

Studies on growth, yield and quality of tomato hybrids under greenhouse

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Abstract: Investigations were carried out in tomato (*Lycopersicon esculentum*, Mill) with two hybrids SH 7611 and Arka Abijith to study the quantitative characters so as to develop a suitable production package for hybrid tomato under greenhouse. Experiments were carried out during two seasons viz. Summer and *kharif* in the greenhouse available at College Orchard, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. A set of standard packages for growing an indeterminate hybrid tomato (SH 7611) in green house was used as a check and in the different packages, one of the components for the respective package was modified so as to study its effect on growth, yield and quality of hybrid tomato under protected cultivation. Based on the observations on yield, quality and physiological parameters, the treatment with growing medium, soil: Compost: Sand (2:1:1), irrigation regime 20 Kpa, basal application of 50: 50: 50 kg ha⁻¹ NPK with Azospirillum and Phosphobacteria water soluble fertilizers (250: 250: 250 kg ha⁻¹ NPK) and mulching is recommended for cultivation of the hybrid SH 7611 under greenhouse.

Key words: Greenhouse, Tomato, Media, Fertigation, Mulching, Irrigation regime.

Introduction

Tomato (*Lycopersicon esculentum* Mill), is one of the most popular vegetable crops widely grown which ranks next to potato. It is an source of vitamin A and C. In tropical Asia, it is an important cash earning crop for small farmers (Villareal, 1980).

Though attempts have been made in the recent past to standardize various management practices of greenhouse tomato, an integrated study comprising different packages of practices are lacking especially in India. So an extensive study was conducted at the Department of vegetable Crops, Horticultural College and Research Institute, Coimbatore during May 2001 to January 2002 (*Kharij*) and from February 2002 to August 2002 (*Summer*) at the college Orchard greenhouse with the objective of finding out a suitable medium, plant nutrients, irrigation regime, mulching and spacing on growth, yield and quality of hybrid tomato under greenhouse.

Materials and Methods

The experiments were laid out in randomized block design with 12 treatments replicated thrice. The details of the treatments are given in the Table 1.

The tomato (*Lycopersicon esculentum* Mill), indeterminate hybrid SH 7611 was chosen for the study. The existing popular tomato hybrid Arka Abijith was chosen as a base for comparison of the performance of the hybrid under various packages of practices under greenhouse condition. A set of standard package was modified so as to study its effect on growth, yield and quality of hybrid tomato under protected cultivation. As in other cases in one of the treatment packages, the variety component was substituted with Arka Abijith, a semi determinate hybrid. The experiment was carried out in a greenhouse of 12 m length and 9 m breadth. The entire area in the greenhouse was divided into 12 beds each having 3.76 m length and

Table 1. Treatment details

Treatments	Hybrid	Medium	Basal application	Fertigation schedule	Irrigation regime	Mulching	Spacing (cm)
T ₁	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₂	SH 7611	soil:compost:sawdust (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₃	SH 7611	soil:compost:coco peat (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₄	SH 7611	soil:compost:paddy husk (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₅	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	40 Kpa	Black	60 x 45
T ₆	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ K+ azospirillum+ phosphobacteria	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₇	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with straight fertilizers	20 Kpa	Black	60 x 45
T ₈	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Without	60 x 45
T ₉	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₁₀	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ K+ azospirillum+ phosphobacteria	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	60 x 45
T ₁₁	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	Top dressing of NPK in 5 splits	20 Kpa	Black	60 x 45
T ₁₂	SH 7611	soil:compost:sand (2:1:1)	50:50:50 kg ha ⁻¹ NPK	250:250:250 kg ha ⁻¹ NPK with water soluble fertilizers	20 Kpa	Black	30 x 22.5

Table 2. Mean performance of tomato hybrids for growth, yield and quality characters under green house

