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Effect of plant spacings and cultivars on spread of Yellow Vein Mosaic Virus (YVMV) disease

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A B S T R A C T

Spread of yellow vein mosaic virus (YVMV) disease in different plant spacing 30 x 30 cm, 50 x 30 cm, 60 x 30 cm, 60 x 60 cm and 60 x 40 cm and using two cultivars, i.e., Cv. Parbhani Kranti and Local indicated that the first appearance of symptom was earlier in Cv. Local and late in Cv. Parbhani Kranti. The rate of infection was higher at 45 to 60 days after sowing in both kharif and summer while in Cv. Local it was higher at 30 to 45 days after sowing. Less infection rate was observed at 30 to 45 days after sowing in closer plant spacing 30 x 30 cm in both kharif and summer seasons also the minimum infection rate throughout its growth period was observed in closer plant spacing i.e. 30 x 30 cm in kharif. Among Cultivar Cv. Parbhani Kranti show slow progress of the disease. Among plant spacings the closer plant spacing 30 x 30 cm show slow progress of the disease followed by 50 x 30 cm and 60 x 30 cm both in kharif and summer seasons.

Keywords: Yellow vein mosaic virus, okra, whitefly, plant spacing, cultivars, disease spread.

Introduction

Yellow vein mosaic virus (YVMV) disease of okra (*Abelmoschus esculentus*) was most destructive disease in India as it was reported as long back in 1924 (Kulkarni 1924). It affects the quality and yield of okra. Attempts have been made by several workers to reduce the disease through cultural control by use of polythene mulching and intercropping (Shastry & Singh 1973; Khan & Mukhopadhyay 1985). In the present study, effects of different plant spacings along with varietal reactions on spread of YVMV have been tried.

Materials and Methods

To study the effect of different plant spacing on apparent infection rate and disease progress of yellow vein mosaic of okra a field experiment was conducted.

The experiment was laid out in factorial randomized block design with five different plant spacings and two cultivars *viz.* Parbhani Kranti and Local as treatments with four replications. The sowing was done on 30th July, 2005 in *kharif* season and on 16th February, 2005 in summer season, respectively. The crop was cultivated by adopting all recommended cultural practices. The plots were exposed to natural invasion by whiteflies for natural spread of the disease.

Whiteflies counts were recorded as per the method modified from Sipell *et al*. (1982). The whiteflies were counted early in the morning before 8 o'clock from three leaves i.e., bottom, middle and top leaves of randomly three selected plants from each treatment. The whitefly counts were recorded from 7 days to 120 days after sowing with an interval of 7 days. The data on vector population was transformed by using Poison formula, $x + 0.5$ where, x = average number of vectors and analyzed statistically.

The plant showing infection to yellow vein mosaic were marked at different growth stages, i.e., from incidence to 120 days after sowing with an interval of 15 days. The percentage of incidence was worked out.

An apparent infection rate (r) as influenced by

different treatments in the experiment was calculated by using the formula as suggested by Vander Plank (1963).

$$r = \frac{2.3}{t_2 - t_1} \log_{10} \frac{x_2 (1-x_1)}{x_1 (1-x_2)}$$

Where,

r = Infection rate in unit per day

t_2-t_1 = Time (days) between first observation and subsequent observation

x_1 and x_2= Percentage of disease on the first and subsequent observation dates, respectively

Similarly, based on incidence at different stages of crop, the disease progress curves were drawn as cumulative curve by plotting disease value as $\log_e (1/1-x)$ against time (Vander Plank 1963).

Results

The data on an apparent infection rate and progress of yellow vein mosaic disease as influenced by cultivars and plant spacing's is presented in Tables 1a and 1b and Fig. 1a and 1b.

The cultivars *viz.* Parbhani Kranti and Local differed in exhibiting the disease incidence. In cultivar Local first disease incidence was noticed at 30 days after sowing in both *kharif* and summer. In cv. Parbhani Kranti it appeared 45 and 30 days after sowing in *kharif* and summer respectively. The delayed occurrence of disease in cv. Parbhani Kranti influenced infection rate of disease yellow vein mosaic of okra. The infection rate in cv. Parbhani Kranti was highest between 45 to 60 days after sowing in both *kharif* and summer and in cv. Local it was between 30 to 45 days after sowing in both the cultivars. In subsequent growth stages infections occurred throughout the season, but the in both the cultivars infection increases with increase in the age of the crop.

