

Response of Genotypes and Transplanting Schedule in Relation to Seed Quality in Tomato

MOHINDER KAUR AND J.S. KANWAR

Directorate of Research, Punjab Agricultural University, Ludhiana-141004
jskanwar@yahoo.com

ABSTRACT Studies were conducted to investigate the response of six tomato genotypes (VFN 8, ACC 8, W 321, Punjab Chhuhara, ACC 2 and I-181) under four planting dates (November 20, December 5, December 20 and January 5) on seed quality in tomato at Punjab Agricultural University, Ludhiana during 2002-2003. Highest fruit yield (879.82 q/ha), 1000-seed weight (2.81 g) and seed vigour index (1399.22) were recorded in November 20 planted crop, whereas fruit weight (85.04 g) and number of seeds per fruit (98.97) were highest in December 5 transplanted crop. Germination percentage of 79.62% in November 20 planted crop was at par with December 5 planted crop (78.78%). Among genotypes, maximum mean fruit yield (747.73 q/ha) and seeds number/fruit (132.98) were obtained in ACC-8, whereas W-321 had the highest 1000-seed weight. The genotype I-181 had maximum seed vigour index (1420.12). The seed germination percentage of genotypes differed non-significantly. The interaction between planting dates and genotypes was non-significant for 1000-seed weight, germination percentage and seed vigour index.

Keywords: Tomato, seed quality, planting dates

Tomato, an important vegetable crop, is grown for fresh market as well as for processing purpose. Quality seed can significantly boost up its productivity. Production of quality seed is possible only under favourable climatic conditions such as temperature and relative humidity, etc. The temperature especially at the time of flowering and fruit set is very important and any stress on the crop at that time adversely affects the quality of seed [1]. In view of the meager information available on this aspect in tomato, the present study was, therefore, undertaken to find out the influence of planting dates on the seed quality in different genotypes of tomato.

MATERIALS AND METHODS

The experiment was conducted at Punjab Agricultural University, Ludhiana in split plot design with three replications during 2002-2003. The six genotypes ((VFN 8, ACC 8, W 321, Punjab Chhuhara, ACC 2 and I-181) were accommodated in the sub plots and sown during four planting dates (November 20 (D_1), December 5 (D_2), December 20

(D_3) and January 5 (D_4). The genotypes were planted with a spacing of 45 cm between the plants and 1.0 m between the rows. Recommended cultivation operations and plant protection measures were carried out during the course of investigation. The ripe fruits from five plants were harvested and the seeds were extracted manually after fermenting the fruits. Seed germination test was carried by 'Between Paper (BP) method'. Three replications of 100 seeds, each were placed between the germination papers and kept in incubator at $25 \pm 1^\circ\text{C}$. Seed vigour was computed by measuring the combined root-shoot length of sample and multiplied by its germination per cent. The 1000-seed weight was estimated on 3 samples, each drawn from the seed lot of each treatment.

RESULTS AND DISCUSSION

The computation of ANOVA over the planting data showed significant variation among planting dates in respect of germination percentage, 1000-seed weight and seed vigour index (Table 1). Similarly, the genotype differences for these

Table 1. ANOVA over the planting dates for fruit size (g), seeds/fruit, fruit yield (q/ha), 1000-seed weight, germination percentage and seed vigour index.

Source of variation	d.f.	Fruit weight (g)	Seeds/fruit	Mean sources			
				Fruit yield (q/ha)	1000-seed weight (g)	Germ %	Seed vigour index
Replication	2	44.20	56.59	2484.00	0.0094	0.79	874.66
A	3	319.52*	1956.53*	896552.0*	0.838	240.30*	240189.60*
Error a	6	6.40	52.82	2504.45	0.0027	3.71	1170.96
B	5	4155.74*	15257.35*	64972.80*	0.088*	3.09	69800.53*
AB	15	67.44*	35.99	3678.21*	0.0014	4.78	2716.92
Error B	40	8.80	41.24	1817.30	0.0026	4.39	2477.28

*significant at 5% level of significance

characters except germination percentage remained significant over the planting dates. The interaction effects between genotypes and planting dates were non-significant for number of seeds/fruit germination percentage, 1000-seed weight and seed vigour index, whereas it was significant for fruit weight and fruit yield.

