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Efficacy *in-vivo* of Different Fungicides in Controlling Stemphylium Blight of Lentil During 1998-2001

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Abstract

In an experiment with seven different fungicides such as Rovral 50WP @ 0.2 %, Dithane M-45 @ 0.2 %, Tilt 250EC @ 0.05 %, Cupravit @ 0.3 %, Macuprax @ 0.25 %, Ridomil MZ-72 @ 0.2 % and Bavistin 50WP @ 0.15 % were tested in the field during 1998-2001 to control *Stemphylium* blight lentil. Among the fungicides Rovral 50WP @ 0.2 % was noted as the most effective fungicide followed by Dithane M-45 @ 0.2 % and Tilt 250EC @ 0.05 %.

Introduction

Lentil (*Lens culinaris* Medik.) is the second most important pulse crop in terms of both area and production and rates the highest consumers' preference. It contributes 25 % of the total pulse production (Anonymous, 1991). Lentil is a popular and widely cultivated crop in Bangladesh and in many other tropical countries. In Bangladesh at least 17 diseases attack the crop causing appreciable yield losses. Among them blight (*Stemphylium botryosum*), rust (*Uromyces fabae* L.) and foot and root rot (*Sclerotium rolfsii* Sacc.) are considered as major problems for lentil cultivation in the country (Ahmed, 1985). Occurrence of *Stemphylium* blight is the most common and destructive disease in all lentil growing areas of Bangladesh. Though the occurrence of the disease has been recorded in the country long ago.

Its adverse effect on lentil yield was experimentally demonstrated (Bakr and Zahid, 1986). *Stemphylium botryosum* was isolated from blighted infected leaf samples of lentil (Chowdhury and Asheque, 1996). Control of plant diseases becomes most successful and economical when management approach involving several methods are employed including chemical means, cultural practices and use of resistant host etc.

Time of sowing had marked effect upon the level of disease incidence and thus by manipulating the sowing time incidence might be avoided (Hedge and Anahosur, 1994). Some agronomical practices viz., intercropping, mixed cropping and sole cropping have effect in influencing micro-climate and forming physical barrier in crop field to prevent some organisms responsible for various

diseases. This is a non-chemical way to check and retard the spread of disease. Cropping system is a very effective means to check the spread of disease (Gour and Singh, 1996).

Materials and Methods

The experiment was conducted under natural epiphytotic condition. The experiment was laid out in a piece of land following RCB design with three replications (Zaman, *et. al.*, 1982). The unit plot size was 4m x3m with 25cm row to row spacing. A susceptible genotype L-81124 was sown on November 23. Seven fungicides and one control comprised eight treatments. The fungicides included were Rovral 50WP @ 0.2 %, Dithane M-45 @ 0.2 %, Bavistin 50WP @ 0.15 %, Cupravit @ 0.3 %, Tilt 250EC @ 0.05 %, Macuprax @ 0.25 % and Ridomil MZ-72 @ 0.2 %. Concentration of fungicides and their active ingredients are presented in Table I.

The experiment was kept under constant observation. First spray was given just after

the appearance of disease symptom in the field. Four sprays were given at an interval of 15 days. Data were recorded before every spray using 1-9 scoring scale from 25 randomly tagged plants/plot. Percent Disease Index (PDI) was computed according to the formula as described below (Wheeler, 1969) and calculated based on the final data recorded at 15 days after the last spray.

$$PDI = \frac{\text{Sum of numerical values}}{\text{No. of plant parts observed}} \times \frac{100}{\text{Maximum disease rating}}$$

Percent data were statistically analyzed after arcsine transformation Percent Disease Control (PDC) was calculated on the basis of the following formula (Shivankar and Wangikar, 1993).

$$PDC = \frac{\text{Disease in control plot} - \text{Disease in treated plot}}{\text{Disease in control plot}} \times 100$$

Data were recorded on yield and yield attributes after necessary sun drying. Yield

Table I. Selected fungicides, concentration used and their active ingredients

Fungicides	Concentration (%)	Active ingredients
1. Rovral 50WP	0.2	Iprodione 50 %
2. Dithane M-45	0.2	Mancozeb 80 % + manganese ethylene
3. Bavistin 50WP	0.15	50 % Methyl 2 benzimidazole carbamate
4. Cupravit	0.3	Copper oxychloride with 50% metallic copper
5. Tilt 250EC	0.05	Propiconazol 250g a.i./litre
6. Macuprax	0.25	580g natural bordeaux mixture and 70g cufraneb/kg
7. Ridomil MZ-72	0.2	Metalaxyl 80g a.i./kg + mancozeb 640g a.i./kg.

increase over the control was calculated. All data were analyzed statistically and means were compared by DMRT (Steele and Torrie, 1980). The correlation among percent yield increased over control and percent disease control was calculated.

