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## Response of tomato hybrids to different growing media and fertigation on plant height and their Interaction effect in tomato production under naturally ventilated poly house

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### Abstract

The response of tomato hybrids to different growing media and fertigation on plant height and interaction effect in tomato production under naturally ventilated poly house was studied at the Research Farm of Department of Agricultural Engineering, CSK Himachal Pradesh Krishi vishwavidyalaya, Palampur during summer season of 2013 and 2014 in two separate experiments inside the naturally ventilated playhouses. In this experiment, treatments comprising three hybrids (Avatar, Rakshita and Naveen 2000 plus), three fertigation levels (NPK @ 20:20:20 g/m<sup>2</sup>, NPK @ 25:25:25 g/m<sup>2</sup> and NPK @ 30:30:30 g/m<sup>2</sup>) and two growing media (vermicompost and coco peat: vermicompost) was laid out in a randomized block design with three replications. Hybrid Naveen 2000 plus, application of NPK @ 30 g/m<sup>2</sup> and growing media consisting of coco peat: vermicompost (1:1, v/v) produced significantly taller plants during both the years at all the stages of growth.

**Keywords:** Protected cultivation, hybrids, ventilated poly house, fertigation and growing media

### 1. Introduction

Tomato (*Solanum lycopersicum* Mill.), member of solanaceae family, is one of the most important vegetable crops grown throughout the world. Tomato has attained a status of high value crop in India in recent years with an area of 882 thousand ha with a production of 18735.9 thousand MT with a productivity of 21.2 MT/ha (Anonymous 2014) [1] and occupies a pride place among vegetables in Indian cuisine because of its delicacy and pleasant flavour. At present, cultivation of tomato in open fields is a wide spread practice in Himachal Pradesh. But, the tomato crop grown in open fields is exposed to various abiotic and biotic stresses and therefore, it is not possible to produce high quality tomato in terms of size, shape, and colour and free from diseases and pests as compared to tomato produced under protected environment. With the increasing zeal for its cultivation, the farmers are aptly looking towards improved varieties to meet out the higher standards of quality and quantity. Among tomato cultivars, hybrids have really brought the revolution in tomato cultivation. Other important component of growing crops under protected conditions is growing media and application of fertilizers with the irrigation water called fertigation which influences productivity and quality of tomato.

### Materials and Methods

The experiment was conducted in naturally ventilated poly house during summer-season (March to August) in the year 2013 and 2014 at the Research Farm of the Himachal Pradesh Krishi Vishwavidyalaya Palampur. The area represents the sub-humid mid hill zone of Himachal Pradesh and is characterized by the sub-tropical climate. Mild summer and cool winter characterized the climate of Palampur. The seeds of the three hybrids were sown in plastic plug trays by using soilless media having coco peat, perlite and vermiculite in the ratio of 3:1:1, respectively inside the naturally ventilated poly house on 20<sup>th</sup> Feb 2013 and 2014 to get healthy and disease free seedlings of tomato. The seedlings were ready for transplanting after one month of sowing and were subsequently transplanted inside the naturally ventilated poly house equipped with drip irrigation system. Before transplanting, beds were prepared. These beds were thoroughly sterilized with 4 per cent formalin (1 litre of 40 per cent commercial formalin in 7 Litre of water).

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Beds were covered with black polyethylene sheet for 7 days after formalin application. Then polyethylene sheet was removed and soil raked well for a week in order to remove the fumes of formalin. Before transplanting, beds were prepared with growing media comprising of vermicompost alone and mixture of coco peat and vermicompost (1:1, v/v) up to 15 cm depth. The basal dose of N, P and K @ 100 kg/ha from straight fertilizers was applied in the form of urea (21.5 g/m<sup>2</sup>), single super phosphate (62.5 g/m<sup>2</sup>) and muriate of potash (16.5 g/m<sup>2</sup>). Remaining dose of NPK was applied with water soluble fertilizer (poly feed 19:19:19) starting from 3<sup>rd</sup> week after transplanting and up to 15 days prior to final harvest. Fertigation was done twice a week. The plants were irrigated daily with drip irrigation system, one dripper was provided for each plant. Plants were watered regularly before 12 noon or late evening. Other cultural practices and standard plant protection measures were also adopted from time to time to ensure healthy crop stand. After 30-35 days of transplanting, plants were trained to 2 stems and staked with the help of nylon threads connected to the wire inside the poly house. Other cultural practices and standard plant protection measures were also adopted from time to time to ensure good and healthy crop stand. There were eighteen treatment combinations comprising of three hybrids, two growing medium and three fertigation levels of NPK. Observation recorded is plant height. Five plants were selected randomly from each plot and tagged. Height of these tagged plants was recorded from the ground level up to top most leaf tip at 30, 60, 90 and 120 days after transplanting and at final harvest. The average of these was taken as mean plant height.