Treatments	Plant height (cm)		Flower clusters plant ⁻¹		Yield plant ⁻¹		Yield t ha ⁻¹		Titration acidity (%)		Ascorbic acid (mg 100 g ⁻¹)	
	Kharif	Summer	Kharif	Summer	Kharif	Summer	Kharif	Summer	Kharif	Summer	Kharif	Summer
T ₁	261.62	260.47	58.43	52.33	5.82	4.40	215.34	165.87	0.52	0.48	26.22	26.10
T ₂	265.12	263.10	55.32	50.33	5.67	4.20	209.79	156.19	0.41	0.38	24.84	23.80
T ₃	265.68	263.60	54.16	50.00	5.72	4.35	211.64	161.78	0.54	0.52	25.23	24.23
T ₄	261.74	260.20	52.02	42.00	5.45	4.10	201.65	152.48	0.48	0.46	21.44	21.40
T ₅	253.10	250.20	46.64	44.66	5.12	3.90	189.44	145.04	0.50	0.50	22.88	22.60
T ₆	278.20	276.10	62.14	56.33	6.10	4.85	225.70	177.84	0.56	0.54	28.68	28.20
T ₇	274.14	272.10	48.14	44.00	5.28	3.80	195.36	141.32	0.40	0.41	22.46	22.30
T ₈	269.68	267.63	45.13	41.00	5.42	3.52	200.54	130.90	0.48	0.46	23.67	23.60
T ₉	260.40	259.20	48.14	44.33	5.55	4.15	205.35	154.34	0.50	0.49	24.82	24.80
T ₁₀	280.24	278.80	60.12	52.33	6.00	4.60	222.00	171.07	0.54	0.52	27.12	26.70
T ₁₁	268.64	266.63	47.12	45.00	4.52	3.65	167.24	135.75	0.38	0.38	22.82	22.20
T ₁₂	294.36	292.30	44.18	41.00	2.80	2.20	207.20	163.99	0.44	0.42	20.42	20.20
Mean	269.41	267.53	51.58	46.89	5.28	4.06	195.36	154.71	0.47	0.46	24.22	23.84
SEd	1.1868	1.1757	0.9862	0.8247	0.0821	0.0729	1.462	1.3179	0.0167	0.0129	0.5621	0.4296
CD (P=0.05)	2.6278	2.4382	1.8282	1.7103	0.1623	0.01511	2.824	2.7331	0.0282	0.0267	0.9256	0.8909

1.26 m breadth. Each bed was further divided into 3 sections with length of 1.24 m and breadth of 1.26 m, containing 9 plants in all treatments except T₁₂, which had 12 plants per section.

Observations on plant height, number of flower clusters per plant, number of fruiting clusters per plant, single fruit weight, yield per plant, yield per hectare, titration acidity and ascorbic acid content were recorded and statistically analysed.

Results and Discussion

The results presented in the table 2 revealed that the hybrid SH 7611 excelled over the standard hybrid Arka Abijith in both seasons. The highest values for all the characters studied were recorded in *Kharif* season than summer. The highest number of flower clusters per plant (62.14), yield per plant (6.10 kg) and yield per hectare (225.70 t) were recorded for the hybrid SH 7611 under the treatment T₆ with growing medium of soil: compost: sand (2: 1: 1), irrigation regime of 20 Kpa, nutrition with basal 50 Kg ha⁻¹ K + azospirillum + phosphobacteria and fertigation @250: 250: 250 kg ha⁻¹ NPK with water soluble fertilizers, with black polythene mulch and with spacing of 60 x 45 cm. The highest single fruit weight (85.14 g) was recorded in for SH 7611 under the treatment T₁₀ with growing medium of soil: compost: sand (2: 1:1), irrigation regime of 20 Kpa, nutrition with basal 50: 50: 50 Kg ha⁻¹ NPK + Azospirillum + Phosphobacteria and fertigation @ 250: 250: 250 kg ha⁻¹ NPK with water soluble fertilizers, with

black polythene mulch and with spacing of 50 x 60 cm.

These two treatments viz. T₆ and T₁₀ had biofertilizers as one of the components. These would have supplied more nitrogen (Alberto *et al.* 1986) and phosphorus, which are essential for photosynthesis to help in having more number of flowers, fruits and also improvement of fruit size and fruit weight. The phosphobacteria would have made more P available (by converting unavailable P in to available one) there by would have encouraged early growth of roots. The phosphorus would have also encouraged more fruit set. P is one of the important essential elements required for fruit set. Phosphorus supplied through fertigation would have been made available by observations confirm the reports of Alan and Zulkadir (1994), who had reported an enhancing effect of organic growing media combined with inorganic fertilizers in increasing the number of fruits in greenhouse tomato.

The highest plant height was recorded (294.36 cm) in treatment T₁₂ with reduced spacing of 30 x 22.5 cm and was attributed to the greater crop competition as reported by Papadopoulose and Pararajasingham (1997), which affected negatively the yield performance of the hybrid SH 7611 under T₁₂.

The treatment T₆ and T₁₀ also recorded to have the best fruit quality as evidenced by their highest values in titrable acidity (0.56 per cent), total sugars (1.94 per cent) and ascorbic content (28.44 mg 100 g⁻¹) of the fruits. These results are in accordance with

findings of Youssef *et al.* (2001), who had found that the organic matter and inorganic fertilizer combination helped to produced fruits with high vitamin C content and acidity. The better cultural conditions present in these treatments might have enhanced the performance of the hybrid in terms of fruit quality. These support the views of Papadopoulose (1998).

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