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EVALUATION OF FUNGICIDES AGAINST *ASCOCHYTA* GRAM BLIGHT

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Abstract

Out of 9 fungicides tested *In Vitro* Tecto-60 inhibited mycelial growth of *Ascochyta rabiei* followed by Chlorothalonil, Karathane, Benlate, Dithane M-45 and Vitavax. Brassicol, Afugan and Bayleton were moderately effective. Tecto-60 inhibited mycelial growth at a dosage rate of 5 μg/ml. When used as foliar spray Tecto-60 and Chlorothalonil reduced the pod and seed infection by *A. rabiei.* Tecto-60 gave maximum increase in seed yield (78%) followed by Chlorothalonil (61%) and Benlate (58%). Karathane was phytotoxic.

Introduction

Gram blight caused by *Ascochyta rabiei* (Pass.) Lab., is a serious disease of gram (*Cicer arietinum* L.) in the Punjab and NWFP. The disease was first reported in 1911 (Butler, 1918) from North West Frontier Province. The fungus infects foliar parts of gram plants (Kaiser, 1972) and is seed-transmitted (Maden *et al.,* 1975). The disease appears in epiphytotic proportions in areas where rainfall and R.H. is high during the growing season (Kaiser, 1972). In Pakistan during 1979 and 1980 upto 70% crop loss have been observed presumably due to the appearance of a new race of gram blight pathogen, which severly attacked gram cultivars C-235 and C-727 (Nene, 1982). The effect of fungicides was therefore evaluated on mycelial growth of *A. rabiei* and the fungicides suppressing growth were further tested under field conditions as foliar spray.

Material and Methods

Nine fungicides including 5 systemic viz.; Thiabendazole (TBZ), (2-4, thiazolyl)-2 benzimidazole), Merk and Co., Mertect, tecto-60, WP; benomyl, (Methyl, 1-(butyl-carbamoyl), 2 benzimidazole), Du Pont, benlate, 50 WP; Carboxin, (5-6 dihyobro-2-methyl-1, 4-oxathin-3. carboxinilide), Uniroyl, Vitavax, 75 WP; pyrozophos, (0-6, ethoxycarbomyl-4-methylpyrazolo (1,5a) primidine-2-yl-00-die-thyl phosphorothioate), Hoechst's afgugan, 30 EC and triadimefon (1-4 chlorophenoxy) −3,3-diethyl-1 (1-H-1, 2,2,4-triazol-1-yl) Butanon, Bayer chem. Co's bayleton, 80 WP and 4 non-systemic viz.; chlorothalonil, (tetrachloroiso-phthalonitrile), Diamond Alkali Co's daconil 2787, 75 WP,

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Mancozeb (Zinc 2% + 78% Maneb), manganese ethylene bisdithiocarbamate), Rohm and Haas, dithane M-45; Quintozene, (pentachloronitrobenzene), Hoechst's brassicol, 29 TP and Dinocap, (a mixture of 78% 2,4-dinitro-6-octylphenyl crotonate and 22% 2-6-dinitro-4-octylphanyl crotonate), Rohm and Haas's Karathane 25 WP., were used @ of 5, 10, 20 and 50 μg (a.i.)/ml by poisoned food technique against the mycelial growth of *A. rabiei* ((Nene, 1979). The fungus was isolated from diseased stem pieces of gram, and maintained on gram seed meal agar (GSMA) containing gram flour-20g, glucose-20g, agar agar-20g, and distilled water 1000 ml. Each fungicide incorporated separately in autoclaved melted GSMA was poured into sterilized Petri plates, 20 ml in each inoculated with a 5 mm disc of actively growing culture of *A. rabiei* and incubated at 22°C. GSMA medium without fungicide served as control. There were 3 replicates of each treatment and mean colony diameter was recorded after 15 days growth.

For *In Vivo* test a local blight susceptible gram cultivar C-727 was planted in rows of 5m x 1.8 m plot in October, 1982 at the Research Farm of Agricultural University, Faisalabad. Foliar spray of 6 fungicides was made soon after the first appearance of the blight in the field under natural conditions. Five protective sprays at 12 days interval beginning 1st February, 1983, was made @ 1132 g (a.i.) per hectare per 1136 litre of water. A spore suspension of *A. rabiei* (18–20,000 spores/ml) in tap water was also sprayed after 24 hours of each fungicidal spray. Control plots were sprayed with equal amount, of water without a fungicide. Disease severity (DSI) was rated using 0–5 scale of Morrali & Mckenziee (1974). Using 10 random plants at maturity stage, DSI was calculated, as suggested by Gemawat & Prasad (1969), using the following formula:

$$DSI = \frac{\text{Total of all ratings}}{\text{No of plants examined}} \times \frac{100}{\text{Max. disease rating}}$$

Pod infection was determined out of 400 pods from each treatment in each replication and all pods were threshed to obtain seed yield. Similarly a random sample of 400 seeds of each treatment of each replication was used and evaluated for seeds with *A. rabiei* lesions.

