

## Control of Natural Virus Infection on Okra (*Abelmoschus esculentus*) by Root Extract of *Boerhaavia diffusa*

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### SUMMARY

**Yellow vein mosaic on okra (*Abelmoschus esculentus*) under natural condition was suppressed by partially clarified aqueous root extract of *Boerhaavia diffusa*. Treatments were administered as foliar sprays at concentration of 4% at 7 days interval, commencing from the time when plants were at seedling stage. Regular sprays of root extract of *Boerhaavia diffusa* were highly effective in reducing okra yellow vein mosaic disease. Comparative data recorded with respect to infection, growth, flowering, fruiting and yield revealed that extract from the roots reduced infection by about 80%. Flowering and consequent fruiting were observed in all treated beds, which showed high yield. Fruits were more in number, soft and green as compared to yellow and fibrous fruits in control beds.**

### Key words :

*Boerhaavia diffusa*, Aqueous root extract, Okra yellow vein mosaic virus

Okra (*Abelmoschus esculentus*) is an important vegetable crop of UP, Bihar, MP, Maharashtra etc. It suffers from a very destructive disease, yellow vein mosaic (YVM) spread by whitefly, *Bemisia tabaci*. The YVM has been reported as a major disease of okra (Shivpuri *et al.*, 2004), causing 25-35% mortality of plants every year in most of the okra growing areas of the country. Okra yellow vein mosaic disease is caused by OYVMV, which is transmitted by the whitefly. It not only inflicts drastic reduction in fruit yield but also affects the fruit quality, yield losses to a tune of 95.7% have been reported in case of early infection (Pun and Doraiswamy, 1999; Pun *et al.*, 2005). The climatic conditions of plateau region of UP generally favour disease development. In order to control the disease, the bioefficacy of conventional insecticides was tested against pests of okra (Patel *et al.*, 1997; Mote *et al.*, 1994; Bhagat *et al.*, 1997). Induction and transfer resistance in okra was also tried (Fungra and Rajpoot, 1993, 1999; Jambhale and Nerkar, 1983). The main aim of the present work was to determine the efficiency of root extract of *Boerhaavia diffusa* in checking the disease under field conditions. The extract has earlier

been reported as inducer of resistance in susceptible host plants against viruses showing mosaic type of symptoms (Awasthi *et al.*, 1984; Verma *et al.*, 1979; Verma and Srivastava, 1985; Singh *et al.*, 2004; Singh and Awasthi, 2004; Awasthi and Verma, 2006; Singh, 2006).

### MATERIALS AND METHODS

Seeds of okra cultivar Parbhani Kranti were sown in separate beds. Upon germination, the seedlings were adjusted to approximately 500 plants/bed (bed size = 10×7 meter<sup>2</sup>) during 200-05 and 2005-06. Care was taken to avoid the growth of border weeds along the sides of the bed to facilitate the free flow of virus vector.

The sample of *Boerhaavia diffusa* (BD) roots was collected from fully mature plants in Kushinagar, U.P. roots after washing in running tap water, cut into small pieces, dried under natural sunlight and grounded to fine powder. The *Boerhaavia diffusa* powder was soaked in 0.2 M Sodium acetate (NaHCOOH) buffer (pH 5.2) in the ratio of 1:5. The pulp was squeezed through two folds of muslin cloth and filtrate was centrifuged at 8000 rpm for 15 minutes. To the supernatant, 60% ammonium sulphate was added and kept overnight. The

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precipitate formed was collected after centrifugation, dissolved in small amount of buffer and dialysed against Sodium acetate buffer (0.02 M, pH 5.2). The clear dialysate was diluted upto 1:5 with the help of distilled water. Sprays on test plants were done with the help of pneumatic hand sprayer, until drip off occurred.

Observations on disease incidence were made at weekly intervals with respect to plant height, flowering and fruiting at the end of the experiment when the crop was mature. Final reading also included fruit length, number of fruits per plant and yield.