Results and Discussion

The results of *in-vivo* efficacy of different fungicides in controlling Stemphylium blight of lentil during 1998-2001 are presented in Table viz., 2, 3 and 4. Data on Percent Disease Index, Percent Disease Control, 1000-seed weight, yield/plant (g), yield/plot (kg), yield/ha (kg) and percent yield increase over control were noted.

It is indicated in Table II that during 1998-1999 all fungicides had effect over the

control in reducing the disease. Among the fungicides tested Rovral 50WP @ 0.2 % was found most effective followed by Dithane M-45 @ 0.2 % and Tilt 250EC @ 0.05 % and differed significantly from the other fungicides tested.

Rovral 50WP showed the highest PDC (52.3) followed by Dithane M-45 (51.2).

In respect of yield/ha and other yield attributes viz., 1000-seed weight, yield/plant and yield/plot. Rovral 50WP exhibited the best performance with 79.2 % yield increase over control and PDC (52.4) followed by Dithane M-45. The yield (79.2 kg/ha) obtained by Rovral 50WP was found statistically the highest among the treatments and differed from others. Rovral 50WP @ 0.2 % was

Table II. *In-vivo* effect of fungicides on disease severity and yield of lentil during 1998-1999

Treatment	PDI	PDC	1000-seed wt. (g)	Yield/plant (g)	Yield/plot (kg)	Yield/(kg)	% Yield increase
Rovral 50WP	40.2d	52.4	18.2a	1.46a	1.20a	1000.0a	79.2
Dithane M-45	41.2abc	51.2	15.9b	1.23b	0.97b	916.0b	64.2
Bavistin 50WP	76.0ab	9.9	14.3bc	1.00c	0.77c	641.7bc	14.9
Cupravit	75.0bc	11.1	14.8bc	1.00c	0.72c	600.0bc	7.4
Tilt 250EC	42.5abc	49.6	15.4b	1.16bc	0.98b	816.6b	46.2
Macuprax	72.6c	13.9	14.9bbc	1.10bc	0.70c	583.3cd	4.5
Ridomil MZ-72	83.2abc	1.4	14.9b	1.03d	0.68c	566.0cd	1.4
Control	84.4a	-	13.4c	0.46c	0.67c	558.3cd	-
F-test	**		**	**	**	**	
CV (%)	8.47		4.59	7.05	8.44	1.38	

Mean (s) in the column followed by common letter (s) do not differ significantly at 0.01 level. In case of PDI, analysis was done after arcsine transformation.

found as the most effective fungicide to control Stemphylium blight of lentil.

It is revealed from Table III that during 1999-2000 all treatments had significant effect over control except Macuprax and Ridomil

by Macuprax @ 0.25 % (9.1). The highest yield (858.3kg) was obtained from Rovral 50WP @ 0.2 % followed by 791.6kg of Dithane M- 45 @ 0.2 %. Rovral 50WP contributed to 51.5 % yield increase over the control and PDC (48.5).

Table III. *In-vivo* effect of fungicides on disease severity and yield of lentil during 1999-2000

Treatment	PDI	PDC	1000-seed wt. (g)	Yield/plant (g)	Yield/plot (kg)	Yield/ha (kg)	% Yield increase
Rovral 50 WP	40.0f	48.5	22.0a	2.50a	1.03b	858.3a	51.5
Dithane M-45	48.4ef	37.6	19.8ab	1.76b	0.95c	791.6b	39.7
Bavistin 50WP	66.0bc	14.9	19.0abc	1.26d	0.85cde	708.3d	25.0
Cupravit	67.4cd	13.1	18.0bc	1.43c	0.83de	691.6d	22.6
Tilt 250EC	54.6de	29.6	19.3abc	1.43c	0.91cd	758.3c	33.8
Macuprax	70.4abc	9.1	18.3bc	1.16d	0.79ef	658.3e	16.2
Ridomil-MZ-72	74.3ab	4.3	16.8bc	1.13d	0.70f	583.3f	2.9
Control	77.6a	-	15.6c	0.80e	0.68a	566.6g	-
F-test	**		**	**	**	**	
CV (%)	4.2		7.20	4.15	4.66	1.39	

Mean (s) in the column followed by common letter (s) do not differ significantly at 0.01 level. In case of PDI, analysis was done after arcsine transformation.

MZ-72. Rovral 50WP @ 0.2 % Reduced PDI significantly and performed the best followed by Dithane M-45 @ 0.2 % and Tilt 250EC @ 0.05 % showing PDI 40.0, 48.4 and 54.6, respectively.