## Results and Discussions

### Plant height (cm)

The observation on plant height (cm) at 30, 60, 90 and 120 days after transplanting and at harvest as influenced by hybrids, fertigation levels and growing media used. In general, the increase in plant height was rapid upto 120 days

after transplanting, thereafter the elongation rate of the plant started declining in all the hybrids giving a sigmoid nature of the curve at all stages of growth upto 120 days after transplanting. Hybrid Naveen 2000 plus produced significantly taller plants than hybrid Rakshita and Avatar during both the years at all the stages of growth. The plant height of a hybrid is basically its genetical character that is slightly changed by management. It was exhibited in comparative evaluation under the present study. Thus, a difference in plant height among the hybrids is expected due to their respective varietal characters. Similar findings among hybrids were also reported by Singh (2005) [2].

The plant height significantly increased at all the growth stages under study due to the application of NPK @ 20, 25 and 30 g/m<sup>2</sup> through fertigation. Plant height recorded at all growth stages increased significantly with the fertigation of NPK @ 30 g/m<sup>2</sup> than NPK @ 25 g/m<sup>2</sup>. Application of NPK @ 25 g/m<sup>2</sup> also recorded significantly taller plants than NPK @ 20 g /m<sup>2</sup> at all the growth stages of the crop after transplanting. Similar trend was observed in the second year of study. Since nitrogen and phosphorus are said to be closely related with cell division and development, these might have resulted in better growth in the present study. These results are in conformity with those of Singh *et al.* (2005) [3].

Different growing media have exhibited varied responses to plant height of tomato and the growing media consisting of coco peat: vermicompost (1:1, v/v) produced significantly taller plants (213.7 cm in 2013 and 225.4 cm in 2014) than growing media consisting of vermicompost. The maximum plant height of tomato plants grown in coco peat+vermicompost mixture might be ascribed to the fact that this media have provided better physico-chemical properties besides maintaining a requisite biological balance which have contributed to the better growth of plants in comparison to the other growing media used. These findings also got the support from the earlier reports of Yau and Murphy (2000) [4].

The interaction effect was found to be non-significant.

**Table 1:** Plant height (cm) as influenced by different treatments at different growth stages

Treatment	Plant height (cm)									
	2013					2014				
	30 dat	60 dat	90 dat	120 dat	at harvest	30 dat	60 dat	90 dat	120 dat	at harvest
<b>Hybrids</b>										
Rakshita	36.5	83.3	149.9	205.4	214.9	37.2	84.9	152.8	209.3	219.0
Naveen 2000 plus	37.9	86.5	155.7	213.3	223.2	38.6	88.1	158.6	217.3	227.4
Avatar (7711)	35.0	79.7	143.5	196.7	205.8	36.1	82.3	148.1	202.9	212.3
SEm±	0.3	0.7	1.3	1.8	1.9	0.3	0.7	1.2	1.6	1.7
CD (P=0.05)	0.9	2.1	3.8	5.2	5.5	0.8	1.9	3.4	4.6	4.9
<b>Fertigation levels</b>										
NPK @ 20 : 20 : 20 g/m <sup>2</sup>	34.9	79.5	143.1	196.1	205.1	35.9	81.8	147.3	201.8	211.1
NPK @ 25 : 25 : 25 g/m <sup>2</sup>	36.6	83.4	150.1	205.7	215.2	37.4	85.3	153.5	210.3	220.1
NPK @ 30 : 30 : 30 g/m <sup>2</sup>	38.0	86.6	155.9	213.6	223.5	38.7	88.2	158.7	217.4	227.5
SEm±	0.3	0.7	1.3	1.8	1.9	0.3	0.7	1.2	1.6	1.7
CD (P=0.05)	0.9	2.1	3.8	5.2	5.5	0.8	1.9	3.4	4.6	4.9
<b>Growing media</b>										
Vermicompost	35.5	81.0	145.8	199.8	209.0	36.3	82.8	149.1	204.3	213.7
Cocopeat: Vermicompost (1:1)	37.4	85.3	153.6	210.5	220.2	38.3	87.4	157.2	215.4	225.4
SEm±	0.3	0.6	1.1	1.5	1.6	0.2	0.5	1.0	1.3	1.4
CD (P=0.05)	0.8	1.7	3.1	4.3	4.5	0.7	1.5	2.8	3.8	4.0

