

Participatory Evaluation of Tomato Varieties for Commercial Cultivation During Rainy Season Under Kaymore Plateau and Satpura Hills – Agro-Climatic Zone of Madhya Pradesh

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Abstract

Four tomato varieties, namely Kashi Vishesh, Kashi Anupam, Kashi Amrit and Hisar Arun (S-7), were evaluated against the variety Navoday in farmer's field with farmer's participation for yield potential and other yield characters at Satna, Madhya Pradesh during rainy seasons of two consecutive years 2009 and 2010. The experiment was arranged in complete randomized block design with 5 replications, farmer as a replication. The results of the experiment revealed that all the tested varieties have more yield potentiality than Navoday variety. Kashi Vishesh took the least time to flowering (44.49 days) and first harvest (73.14 days) after transplanting, gave the highest survivability of plants at harvest (91.25%), produced the maximum number of clusters per plant (11.90), number of flowers per cluster (1.99), number of fruits per plant (23.02), the highest marketable fruit yield (290.29 q per ha) and had the low incidence of Yellow Leaf Curl Virus disease. The investigation led to infer that Kashi Vishesh was the best-performing variety, and therefore, it could be recommended for commercial production during rainy season under rain fed conditions in well drained soils of the undulating terrain. Kashi Anupam with moderate high yield and some tolerance to Tomato Yellow Leaf Curl Virus might be regarded as other potential variety for the rainy season production of tomato

Keywords: participatory, undulating terrain, rainy season, Tomato Yellow Leaf Curl Virus (TYLCV)

1. Introduction

Tomato (*Solanum lycopersicum* L.) is one of the major commercial vegetable crops and widely grown both in the plains and hills of India. Tomato is cultivated in 83000 ha area in India with a total production of 7, 90,000 tonnes. Tomato cannot be grown in plains during June-October owing to high temperature and stagnation of water in fields during rainy season. Nonetheless, it can be grown successfully under rain fed conditions in well drained soils of the undulating terrain. Thus, sloppy lands and precipitation mainly received during June to September provide congenial conditions for growing rainy season tomatoes in certain areas and it can be a boon in supplementing the income of small and marginal farmers of the regions.

Though rainy season tomato cultivation is becoming increasingly attractive for cash generation in the undulating terrain of this agro climatic zone, the productivity of crop is very low due to several production problems, such as high mortality of seedlings at nursery stage, high incidence of yellow leaf curl virus, early and late blight incidences and unavailability of suitable varieties for the rainy season, thus- limiting tomato cultivation on a commercial scale. Kallo et al. (1998), while evaluating the performance of twenty cultivars of tomato for yield and its components, found Kashi Vishesh, Kashi Amrit, Kashi Anupam and Hisar Arun promising cultivars for rainy season in terms of good yield, attractive fruit shape and size, and comparatively less damage from insects and diseases. He also suggested use of TYLCV tolerant or resistant varieties for effective management of disease for rainy season production. Though there are many reports on varietal selection, appropriate time of planting, as well

as pest and disease control measures for rainy season tomato, these constraints still prevail in the farmers' fields. For promoting rainy season tomato production as a remunerative enterprise in the undulating terrain, availability of varieties tolerant to heat, rains and yellow leaf curl virus has become major constraint. Majority of tomato growers purchase tomato seeds from the market with no certainty of good performance. To provide alternative option of varieties and selection of suitable varieties to the vegetable growers, the experiment was conducted to evaluate four varieties of tomato especially recommended for rainy season cultivation against the variety (Navoday) cultivated currently by most of the farmers during rainy season.

