

Screening of fungicides *in-vitro* against *Fusarium* causing rot of gladiolus corms

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Fusarial rot of gladiolus corms is an important disease of gladiolus. An experiment conducted to screen different fungicides and their combinations against Fusarium in-vitro indicated that combination of two fungicides gave better results than their constituents alone. Amongst the ten fungicides tested individual Benlate and Maneb at one percent were most effective in-vitro. One percent of the combination of Bavistin — Difoltan (0.5 percent active ingredient of each) proved to be best giving an inhibition zone of 4.00 cm. diameter, followed by 1 percent mixture of Maneb + Difoltan giving an inhibition zone of 3.90 cm. diameter. In general, Difoltan and Captan wherever used in combination with some other fungicide gave better results than Difoltan or Captan alone. Morestan, Kocide and Blitox were found to be ineffective in inhibiting the growth of Fusarium in-vitro.

Keywords : *Fusarium, Fungicides*

Gladiolus is affected by *Fusarium* to an extent of 60-70 per cent which results in a considerable loss (Vlasova and Shitan, 1974). *Fusarium* causes rotting of corms and follows by drying of the leaves. There are reports on control of *Fusarium* infection on gladiolus by various workers from different countries (Magie, 1974, Shumilenko, 1973, Magie and Wilfret, 1974). A considerable extent of *Fusarium* infection on gladiolus grown around Bangalore was noted in 1977. The objective of this study was to screen the various fungicides and their combinations for controlling the gladiolus corm rot caused by *Fusarium* sp *in-vitro*.

Materials and Methods :

The culture was isolated from the infected corms by following the tissue isolation technique. The purified culture was tested for its pathogenicity and maintained on the potato dextrose agar slants.

The suspension of *Fusarium* spores and mycelial mat was prepared in sterilized

water. All the fungicides under test (Table-1) were screened for their activity against *Fusarium* by following the standard antibiotic cup assay method. One per cent (active ingredient) of all fungicides and their combinations (0.5 percent a. i. of each) were prepared in distilled sterilized water. All the fungicides used in the present study were commercial formulations which were obtained from the market. Potato dextrose agar (30 ml.) mixed with required volume of 1% streptomycin sulphate solution to avoid bacterial contamination was used to prepare fungal lawn. Half ml. of spore suspension was added to the medium, mixed well and poured in a sterilised petriplate with the metal cup at the centre. The metal cups were removed after the setting of agar in the plates. Later 0.2 ml. of 1% solutions of the fungicides and their combinations (Table-1) were added into the well at the centre. These plates were incubated over-night at 4°C to enable the fungicides to diffuse out in the medium. Then the plates were incubated at room temperature for 3 days and the diameter of the inhibitory

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Table 1 : Screening of fungicides and their combinations for control of *Fusarium* rot of gladiolus *in-vitro*.

Fungicide	Inhibition zone (cm)
1. Captan	1.70
2. Dithane Z-78	2.60
3. Maneb	3.20
4. Bavistin	3.00
5. Sicarol	2.10
6. Benlate	3.20
7. Difoltan	2.00
8. Morestan	—
9. Kocide	—
10. Blitox	—
11. Bavistin + Benlate	3.65
12. Bavistin + Maneb	2.60
13. Bavistin + Dithane — Z-78	2.75
14. Bavistin + Difoltan	4.00
15. Bavistin + Sicarol	1.80
16. Bavistin + Captan	2.50
17. Dithane — Z-78 + Maneb	2.50
18. Dithane — Z-78 + Difoltan	3.50
19. Dithane — Z-78 + Sicarol	2.10
20. Dithane — Z-78 + Captan	3.25
21. Maneb + Benlate	2.35
22. Maneb + Difoltan	3.90
23. Maneb + Sicarol	2.95
24. Maneb + Captan	3.75
25. Sicarol + Captan	3.10
26. Sicarol + Difoltan	2.55
27. Captan + Benlate	3.25
28. Captan + Difoltan	3.65

Note : Average of three replications.

zones were recorded. All the treatments were replicated thrice.