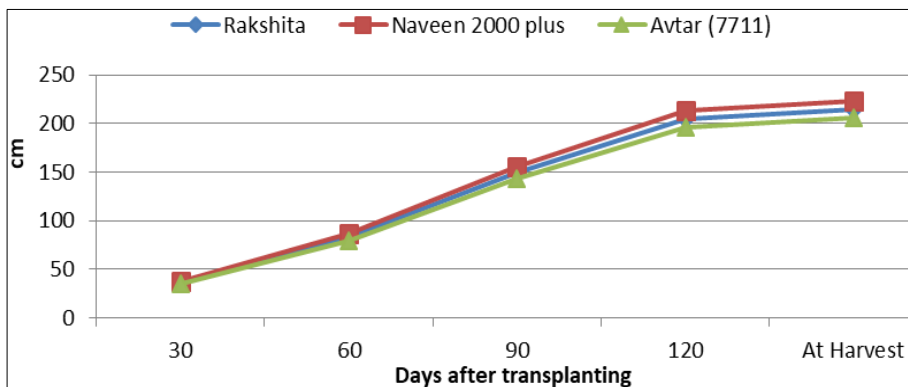


Fig A

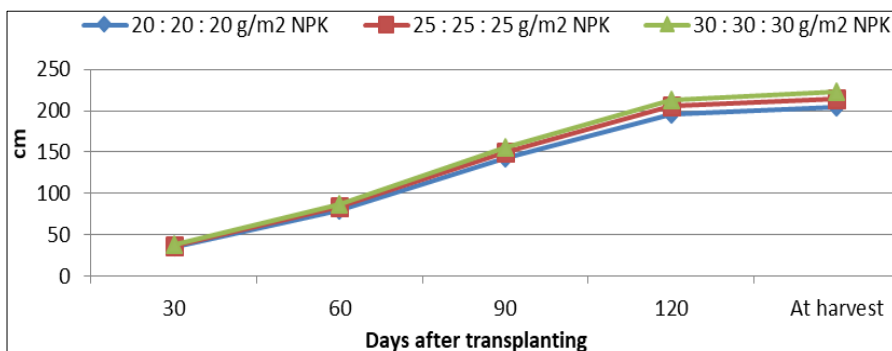


Fig B

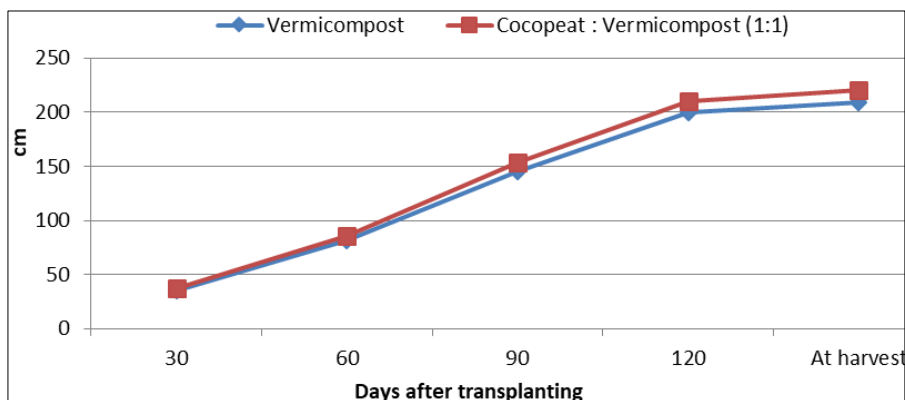


Fig C

Fig 1: (A, B, C) Plant height (cm) as influenced by different treatments at different growth stages (2013)