In respect of PDC (Percent Disease Control), Rovral 50WP @ 0.2 % had the best performance (48.4) followed by (37.6) of Dithane M-45 @ 0.2 %. The lowest PDC was exhibited by Ridomil MZ-72 @ .0.2 % (4.3) followed

It is evident from Table IV that during 2000-2001, the Percent Disease Index (PDI) was the lowest (34.2) in Rovral 50WP treated plot followed by 47.8 and 54.6 of Dithane M-45 and Tilt 250 EC treated plots, respectively.

The lowest control of disease was shown by Macuprax @ 0.25 %. All treatments had significant effect over the control in respect of PDI. The highest PDC (54.0) and percent yield increase over control (106.9) was

Table IV. *In-vivo* effect of fungicides on disease severity and yield of lentil during 2000-2001

Treatment	PDI	PDC	1000-seed wt. (g)	Yield/plant (g)	Yield/plot (kg)	Yield/ha (kg)	% Yield increase
Rovral 50WP	34.2e	54.0	22.3a	2.20a	1.20a	1000.0a	106.9
Dithane M-45	47.8de	35.8	20.3ab	1.47cd	0.84bc	704.0b	45.7
Bavistin 50WP	60.2bc	19.2	18.3bcd	1.56cd	0.67dc	558.3e	15.5
Cupravit	60.1bc	19.3	18.7bc	1.56cd	0.73cd	608.3c	25.9
Tilt 250 EC	54.6cd	26.7	20.0ab	1.80b	0.85b	700.3b	45.0
Macuprax	69.8ab	6.3	17.3cd	1.63bc	0.69d	575.0de	18.9
Ridomil MZ-72	67.8b	8.9	17.3cd	1.40d	0.71d	591.6cd	22.4
Control	74.5a		15.7d	1.37d	0.58e	483.3f	-
F-test	**		**	**	**	**	
CV (%)	6.70		4.79	2.51	4.89	1.46	

Mean (s) in the column followed by common letter (s) do not differ significantly at 0.01 levels. In case of PDI, analysis was done after arcsine transformation.

shown by Rovral 50WP @ 0.2 % followed by 35.8 and 45.7 % of Dithane M-45. In respect of yield and yield attributes, Rovral 50WP performed the best among the treatments excepting 1000-seed weight where it was statistically similar with Dithane M-45 and Tilt 250EC.

In the present study significant reduction of PDI and increased yield was achieved with fungicidal spray. On the basis of the investigation over the years it is noted that Rovral 50WP @ 0.2 % was the best fungicide in reducing PDI and increasing yield followed by Dithane M-45 @ 0.2 % and Tilt 250 EC @ 0.05 %. In India, (Gupta and Srivastava, 1988) obtained mancozeb as the best

fungicide to control *Stemphylium* blight of onion bulb crop and gave the highest economic return. In the present study mancozeb gave the second highest yield. Some Indian workers (Gupta, *et. al.*, 1996) attributed effective control measure of purple blotch of onion caused by *Stemphylium botryosum* with 3 sprays of Rovral 50WP (Iprodione) @ 0.25 %. Other Indian workers (Srivastava, *et. al.*, 1995) controlled *Stemphylium vesicarium* with spraying of Iprodione @ 0.2 %. The results of (Bakr and Ahmed, 1992) were in agreement with the findings of the present study.

Successful control of *Stemphylium botryosum* was achieved by spraying with Rovral

50WP @ 0.2 % at an interval of 15 days (Hossain, 2000).

Therefore, Rovral 50WP @ 0.2 % is recommended as an effective fungicide to control *Stemphylium* blight of lentil caused by *Stemphylium botryosum*. Effect of Rovral 50WP in the field is shown below in Plate 1.

contributed to the highest PDC and corresponding yield followed by Dithane M-45 (0.2) and Tilt 250 EC (0.05). PDC was found positively correlated with percent yield increase. It was linear and could be described by equation $y=1.2959x-3.4502$ and regression of coefficient $R^2=0.9132$. (Fig.1).

