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EVALUATION OF SELECTED FUNGICIDES FOR CONTROLLING PURPLE BLOTCH DISEASE OF SMALL ONION

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ABSTRACT

Purple blotch disease of small onion causes significant reduction in yield. Certain fungicides i.e. Acrobat, F500, Antracol, Folicur and alternative application of Antracol and Folicur were evaluated for controlling purple blotch disease of small onion (*Alium cepa* L. var *aggregatum* Group) caused by *Alternaria porri* (Ellis) Ciffer during wet (*maha*) season under natural condition of infection in the field. Spraying was started at 10 days after planting (before appearance of typical symptoms) and continued further 5 times at 10-day intervals. Disease severity (PDI) was taken at 10-day intervals just before each spraying and marketable bulb yield was recorded at harvest. Plots treated with F 500 at the rate of 7ml/10l gave lowest disease severity and highest yield followed by Folicur at the rate of 3.5ml/10l. However, differences in disease severity and yield between these two fungicides are on par suggesting that both fungicides were equally effective for the management of purple blotch disease in small onion during the wet season.

KEYWORDS: *Alternaria porri*, fungicides, Purple blotch, Pyraclostrobin, small onion.

INTRODUCTION

Purple blotch disease caused by *Alternaria porri* (Ellis) Ciferri is one of the most important diseases on small onions (Hadisutrisno *et al.*, 1995). Development and spreading of disease is greatly correlated with warm weather plus humid conditions. The disease reaches epidemic proportions every year during the wet (*maha*) season. Hence, the production of onion in Sri Lanka is limited to wet season, due to purple blotch disease. The fungus can cause a reduction in yield from 30 to 50 percent (Pascua *et al.*, 1999). Nevertheless 90 to 100 percent yield loss of small onion is evident in low country dry zone of Sri Lanka during wet season due to purple blotch disease if left uncontrolled.

Control of purple blotch has been accomplished primarily by the application of chemical fungicides and resistant cultivars (Hadisutrisno *et al*, 1995). Many of the small onion cultivars grown in Sri Lanka has no measurable level of resistance or the level of resistance is less than sufficient under most purple blotch epidemic conditions (Sumanaratne J.P. personnel communication). Therefore, cultivation of resistance small onion varieties does not offer a practical solution to control early blight disease. Currently management of onion purple blotch disease relies principally on foliar application of fungicides (Hadisutrisno *et al.*, 1995). Application of fungicides after appearance of symptoms is not much effective especially during the wet season, as climatic conditions prevailing during wet season are conducive for rapid disease development. Even application of some recommended fungicides did not give proper control of purple blotch in the wet (*maha*) season crop (Sumanaratne, 2001). Both early and late established crops during wet season are affected with purple blotch (Sumanaratne, 2002; Sumanaratne, 2001). True seed production of onion during wet season is also affected with purple blotch disease. Sumanaratne (2000) reported that proper management of purple blotch disease is the key determinant factor in true seed production during wet season. Calendar base fungicide spraying schedule seems effective in controlling of purple blotch during wet season. Therefore exploration of much more effective fungicides for the control of this disease is highly prioritized. The present investigation was undertaken to find out the efficacy of foliar spray of some fungicides against purple blotch disease of small onion.

MATERIALS AND METHODS

Experiments were conducted at the research field of Regional Agricultural Research & Development Center, Aralaganwila (DL_{2b}) during wet (*maha*) season 2003/2004. Two new fungicides Imethomorph + Mancozeb (Trade name – Acrobat) and Pyraclostrobin (Trade name - F 500) along with 2 recommended fungicides Propineb (Trade name – Antracol) and Tebuconazole (Trade name – Folicur) were field evaluated for their efficacy against purple blotch. Dosages and the spraying schedule of fungicides are shown in the table 1.

Table 1. Fungicides, dosages and their spraying schedule.