The plant spacings showed no congenial influence on the infection rate at different growth stages of okra. However, at seedling stage i.e. 30 to 45 days after sowing, the infection rate was highest in 50 x 30 cm (r=0.0351) than rest of the spacing's in *kharif* season, while it was highest in 30 x 30 cm spacing (r=0.0762) in summer season. The infection rates in all plant spacings in substantial growth stages from 45 days till harvesting decreased progressively.

The progress of yellow vein mosaic of okra was influenced by cultivars is depicted in Fig. 2a and by plant spacing's in Fig. 2b.

The cultivars exhibited difference in the pattern of development of yellow vein mosaic of okra. Cultivar Parbhani Kranti recorded less disease incidence and showed the slow progress in development of disease. The first incidence was noticed 30 days after sowing and in subsequent growth stages the disease increased but steadily in *kharif*. In cultivar Local first incidence of the disease was noticed 30 days after sowing but the progress of the disease in subsequent growth stages was very fast as compared to Cv. Parbhani Kranti. Similar trend in respect of progress of the disease was found in both the cultivars in summer season.

The disease progress curve as influenced by plant spacings depicted in Fig. 2b revealed that the plant spacing showed influence on progress of the yellow vein mosaic disease of okra. In closer plant spacing 30 x 30 cm (T_1) the progress of the disease was slow throughout the growth period followed by 50 x 30 cm (T_2), 60 x 30 cm (T_3), 60 x 40 cm (T_5) and 60 x 60 cm (T_4). Progress of the disease in summer was similar to *kharif*.

Discussion

The highest infection rate in cv. Parbhani Kranti was between 45 and 60 days after sowing and in cv. Local between 30 and 45 days after sowing in both *kharif* and summer. In subsequent growth stages infections occurred throughout the season and decreased with increase in age of the crop. The plant spacings did not influence the infection rate considerably. However, at seedling stage (30 to 45 days after sowing) some differences were noticed. The spacing 50 x 30 cm recorded highest infection in *kharif* while, closer spacing 30 x 30 cm recorded highest infection in summer. A similar result of influence of spacing on infection rate was reported by Sonwane (2004).

Less incidence and slow development of yellow vein mosaic disease was observed in cv. Parbhani Kranti than cv. Local in both *kharif* and summer. The closer plant spacings 30 x 30 cm and 50 x 30 cm recorded less incidence of the disease in both *kharif* and summer in all spacing's. The development of disease was also slower in wider spacings. Similar result in CV. Local was also obtained by Sonwane (2004).

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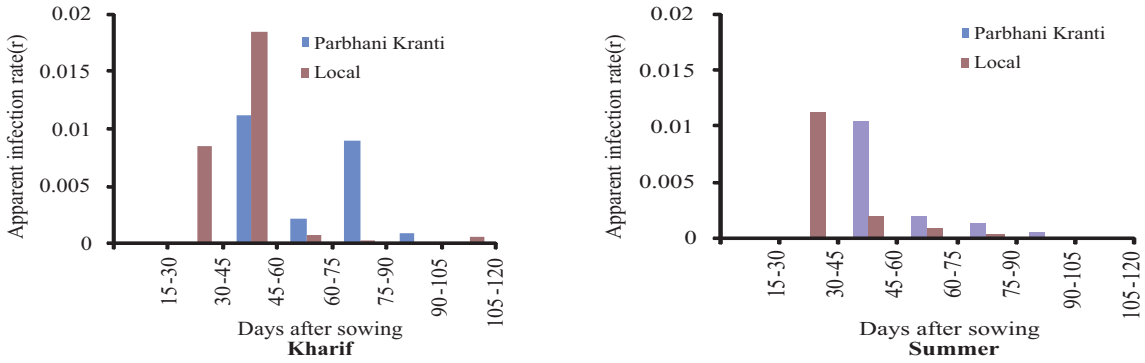

Fig. 1a Rate of yellow vein mosaic disease increase (apparent infection rate(r) as influenced by cultivars of okra)