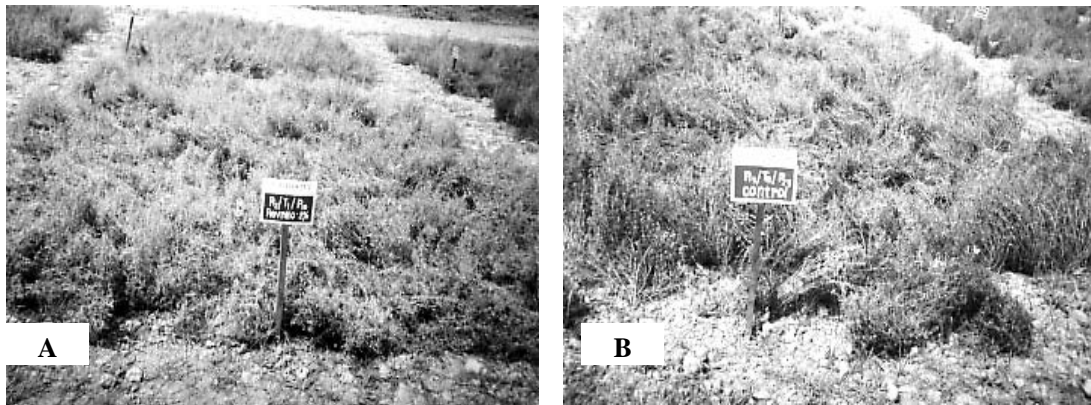


Plate 1. Rovral 50 WP treated and control (untreated) plot of lentil at maturity
 A. Treated plot B. Control (untreated) plot

Relationship between PDC and yield increase over the control during 1998-2001

During 1998-1999 the effect of the fungicides exhibited that Rovral 50WP (0.2)

In 1999-2000 the highest PDC and corresponding yield was given by Rovral 50WP (0.2) followed by Dithane M-45 (0.2) and Tilt 250EC (0.05). The percent yield increase showed positive correlation with PDC which

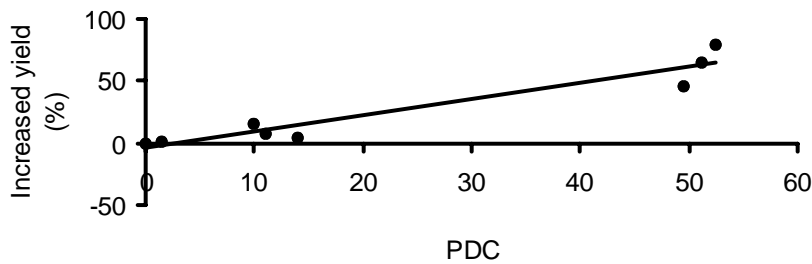


Fig. 1. Relationship between PDC and yield increase over control during 1998-1999

was linear and exhibited by the equation $y=1.0046x+4.1346$ and regression of coefficient $R^2=0.9456$ (Fig.2).

Control through chemical means showed Rovral 50WP @ 0.2% as the most effective fungicide when tested in-vivo. Thus, it is rec

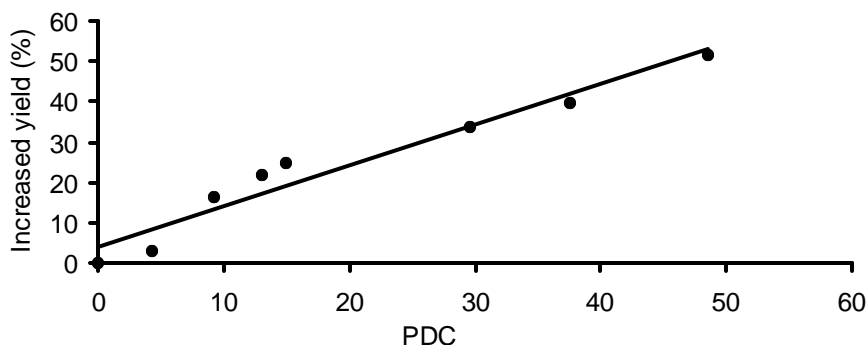


Fig. 2. Relationship between PDC and yield increase over control during 1999-2000

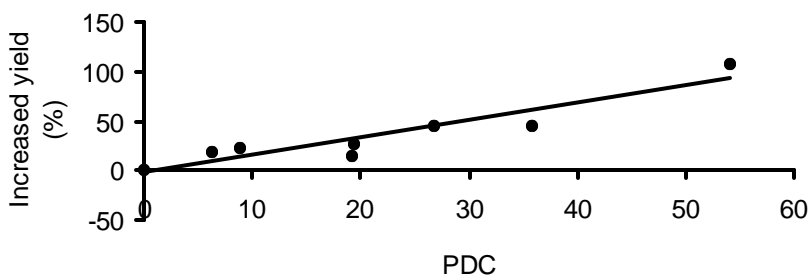


Fig. 3. Relationship between PDC and yield increased over control during 2000-2001

Similarly, in 2000-2001 the highest yield increase with corresponding PDC was recorded from Rovral 50WP (0.2) followed by Dithane M-45 (0.2) and Tilt 250EC (0.05). The yield obtained was correlated positively with PDC which was linear and could be shown by the equation the equation $y=1.7522x-2.1533$ and coefficient of regression $R^2=0.8755$. (Fig3).

ommended to spray the fungicides thrice at an interval of 15 days from the day of first appearance of disease in the field. However, the control through chemical means is very effective against any disease for which it is still well adapted everywhere in the world.

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