T. No.	Common Name	Dilution	Rate of Application	Spraying schedule					
				10 DAP	20 DAP	30 DAP	40 DAP	50 DAP	60 DAP
1	Dimethomorph + Mancozeb 90/600 g/kg WP	30g/10l	1500g/ha	√	√	√	√	√	√
2	Pyraclostrobin 250g/l EC	7ml/10l	350ml/ha	√	√	√	√	√	√
3	Propineb 70% WP	20g/10l	1000g/ha	√	√	√	√	√	√
4	Tebuconazole 250g/l EW	3.5ml/10l	175ml/ha	√	√	√	√	√	√
5	Propineb 70% WP + Tebuconazole 250g/l EW	20g/10l + 3.5ml/10l	1000g/ha + 175ml/ha	√P	√T	√P	√T	√P	√T
6	Control (Teepol mixed water sprayed)	10ml/10l	-	-	-	-	-	-	-

√ = denotes spraying of fungicide on particular date; √P = spraying of Propineb
√T= spraying of Tebuconazole

These treatments were tested on 1m X 2m field plots planted with bulbs of small onion cultivar Vethalan at recommended spacing of 10cm X 10cm. Each treatment was replicated 3 times in a randomized complete block design. Field establishment was done in the second week of December 2003 so that the crop would coincide with epidemic level of disease. Spraying was started 10 days after planting (before appearance of typical symptoms) and continued for a further 5 times at 10 day intervals by using a hand operated knapsack sprayer. Teepol was mixed with each fungicide spray solution at the rate of 1 ml/l as a surfactant. Control plots were sprayed with 0.1 percent Teepol solution. Percent disease severity (PDI) was taken at 10-day intervals just before each spraying. It was assessed visually according to the proportion of total leaves (foliage) affected due to the purple blotch disease. Crop was harvested 11 weeks after planting. Marketable bulb yields were recorded. These parameters were taken as indices to evaluate the efficacy of treatments. Data was analyzed by Minitab and mean separation was done using DMR test.

RESULTS AND DISCUSSION

Certain fungicides were evaluated in this study for their efficacy against purple blotch disease of small onion under field condition with natural infection. Many workers have demonstrated the foliar application of fungicides for the effective and efficient management of onion purple blotch under field condition (Schwartz and Mohan, 1995; Borker and Patil, 1995; Hug *et al.* 1994). The performance of the fungicides in reducing disease severity (PDI) and the increase in bulb yield is shown in Table 2. Lowest disease severity of 19.26% was recorded with the application of F 500 followed by Folicur (25.33%). However differences in PDI between F 500 and Folicur were not significant suggesting that both fungicides were equally effective in controlling the purple blotch of small onion. It was reported that F 500 had excellent efficacy against *Alternaria porri* (Anonymous, 2001). Similarly Folicur had shown high efficacy against purple blotch disease of shallot caused by *Alternaria porri* (Anonymous, 1999).

Highest disease severity of 56.33 was recorded in the untreated control. Third best performance was recorded with alternative application of Antracol and Folicur at 10-day intervals. Disease severity values recorded with Acrobat (54.93%) and Antracol (49.86%) were on par with the control (56.33%) suggesting that there is no proper control of purple blotch by application of either Acrobat or Antracol during the wet season. In contrast, Hug *et al* (1994) demonstrated the efficacy of Antracol 0.2% in controlling purple blotch disease. However, these fungicides may be effective under less severe conditions.

Table 2. Average purple blotch disease severity (Ave. PDI) and bulb yield of small onion in different fungicide treatments

Trt. No	*Fungicides*	*Ave. Percent Disease Severity*	*Total bulb yield (kg/ha)*
1	Acrobat MZ	54.93 (47.87) cd	1478 c
2	F 500	19.27 (26.00) a	7500 a
3	Antracol 70% WP	49.87 (44.94) cd	1878 c
4	Folicur EW 250	25.33 (30.20) ab	5789 ab
5	Antracol 70% WP + Folicur EW 250	37.27 (37.60) bc	3144 bc
6	Control	56.33 (48.70) d	989 c
CV%		10.94%	37.63%

* Values are mean of 3 replicates; * Values with same letter in a column are not significantly different at P=0.05 level (DMRT); * Values within parenthesis are arcsine values

It is evident from Figure 1 that untreated control plots showed 84% disease when crop approached the maturity while F 500 and Folicur showed 38% and 46% respectively. This suggests that more than 80% disease infection is possible during wet season if left uncontrolled. Planting season had a pronounced effect on the incidence of purple blotch and yield of onion (Sinha and Sinha, 1995). Therefore spraying of fungicides is an integral practice in onion cultivation especially during the wet season where climatic conditions are conducive for the purple blotch disease development and spreading.