Dates of transplanting had significant effect on the fruit weight. The maximum fruit weight (85.04g) was observed in the crop transplanted on December 5 which was significantly higher than November 20 transplanted crop. Larger fruit size obtained in D₂ planting might be due to optimum climatic condition for proper vegetative and reproductive growths. Singh and Tripathy [2] has reported similar results. Among genotypes, the highest fruit weight (104.45g) was obtained in VFN 8 followed by ACC 2 (86.69g), ACC 8 (84.96 g) and W 321 (83.90g) which were at par among each other. Bhardwaj and Thakur [3] obtained similar results in different genotypes of tomato.

December 5 planting gave highest number of seeds per fruit (98.97) followed by D₁ (91.21), D₃ (78.81 seeds) and D₄ (77.05). Less number of seeds in later plantings D₄ might be due to the adverse effect of environment especially of higher temperature on seed setting ability of the genotypes (Fig. 1). Among genotypes, highest number of seeds per fruit (132.98) was obtained in ACC 8 followed by W321 (111.20) and VFN 8 (109.20) which were at par with each other. Similar results have been reported by El-Ahmadi and Stevens [4] and Bhutani *et. al.* [5].

Highest fruit yield (879.82q/ha) was obtained in November 20 transplanting. It was due to more number of fruits per plant. Among genotypes, highest fruit yield (747.73 q/ha) was obtained in ACC 8 followed by Punjab Chhuhara (702.33q/ha). Fruit yield per hectare of VFN 8 (614.04 q), W321 (618.90 q) and ACC 2 (641.18 q) was at par with each other whereas 1-181 gave lowest yield (537.35 q/ha). Similar observations were made by Mishra & Lal [6]. There was significant interaction between dates of transplanting and genotypes for yield, Punjab Chhuhara produced highest fruit yield (945.73 q/ha) in D₁ planting was at par with D₂ planting (881.96q/ha).

The test weight (1000-seed weight) was significantly influenced by the planting dates (Table 2). The maximum weight of 1000-seed (2.81g) was recorded in crop planted on November 20. The maximum 1000-seed weight in the earliest planting D₁ may be due to the fact that seed might have got maximum time for its development at optimum climatic conditions (Fig.1). The genotypes also differed significantly for 1000-seed weight. Highest 1000-seed weight (2.70g) was produced by W 321 which was significantly more than ACC 8 (2.64g) and I-181 (2.60g) which were at par with each other. Similar observations with respect to 1000-seed weight was made by Sharma and Rastogi [7] and Vadivel and Arumugam [8].

Seed germination percentage was also significantly affected by planting seasons (Table.3). The highest seed germination (79.2%) was recorded in November 20 planted crops, which was at

Table 2. Mean performance of genotypes with respect to fruit weight, seeds/plant, fruit yield (q/ha), 1000-seed weight (g), seed germination percentage and seed vigour index under different planting dates in tomato.

Genotype	Fruit weight (g)					No. of seeds/fruit					Fruit yield (q/ha)				
	D ₁	D ₂	D ₃	D ₄	Mean	D ₁	D ₂	D ₃	D ₄	Mean	D ₁	D ₂	D ₃	D ₄	Mean
VFN 8	112.30	118.16	94.66	92.70	104.45	116.26	123.30	99.60	97.73	109.28	912.70	771.00	418.46	354.00	614.04
ACC8	84.33	90.96	82.76	81.80	84.96	137.20	150.56	123.60	120.56	132.98	935.23	871.46	604.50	579.73	747.73
W321	83.33	89.63	81.50	81.16	83.90	117.36	127.20	101.20	99.06	111.20	827.23	749.23	457.46	441.70	618.90
Punjab Chuhara	51.66	56.33	49.93	48.33	51.56	51.20	56.03	41.23	40.50	47.24	945.73	881.96	521.23	460.40	702.33
ACC2	86.00	91.00	85.26	84.50	86.69	68.23	74.30	55.60	54.80	63.23	890.06	791.23	460.46	422.96	641.18
I-181	61.66	64.16	66.83	65.00	64.41	57.00	62.20	51.66	49.63	55.12	768.00	658.46	382.46	340.50	537.35
Mean	79.88	85.04	76.82	75.58		91.21	98.97	78.81	77.05		879.82	787.22	474.10	433.21	
CD (P = 0.05)											40.82				
Date of transplanting (D)	2.06					5.92					35.15				
Genotypes(G)	2.44					5.29					70.30				
Interaction (DXG)	4.89					NS									