2. Material and Methods

The experiment was conducted in Majhgawan block of Satna District during rainy seasons of two consecutive years 2009 and 2010. The experiment was arranged in a complete randomized block design (RCBD) with 5 replications, farmer as replication. Performance of four open pollinating tomato varieties (Kashi Vishesh, Kashi Anupam, Kashi Amrit and Hisar Arun) recommended by Indian Institute of Vegetable Research, Varanasi for rainy season production was evaluated against the Navoday variety cultivated by the farmers. All these varieties were sown in the raised nursery beds on 5th of June 2009 and 2010. After 25 days, the seedlings were transplanted in the experimental plots on 30th June of 2009 and 2010. The individual plot size was 15 m² (3 x 5 m) per treatment. Seedlings were transplanted with a spacing of 45 cm on ridges and 45 cm apart, counting a total of 60 plants per plot. The experimental plots were interspaced at 1.2 m. Each cultivar was given the same management treatments i.e. fertilization, irrigation, weeding and spray against insects, pests and diseases. Compost@25 tonnes per ha and NPK@ 50:60:60 kg per ha was applied as basal dose during field preparation and additional dose of nitrogen@70 kg per ha was applied as top dressing in two equal splits at 30 and 50 days after transplanting. Irrigation was applied as and when necessary. Normal cultural practices were adopted to raise the crops successfully. Five plants were selected at random in each plot every year to record the observations on plant height, number of branches, days to flowering, days to first fruit harvest, number of clusters per plant, number of fruits per cluster, fruits per plant, average fruit weight, marketable fruit yield, non-marketable fruit yield, and plant stand (survivability) at harvest. The yield was recorded on plot basis. TYLCV incidence and severity were recorded 75 days after transplanting. The severity was rated in 3 grades: 1- mild symptoms (light foliar yellowing), 2- moderate symptoms (light foliar yellowing, curling and slight plant stunting) and 3- severe symptoms (very severe plant stunting, leaf size reduction, leaf curling and yellowing). The mean data for all observations over two years were pooled and statistically analyzed following standard procedure.

3. Results and Discussion

Pooled analysis of variance carried out for all the characters revealed superiority of the tested varieties in relation to control variety (Navoday) cultivated by the farmers and indicated the need for selection of suitable variety for rainy season. The mean performance of the varieties in respect of plant height, number of primary branches, days to flowering, days to first harvest of fruits after transplanting, plant stand at harvest and incidence of TYLCV is presented in Table 1. All four tested varieties recorded smaller plant height than Navoday. Among all the varieties, the shortest plant height (61.96 cm) was recorded in Hisar Arun, followed by Kashi Vishesh (62.24 cm), and Kashi Anupam (65.59 cm), while the tallest plant (69.27 cm) was Navoday. The varieties were also observed to produce lesser number of branches per plant (7.30 to 7.96) as compared with Navoday, which produced 9.34 branches per plant. The variety Kashi Vishesh took the least time to flowering (44.49 days), followed by Hisar Arun (45.65 days) and Kashi Anupam (56.90 days). Similarly, the cultivar Kashi Vishesh took 73.14 days to the first harvest and thus was the earliest one, while Navoday was the late variety taking 83.18 days to the first harvest. The days to first harvest is envisaged as an index of earliness and plant stand at harvest in a variety is one of the important parameters for rainy and off-season production of tomato, which determines the resistance and tolerance of a variety to a particular environment and incidence of pests and diseases. The survival percentage among the varieties was found significantly different. The highest percentage of survivability of plants at harvest was observed in Kashi Vishesh (91.25%), followed by Kashi Anupam (87.41%), whereas the lowest survivability was observed in Navoday (69.38%). TYLCV incidence ranged from 15% in Kashi Vishesh to 46.94% in Navoday at 75 days after transplanting. Varieties Kashi Vishesh and Kashi Anupam had the low TYLCV incidence, whereas the varieties Hisar, Arun and Navoday showed high level of infection. Substantial variability for plant height, days to first harvest and incidence of TYLCV in tomato were also reported earlier by Kallo et al. (1998) and Manoj and Raghav (1998).

