Interaction effect of plant geometry and training methods on growth, yield and quality of tomato under semi-controlled poly-house conditions.

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ABSTRACT

An experiment was conducted under the semi-controlled poly house with three training systems single stem (T_1), double stem (T_2) and three stems (T_3) and two spacing 45 cm ×30 cm (S_1) and 45 cm × 45 cm (S_2) replicated four times at Division of Horticulture Faculty of Agriculture Wadura SKUAST-K (J&K) during Kharif -2022 & 2023 to investigate the effects of plant geometries and training levels on growth, yield and quality of tomato under semi-controlled poly-house. Among the treatment combinations studied in two years, maximum plant height (88.66 and 81.66 cm) , average fruit weight per plant (96.33 and 93.33g), T.S.S (6.00 & 5.96 B^0) , Specific gravity (1.70 &1.68) was recorded by T_1S_2-Single stem with 45 cm × 45 cm spacing respectively, however highest number of ripe fruits per plant (29.66 and 28.00),Yield per plant (1.60 & 1.44 kg) and Yield m^2 (9.80 &7.30 kg) was registered with T_3S_1-Three stems with 45 cm × 30 cm respectively in both years .

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Key words: Plant geometry, Quality, Semi-controlled poly-house, Training

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Introduction

Tomato (*Solanum lycopersicum* L.) is an important warm season solanaceous vegetable crop that cannot tolerate frost and freezing temperatures. Tomato is a good source of vitamins, minerals and antioxidants so it is an important ingredient of traditional and modern days' food. The tomato pulp and juice are mild aperients (laxative), a promoter of gastric secretion and act as blood purifier and intestinal antiseptic (Hazra *et al*., 2022). Tomatoes and tomato products are rich in antioxidant and carotenoids (Pinela *et al*., 2012).Further, the consumption of tomatoes has been shown to reduce the risks of cardiovascular disease and certain types of cancer, such as cancers of prostate, lung and stomach (Canene-Adams *et al*., 2005). The major tomato growing countries are China, India,

USA, Turkey and Egypt. India is the second largest producer of tomato in the world and it is also the second largest vegetable crop of the country. Among different factors, plant geometry and training play an important role as the former helps in preventing overcrowding and competition, thus helps in avoiding poor fruit set and delayed maturity while the latter improves air circulation through the plants under humid and moist conditions where tomato plants are more prone to diseases. Moreover, ideal plant geometry reduces the competition among plants for acquiring nutrients from the soil. Plant density and pruning of side shoots play a key role in efficient use of the area inside protected structures. Optimum plant spacing may help in efficient utilization of land and solar radiation for obtaining good quality of fruits and yield (Mantur *et al.*, 2014). On the other hand, stem pruning influences the quality and productivity of fruits by influencing the light utilization pattern as well as source-sink balance (Kumar *et al.*, 2014). Keeping in view the above facts, the present study was conducted to investigate the effects of plant geometries and training levels on growth, yield and quality of tomato under semi-controlled poly-house.

Material and Methods

The experiment was carried out under semi-controlled polyhouse at Division of Horticulture, FOA, Wadura SKUAST-Kashmir (J&K) during Kharif- 2022 and 2023 in a randomized block design with four replications. The treatments consisted of three training systems *i.e.*, single stem (T_1), double stem (T_2) and three stems (T_3) and two spacing 45 cm ×30 cm (S_1) and 45 cm × 45 cm (S_2). For the present investigation high yielding and indeterminate variety Shalimar Tomato -1 was selected and seeds were sown in nursery under protection condition due to high altitude temperate conditions. The observations were recorded on traits viz, plant height, no. of ripe fruits, average Fruit weight , yield per plant , yield per square meter, T.S.S and specific gravity using standard

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procedure. The data thus collected were subjected to analysis of variance, using the method proposed by Gomez and Gomez (1984).

