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Functional performances of tomato hybrids under polyhouse conditions at Tiruchirappalli, Tamil Nadu

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Abstract
An experiment was conducted under polyhouse conditions with three tomato hybrids namely Arka Rakshak, Shivam and Lakshmi to find the hybrid suitable for Tiruchirappalli region of Tamilnadu. The experimental design was laid out in a Randomized Block Design with eight replications. Quantitative yield parameters such as plant height (cm), flower cluster/plant, flowers/cluster, fruits/plant, single fruit weight (g) and yield/plant (kg) were studied. Hybrid Shivam recorded the highest in Number of fruits plant^{-1} (63.13), Single fruits weight (96.33 g) and Yield plant^{-1} (5.10 kg plant^{-1}).

Keywords: Tomato hybrids, Arka Rakshak, Shivam, Lakshmi, polyhouse cultivation, yield

Introduction
Tomato (*Solanum lycopersicum* L., 2n=24) is one of the most important vegetable crops grown both under tropical and sub-tropical conditions in India. It belongs to the family solanaceae and ranks second in vegetables after potato. It is most economically important vegetable crop and is widely cultivated in India with a total area of 83,000 ha and production of 7.90 Lakh tonnes. The general popularity and health benefits associated with this vegetable crop make it one of the most commercially viable of all agricultural commodities. Tomatoes are consumed fresh, cooked or processed into various products. The tomato is composed mainly of water (approximately 90%), soluble and insoluble solids (5-7%), citric and other organic acids and vitamins and minerals (Pedro and Ferreira, 2007) [1]. Tomato is becoming the main supplier of several plant nutrients and providing an important nutritional value to the human diet (Wilcox *et al.*, 2003) [2]. Ripe tomatoes have a high content of the antioxidant lycopene, which plays a possible role in the prevention of certain forms of cancer (Agarwal and Rao, 2000; Radzevicius *et al.*, 2009) [3, 4]. Another important antioxidant is carotene (Radzevicius *et al.*, 2009) [4], also noted for its cancer prevention properties. Tomatoes thrive best in moderate climates, but can adapt to a wide range of climatic conditions. The crop required warm weather and abundant sunshine for best growth and development. The plant grows best when provided with uniform moisture and well drained soil (Gould 1992) [5]. They can be grown in a variety of soil types, but do best on well-drained, fertile soils. They can be cultivated in the open under field conditions or in a greenhouse under environmentally controlled conditions.
Since tomato is a very good source of income to small and marginal farmers in India, it ranks third in area immediately after potato and onion crop and second in production immediately after the potato Crop (Anon., 2016) [6]. Even though India is the second largest tomato producer in the world next to China, the productivity lies large below the average productivity of many small countries due to number of reasons ranging from climatic conditions to technology employed in management of crop, but most importantly the poor selection of varieties suitable to a particular region. Seed source or the variety is the cheapest input in crop production, yet the most important and yield deciding factor in the course. Therefore, the present experiment was conducted as on farm testing for evaluation of high yielding tomato hybrids for higher production under polyhouse conditions of Tiruchirappalli District, Tamil Nadu area to fulfill the demand of the people and also go for production in commercial scale.

Materials and Methods

The experiment was conducted during Kharif season of 2018-19 under naturally ventilated polyhouse at Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Tiruchirappalli, Tamilnadu. Three hybrids namely Arka Rakshak, Shivam and Lakshmi were selected for the experiment. The experimental design was laid out in a Randomized Block Design with eight replications. The seeds were sown in protrays using sterilized and enriched coco-peat as growing media. The main field was prepared to a fine tilth and FYM @ 25 t ha-1 was applied at the time of last ploughing. All other cultural practices including fertigation are followed as per the recommendations of crop production guide of Horticultural Crops, Tamil Nadu Agricultural University. Quantitative yield parameters such as plant height (cm), flower cluster/plant, flowers/cluster, fruits/plant, single fruit weight (g) and yield/plant (kg) were studied. The estimates of mean, variance and standard error were done as per Panse and Sukhatme (1967) [7]. The differences between treatments means which were higher than the respective CD values were considered as significant difference at the 5% level of probability (P=0.05). The difference between two treatments means were considered as significant.

Result and Discussion

The performance of three tomato hybrids, under polyhouse conditions during kharif crop, for different quantity parameters were presented in table 1. The results revealed that quantitative characters of three hybrids such as plant height (cm), flower cluster/plant, flowers/cluster, fruits/plant, single fruit weight (g) and yield/plant (kg) showed highly significant to each other. The plant height is found to be maximum in Lakshmi (114.82 cm) followed by Shivam (107.73 cm). Number of flower clusters plant^{-1} recorded its highest value in Lakshmi (19.57) followed by Shivam (17.73). On observing number of flowers cluster^{-1}, Shivam (6.65) and Arka Rakshak (6.63) are recorded maximum number of flowers and on par with each other. Hybrid Shivam recorded the highest values in parameters such as Number of fruits plant^{-1}, Single fruits weight and Yield plant^{-1} as 63.13 fruits plant^{-1}, 96.33 g fruit^{-1} and 5.10 kg plant^{-1} respectively. From these observations, it is revealed that, the plant height and the number of inflorescence (cluster per plant) have no influence on yield of the plant.

Also it is clear that the yield plant^{-1} effected its variation, after the fruit set occurs. In this experiment, maximum single fruit weight, number of fruits plant^{-1}, yield per plant was recorded in Shivam variety. Number of fruits per plant and single fruit weight are the entities that directly contribute to the yield per plant and to total yield per unit area. This is in evident with the experimental results of Dheemanth *et al.,* 2020 [8], Rangnamei *et al.,* 2017 [9], in tomato crop. Results obtained by Ali *et al.,* (2012) [10], Shresta and Sah (2014) [11], Lekshmi and Celine (2015) [12], for yield per plant also recorded in accordance with this experiment.

The hybrids studies for the conduct of this experiment are commercially important among farmers due to the yield performances, is observed with variation in yield. The variation in yield between the hybrids may also be due to genetic differences among the varieties since they were grown under the same environmental conditions (Olaniyi and Fagbayide 1999) [13]. Zahedi and Ansari (2012) [14] found significant variation in yield of tomato genotypes, whose impact on plant growth and yield was different for different genotypes.

Table 1: Quantitative parameters of tomato hybrids under polyhouse

Hybrids	Plant height (cm)	Number of flower cluster plant^{-1}	Number of Flowers cluster^{-1}	Fruits plant^{-1}	Single fruit weight (g)	Yield plant^{-1} (kg)
Arka Rakshak	98.61	16.53	6.63	60.80	85.15	4.80
Lakshmi	114.82	19.57	5.87	56.73	94.07	4.65
Shivam	107.73	17.73	6.65	63.13	96.33	5.10
Mean	107.05	17.94	6.38	60.22	91.85	4.85
SE.d.	0.74	0.14	0.04	0.29	0.54	0.02
CD	1.58	0.30	0.08	0.63	1.15	0.04

Conclusion

From the experimental results, it was concluded that Shivam hybrid recorded maximum yield of (5.10 kg plant^{-1}) and found suitable for polyhouse conditions at Tiruchirappallai district, Tamilnadu and the area with similar type of semi arid tropics for its comparative performances under polyhouse conditions.

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