ISSN: 2224-0616
Int. J. Agril. Res. Innov. & Tech. 4 (1): 40-43, June, 2013 Available online at http://www.ijarit.webs.com

EFFECT OF DIFFERENT SOWING DATES ON YIELD OF TOMATO GENOTYPES

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Received 13 January 2014, Revised 27 May 2014, Accepted 28 June 2014, Published online 30 June 2014

Abstract

The experiment was conducted at Agricultural Research Station, Thakurgaon, Bangladesh during October 2009 to March 2010 to observe the effect of sowing dates on yield of tomato genotypes. Three sowing dates viz. October 1, October 15 and October 30 were considered as factor A and tomato variety viz., BARI Tomato-2, BARI Tomato-3, BARI Tomato-4, BARI Tomato-9 and BARI Hybrid Tomato-4 considered as factor B. The experiment was laid out in RCBD (Factorial) with three replications. Early flowering (52.40 days) as well as early fruit harvesting (119.13 days) was occurred in October 1 sowing, where as sowing on October 30 resulted in delayed flowering (71.73 days) and fruit harvesting (140.67 days), respectively. Number of fruits per plant was also the highest (27.40) in October 1 sowing and the lowest (13.73) was in October 30 sowing. Seed sowing of October 1 was found better in respect of yield (74.75 tha^{-1}) compared to October 15 (58.55 tha^{-1}) and October 30 (24.60 tha^{-1}) sowing. Among the variety, BARI Tomat-2 produced the highest (68.12 tha^{-1}) marketable yield followed by BARI Tomato-9 (56.16 tha^{-1}) and BARI Tomato-3 while BARI Tomato-4 gave the lowest (36.91 tha^{-1}) marketable yield.

Keywords: Tomato, Genotype, Sowing, Flowering, Fruit Setting and Yield

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Introduction

Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular vegetables in Bangladesh, which is receiving increased of the growers and consumers and made its position within few of the highest cultivated vegetables. It is an essential component of human diet for the supply of vitamins, minerals and certain hormone precursors in addition to protein and energy (Boamah *et al*., 2010; Kallo, 1993). In Bangladesh, congenial atmosphere remains for tomato production during October to March. It is mainly grown in winter season. High temperature decreases flower production and /or to bud and flower drop. However, differences between varieties in fruit set under high temperature have been reported (FAO, 1990). Went (1984) assured that fruit set was abundant only when night temperature was between 15^{0}C and 20^{0}C, which might over simplify the issue. The importance of temperature in fruit set was clearly evident. Curme (1992) reported that fruit set in certain varieties with temperature as low (7.2^{0}C) and with temperature as high (26.6^{0}C) (Schaible, 1990) had created more flexible situation in respect of the variety temperature interactions. Climate change is a major threat for crop production not only Bangladesh but also all over the world. The meteorological data for the last 10 years indicated that the crop suffer from cold injury during the month of January (Anonymous, 2007) which result shy yield of this crop. In some areas of the country particularly in the northwestern part, the night temperature falls even sometimes go below 5-6^{0}C which results tremendous yield loss in tomato. By this time BARI released a good number of tomato variety but their characteristics against tolerance to cold temperature injury has yet not been studied. Therefore, the present study was undertaken to find out the effect of sowing date on flowering, fruit setting and yield of tomato genotype.

Materials and Methods

The experiment was carried out at the Agricultural Research Station, BARI, Thakurgaon during the cropping season of October 2009 to March 2010. Three different dates of sowing viz. October 1, October 15 and October 30 considered as factor A and tomato variety viz., BARI Tomato-2, BARI Tomato-3, BARI Tomato-4, BARI Tomato-9 and BARI Hybrid Tomato-4 considered as factor B. The experiment was laid out in RCBD (Factorial) with three replications. The unit plot size was 4 m x 1 m. The crop was fertilized with

cow dung 10 tonha^{-1}, urea 300 kgha^{-1}, TSP 250 kgha^{-1}, MOP 200 kgha^{-1}, gypsum 100 kgha^{-1} and boric acid 12 kgha^{-1}. Total amount of cow dung, TSP, and one third of MOP were applied during final land preparation. Urea and rest of MOP were applied in two equal installments at 21 and 35 days after transplanting. Thirty days old seedlings were transplanted in the main field according to treatments. Irrigation along with other intercultural operations and plant protection measures were taken as and when necessary. Data were collected on flowering, fruit setting and yield contributing characters and analyzed statistically.

