

Effect of micronutrients as IDM component on host proneness for chlorotic mottle (Geminivirus) disease in frenchbean (*Phaseolus vulgaris* L.)

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ABSTRACT

Micronutrient application as IDM component was found to trigger resistance in Frenchbean (*Phaseolus vulgaris* L.) cv. CONTENDER against development of chlorotic mottle (Geminivirus) disease tested in *rabi* and *kharif* seasons. Observations in the form of vigor, appearance of disease at days after sowing and stress tolerance index I revealed positive effect of micronutrients in comparison to insecticidal treatment in microplot studies. The effects of micronutrients on chlorotic mottle disease were evidently seen in *rabi* season and *kharif* season crop.

Key words : Frenchbean, Chlorotic mottle, Geminivirus, Vigour.

Frenchbean (*Phaseolus vulgaris* L.) is an important vegetable and pulse crop. After chlorotic mottle (geminivirus) disease outbreak the crop cultivation became non profitable. Chlorotic mottle (geminivirus) disease in Frenchbean has a very short history in Jabalpur region (Keshwal, 2001). Before that Frenchbean crop was extensively grown in this area. Practice like vector control yielded no result. The effect of micronutrients as IDM (integrated disease management) components have been studied to know as what type of effect they do on host vis-a-vis reduction and or increase in disease, helping fight back phenomenon of the host and so on. The effect of micronutrients was aimed at analysing the above effect in terms of increasing plant resistant once, suppression of inoculum build up and sustaining health/growth and yield. These were mediated in a trial through microplot studies and study of various disease aspects and yield parameters/plant performance.

MATERIALS AND METHODS

Experiments were conducted in the Plant Virology Laboratory, cagehouse, glasshouse and microplots of Plant Pathology Department, College of Agriculture, JNKVV, Jabalpur (M.P.). Election microscopy was done in Advance Centre for Plant Virology, IARI, New Delhi. Study on inoculum reduction and factors indicating host resistance against chlorotic mottle (geminivirus) disease in Frenchbean was done. Experiment was conducted in microplot in the cagehouse in *kharif* and *rabi* seasons of year 2002-2003 using Frenchbean cultivar, Contender. Micronutrients (in the form of chemical compounds) were taken along with the application of systemic insecticides (Metasystox and Carbofuran) for vector control. Application of sulphur, metasystox, zinc sulphate, ferrous

sulphate, carbofuran and manganese sulphate was done. Micronutrients as soil application were applied at once before sowing of seeds and followed by spray application twice at 15 and 30 days after germination of seeds. Four replications were made. Routine seed treatment with fungicides, thiram (3g/kg) and bavistin (1.5 g/kg) along with Rhizobium culture was followed. The plants in pots with severe symptoms of chlorotic mottle (geminivirus) disease were kept in between the replications for natural inoculation. Observations were recorded as appearance of disease at days after sowing, plant vigour (plant vigour was calculated by indirect method with the help of disease index), disease index (calculated from five random plants), stress tolerance index (STI) and yield per plant and yield per plot. Data were used for computation of various parameters using the following formula:-

$$\text{Disease index (DI)} = \frac{\sum \text{of numerical ratings} \times 100}{\text{No. of plants observed} \times \text{highest degree of rating}}$$

$$\text{Stress tolerance index (STI)} = \frac{\text{Yield of healthy plant} \times \text{Yield of disease plants}}{(\text{mean yield of healthy plant})^2}$$

Disease index:

Numerical rating description

0	Healthy
1	Initial symptoms on leaf
2	Mild symptoms on leaf
3	Symptoms on leaf and other parts of plant
4	Severe symptoms over category 3
5	Complex symptoms, distortion, dwarfing etc.

RESULTS AND DISCUSSION

It is evident from the data present in the Table 1 that

application of ferrous sulphate increased the plant vigour to a tune of (95 in *kharif* and 89 in *rabi*) followed by Zinc sulphate, manganese sulphate (79 and 81) and sulphur (69 and 45) in comparison to check (68 and 45). The application of carbofuran (72 and 77) and metasytox (69 and 58) affected the plant vigour positively. The disease appearance was in case of ferrous sulphate at (43, *kharif* and 32, *rabi*) DAS followed by manganese sulphate (16 and 20), sulphur (9 and 10) and zinc sulphate (30 and 19), application of carbofuran (13 and 11) and metasytox (17 and 21) delayed the disease initiation as compare to check (10 and 8). Application of zinc sulphate increased the ratio of stress tolerance index (STI) to a tune of (5.61, *rabi* and 4.60, *kharif*) followed by ferrous sulphate (3.81 and 2.74) manganese sulphate (4.50 and 3.46) sulphur (3.67 and 3.75) as compared to check (2.20

results were found on okra yellow vein mosaic (geminivirus) disease by (Pun *et al.*, 2000).

Indicators revealed the significance of micronutrient application in triggering resistance for chlorotic mottle (geminivirus) disease development in Frenchbean crop. Observations in the form of appearance of disease at days after sowing, plant vigour stress tolerance index (STI) reveal positive effect of micronutrients in comparison to check. The effect of micronutrients as IPM component was evidently seen in both, *rabi* and *kharif* season crop.

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Table 1 : Effect of micronutrients as IDM component, host proneness									
Vigor and initiation of infection as affected by									
Observations in season	Check	Sulphur	Carbo-furan	Zinc sulphate	Ferrous sulphate	Meta-systox	Manga-nese sulphate	S.E.±	C.D.
<i>kharif</i>									
Vigor	68	69	72	90	95	69	79	1.38	2.19
DAS	10	9	13	30	43	17	16	3.04	6.40
STI	2.58	3.75	4.49	4.60	2.74	4.29	3.46	1.34	2.83
<i>rabi</i>									
Vigour	45	45	77	90	89	58	81	1.33	2.81
DAS	8	10	11	19	32	21	20	4.31	9.07
STI	2.20	3.67	5.35	5.61	3.81	4.48	4.50	0.91	1.91

DAS = Days after sowing,

STI = Stress tolerance index,

Dose = 0.1%

and 2.58). Application of carbofuran (5.35 and 4.49) and metasytox (4.48 and 4.29) was also found effective to increase the STI.

Application of micronutrients helped to increase the plant vigour, late appearance of disease and increase stress tolerance index. In *kharif* and *rabi* seasons ferrous sulphate and zinc sulphate increased the plant vigour. Appearance of disease was delayed by ferrous sulphate and zinc sulphate in *kharif* season and in *rabi* season only ferrous sulphate was found more effective. Stress tolerance index (STI) was more increased by zinc sulphate in both *rabi* and *kharif* seasons. Overall performenc of micronutrients as IDM component indicated the positive effect of zinc sulphate and ferrous sulphate. Likely same

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