd week of September in both the years. After sowing seeds were covered with light soil and farm yard manure followed by watering with rose cane. Complete germination took place within 3 to 5 days of sowing seeds. The experimental plots were ploughed and disked several times before transplanting of the seedlings. The healthy and uniform 25

day old seedlings of each variety were transplanted separately in separate plots. The 25 day old seedlings were transplanted from nursery to plots when they attained a height of 4 inch with 5 to 6 compound leaves. Seedlings were planted at a spacing of 60 cm x 45 cm. A uniform fertilizer dose of NPK (125:50:100 kg/ha) was applied to each plot. The DAP, potash and half of nitrogen were applied at the time of land preparation while remaining half dose of nitrogen was applied in two split doses after 3 to 4 weeks of transplanting at flowering and fruiting stages of the crop.

The seed beds were watered before uprooting the seedlings in order to minimise the damage to the roots. Thinning was done when seedlings were 3 cm tall keeping 3 cm space within rows. Around twenty five days old seedlings of each genotype were transplanted on 3rd week of October of each year in a plot size of 3.0 m x 2.7 m. The crop was raised successfully following normal cultural practices. For data recording on vegetative growth, yield and yield attributing characters like plant height, number of branches, number of fruits per plant, days required from transplanting to first harvest, average fruit weight etc 5 plants were selected at random from each plot. The yield was calculated on plot basis and on per hectare basis. The yield per plant was calculated by multiplying the average fruit weight with average number of fruits per plant calculated per plant and then converted into hectare basis. The data on plant height, number of branches, number of fruit clusters per plant, number of fruits per plant, fruit weight (g) of individual fruits, weight of fruits per plant (kg) and fruit yield (per ha) were recorded up to maturity and tomato yield was assessed at final harvest. All the mean data over the two years were analysed statistically following standard procedure as described by Panse and Sukhatme (1979).

RESULTS and DISCUSSION

The mean performance of genotypes over the years 2010-11 and 2011-12 is presented in Table 1.

Plant height: It is evident from Table 1 that the tallest plant was manifested by BT-106 (78.6 cm) followed by Utkal Pragyan (73.6 cm) and Swarna Lalima (69.5 cm) while shortest plant height (39.6 cm) was recorded in Utkal Urvashi. Thus a wide range of plant height (39.6 cm to 76.8 cm) was noticed in test cultivars. The tallness, shortness and other morphological differences are varietal characteristics which are controlled and expressed by certain genes. Kallo et al (1998) also reported differences in plant height among varieties of tomato under varietal evaluation trial.

Number of branches: From the data depicted in the Table 1 it is revealed that maximum number of branches was found in BT-106 (10.8) followed by Utkal Pragyan (9.4) and minimum in Utkal Urvashi (5.7). The data show an increasing

Table 1. Plant and fruit growth of tomato genotypes at RRTTS, Bhawanipatna

Genotype	Plant height (cm)	# branches /plant	Fruit length (cm)	Fruit diameter (cm)
Utkal Pallavi (BT-1)	44.6	6.4	4.5	3.3
Utkal Dipti (BT-2)	48.7	7.2	3.3	3.5
Utkal Kumari (BT-10)	52.8	7.5	3.4	4.5
Utkal Urvashi (BT-12)	39.6	5.7	4.8	4.1
Utkal Raja	61.5	8.1	3.7	4.9
Utkal Pragyan	73.6	9.4	3.4	3.7
BT-106	76.8	10.8	3.1	4.1
BT-317	43.3	6.1	3.2	4.0
Swarna Lalima	69.5	8.5	3.8	5.0
Pusa Ruby	46.4	6.8	3.2	4.6
$CD_{0.05}$	4.63	0.89	0.294	0.411

tendency in the number of branches per plant with an increase in the plant height. These results are in close conformity with the findings of Ahmad et al (2007) and Sharma and Rastogi (1993) who reported significant variation among the cultivars of tomato for the number of branches per plant.

Time required for first picking of fruits: The time required between transplanting and harvesting of first mature fruit varied between 73 to 90 days (Table 2). The variety BT-2 (Utkal Dipti) was found to be the earliest where first harvesting started 73 days after transplanting followed by BT-317 (76 days), BT-10 (Utkal Kumari) and BT-106 (78 days). On the other hand BT-12 (Utkal Urvashi) took 90 days for first picking of fruits followed by 86 days in BT-1 (Utkal Pallavi) and Swarna Lalima, 80 days in Utkal Raja and Utkal Kumari (BT-10). These results are in close proximity with the findings of Mohanty and Prusty (2001).