Results and Discussion

In Vitro Evaluation: All the systemic and non-systemic fungicides inhibited growth of *A. rabiei* with increasing concentration of fungicides. Tecto-60 and chlorothalonil were most effective. Tecto inhibited fungus growth even at 5 μg/ml. while chlorothalonil did not inhibit growth @ 50 μg/ml, (Table 1). Karathane, benlate, vitavax, dithane M-45, brassical, bayleton and afugan showed less inhibition. Tecto-60 and benlate are chemically related compounds which show systemic fungitoxic activity in many crop plants (Erwin, 1969). The significant difference between growth of *A. rabiei* on GSMA

Table 1. *In Vitro* effect of fungicides on radial growth of *Ascochyta rabiei* on gram seed meal agar (GSMA) medium.

Fungicides.	Colony diameter (mm) at concentrations (μg/ml)			
	5	10	20	50
Systemic Fungicides.				
Tecto-60	0 a*	0 a	0 a	0 a
Benlate	43 cd	38 cd	26 d	15 c
Vitavax	40 c	35 c	30 d	20 d
Afugan	46 d	42 e	40 f	35 f
Bayleton	44 d	41 de	38 f	36 f
Non-systemic Fungicides				
Chlorothalonil	36 b	28 b	15 b	8 b
Dithane M-45	43 d	38 cd	31 f	17 cd
Brassicol	45 d	42 de	37 f	30 e
Karathane	40 c	31 b	23 c	11 b
Control	52 e	52 f	52 g	52 g

*Values in the same column followed by the same letter do not differ significantly at P (0.01) according to Duncan's Multiple Range Test.

medium containing Tecto-60 and benlate might be due to their differential conversion rate to methyl-2-benzimidazole carbamate (MBC) and its uptake by the fungus (Nene & Thapliyal, 1979). Vitavax, afugan and bayleton also possess systemic activity but they were not as effective as Tecto-60. This might be due to their selective differential mode of action.

Field evaluation: TBZ was the effective fungicide in reducing disease severity followed by chlorothalonil, benlate, karathane, dithane M-45 and vitavax (Table 2). Benlate, dithane M-45 and karathane were similar in their effectiveness in reducing the disease severity. The most effective fungicides in reducing pod and seed infection were TBZ and chlorothalonil. There was no significant difference in pod and seed infection in plots sprayed with benlate and dithane M-45. The effectiveness of TBZ in control of *A. rabiei* infection is similar with the results of Kaiser *et al.*, (1973) and that of chlorothalonil with Ilyas & Bhatti (1984).

Table 2. Effect of foliar spray of fungicides on disease severity Index, per cent pod and seed infection and grain yield of gram in field

Fungicides	Disease severity index (%)	% pod infection	% seed infection	Average yield (kg/ha)	% yield increase over control
Tecto-60	27 a	8 a	8 a	1140 a	78.00
Benlate	46 c	25 b	18 b	1012 b	58.00
Vitavax	57 d	34 c	26 d	680 cd	6.00
Chlorothalonil	34 c	11 a	6 a	1041 b	62.00
Dithane M-45	49 c	29 bc	21 bc	732 c	14.00
Karathane	46 c	27 b	22 cd	674 cd	5.00
Control	83 e	80 d	74 c	642 d	

*Values of the same category not followed by the same letter differ significantly at 5% level of probability.

TBZ increased the maximum seed yield (78%) followed by chlorothalonil (62%), benlate (58%) and dithane M-45 (14%). There was no significant difference in seed yield obtained from spray treatments of chlorothalonil and benlate. Benlate and dithane M-45 sprays were similar in their effectiveness in reducing disease severity, per cent pod and seed infection, whereas benlate gave four times (58%) more yield than dithane M-45 (14%). This may be due to the growth regulating and yield increasing effect of benlate (Schreiber & Mock, 1975). Karathane was phytotoxic in producing russetting, distortion and drying of leaf tips and young shoots resulting in low yield. Vitavax reduced disease severity, percent pod and seed infection, but it did not significantly improve the seed yield. Increased seed yield of chickpea has been reported by Reddy & Singh (1983) by foliar application of chlorothalonil to a gram blight susceptible cultivar, which is similar to our results.

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