Data in table 2 revealed that application of Antracol, which has already been recommended for purple blotch disease control, was not much effective in controlling purple blotch during the wet season. Being a contact fungicide, Antracol can easily be washed off from foliage due to frequent rains and accumulation of dew during the wet season and exposing plants to purple blotch conidia. Borkar and Patil (1995) found that disease intensity was reduced only by 6% using contact fungicide mancozeb. However, F 500 was highly effective against purple blotch even during the wet season though it is a fungicide with protective activity. Curative activity of F 500 in addition to protective activity (Anonymous, 2003) may also be a reason for high efficacy of F 500. In contrast, Folicur found to be effective is systemic in action. Therefore less chances of washing off may lead to high efficacy during wet season.

Irrespective of the kind of fungicides sprayed, the disease severity increased with age of the crop (Figure 1). This is because onion leaves are increasingly susceptible to *A. porri* as they age and leaves that emerge close to bulb maturity are more susceptible to the pathogen (Schwartz and Mohan, 1995).

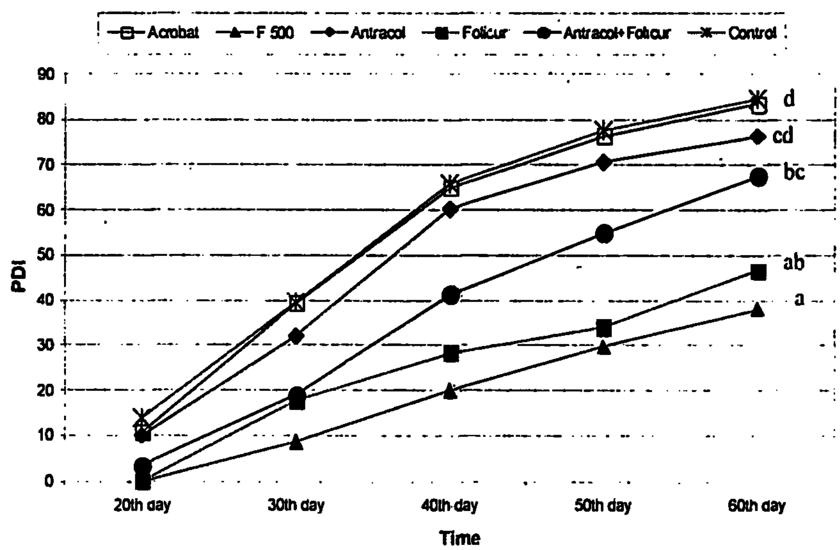

Figure 1. Purple blotch disease sevearity (PDI) in different fungicide treatments .under field condition

Fungicide spraying was stopped 2 weeks before harvesting. Bisht *et al* (1993) reported that last 2-3 weeks before harvesting were the most critical period contributing to yield loss. Therefore continuous application of fungicides is required to achieve better-controlled and subsequent higher yield. However, pre- harvesting intervals should be taken into consideration when fungicidal sprays close to harvesting date.

Bulb yield of small onion in different fungicide treatments are also shown in Table 2. Efficacy of fungicides in reducing disease severity was reflected in respective yields. According to Srivastava *et al* (1991), Fungicide treatments were found to have a variable effect on yield. Upadhyay and Tripathi (1995) demonstrated that fungicides significantly reduced disease intensity and gave increased yield over the control. Maximum yield of 7500kg/ha was recorded with the application of F 500 followed by 5789kg/ha with folicur. Control plots gave least yield of 989kg/ha. However differences in bulb yields obtained from Acrobat (1478kg/ha), Antracol (1878kg/ha) and alternative application of Antracol and Folicur were not significant. Tahir *et al* (1991) demonstrated that application of Chlorothalonil best controlled the purple blotch and increased yield by 19.9%.