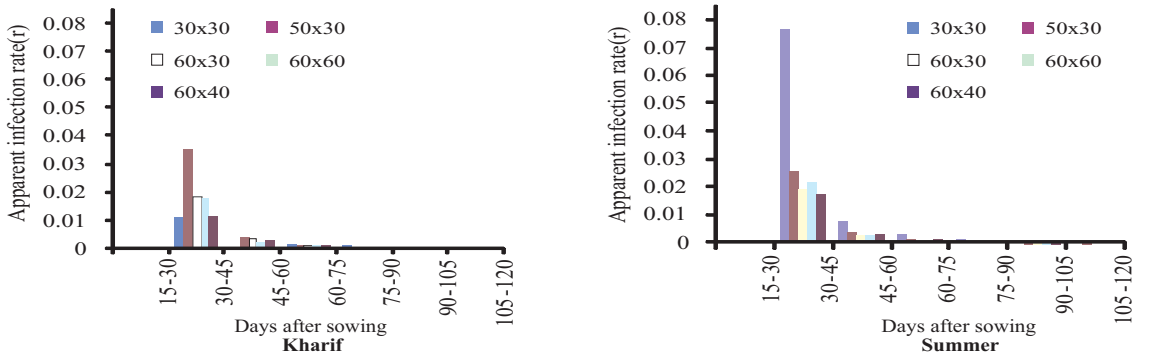

Fig.1b Rate of yellow vein mosaic disease increase (apparent infection rate (r)) as influenced by plant spacings in okra

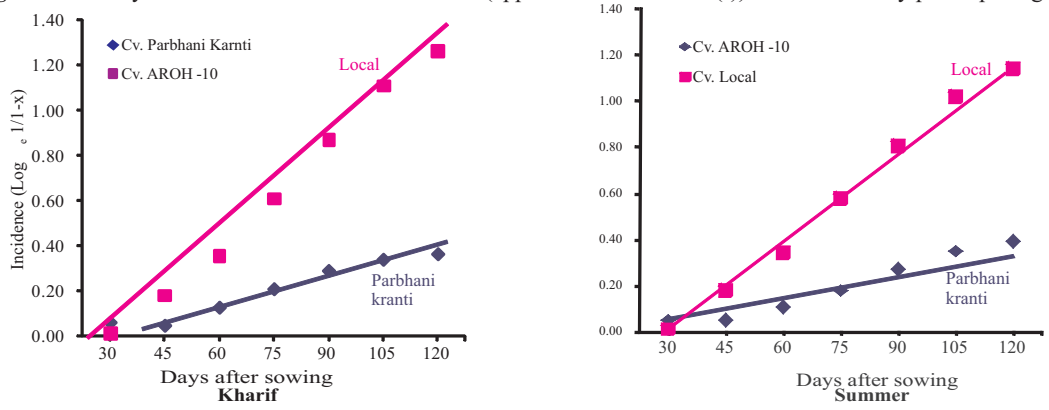

Fig. 2a Yellow vein mosaic disease progress as influenced by cultivars in okra

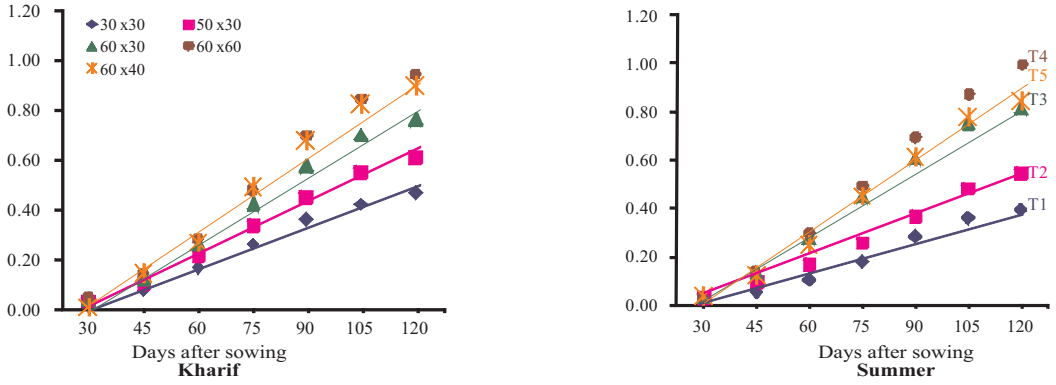

Fig. 2b Yellow vein mosaic disease progress as influenced by different plant spacings in okra

