

## Influence of Foliar Sprays of Fungicides, Phytoextracts and Bioagent on Powdery Mildew and Yield of Mustard

Indian mustard [*Brassica juncea* (Linn.) Czern and Coss] is the most important oilseed crop in India next to groundnut. Mustard crop suffers from about sixteen fungal diseases. Powdery mildew, caused by *Erysiphe cruciferarum* Opiz. Ex. Junell., is becoming widespread disease in most mustard growing areas of India including Gujarat. Therefore, effective management approach is desirable. Phytoextracts and bioagents are safer and eco friendly. Scientific data on the use of *Trichoderma* against powdery mildew are scanty, hence it deserves to be investigated under field condition. Therefore, this paper presents the field management of powdery mildew of mustard through foliar sprays of fungicides, phytoextracts and *Trichoderma viride*.

Certified seeds of variety GM-2 treated with Thirum @ 4 g/kg seeds were sown under field conditions in randomized block design with three replications @ 3.5 kg seed per hectare in last week of October, 2005. Required concentration of fungicidal solution for foliar spray of each fungicide was prepared on the basis of active ingredient available in formulation. Fresh and healthy leaves of neem (*Azadirachta indica* A. Juss.), eucalyptus (*Eucalyptus globulens*), karan (*Nerium indicum*) and karanj (*Pongamia pinnata* L.) were cut into small pieces and macerated in sterilized distilled water (1:1 w/v basis) by blender. Similarly, healthy bulbs of onion (*Allium cepa* L.), after removing the outermost thin layer, were macerated in sterilized distilled water by blender. Filtered extracts were considered as standard (100%) solution. Standard extracts were further diluted to 5 % by water for foliar spray. *T. viride*, grown on potato dextrose broth for 10 days at  $28 \pm 2^\circ\text{C}$  in conical flask, was made into a suspension using water and was filtered through sterilized muslin cloth. It was further diluted in water to 3 % ( $10^5$  spores/ml) for foliar spray. Foliar sprays of fungicides, phytoextracts and *T. viride* were done thrice at an interval of 12 days commencing from the

appearance of powdery mildew in the experimental area. Disease indices of powdery mildew from the net plot area were recorded 7 days after the third spray. Randomly selected 20 plants from each plot were assessed visually using 0-5 rating scale on the basis of severity of powdery mildew (Singh and Singh, 1982). Then, per cent disease intensity (PDI) was calculated (McKinney, 1923). Seed yield of net plot area of each plot was recorded after harvest of the crop. Finally, yield in kg/ha was worked out by multiplying yield of net plot area with multiple factor.

Data presented (Table 1) revealed the significant differences in PDI and seed yield. None of the treatments gave complete control of powdery mildew disease. Tridemorph, a systemic fungicide, performed significantly the best as evident from significantly minimum PDI (23.33) followed by Hexaconazole (35.00), Tebuconazole (35.33) and Wettable sulphur (38.67) as against 80.67 PDI recorded in untreated control treatment. None of the phytoextracts helped reducing the disease significantly or the control. However, foliar sprays of *T. viride* showed significant reduction of powdery mildew over control. Percent-wise, fungicidal sprays reduced the powdery mildew by 35.95 to 71.07 % over control, whereas *T. viride* gave 18.59 % reduction over control. Seed yield was significantly maximum in Tridemorph (2685.16 kg/ha) showing 19.10 % increase over the control. It was at par with Hexaconazole (2623.44 kg/ha), Tebuconazole (2592.57 kg/ha), Wettable sulphur (2530.84 kg/ha) and Difenconazole (2484.55 kg/ha). *T. viride*, though nonsignificant, gave considerable higher yield (2345.66 kg/ha) than any of the five phytoextracts evaluated. All the phytoextracts failed to increase yield significantly over the control. Present findings have confirmed the efficacy of Tridemorph reported by earlier workers against powdery mildews (Upadhyay and Singh, 1994; and Tripathi *et al.*, 2001). Patel *et al* (1992) have also reported

Table 1. Intensity of powdery mildew and seed yield as influenced by foliar sprays

| Treatments                           | Conc. (%) | Per cent disease intensity | Per cent reduction in disease intensity over control | Seed yield (kg/ha) | Per cent increase in seed yield over control |
|--------------------------------------|-----------|----------------------------|------------------------------------------------------|--------------------|----------------------------------------------|
| Hexacon (Contaf 5 EC)                | 0.05      | 35.00                      | 56.61                                                | 2623.44            | 17.19                                        |
| Wettable sulphur (Sulfex 80 WP)      | 0.20      | 38.67                      | 52.06                                                | 2530.84            | 14.16                                        |
| Tebuconazole (Folicur 25 EC)         | 0.05      | 35.33                      | 56.20                                                | 2592.57            | 16.21                                        |
| Tridemorph (Calixin 48 EC)           | 0.04      | 23.33                      | 71.07                                                | 2685.16            | 19.10                                        |
| Difenconazole (Score 25 EC)          | 0.05      | 51.67                      | 35.95                                                | 2484.55            | 12.56                                        |
| Onion bulb extract                   | 5.00      | 78.33                      | 02.91                                                | 2227.35            | 2.47                                         |
| Neem leaf extract                    | 5.00      | 74.00                      | 08.27                                                | 2175.87            | 0.16                                         |
| Eucalyptus leaf extract              | 5.00      | 74.67                      | 07.44                                                | 2201.63            | 1.33                                         |
| Karan leaf extract                   | 5.00      | 73.33                      | 09.10                                                | 2237.64            | 2.92                                         |
| Karanj leaf extract                  | 5.00      | 76.33                      | 05.38                                                | 2206.77            | 1.56                                         |
| <i>Trichoderma viride</i> suspension | 3.00      | 65.67                      | 18.59                                                | 2345.66            | 7.39                                         |
| Untreated check                      | -         | 80.67                      | -                                                    | 2172.27            | -                                            |
| S. Em. $\pm$                         |           | 2.55                       |                                                      | 113.83             |                                              |
| C. D. 0.05                           |           | 7.48                       |                                                      | 333.83             |                                              |
| C. V. %                              |           | 7.50                       |                                                      | 8.30               |                                              |

effective results of Tridemorph and Wettable sulphur against powdery mildew of mustard. Earlier findings of Sharmila *et al* (2004) on promising efficacy of various triazole fungicides against powdery mildew substantiate the present finding regarding triazole fungicides, viz. Hexaconazole, Tebuconazole and Difenconazole. Deore and Sawant (2000) found various species of *Trichoderma* quite effective against powdery mildew of guar. So far, investigation on biocontrol potential of the species of *Trichoderma* has been largely concentrated for soil borne diseases, but outcome of present investigation has clearly highlighted the promising potential *T. viride* against

powdery mildew as well. Yield increase in fungicidal sprays could be attributed to the significant reduction of diseases intensity, and thereby improvement of crop health for better growth and development. As mustard powdery mildew fungus infects the green leaves, stem, branches as well as developing green silique, there is every possibility of adverse effects of the disease on yield potential of the crop. In the present investigation, foliar sprays of fungicides and *T. viride* reduced powdery mildew significantly and thereby indirectly they reduced stress of pathogen on mustard crop.

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