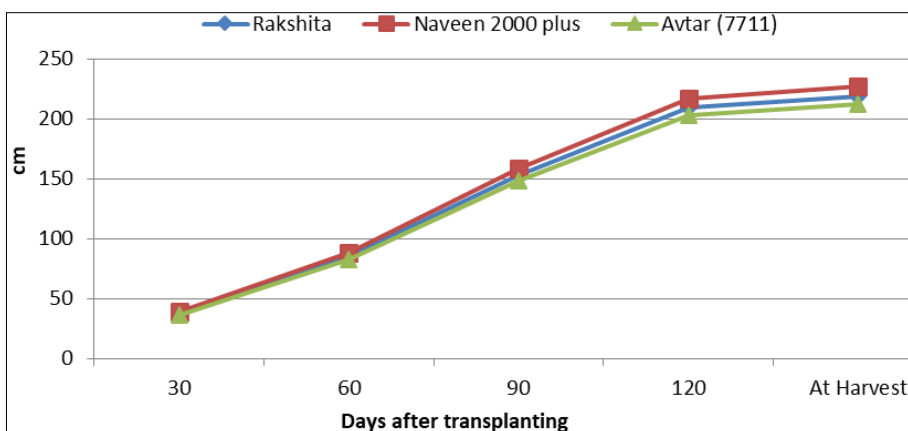


Fig A

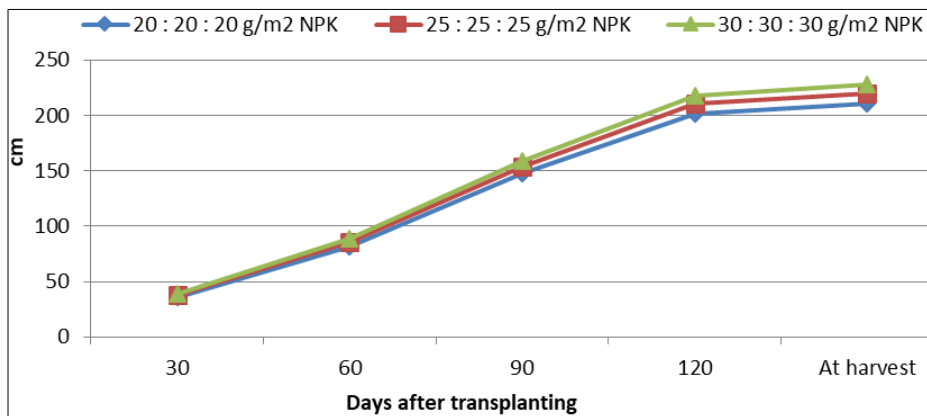


Fig B

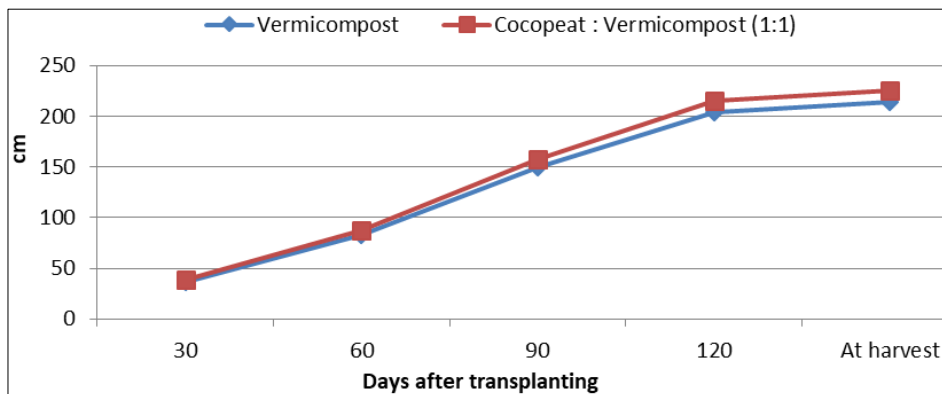


Fig C

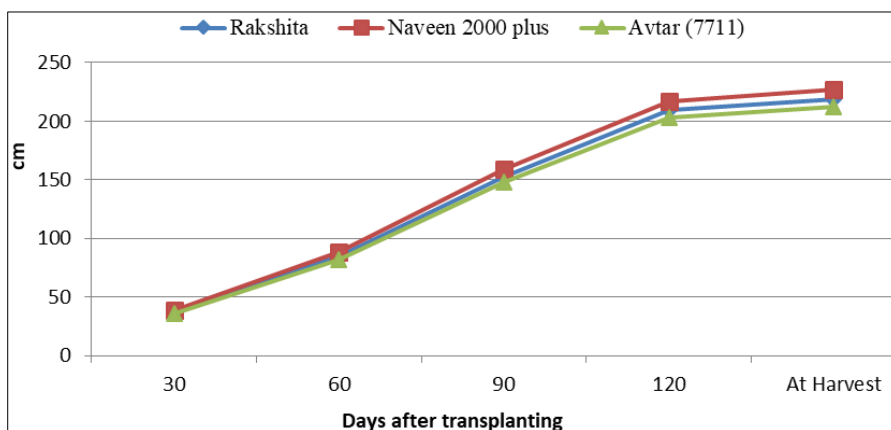


Fig D

Fig 2: (A, B, C, D) Plant height (cm) as influenced by different treatments at different growth stages (2014)

### Conclusions

- Hybrid Naveen 2000 plus produced significantly taller plants than hybrid Rakshita and Avtar during both the years.
- The plant height recorded at different growth stages increased significantly with the fertigation of NPK @ 30 g/m<sup>2</sup> than NPK @ 25 g/m<sup>2</sup>.
- Growing media consisting of coco peat: vermicompost (1:1, v/v) produced significantly taller than growing media consisting of vermicompost.
- Interaction was not significant.

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