Results and Discussion

Effect of sowing date

There was a significant difference among the different seed sowing dates in respect of yield and yield attributes (Table 1). The earliest 50% flowering was detected at October 1 (52.40 days) followed by October 15 and October 30. More or less similar findings were reported by Sam and Iglesias (1994) in tomato in Cuba who observed that early October proved to be suitable date to planting tomatoes in the field. Peyvast (2001) reported that the early sowing date significantly affected tomato inflorescence initiation. Similar trend was found in case of first harvesting. Cluster per plant of tomato were significantly influenced by sowing dates. The highest number of clusters per plant (25.60) was obtained from early sowing (October 1) followed by mid sowing (October 15). This result was almost similar to the findings of Haque *et al*. (1999). The maximum number of flowers per cluster (5.33) was recorded from October 1 sowing and October 30 produced the minimum (4.40) number of flowers per cluster. This result was agreed with the findings of Hossain *et al*. (1986) who reported that early sowing enhanced total number of flowers per plant. Almost similar trend was found in case of fruit setting per cluster (Table 1). Fruit size (4.76 cm × 4.88 cm) of early sowing was bigger than others sowing. The highest average fruit weight (66.33 g) was found in October 1 seed sowing followed by October 15 sowing (59.13). October 1 seed sowing scored the highest number of fruits per plant (27.70) and the late sowing scored the lowest number of fruits per plant (13.73). This result was agreed with findings of Taha *et al.,* (1984). The crop grown from October 1 seed sowing produced the highest marketable fruit yield (74.75 t/ha) and the lowest (24.60 t/ha) was from October 30. This may be due to better translocation of photosynthesis from source to sink and higher accumulation of photosynthesis in the fruits. Plants of October 1 seed sowing get shorter cold condition at flowering and fruit development stage. On the contrary, other sowing dates get extreme cold condition at these stages resulted low yield. These results were agreed with the findings of Peyvast (2001) who reported that the earliest sowing date resulted in a significantly higher total fruit yield compared to the later sowing date. Singh and Tripanthy (1995) showed variation in yield of tomato when sown in different dates from June to August at Orissa of India.

Effect of tomato genotypes

Flowering, fruit setting and fruit yield of tomato were significantly influenced by different tomato genotypes (Table 2). The days required for 50% flowering was found the earliest (53.78 days) in BARI hybrid Tomato-4 while the flowering was detected delayed (63.67 days) in BARI Tomato-3. Similar trend was found in case of first harvesting. BARI Hybrid Tomato-4 produced the highest number of cluster per plant (23.00) and BARI Tomato-3 produced the lowest number of cluster per plant (18.44). The number of flower per cluster was also the highest (5.77) in BARI Hybrid Tomato-4 where as the lowest in BARI Tomato-3 (4.22). Number of fruit set per cluster was also detected maximum (4.56) in BARI Hybrid Tomato-4 and the minimum (3.22) was in BARI Tomato-3. The maximum fruit length (5.34 cm) was recorded from BARI Tomato-9, which was statistically identical to BARI Tomato-2 (4.94 cm) and the lowest fruit length (3.52 cm) was recorded from BARI Tomato-4. On the other hand, the maximum fruit diameter (4.79 cm) was recorded from BARI Tomato-2, which was statistically similar to BARI Toimato-3 and the minimum fruit diameter (3.74 cm) was counted from BARI Tomato-4. The highest average fruit weight (72.33 g) was obtained from BARI Tomato-2 followed by BARI Tomato-3 (68.89 g) and the lowest average fruit weight (39.67 g) was obtained from BARI Hybrid Tomato-4. The highest number of fruits (27.78) was recorded by the genotype BARI Hybrid Tomato-4 and the lowest number of fruits (18.33) was recorded in BARI Tomato-3. Similar results were reported by Mohammed (1995) and Mahmoud (2005). The highest marketable fruit yield was recorded (75.31 tha^{-1}) from BARI Tomato-2 whereas the lowest fruit yield (36.91 tha^{-1}) was recorded from BARI Tomato-4. This may be due to its maximum fruit size, average fruit weight and number of fruits per plant. These results were agreed with previous findings of Omara (1995).

Combined effect of sowing date and tomato genotypes

Combined effect of sowing date and tomato genotypes had influenced on different yield parameters (Table 3). The earliest (47 days) 50% flowering was found in BARI Hybrid Tomato-4 with October 1 seed sowing.

Table 1. Effect of sowing date on the yield and yield contributing characters of tomato

Time of sowing	Days to 50% flowering	No. of clusters/ plant	No. of flowers/ cluster	No. of fruits/ cluster	Days to 1st harvest	Fruit length (cm)	Fruit diameter (cm)	Average fruit weight (g)	No. of fruits/ plant	Yield (tha^{-1})
S_1	52.40	25.60	5.33	4.20	119.13	4.76	4.88	66.33	27.40	74.75
S_2	56.67	19.20	4.67	3.67	132.67	4.43	4.48	59.13	24.20	58.55
S_3	71.73	15.33	4.40	3.26	140.67	4.21	3.76	46.13	13.73	24.60
LSD $_{(0.05)}$	4.034	2.105	0.441	0.45	2.951	0.330	0.154	3.036	2.336	1.960
CV (%)	5.17	14.04	12.68	6.17	3.01	9.90	14.83	7.10	14.34	12.36

Table 2. Effect of genotypes on the yield and yield contributing characters of tomato