Number of fruit clusters and fruits per plant: It is evident from Table 2 that the number of clusters per plant varied between 10.1 (Pusa Ruby) to 15.4 (Utkal Pallavi ie BT-1). The varieties like BT-106, Utkal Pragyan and Swarna Lalima had 14 clusters/plant while 12 clusters were obtained in cultivars BT-317 and BT-12 (Utkal Urvashi). A wide range of variation was observed for number of fruits per plant. It varied from 23 in Pusa Ruby to 58 in BT-1 (Utkal Pallavi). Maximum number of small sized fruits (58, mean weight 24.7 g) were borne by Utkal Pallavi followed by

Table 2. Yield and yield attributing traits of tomato genotypes at RRTTS, Bhawanipatna

Genotype	Time taken to 1st picking after transplanting	# fruit clusters/ plant	# fruits/ plant	Fruit weight (g)	Yield (kg/plant)	Yield (kg/plot)	Yield (ton/ha)
Utkal Pallavi (BT-1)	86	15.4	58	24.7	1.7	41.9	35.8
Utkal Dipti (BT-2)	73	15	52	23.3	1.8	44.2	37.9
Utkal Kumari (BT-10)	80	13.8	48	41.7	1.8	44.4	38.0
Utkal Urvashi (BT-12)	90	12.0	33	40.7	1.5	37.2	31.8
Utkal Raja	84	12.0	33	50.0	1.9	47.1	40.8
Utkal Pragyan	80	14.0	40	33.0	2.1	53.4	45.8
BT-106	78	14.6	50	30.3	2.2	58.0	49.7
BT-317	76	12.0	45	35.0	1.7	40.5	34.7
Swarna Lalima	86	14.0	34	57.0	1.9	49.1	42.0
Pusa Ruby	82	10.1	23	41.0	1.7	42.2	36.1
$CD_{0.05}$	1.16	NS	-	9.371	0.221	6.463	6.535

BT-2 ie Utkal Dipti (52, mean weight 23.3 g). The cultivar Swarna Lalima bore 34 fruits per plant having mean fruit weight of 57.0 g while Utkal Raja registered 33 fruits per plant with mean fruit weight of 50 g. Thus there is an inverse relationship between average fruit weight and number of fruits per plant (Table 2).

Fruit size (fruit length and fruit diameter): From Table 2 it is clear that the diameter of the fruits ranged between 3.3 cm in Utkal Pallavi to 4.9 cm in Utkal Raja. Similarly the length of fruits was greatest in Utkal Urvashi (4.8 cm) and lowest in BT-106 (3.1 cm). Significant differences were observed with respect to fruit length. Utkal Urvashi (4.8 cm) recorded the greatest fruit length followed by Utkal Pallavi (4.5 cm), Swarna Lalima (3.8 cm) and Utkal Raja (3.7 cm).

Mean fruit weight: Among the ten tomato genotypes Swarna Lalima produced the maximum individual fruit weight (57.0 g) followed by Utkal Urvashi (50 g) and BT-10 (41.7 g) (Table 2). The lowest fruit weight was recorded in Utkal Dipti (23.3 g) followed by Utkal Pallavi (24.7g), BT-106 (30.3 g), Utkal Pragyan (33 g) and BT-317 (35 g). These results are similar to the findings of Mohanty and Prusty (2001).

Yield: The data presented in the Table 2 indicate that the variety BT-106 recorded the highest fruit yield (2.2 kg/plant) followed by Utkal Pragyan (2.1 kg/plant) while minimum fruit yield of 1.5 kg/plant was notice in variety Utkal Urvashi (BT-12). Pusa Ruby gave an yield of 1.7 kg/plant under western undulating zone however Mishra and Lal (1998) reported that variety Pusa Ruby gave the maximum fruit yield per

Table 3. Incidence of leaf curl virus in tomato genotypes at RRTTS, Bhawanipatna

Genotype	Plants affected by leaf curl virus (%)
Utkal Pallavi (BT-1)	3.3
Utkal Dipti (BT-2)	7.8
Utkal Kumari (BT-10)	11.1
Utkal Urvashi (BT-12)	8.9
Utkal Raja	13.3
Utkal Pragyan	7.8
BT-106	6.7
BT-317	5.6
Swarna Lalima	5.6
Pusa Ruby	22.2

plant (2.7 kg). The highest yield/plot was obtained in BT-106 (58 kg) followed by Utkal Pragyan (53.4 g) and Swarna Lalima (49.1 g). Likewise the per hectare yield was highest in BT-106 (49.7 ton/ha) followed by Utkal pragyan (45.8 ton/ha), Swarna Lalima (42 ton/ha) and Utkal Raja (40.4 ton/ha). The highest fruit yield in BT-106 was attributed to production of more number of medium size fruits whereas higher yield in Swarna Lalima and Utkal Raja was due to production of comparatively lesser number of heavier fruits (Table 1). Lowest fruit yield of 31.8 ton/ha was recorded in BT-12 ie Utkal Urvashi. Similar type of yield in tomato cultivars was also reported by Sanjoy et al (1999) who reported the fruit yield per ha in the range of 47 to 60.7 ton/ha. The variation in yield at different locations may be attributed to growing of different cultivars under different agro-climatic conditions and also it may depend upon the cultural practices followed and incidence of pests and diseases. No incidence of bacterial wilt was noticed in any tomato genotype grown in this zone. However Table 3 depict that leaf curl virus attack at later stage of the crop was found in all the genotypes and maximum incidence was observed in Pusa Ruby (22.2%).

CONCLUSION

On the basis of growth, yield, yield attributing characters and incidence of leaf curl disease the genotypes BT-106, Utkal Pragyan and Swarna Lalima are advocated for popularization among the tomato growers of the western undulating zone of Odisha. However potential of these cultivars is needed to be further tested under the climatic conditions of this zone of Odisha to bring forth substantial conclusions.

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