Table 1a.
Yellow vein mosaic disease development and apparent infection rate (r) as influenced by cultivars and plant spacing in okra during *kharif*

Sr. No.	Treatments	Disease incidence (%) days after sowing (cumulative)								Apparent infection rate (r*) unit/day at different growth development stages						
		15	30	45	60	75	90	105	120	15-30	30-45	45-60	60-75	75-90	90-105	105-120
A)	**Cultivars**															
1.	Parbhani Kranti	0.00	0.00	4.43	11.75	18.66	24.95	28.57	30.29	0.00	0.00	0.0111	0.0022	0.0009	0.0003	0.0001
2.	Local	0.00	5.74	16.52	29.85	45.62	58.01	66.99	71.69	0.00	0.0085	0.0184	0.0007	0.0003	0.0001	0.0005
B)	**Plant spacing (cm)**															
3.	30x30 cm	0.00	1.23	6.87	15.10	22.85	29.82	34.18	36.88	0.00	0.0107	0.0004	0.0015	0.0007	0.0002	0.0001
4.	50x30 cm	0.00	2.11	9.24	18.72	28.03	35.70	41.98	45.22	0.00	0.0351	0.0039	0.0012	0.0005	0.0002	0.0001
5.	60x30 cm	0.00	3.21	10.79	22.73	33.87	43.31	50.24	53.01	0.00	0.0183	0.0034	0.0010	0.0004	0.0002	0.0000
6.	60x60 cm	0.00	3.37	12.96	24.16	37.74	49.88	56.68	60.92	0.00	0.0180	0.0025	0.0010	0.0004	0.0001	0.0000
7.	60x40 cm	0.00	4.42	12.51	23.29	38.21	48.67	55.80	58.92	0.00	0.0115	0.0026	0.0011	0.0003	0.0001	0.0000

* $r = \frac{1}{t_2 - t_1} \times \log_{10} \frac{x_2(1-x_1)}{x_1(1-x_2)}$

Table 1b.

Yellow vein mosaic disease development and apparent infection rate (r) as influenced by cultivars and plant spacing in okra during summer

Sr. No.	Treatments	Disease incidence (%) days after sowing (cumulative)								Apparent infection rate (r*) unit/day at different growth development stages						
		15	30	45	60	75	90	105	120	15-30	30-45	45-60	60-75	75-90	90-105	105-120
A)	**Cultivars**															
1.	Parbhani Kranti	0.00	0.65	4.33	9.94	16.31	23.56	29.44	32.06	0.00	0.00	0.0104	0.0028	0.0013	0.0005	0.0001
2.	Local	0.00	4.75	15.78	28.54	43.57	55.20	63.81	67.97	0.00	0.0113	0.0019	0.0008	0.0003	0.0001	0.0000
B)	**Plant spacing (cm)**															
3.	30x30 cm	0.00	1.34	4.93	9.62	16.14	24.48	29.96	32.42	0.00	0.0762	0.0077	0.0030	0.0014	0.0004	0.0000
4.	50x30 cm	0.00	2.53	8.76	15.23	22.72	30.64	38.24	42.16	0.00	0.0254	0.0035	0.0015	0.0007	0.0001	0.0001
5.	60x30 cm	0.00	3.23	12.19	23.84	35.93	45.39	52.69	55.56	0.00	0.0189	0.0028	0.0009	0.0004	0.0001	0.0000
6.	60x60 cm	0.00	3.00	12.93	25.67	38.86	50.14	58.28	63.05	0.00	0.0216	0.0027	0.0009	0.0003	0.0001	0.0000
7.	60x40 cm	0.00	3.40	11.44	21.82	36.04	45.75	53.95	56.87	0.00	0.0171	0.0029	0.0012	0.0004	0.0002	0.0000

* $r = \frac{1}{t_2 - t_1} \times \log_{10} \frac{x_2(1-x_1)}{x_1(1-x_2)}$