



Performance of *Kharif* hybrid tomato varieties in plateau agro-ecosystems of Odisha

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ABSTRACT

Tomato (*Solanum lycopersicum* L.) is the second most important vegetable of the world. Its demand in the market is throughout the year though it is regarded as a winter crop. In the well drained soils of plateau ecosystem, it can be cultivated in *kharif* season even in open field. Mayurbhanj district of Odisha is an extension of Chhotanagpur plateau representing North Central plateau agro climatic zone. Tomato is cultivated by the farmers of the district sporadically with the varieties available in local market. This experiment was under taken during 2015-16 to 2016-17 in the KVK, Mayurbhanj adopted village Badabil in the Farmers' field to evaluate the performance of best suitable tomato variety in *kharif* season. From the three F1 hybrids taken, Laxmi variety was found giving the highest yield of 178.4 q ha⁻¹ though it was more prone to wilting like diseases. Proper plant protection measures should be taken to reduce the yield loss due to incidence of insect pest and diseases. Arka Rakshak F1 hybrid was found less suitable in this plateau ecosystem for *kharif* season.

Key words: *Kharif*, plateau, tomato, wilt, yield

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is the second most important vegetable in economic importance and consumption in the world after potatoes (Ibitoye et al., 2009). India is the second largest producer of tomatoes contributing 11.5% of global production after China (23%) (Shelke et al., 2016). Ripened tomatoes comprised of water (approximately 90%), soluble and insoluble solids (5-7%), citric and other organic acids and minerals. It is a rich source of vitamin A and C and also contains minerals like iron and phosphorous. Furthermore tomato is the richest source of dietary fibres, antioxidants like lycopene and beta-carotene (Singh et al., 2017). The antioxidant lycopene present in tomato plays an important role in prevention of cancer and other diseases in human beings (Agarwal and Rao, 2000). Its palatability and consumption in all forms has made it one of the most demanding vegetable globally. However,

being a winter crop, in the peak production season, it faces distress sale but as an off season crop, it has a good market demand with much remunerative for the farmers (Pradhan et al., 2017). As Scherinemachers et al. (2016) opines cultivation of crops outside the regular cropping calendar when supply is low and prices are high, can give farmers better profits and consumers more choice. Tomato production during *kharif* and summer is generally less due to a number of biotic and abiotic factors. Atmospheric temperature and intensity of rainfall limits its production around the year. Now- a-days tomato is cultivated in open field condition or in green house conditions (Pandey et al., 2006). Though demand is high, it cannot be produced everywhere in all the times. Odisha state has ten agro climatic zone which creates lots of opportunities for production of different types of crops in each season. The plateau area of Northern Odisha is an extension of Chhotanagpur plateau region. Its well

drained soil and undulated topography with mild temperature creates a platform for production of off season vegetables like tomato. Keeping in view of the importance of *kharif* tomato production, this study was undertaken to find out the best suitable variety in plateau ecosystem of Odisha.

MATERIALS AND METHODS

Mayurbhanj district, present in North Central plateau agro climatic zone of Odisha was selected purposively for the study. The land of the district is primarily undulated, well drained. About 50 acres of tomato was cultivated in Jashipur and its adjoining Karanjia and Raruan blocks during *kharif* season. This experiment was taken in farmer's field in KVK adopted village Badbil of Jashipur block with seven selected farmers with 0.25 acre of land each. Soil is sandy loam having soil pH 6.2. It was with high organic carbon, medium to high available N, Medium P and medium K. This trial was undertaken to ascertain the best suitable variety which was accessible and could be cultivated by the farmers of the zone. Three F1 hybrids Laxmi, Sakhyam and Arka Rakshak were taken for the study during *kharif* 2015-16 and 2016-17. The

phenological development and different yield attributing characters were recorded in due time and were analysed with different appropriate statistical tools. The relation between different factors was enumerated using t-test.