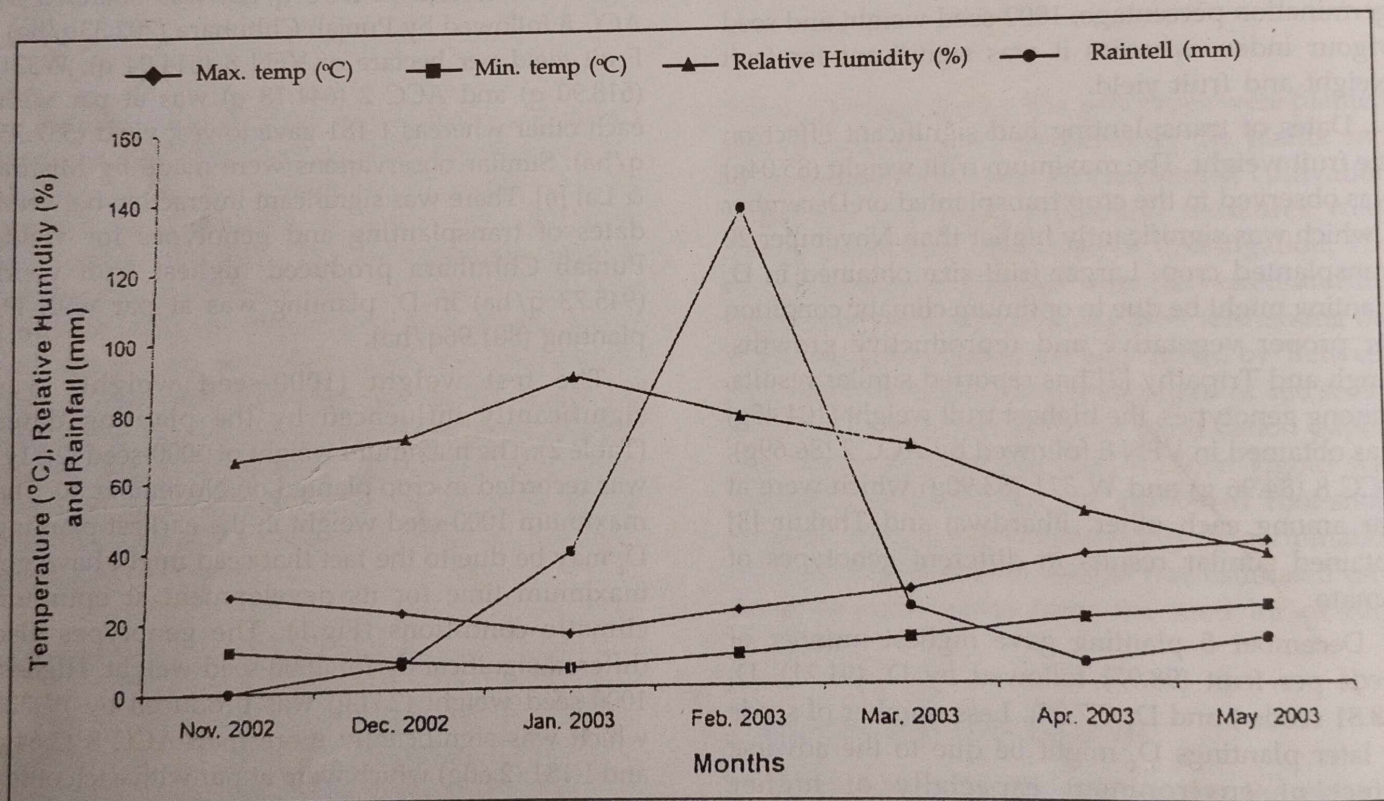


Fig.1: Meteorological data during the course of investigation

with December 5 planting (78.7%). The possible reason for the reduction in the seed germination percentage in D₃ (75.02%) and D₄ (71.69%) planted crops might be due to the impairment in the development of seed at high temperature. The genotypes had non-significant effect on the seed

germination percentage (Table 3). Sharma and Rastogi [4] also observed non-significant differences in germination percentage of different genotypes. Interaction of dates of planting and genotypes was also non-significant with respect to the germination percentage of the seeds.

Table 3. Mean performance of genotypes with respect to fruit weight, seeds/plant, fruit yield (q/ha) 1000-seed weight (g), seed germination percentage and seed vigour index under different planting dates in tomato.