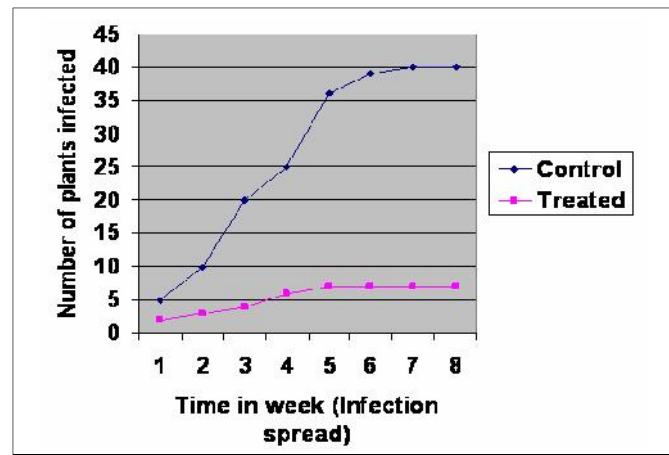
**RESULTS AND DISCUSSION**

The disease was apparent from the first week onwards in all the beds of okra, however in the third week disease spread stabilized in the treated beds. Between 4<sup>th</sup> and 5<sup>th</sup> week, control beds exhibited a steep rise in disease and number of plants infected shot up from 20% to 35%-40% (mean o two years *i.e.* 2004-05 and 2005-06 ), indicating perhaps a fresh vector attack which had no effect on the treated beds.

The per cent protection afforded by *B. diffusa* extract initially was 85%. Treated okra displayed a better response in the initial phase but exhibited a sudden rise in disease incidence between the third and fourth weeks before stabilizing again from fifth week onwards. There was however, a corresponding increase in the control bed as well (Fig.1).

The final figures showed 35% decrease in number of diseased plants in beds treated with *B. diffusa* extracts. Disease suppression due to *B. diffusa* extract treatment resulted in better growth, flowering and yield of plants. Enhancement of final yield was notable in *B. diffusa* extract treated beds. Total crop yield was 68.5 kg in treated beds in contrast to 37.75 kg in control beds (Table 1).

As a whole, the root extract of *Boerhaavia diffusa* was found to be most effective in all observations recorded. As compared to control, yellow vein mosaic disease characterized by bright yellow areas alternating with green and occasional leaf turning fully yellow was checked to a considerable extent in *B. diffusa* treated plants (Verma *et al.*, 1979; Singh *et al.*, 2004; Singh and Awasthi, 2004). Previous reports of *Boerhaavia diffusa* was as inducer of resistance against virus infections (Awasthi *et al.*, 1984; 1989; Verma *et al.*, 1984; Singh and Awasthi, 2004; Awasthi and Verma, 2006; Singh, 2006). Root extract has been claimed to provide protection in a wide variety of vegetable crops. Data recorded during 2004-05 and 2005-06 here suggested the use of *Boerhaavia diffusa* as a source of possible prophylactic agent against the yellow vein mosaic disease of okra (Fig. 2).



**Fig. 1 :** Effect of BD root extract on disease incidence of okra crop under field conditions

**Table 1 :** Effect of BD root extract on protection of okra crop from disease and crop yield (mean of two years *i.e.* 2004-05 and 2005-06)

Sr. No.	Aspect	BD root extract treated				Control			
		I	II	III	IV	I	II	III	IV
1.	Number of plants	500	500	500	500	500	500	500	500
2.	Number of diseased plants	65	68	57	72	152	161	143	149
3.	Disease severity	++	++	+	++	++++	++++	+++	++++
4.	Number of fruits per plant	8±1	9±0.5	10±1	9±0.25	5±0.1	6±0.2	8±0.3	6±0.3
5.	Fruit length (cm)	11±2	12±1	12±1.5	12±1.75	8±0.5	8±1.5	10±1.0	9±0.5
6.	Plant height (cm)	75±5	80±5	85±3	80±2.5	65±3.5	35±2.9	40±4	35±3.0
7.	Total crop yield (kg)	66±3	69±2.5	72±1.9	67±2.6	35±4	38±4.5	42±5.2	36±2.3

+ = Mild  
 ++ = Normal symptoms  
 +++ = Severe symptoms  
 ++++ = Very severe symptoms



**Fig. 2 :** Effect of phytoproten obtained from roots of *Boerhaavia diffusa* on growth and disease incidence in *Abelmoschus esculentus*  
 (a) Untreated control plant showing viral infection  
 (b) Treated plant showing no infection  
 (c) Untreated control plant showing high inflection, reduced growth and low fruit setting  
 (d) Treated plant showing better growth and increased fruit setting

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