On-farm evaluation of high yielding tomato hybrids against tomato leaf curl virus in southern zone of Tamil Nadu

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ABSTRACT

Tomato is the important vegetable crop cultivated in Tirunelveli district of Tamil Nadu. Tomato leaf curl virus is the major problem faced by the farmers which leads to major yield reduction. An attempt was made to identify leaf curl virus resistant hybrids suitable for this region through on-farm trials in Tirunelveli district during 2018. The results revealed that Arka Samrat recorded higher yield of 56.40 tonnes/ha, more number of fruits (22 fruits/plant) and lower incidence of leaf curl virus (1.2%) compared to other varieties. Higher net return of Rs 2,30,500/ha and benefit-cost ratio of 2.71 were recorded in Arka Samrat compared to the other hybrids. Farmers were found satisfied with the Arka Samrat tomato hybrid due to its lower incidence of leaf curl virus, high market preference and high yielding nature. Arka Samrat would be a better option to the farming community for enhancing the productivity of tomato in southern zone of Tamil Nadu.

Keywords: Tomato hybrids; Arka Samrat; yield; leaf curl virus; disease resistance

INTRODUCTION

Tomato (*Solanum lycopersicon* L) belongs to Solanaceae family and it ranks third in priority after potato and onion in India. In India the tomato is grown in 7,89,000 ha area with a production of 19,759,000 MT and productivity of 16.1 MT/ha (Anon 2018). Begomoviruses, groundnut bud necrosis virus (GBNV), bacterial wilt (BW), root knot nematodes, foliar diseases such as early blight (EB), late blight and powdery mildew and insect pests such as red spider mite and leaf miner including pin worm (*Tuta absoluta*) have become major constraints in tomato production. Out of many diseases in tomato, bacterial wilt and tomato leaf curl virus (ToLCV) diseases are major diseases devastating crop and farmers income. The virus which is transmitted by the whitefly, *Bemisia tabaci* Gennadius belongs to the group of Geminiviruses (Fouquet et al 2003). The disease induces severe stunting, bushy growth and partial or complete sterility depending on the stage at which infection has taken place. The infected plant bears few or no fruits. The disease is serious throughout India and yield losses may be as high as 100 per cent (Kalloo 1988).

MATERIAL and METHODS

The present study was carried out by ICAR-Krishi Vigyan Kendra, in the Sundrapandiyapuram village of Tenkasi block, Tirunelveli district during the rabi season of 2018. The trial was taken up in the irrigated conditions where the tomato leaf curl virus was predominant one. Randomized block design was adopted in the trial by using 3 treatments and 5 replications. The treatments included resistant hybrids like Arka Samrat and Arka Rakshak selected for on-farm trials with the farmers practice of Shivam (local check). The special features of the selected varieties are presented in Table 1. The selected progressive farmers were trained on scientific method of cultivation as recommended by Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu. The sowing was performed by the farmers as per the scientists guidelines. The demonstrated fields were regularly monitored and periodically observed by the scientists of the KVK. Incidence of leaf curl virus disease was calculated by counting of the number of plants infected and total number of plants in the plot by using the formula as suggested by Banerjee and Kalloo (1987).

$$\text{Pest/disease incidence (\%)} = \frac{\text{Number of plants infected in a row}}{\text{Total number of plants in a row}} \times 100$$

At the time of harvest yield data were collected from all the treatment plots. The cost of cultivation and profit details of both the systems were collected from the farmers for working out the benefit-cost ratio. Each hybrid was sown in an area of 1 acre in each farmer's field and the package of practices was followed as per the Tamil Nadu Agricultural University recommendations. The data on fruit yield and cost economics of all the varieties were recorded based on the prevailing market prices.

RESULTS and DISCUSSION

The results of the on-farm trials (Table 2) reveal that lower incidence of leaf curl virus was recorded in Arka Samrat (1.2%) that was on par with Arka Rakshak (2.0%) hybrid. The highest incidence of the virus (26.5%) was recorded in farmer practicing hybrid Shivam (local check). The data given in Table 3 indicate that Arka Samrat hybrid recorded the highest fruit yield of 56.40 tonnes/ha followed by Arka Rakshak (51.90 tonnes/ha). The maximum number of fruits per plant was recorded in Arka Samrat (22) followed by Arka Rakshak (18). Similarly the yield per plant was recorded higher in Arka Samrat (1.75 kg) followed by Arka Rakshak (1.60 kg). Farmer practicing variety, Shivam recorded the lower yield of 41.8 tonnes/ha and low number of fruits per plant (14). The results of the present study are in line with the findings of Dheemanth et al (2020), Sadashiva et al (2017), Jamuna et al (2017), Mamatha et al (2017), Kumar and Gowda (2017) and Lakshmi et al (2017).

The highest gross and net return of Rs 3,68,000/ha and 2,30,500/ha respectively was recorded in Arka Samrat followed by Arka Rakshak the recorded the gross return of Rs 3,27,700/ha and net return of Rs 1,90,200/ha. The lowest gross and net return was observed in local check (Shivam). The highest benefit-cost ratio of 2.71 was recorded in case of Arka Samrat followed by 2.40 in Arka Rakshak. The least benefit-cost ratio of 1.98 was recorded in local check (Table 4).

CONCLUSION

Based on the findings it is concluded that tomato hybrid Arka Samrat recorded higher fruit yield and lower incidence of tomato leaf curl virus. Higher net return of Rs 2,30,500/ha and benefit-cost ratio of

Table 1. Leaf curl virus resistant hybrids selected for on-farm trial and their special features

Variety	Special features
Arka Samrat	Oblate to high round fruited hybrid; bears more number of fruits per plant; fruit around 90-110 g, deep red; firm fruits, suitable for fresh market; triple disease resistance to tomato leaf curl virus, bacterial wilt and early blight; yield 80-85 tonnes/ha in 140 days; released by IIHR, Bangalore, Karnataka
Arka Rakshak	High yielding F_1 hybrid; triple disease resistance to tomato leaf curl virus, bacterial wilt and early blight; fruit square round, large, around 90-100 g; deep red and firm fruits, suitable for fresh market and processing; yield 75-80 tonnes/ha in 140 days; released by IIHR, Bangalore, Karnataka
Farmers practice (Shivam)	Resistant to leaf curl virus; fruit deep red and round in shape; duration 150 days

Table 2. Per cent disease incidence as influenced by hybrids

Hybrid	Disease incidence (%)
Arka Samrat	1.2
Arka Rakshak	2.0
Shivam (local check)	26.5

Table 3. Growth and yield attributes of tomato hybrids

Parameter	Arka Samrat	Arka Rakshak	Shivam (local check)
Number of fruits/plant	22	18	14
Yield per plant (kg)	1.75	1.60	1.25
Yield (tonnes/ha)	56.40	51.90	41.80

Table 4. Cost economics for selected tomato hybrids

Parameter	Arka Samrat	Arka Rakshak	Shivam (local check)
Gross cost (Rs/ha)	1,37,500	1,37,500	1,43,300
Gross return (Rs/ha)	3,68,000	3,27,700	2,81,100
Net return (Rs/ha)	2,30,500	1,90,200	1,37,800
B:C	2.71	2.40	1.98

2.71 was recorded in Arka Samrat compared to the local check. Farmers were satisfied with Arka Samrat hybrid since it performed well with high resistance to tomato leaf curl virus disease and higher market preference. Therefore Arka Samrat tomato hybrid was identified as a leaf curl virus resistant variety for southern zone of TamilNadu.

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