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Results and Discussion

It is evident from the data presented in Table 1, that there was significant difference among treatment combinations tried in experiment related to growth, yield related attributes and quality of tomato. Among different treatment combinations, T_1S_2-Single stem with 45 cm × 45 cm spacing registered maximum plant height (88.66 and 81.66 cm) and average fruit weight per plant (96.33 and 93.33g) respectively in both years which may be due to pinching shoots at their emergence and ultimately diverting the flow of nutrients and manufactured food material towards apical growing point and greater exposure of plants to light leading to higher photosynthetic activities(Lal *et al*.,2014 ,Aminifard *et al*.,2012) however highest number of ripe fruits per plant (29.66 and 28.00),Yield per plant (1.60 & 1.44 kg) and Yield m^2 (9.80 &7.30 kg) was registered with T_3S_1-Three stems with 45 cm × 30 cm respectively in both years, which may be due to four stems character along with close spacing accommodate more number of plants that results in more number of fruits per unit are(Khurana *et al*.,2002, Lal *et al*.,2014).Very close spacing reduces the yield, yield increases with an increase in density (plants or shoots) to some extent and decrease with further increase in density due to the competition amongst the plants or shoots. On the other hand very wider spacing accommodates a lesser number of plants per unit area thereby decreases the yield Mazed *et al.* (2015). Sumiati (1987) repoted that highest yield of tomato was obtained from plants pruned to two or three stems; however pruning to single stem produces larger size fruits. Maximum T.S.S (6.00 & 5.96 B^0) and Specific gravity (1.70 &1.68) was recorded by T_1S_2-Single stem with 45 cm × 45 cm spacing respectively in both years, this may be due to effective utilization of sunlight at wider spacing (Singh and Parmar 2004).

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Conclusion

From the present investigations it is concluded that treatment combination T_1S_2 (single stem and plant spaced at 45×45cm) resulted in maximum plant height , average fruit weight per plant T.S.S , Specific gravity, however highest number of ripe fruits per plant, Yield per plant and Yield m^2 was registered with T_3S_1-Three stems with 45 × 30 cm. Therefore, training system T3-(Three stems and plant Spacing S_1(45X30cm) can be recommended for commercial cultivation for getting the higher yield and for big sized and good quality tomato T_1S_{2-} (single stem and plant spaced at 45×45cm) should be recommended under semi-controlled poly-houses.

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Treatment combinations	Plant Height (c.m)		No. of ripe fruits		Average Fruit weight (g)		Yield per Plant (kg)		Yield m^2(Kg)		Specific gravity		T.S.S B^0	
	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
T_1S_1(Single stem+45cm×30cm)	82.00	81.66	16.66	15.66	73.66	71.66	0.958	0.861	6.69	4.59	1.41	1.46	5.56	5.60
T_1S_2(Single stem+45cm×45cm)	88.66	88.33	13.00	12.00	96.33	93.33	0.582	0.550	4.07	3.85	1.70	1.68	6.00	5.96
T_2S_1(Single stem+45cm×30cm)	74.33	73.66	23.33	23.00	60.00	50.00	1.151	1.016	8.05	6.03	1.24	1.24	4.63	4.70
T_2S_2(Single stem+45cm×45cm)	76.00	75.66	20.66	20.33	61.88	58.33	0.997	0.918	6.98	6.36	1.34	1.35	5.20	5.23
T_3S_1(Single stem+45cm×30cm)	62.00	61.33	29.66	28.00	52.11	21.66	1.604	1.446	11.23	9.30	0.79	0.80	3.30	3.23
T_3S_2(Single stem+45cm×45cm)	66.00	67.00	25.66	25.33	55.66	31.66	1.400	1.340	9.80	7.11	1.06	1.13	4.16	4.26
C.D(P≤0.05)	3.05	3.07	1.72	2.14	2.75	5.16	115.59	152.88	0.80	0.55	0.07	0.05	0.20	0.37

Table 1 : **Effect of treatment combinations on different factors**

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