RESULTS AND DISCUSSION

As per the primary data available, off season tomato was cultivated in this area since more than a decade. Farmers were taking F1 hybrids available to them from the local market. However, no research was made to ascertain the suitable hybrid befitting to this agro climatic zone. The seeds of all three varieties were treated with Thiram 2 g kg⁻¹ and were sown in nursery during the last fortnight of July under low cost poly tunnel to avoid loss due to heavy rainfall. All seedlings were planted in a well drained pulverised soil at a distance of distance of 60 cm × 60 cm after seedling treatment in a solution of Carbendazim @ 2 g per litre and streptocyclin @ 1 g per 10 litre for 15 minutes. After 40 days of transplanting staking was given to plants with wooden sticks. Data recorded during various stages of crop growth on the phenological characters of different varieties in each plot during rabi 2015-16 and 2016-17 are mentioned as below.

Table 1. Phenological characters of different tomato hybrids (Average of the mentioned period)

Varieties	Plant height (cm)	No of branches	Fruits per plant	Average fruit weight (g)	Yield (q ha ⁻¹)
Laxmi	64.6	6.4	52.5	58.4	178.4
Sakhyam	61.5	6.3	45.3	41.4	129.6
Arka Rakshak	83.2	7.0	33.8	38.4	110.0
SEm(±)	2.35	0.16	2.28	2.84	2.52
CD(P=0.05)	6.8	6.6	8.2	7.2	7.4

From Table 1 it was observed that out of the three hybrid varieties tested in this agro-climatic zone, Laxmi variety performed the best. Though all the three varieties were F1 semi-indeterminate hybrids, yet Arka Rakshak performed poorly in comparison to other two

varieties. Arka Rakshak had the tallest physical growth with more number of branches but the fruits produced per plant were much less than the other two. Even it was observed that the average fruit size of the variety was only 38.4 g comparison to Laxmi variety which indicated

the variety was not fitted to this *kharif* season. The highest yield (178.4 q ha⁻¹) was recorded in Laxmi variety. All the yield attributing characters

were found statistically significant at 5% level of significance (Table 2) which corroborates the findings of Sengupta et al. (2018).

Table 2. Paired t –test of hybrid tomato cultivation

Parameters	t-calculated value
Height of plant	5.95*
No. of branches per plant	6.10*
No. of fruits per plant	11.36*
Weight per fruit	3.12*
Yield of tomato	2.57*

*Significant at 5% level of significance

Tomato cultivation in *kharif* season in open field requires much attention. Sufficient moisture and humidity in atmosphere and in soil make the crop prone to fungal infestations. *Fusarium* wilt, leaf blight and bacterial wilts are common problems in *kharif* tomato cultivation. To minimise the losses from such diseases, *kharif* tomato cultivation requires staking and support when the fruit is in contact with soil (Ranganamei, 2017). Such type of cultural practices reduces pest incidence and thereby increases the yield (Saunyama and Knapp, 2003). Table 3 below indicates the susceptibility of tested varieties to major insect pest and diseases.

Table 3. Susceptibility of major insect pest and diseases of different tested varieties

Varieties	Bacterial wilt (%)	Fungal wilt (%)	Leaf blight (%)	Fruit borer infested (%)	Fruit rot (%)
Laxmi	8.3	6.0	5.7	12.4	8.6
Sakhyam	14.1	6.5	4.6	11.6	8.8
Arka Rakshyak	1.6	3.4	7.2	9.6	7.6
SEm(±)	0.34	0.3	0.19	0.26	0.18
CD(P=0.05)	3.6	4.6	4.2	4.6	NS

Wilt is a major disease of tomato crop causing huge loss and reduces the productivity. Above table indicated that from the three hybrids tested, Arka Rakshak was found less susceptible to bacterial and fungal wilt than the other two. Asha et al. (2011) reported that *Fusarium oxysporum* causes vascular wilt in tomato and reduces the yield upto the maximum level. Arka Rakshak was reported to be more infested to leaf blight than Laxmi and Sakhyam. The fruit borer infestation was less in Arka Rakshak. Fruit rot disease was found insignificant with the variation of varieties of tomato.

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