Genotypes	1000-seed weight (g)					Seed germination (%)					Seed vigour index				
	D ₁	D ₂	D ₃	D ₄	Mean	D ₁	D ₂	D ₃	D ₄	Mean	D ₁	D ₂	D ₃	D ₄	Mean
VFN8	2.80	2.72	2.40	2.35	2.56	78.66	78.00	75.00	71.50	75.79	1345.50	1327.86	1145.80	1139.26	1239.60
ACC8	2.88	2.78	2.28	2.42	2.64	78.20	77.66	75.66	73.33	76.21	1453.33	1366.86	1190.36	1175.96	1296.63
W321	2.96	2.85	2.55	2.46	2.70	77.76	77.50	75.33	72.03	75.65	1324.96	1314.86	1141.46	1132.76	1228.51
Punjab Chhuhara	2.72	2.58	2.33	2.27	2.47	80.00	79.96	74.00	71.60	76.39	1321.46	1288.26	1137.86	1131.03	1219.65
ACC2	2.75	2.61	2.38	2.29	2.50	81.33	79.93	74.16	71.33	76.69	1350.26	1337.83	1142.20	1138.13	1242.10
I-181	2.80	2.72	2.46	2.4	2.60	81.80	79.66	76.00	70.40	76.96	1599.80	1437.46	1365.20	1278.03	1420.12
Mean	2.81	2.71	2.43	2.36		79.62	78.7	75.02	71.69		1399.22	1345.52	1187.15	1165.86	

CD (P=0.05)

Date of transplanting (D)

0.04

Genotypes(G)

0.04

Interaction (DXG)

NS

1.57

NS

NS

27.91

41.04

NS

The dates of planting also had significant effect for seed vigour index. (Table 3). Seeds obtained from November 20 planting crop had highest seed vigour index (1399.22) followed by D₂ planting (1345.52). Less seed vigour index in late plantings might be due to the lowered seed quality, as the seed matured in adverse environmental conditions. Similar results were reported in okra, chilli and brinjal [9,10,11] where environment has significant effect on the quality of seed. Among genotypes, the seeds of I-181 had highest seed vigour index (1420.12) followed by ACC 8 (1296.63). The difference in seed vigour index is due to the genetic constitution of the genotype. However, the interaction effect of date of planting and genotypes was non-significant.

From the study, it is inferred that for obtaining better quality seed in tomato the crop should be planted in the last fortnight of November.

REFERENCES

1. KALLOO, G.(1991) Introduction. In: Monographs on tomato *Theoretical and Applied Genetics*. 14:8-9. Springer-Verlar Berlin Herdel-berg, New York.
2. SINGH, D.N. & P. TRIPATHY (1995) Growth and yield of tomato genotypes in wet season on Entisol of Orissa *Indian.J.Agric. Sci.* 65:863-5.
3. BHARDWAJ, M.L.&M.C. THAKUR (1994) Genotype differences for growths and fruit yield in tomato in sub-tropical areas of Himachal Pradesh. *South Indian Hort.* 42:147-51.
4. EL-AHMADI A.B. & M.A. STEVENS (1979) Reproductive responses of heat-tolerant tomatoes to high temperatures. *J. Am. Soc. Hort. Sci.* 104:686-91.
5. BHUTANI, R.D., G.KALLOO & M.L. PANDITA (1983) Genetic variability studies for yield and physico-chemical traits of tomato. *Haryana J.Hort. Sci.* 12:96-100.
6. MISHRA Y.K. & S.D. LAL (1998) Studies on varietal performance of tomato under the agrilclimatic conditions of U.P.hills. *Prog. Hort.* 30:153-57.
7. SHARMA, S.K. & K.B. RASTOGI (1993) Evaluation of some tomato cultivars for seed production under mid hill conditions of H.P. *Ann.Agric. Res.* 14:494-96.
8. VADIVEL, E. & R.ARUMUGAM (1993). Studies on seed yield of tomato. *South Indian Hort.* 41:235-36.
9. YADAV, S.K., B.S.DHANKAR, D.P.DESWAL & R.P.S. TOMAR (2001). Effect of sowing dates and plant geometry on seed production and quality of okra cv. Varsha Uphar. *Seed Res.* 29(2):149-52.
10. KANWAR J.S. & G.BHUVANESHWARI (2004). Chilli seed quality as influenced by genotypes and planting season. *Seed Res.* 32(2): 220-223.
11. MOHANTY, S.K., J.S. KANWAR & B.S. GILL (2002) influence of planting season on quality components of brinjal seed. *Haryana J. Hort Sci.* 31(1&2): 102-105.