Table 1. Performance of tomato varieties in terms of plant growth, survival, flowering, maturity and resistance against tomato yellow leaf curl virus disease

Variety	Plant height [cm]	Number of branches	Days to flowering from transplanting	Days to first harvest from transplanting	Plant stand at harvest [%]	Tomato yellow leaf curl virus	
						Infestation [%]	Disease rating
Kashi Vishesh	62.24	7.67	44.49	73.14	91.25 (72.79)	15.0 (22.70)	1.27
Kashi Amrit	69.13	7.30	47.70	76.30	84.7 (66.99)	36.67 (37.27)	1.60
Kashi Aupam	65.59	7.47	45.90	74.62	87.41 (69.22)	26.67 (31.09)	1.29
Hisar Arun	61.96	7.96	45.65	79.08	77.98 (62.01)	43.89 (41.49)	2.07
Navoday	69.27	9.34	48.48	83.18	69.38 (56.40)	46.94 (43.24)	2.25
SE (m) ±	2.35	0.69	0.97	2.77	4.18	2.56	0.16
CD (0.05)	5.11	1.51	2.11	6.04	9.11	5.57	0.36

*Figures in parentheses are arcsine transformed values.

3.1 Yield and Yield Contributing Attributes

Results on the mean performance of varieties in respect of number of clusters per plant, number of flowers per cluster, number of flowers per plant, fruit weight, as well as marketable and non-marketable yield of fruits are presented in Table 2. Number of cluster per plant, number of flower per cluster, and fruits per plant are the most important yield attributes in tomato (Pandey et al., 2006). Among the varieties tested, the maximum numbers of clusters per plant (11.90), as well as number of flowers per cluster (1.99) were recorded in Kashi Vishesh, followed by Kashi Anupam, which produced 11.88 cluster per plant and 1.94 flowers per cluster. These values were significantly higher than the values recorded in control variety Navoday. Similarly, maximum number of fruits per plant were harvested from Kashi Vishesh (23.02) followed by Kashi Anupam (22.86) and Kashi Amrit (22.18). Infact, all tested varieites were found significantly superior to control variety Navoday, which produced the least number of fruits per plant (14.84). The fruit weight in tested varieties varied from 52.88 g in Hisar Arun to 60.59 g in Kashi Vishesh. The control variety Navoday recorded the maximum fruit weight (61.61 g). The considerable diversity in fruit characteristics of tomato varieties was also reported by Ahmad et al. (2007). Among the tested varieties, the highest marketable yield of fruits (290.29 q per ha) and lowest yield of non-marketable fruits (81.88 q per ha) was obtained from Kashi Vishesh which emerged as the best performing variety. A moderately high yield of 272.94 q per ha and 254.08 q per ha was produced by Kashi Anupam and Kashi Amrit, respectively. On the other hand for Navoday, the lowest yield of marketable fruits (179.03 q per ha) and the highest yield of non-marketable fruits (124.22 q per ha) were recorded. Similar marked differences in fruit yield of tomato varieties were reported by Mishra and Lal (1998) and Rida et al. (2002). The trend observed in the results indicates that the higher yield depends on the number of fruits and weight of fruits per plant as well as earliness. It was apparent, that fruit number and weight per plant showed a positive association with fruit yield of tomato.

Table 2. Yield and yield contributing attributes of tomato varieties

Variety	Number of cluster per plant	Number of fruits per cluster	Number of fruits per plant	Average fruit weight [g]	Marketable fruit yield [q/ha]	Non-marketable fruit yield [q/ha]
Kashi Vishesh	11.90	1.99	23.02	60.59	290.29	81.88
Kashi Amrit	11.45	1.85	22.18	57.51	254.08	89.27
Kashi Aupam	11.88	1.94	22.86	54.88	272.94	86.19
Hisar Arun	9.90	1.82	18.07	52.88	221.02	90.28
Navoday	8.35	1.77	14.84	61.61	179.03	124.22
SE (m) ±	0.47	0.08	1.42	1.86	18.31	8.65
CD (0.05)	1.02	0.16	3.09	4.05	39.90	18.85

4. Conclusion

The investigation allowed to infer that Kashi Vishesh was the best-performing variety under the rainy season in India, and hence can be suggested for commercial cultivation. Kashi Anupam with moderately high yield and some tolerance against TYLCV might be regarded as other potential variety for the rainy season production of tomato.

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