Genotypes	Days to 50% flowering	No. of cluster/ plant	No. of flower/cluster	No. of fruits/cluster	Days to 1st harvest	Fruit length (cm)	Fruit diameter (cm)	Average fruit wt (g)	No. of fruits/plant	Yield (tha^{-1})
V_1	60.78	20.33	4.67	3.67	128.56	4.94	4.79	72.33	22.33	68.12
V_2	63.67	18.44	4.22	3.22	134.33	4.64	4.78	68.89	18.33	55.12
V_3	60.67	18.77	4.33	3.33	131.44	3.52	3.74	43.56	19.88	36.91
V_4	62.44	19.67	5.00	3.78	140.33	5.34	4.54	61.56	20.55	56.16
V_5	53.78	23.00	5.77	4.56	119.44	3.88	4.00	39.67	27.78	48.81
LSD $_{(0.05)}$	3.007	2.718	0.570	0.459	3.802	4.27	0.198	3.920	3.016	3.120
CV (%)	5.17	14.04	12.68	6.17	3.01	9.90	14.83	7.10	14.34	12.36

Table 3. Combined effect of sowing date and tomato genotypes on the yield and yield contributing characters of tomato

Treatment combination	Days to 50% flowering	No. of cluster/ plant	No. of flower /cluster	No. of fruits /cluster	Days to 1st harvest	Fruit length (cm)	Fruit diameter (cm)	Average fruit wt (g)	No. of fruits/plant	Yield (tha^{-1})
S_1V_1	54.00	24.33	5.67	4.33	115.33	5.53	5.33	82.67	30.00	97.21
S_1V_2	54.00	23.00	5.00	3.67	116.67	5.23	5.30	79.00	25.33	83.43
S_1V_3	53.00	26.33	5.00	4.00	119.67	3.53	4.27	46.67	22.67	44.16
S_1V_4	54.00	25.00	5.00	4.33	131.67	5.50	4.97	77.67	27.67	89.56
S_1V_5	47.00	29.33	6.00	4.67	112.33	4.00	4.53	45.67	31.33	59.34
S_2V_1	56.33	19.00	4.33	3.67	131.33	4.76	5.00	74.00	24.67	76.36
S_2V_2	58.00	18.33	4.00	3.00	135.67	4.67	4.76	71.67	20.33	60.56
S_2V_3	58.00	16.67	4.00	3.33	135.67	3.53	3.67	47.00	22.67	44.49
S_2V_4	57.33	18.33	5.00	3.67	140.67	5.40	4.76	60.67	23.67	59.03
S_2V_5	53.67	23.67	6.00	4.67	120.00	3.76	4.03	42.33	29.67	52.33
S_3V_1	72.00	17.67	4.00	3.00	139.00	4.53	4.03	60.33	12.33	30.79
S_3V_2	79.00	14.00	3.67	3.00	150.67	4.04	4.30	56.00	9.33	21.53
S_3V_3	71.00	13.33	4.00	2.67	139.00	3.50	3.30	37.00	14.33	22.07
S_3V_4	76.00	15.67	5.00	3.33	148.67	5.13	3.90	46.33	10.33	19.86
S_3V_5	60.67	16.00	5.33	4.33	126.00	3.86	3.27	31.00	22.33	28.75
LSD (0.05)	5.208	4.707	0.980	1.010	6.58	0.742	0.343	6.790	5.224	7.246
CV (%)	5.17	14.04	12.68	6.17	3.01	9.90	14.83	7.10	14.34	12.36

S_1= 1 October, S_2= 15 October, S_3= 30 October, V_1= BARI Tomato-2, V_2= BARI Tomato-3, V_3= BARI Tomato-4, V_4= BARI Tomato-9 and V_5= BARI Hybrid Tomato-4

Similarly, the number of cluster (29.33), flowers per cluster (6) and number of fruits per cluster (6) of BARI Hybrid Tomato-4 with October 1 sowing showed better performance than other combinations. However, fruit size was observed larger (5.53 cm × 5.33 cm) in BARI Tomato-2 with October 1 sowing compared to other combinations. The highest average fruit weight (82.67 g) was recorded from BARI Tomato-2 with October 1 seed sowing. On the other hand, the highest number of fruits per plant (31) was recorded from BARI Hybrid Tomato-4 with October 1 sowing followed by BARI Tomato-2 (30 g). The highest marketable fruit yield (97.21 tha^{-1}) was obtained from BARI Tomato-2 with October 1 sowing followed BARI Tomato-9 (89.56 tha^{-1}) whereas, the lowest yield (16.86 tha^{-1}) was recorded from BARI Tomato-9 with October 30 seed sowing.

Conclusion

The experiment revealed that the yield of tomato was significantly affected by different sowing dates and tomato genotypes. BARI Tomato-2 with October 1 seed sowing was suitable combination for maximum yield of tomato in northwestern part of Bangladesh.

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