Results and Discussion :

The results of the pathogenicity test of the fungus showed that it caused the rotting of the corms and subsequent drying of the leaves,

The results presented in Table-1 revealed that amongst the ten fungicides tested seven were proved to be active against *Fusarium* and three fungicides viz., Morestan, Kocide and blitox were found to be ineffective. Amongst the individual fungicides tested Benlate and Maneb were the best wherein an inhibition zone was 3.2 cm. diameters in each case. These two fungicides were followed by Bavistin which gave an inhibition zone of 3.0 cm. diameter and was followed by Dithane-Z-78, Sicarol, D Difoltan and Captan. Heligen (1974) reported that one hour treatment of corms in 0.25 per cent cerasan gave 60 per cent control of *Fusarium* rot in gladiolus corms. Shumilenko (1973) reported that immersion of corms in 0.2 per cent Granlan, suspension, 0.6 per cent thiram or 0.4% Zineb for 4 hours prior to planting gave good results. In soil Granlan was proved to be most effective.

Constant use of single fungicide for controlling a particular pathogen results and helps in development of resistant strain for that particular fungicide. However, if more than one fungicides are used it delays the development of resistant strains. All combinations of those fungicides which gave positive results in preliminary studies were tried. The results (Table : 1) indicated that combinations of two fungicides in general gave more promising results than when their constituents were used alone. However, in some cases combinations were found to be less effective than some of their constituents alone. A combination of Bavistin+Difoltan proved to be most effective in inhibiting the *Fusarium* growth. It gave an inhibition zone of 4.0 cm. diameter. A combination of Bavistin+Benlate also gave good results. In case of a combination of Bavistin+Maneb and Bavistin +Sicarol the inhibition zone obtained was less in diameter than that of their respective

constituents alone. In case of maneb and sicarol alone an inhibition zone of 3.20 cm. and 2.10 cm. diameter were observed whereas their mixture with Bavistin gave an inhibition zone of 2.60 cm. and 1.80 cm. respectively. These results indicated that when Bavistan was mixed with either maneb or Sicarol the fungicidal action of bavistin, maneb or sicarol was decreased. A mixture of Bavistin + Dithane Z-78 gave better results than Dithane-Z-78 alone but proved inferior over bavistin alone. Similar was the case with Bavistin + Captan combination.

A combination of Dithane-Z-78 and Difoltan gave an inhibition zone of 3.50 cm. diameter. In general, whenever Difoltan was mixed with some other fungicide it was found to be superior over Difoltan alone and in most of the cases over its other combination constituent also. These results indicated that Difoltan gave good results when used in combination than using alone. A combination of Maneb + Difoltan ranked second in inhibiting *Fusarium* growth *in-vitro* by giving an inhibition zone of 3.90 cm. diameter. Sicarol + Difoltan gave an inhibition zone of 2.55 cm. diameter. Similarly, captan + Difoltan gave an inhibition zone of 3.65 cm. diameter. All these results indicated the superiority of mixing Difoltan with some other fungicide over Difoltan alone.

A combination of Captan + Benlate gave

an inhibition zone of 3.25 cm. diameter, which was bigger than an inhibition zone due to Benlate or Captan alone. An inhibition zone of 3.75 cm. diameter was obtained by using a mixture of Maneb + Captan and it was bigger than an inhibition zone obtained by using Maneb or Captan alone. Captan alone could inhibit *Fusarium* to an extent of 1.70 cm. diameter whereas, whenever, it was mixed with some other fungicide it gave better results than alone. A combination of Sicarol + Captan gave an inhibition zone of 3.10 cm. diameter which was bigger than an inhibition zone obtained due to sicarol or captan alone. These results suggested that when sicarol and captan were mixed together in equal proportion (active ingredient) it had a synergistic effect in their fungicidal action. Maneb + Sicarol also gave better results than sicarol alone.

These results indicated that combination of two fungicides gave better control over the individual performance in general and it may also help in overcoming the risk of development of resistant strains of *Fusarium*. These results have to be confirmed *in-vivo* and these experiments are in continuation.

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