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Evaluation of okra varieties for growth, yield and tolerance to yellow vein mosaic virus (YVMV) in the sub-montane low hills of Himachal Pradesh

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Abstract

Okra, a major vegetable crop grown widely throughout India including Himachal Pradesh is seriously infected by yellow vein mosaic virus (YVMV) which is known to cause losses up to 94%. The productivity of any crop is mainly influenced by cultivar and disease/ pest management. The field evaluation of some important varieties of okra concluded that cultivars P-7 and Prabhani Kranti with a yield potential of 84.04 and 72.29q ha^{-1} in that order were the top yielder in spring-summer season whereas, Varsha Uphaar (117.30q ha^{-1}) and Prabhani Kranti (110.40q ha^{-1}) with low disease incidence (<10%) were the most promising for the rainy season.

Keywords: Okra, evaluation, varieties, yield, tolerance, YVMV.

Introduction

Okra (*Abelmoschus esculentus* (L) Moench) also called as lady's finger or bhindi is one of the most common and principal vegetable crops grown throughout the country. Because of its nutritive value and long post harvest life, it has captured a prominent position among the export oriented vegetables. In Himachal Pradesh, it is grown both as spring-summer (March-June) and rainy season (July-October) crop in the low and mid hill areas.

Of the various factors responsible for enhancing fruit production, selection of a suitable variety for a particular agro-climatic situation assumes greater importance. The crop is attacked by a number of diseases and yellow vein mosaic virus is the most serious and infects all plant parts including fruits (Sharma *et al.*, 1993). This virus has been reported to cause up to 94% loss in yield (Singh, 1985). Therefore, it was considered imperative to evaluate the important commercial varieties to find out the suitable ones w.r.t. quality production and no or minimal disease (YVMV) incidence for cultivation in the low hills of the state.

Material and Methods

The experiment was conducted at Regional Horticultural Research Station, Dr. Y. S. Parmar University of Horticulture and Forestry, Jachh (32^0 18' N 75^0 55'E), Kangra, H.P., during spring-summer and rainy season in 2004 and 2005. Seven okra varieties viz; P-8, Sel.-51, Varsha Uphaar, Arka Anamika, Prabhani Kranti, VRO-6 and P-7 were tested in Randomized Block Design with three replications. Irrespective of varieties, the recommended doses of manure (FYM 100 q ha^{-1}) and fertilizers (N: P_2O_5: K_2O @ 75:55:55kg ha^{-1}) were applied. Whole FYM, Super phosphate and Muriate of Potash and half of CAN was given as basal dose at the time of field preparation and remaining quantity of CAN was applied in two equal splits at 30 and 60 days of seed sowing. Sowing of seeds was done in rows of 45cm during spring-summer and 60cm in rainy season. By thinning (3-4 weeks after seed sowing) the plant stand within rows was maintained at 15cm in summer and 20cm for rainy season crop. All other recommended cultural operations were followed during the period of experimentations. Observations were recorded on growth and fruit yield attributes as given in the table 1 and 2 for spring-summer and rainy season crops, respectively. The reaction of genotypes to disease was assessed based on the scale 0.0: immune; 0.1-5.0: highly resistant; 5.1-10.0: resistant; 10.1-20.0: moderate resistant; 20.1-40.0: moderate susceptible 40.1-70.0: susceptible and >70.0: highly susceptible and presented through Table-3.

Results and Discussion

Spring-summer crop

Perusal of data in Table 1 showed that all characters differed significantly due to varieties except diameter of fruit. The tallest plants were observed in P-8 (73.66cm) followed by at par

Table 1. Performance of okra varieties during spring-summer sseason

Varieties	Plant height (cm)	Days to Ist harvest	No. of fruit/plant	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (gm)	Yield (q ha^{-1})
P-8	73.66	63.33	4.28	11.40	1.44	11.16	59.68
Sel.-51	49.71	59.17	4.77	12.09	1.46	12.23	65.25
Varsha Uphaar	59.36	59.83	3.87	11.01	1.40	10.46	51.23
Arka Anamika	70.64	61.50	4.65	10.53	1.45	10.21	59.43
Prabhani Kranti	55.63	57.50	5.06	11.76	1.46	11.22	72.29
VRO-6	58.93	62.50	3.98	9.84	1.47	9.65	49.50
P-7	67.24	61.17	5.99	10.71	1.43	10.78	84.04
CD (P=0.05)	7.05	1.54	0.71	1.46	NS	1.43	9.13

performance of Arka Anamika (70.64cm) and P-7 (67.24cm). Regarding days to Ist harvest, Prabhani Kranti was the earliest to mature (57.50 days) followed by Sel.-51(59.17) and Varsha Uphaar (59.83). The longest fruits (12.09cm) obtained in Sel.-51 were statistically identifiable with other cultivars except VRO-6, which produced smallest sized fruit (9.84cm). Average fruit weight was also highest in Sel.-51(12.23g) and lowest in VRO-6 (9.65g). Highest numbers of marketable fruits per plant (5.99) were produced by P-7 followed by Prabhani Kranti (5.06) and Sel.-51(4.77). Consequently, the highest yields of 84.04, 72.29 and 65.25q ha^{-1}, respectively were also registered by these varieties in that order. The variations in respect of plant height, days to Ist flower/harvest, fruit size, fruit weight, fruit number and yield per hectare in okra among varieties/ hybrids has also been reported by Patil *et al.*(2005) and Dash *et al.* (2001).