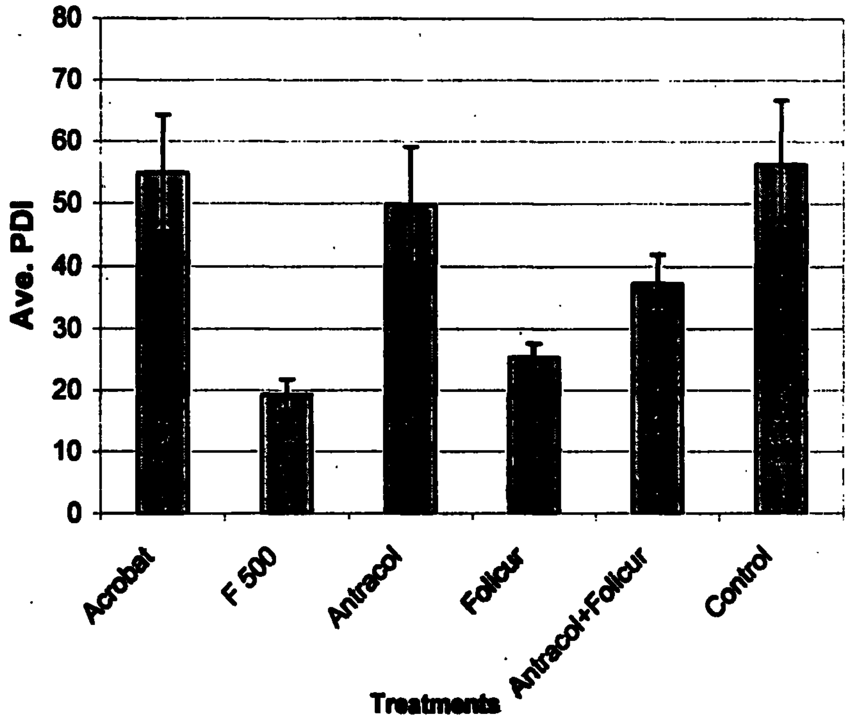

Figure 2. Average purple blotch disease severity in different treatments under field condition

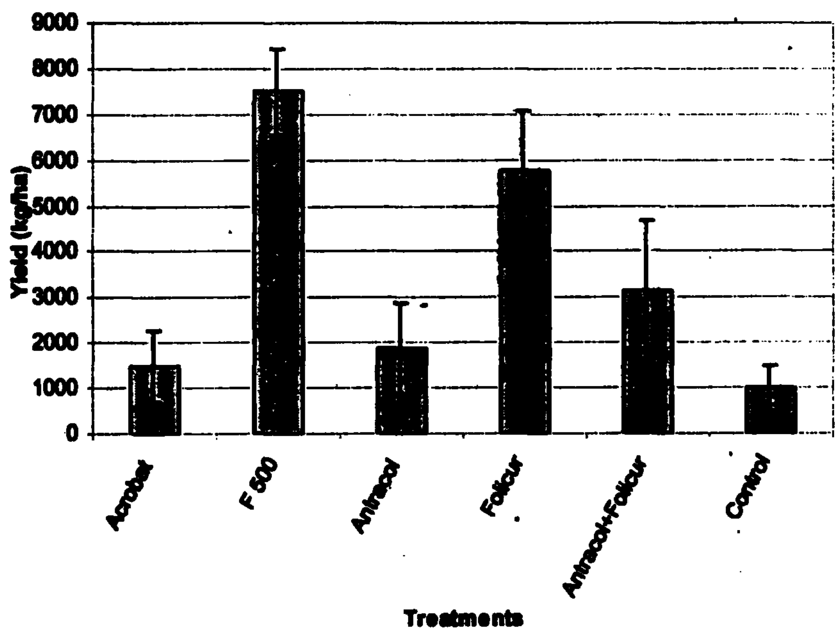

Figure 3. Bulb yield of small onion under different fungicides treatments.

In this study, Teepol was mixed with each fungicide spray at the rate of 1ml/1l as surfactant. Outer most waxy layer of onion leaves prevents the proper contact of fungicidal solution with leaves. Therefore surfactant mixed with fungicide solution enhances the spreading and subsequent increase in fungicides. Sastrahidayat (1994) reported that efficacy of fungicides against purple blotch was increased if Triton X-114 was added as a surfactant.

CONCLUSIONS

Foliar application of certain fungicides can effectively be used for the management of purple blotch disease of small onion. However complete control of disease even with fungicides is difficult to achieve in Aralaganwila region (DL_{2b}) during wet (*maha*) season. Substantial level of purple blotch disease suppression could be achieved through the foliar application of F 500 (7ml/10l; 350ml/ha) or Folicur (3.5ml/10l; 175ml/ha) during wet season. F 500, a highly effective fungicide with protective and curative activity can be recommended for the management of purple blotch disease of small onion. Further F 500 may be alternatively applied with Folicur to minimize the potential emergence of resistant pathogens due to continuous application of Folicur.

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