Rainy season crop

Performance of okra genotypes given in table 2 revealed significant variations for all the traits under scrutiny.

Prabhani Kranti produced the tallest (114.60 cm) plants whereas; VRO-6 registered minimum (92.82 cm) plant height. Varsha Uphaar was earliest (48.43 days) to produce marketable pods whereas, VRO-6 took maximum (55.17) days to Ist harvest. Longest fruits were obtained in Varsha Uphaar (13.34 cm), followed by Prabhani Kranti (12.75 cm) and Sel.-51 (12.47 cm). VRO-6 recorded smallest (10.01 cm) fruits. As far the fruit numbers were concerned, Prabhani Kranti with 12.20 fruits per plant topped the list of varieties, closely followed by Varsha Uphaar (11.61 fruits). VRO-6 produced smallest as well as least number of marketable fruits/plant. The fruit weight varied between 10.14g (VRO-6) and 13.11g (Varsha Uphaar).

The highest pod yield (117.30 q ha^{-1}) was recorded by Varsha Uphaar followed by Prabhani Kranti (110.40 q) and the differences between the two were non-significant. The highest pod production by these varieties is primarily attributed to higher number of fruits per plant, bigger fruit size and the highest individual fruit weight. Singh (2000) evaluated many genotypes in Western UP, and found that Prabhani Kranti was the most promising by virtue of its high yielding ability and pod weight. This variety also recorded better performance at Akola over other newly evolved varieties (Ambare *et al.*, 2005).

Table 2. Performance of okra varieties during rainy season

Varieties	Plant height (cm)	Days to Ist harvest	No. of fruits/plant	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (gm)	Yield (q ha^{-1})
P-8	104.80	54.33	9.47	12.28	1.46	12.77	97.33
Sel.-51	108.40	51.67	9.40	12.47	1.52	11.88	95.22
Varsha Uphaar	106.00	48.43	11.61	13.34	1.44	13.11	117.30
Arka Anamika	104.50	51.17	10.59	12.09	1.51	11.74	99.14
Prabhani Kranti	114.60	50.33	12.20	12.75	1.46	12.18	110.40
VRO-6	92.82	55.17	7.36	10.01	1.55	10.14	69.65
P-7	102.00	51.17	9.45	12.15	1.49	10.97	90.10
CD (P=0.05)	6.70	2.10	1.53	0.91	0.07	1.79	12.99

Incidence of yellow vein mosaic virus

All the seven cultivars were also evaluated for the incidence of yellow vein mosaic virus under field conditions during rainy season in both the years. Perusal of Table 3 revealed that four cultivars viz.; P-8, Prabhani Kranti, Varsha Uphaar and Sel.-51 with disease incidence of < 10.0 % were rated resistant to yellow vein mosaic whereas, Arka Anamika and P-7 with an incidence of 12.30 and 14.40% respectively were placed in the moderate category. Patil *et al.* (2005) evaluated some newly evolved genotypes along with Prabhani Kranti, Varsha Uphaar and Arka Anamika as standard checks and a disease incidence of 4.30, 1.50 and 0.72%, respectively was observed in these checks. Based on three years successive experimentation in UP, Singh (2000) also confirmed the resistance of Prabhani Kranti to yellow vein mosaic virus. Singh *et al.* (2002) found Arka Anamika as moderately resistant to the mosaic virus. Arka Anamika was also found to have moderate resistance to this virus at Karnal (Haryana) whereas; Varsha Uphaar was free from the disease (Srivastava *et al.*, 1995). VRO-6 was found highly infected with virus and registered 44.20 per cent incidence and thus was classified as susceptible in our study. Srabani and Nath (2003) also tested VRO-6 at Kalyani, along with other varieties in relation to yield and disease incidence and rated it moderate yielder (33.24 q/ha) with high degree of mosaic incidence (20.74 % in 1999 and 92.59 % in 2000). However, Vijaya (2004), while conducting similar studies at Rajendranagar (Hyderabad), found VRO-6 as highly productive (67.20 q ha^{-1}) with a moderate incidence (YVMV) of 10.8 per cent (1999) and 5.5 per cent (2000). The reason for such variations in reaction may be attributed to the existence of variable population of vector of different biotypes or strains of YVMV due to location specific effect.

Table 3. Reaction of okra varieties to YVMV under natural field conditions (Rainy season crop)

Values (Scale)	Reaction	Disease Incidence (%)	Varieties
0.00	Symptom less (Immune)	-	-
0.1-5.0	Highly resistant (HR)	-	-
5.1-10.0	Resistant (R)	6.80	P-8
		9.10	Prabhani Kranti
		9.30	Varsha Uphaar
		9.70	Sel.-51
10.1-20	Moderate resistant (MR)	12.30	Arka Anamika
		14.40	P-7
20.1-40	Moderate susceptible (MS)	-	-
40.1-70	Susceptible (S)	44.20	VRO-6
70.1-100	Highly susceptible (HS)	-	-

The study concluded that P-7 and Prabhani Kranti with an yield potential of 84.04 and 72.29q ha^{-1}, respectively are the most promising for spring-summer cultivation whereas, in the rainy season the choice based on yield and resistant reaction to yellow vein mosaic virus should be between Varsha Uphaar and Prabhani Kranti under low hill conditions of Himachal Pradesh.

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