

Evaluation of Foliar Applied Fungicides Against Early Blight of Potato Under Field Conditions

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ABSTRACT

Four fungicides were tested against the early blight disease developed from natural inoculum on twenty potato varieties/lines sown in a randomized complete block design in the research area of Department of Plant Pathology, University of Agriculture, Faisalabad. All the fungicides reduce the disease severity compared to untreated check. However, the effect of Metalaxyl + Mancozeb (72 WP), Ridomil Gold (68WP), Score 250 and Banko 500 SC was more pronounced on tolerant and moderately resistant varieties compared to moderately susceptible or susceptible varieties. The genetic potential of moderately resistant varieties/lines was greatly exploited by the application of fungicides and early blight disease was effectively controlled.

Key Words: Early blight; Potato; *Alternaria solani*; Fungicides

INTRODUCTION

Early blight caused by *Alternaria solani* (Ellis & Mart.) Jones and Grout appears on potato planted in hilly or plain areas of Pakistan and becomes a production limiting factor in some years (Malik & Khan, 1967). In hilly areas, especially the Kaghan valley there is tendency of increased incidence with altitudes of 1,700 to 2,400 m and in some fields 25% of the foliage may be affected (Turkensteen, 1986).

During the last few years early blight has been occurring almost every year primarily due to the soil-borne survival of the fungus, local overwintering/oversummering of inoculum, cultivation of susceptible varieties and favourable environmental conditions. The ultimate control of pathogen is the cultivation of resistant varieties. However, farmers in pursuance of high yield are inclined to cultivate some varieties which may be less resistant to disease. On such varieties (less resistant or tolerant) fungicide application can increase their genetic potential and yield reduction due to disease can be minimized. In fact timely application of fungicides is the best method to control early blight as reported by several research workers (Mathur *et al.*, 1971; Singh, 1971; Dahmen & Staub, 1992; Singh, 1998). The objective of these studies was to evaluate the effect of five fungicides against commercially grown as well as some advanced lines of potato.

MATERIALS AND METHODS

Thirty advanced lines/varieties were planted in two sets based on the availability of seed quantity and field area in a randomized complete block design with three replications. Each variety/line was sown in 15 m row. One set consisted of ten varieties/lines, thus each variety served as block and the treatments were randomized in the blocks.

Four fungicides *viz.*, Diphanoconazole (Score 250 EC), Chlorothalonil (Banko 500 SC), Metalaxyl + Mancozeb (Ridomil Gold MZ 68 WP), and Metalaxyl + Mancozeb 72 WP were applied at 200 g/acre, except Diphanoconazole applied at 120 mL/acre. Untreated rows of each varieties/lines served as check. First spray of the fungicides was done immediately after the initial appearance of disease symptoms. It was scheduled to conduct the second spray after 10 days interval. Since the disease was effectively controlled so second spray was not done to save time and money. The data on disease severity were recorded one day before spray and 10 days after spraying using 0-4 grade scale of Reifschneider *et al.* (1984) and statistically analysed (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Symptoms of early blight were visible on November 30, 2002 in the form of small, isolated, scattered pale brown spots on the leaflets. These spots become covered with a deep greenish-blue growth of the fungus. Lowest leaves were attacked first and the disease progressed upward in the next few days. Shtienberg and Fry (1990) reported that in fields in which the previous crop was potato or tomato the early blight lesions in the current season potato crop appeared early in both the resistant and susceptible varieties. First spray of the fungicides was conducted on 02-12-2002 when the necrotic tissues were showing concentric ridges to produce a target-board effect. In some varieties of potato there was a narrow chlorotic zone around the spot, which faded into the normal green and expanded with the increase in size of spots. Data recorded before spray indicated the uniform spread of the disease and most of the varieties were having disease severity in the 0.5-2.0 grade and are considered moderately resistant or tolerant grade.

Table I. Evaluation of fungicides against early blight disease under natural conditions

Varieties/lines	Untreated Control	Metalaxyl + Mancozeb	Ridomil Gold	LSD
SET I				
% early blight disease severity				
393574-61	1.00 a	0.50 b	0.50 b	0.33
FD-22-3	0.50 a	0.50 a	0.50 a	0.00
393009-1A	0.50 a	0.50 a	0.50 a	0.00
FD-23-1	0.50 a	0.00 b	0.00 b	0.33
FD 1-7	1.00 a	0.50 b	0.50 b	0.33
Diamont	1.00 a	0.83 ab	0.50 b	0.39
391202-40	1.00 a	1.00 a	0.50 b	0.33
SH-20	0.66 a	0.16 a	0.16 a	0.57
9717	0.67 a	0.33 a	0.33 a	0.58
332824	0.16 a	0.16 a	0.16 a	0.46
SET II				
	Untreated Control	Score 250	Banko	LSD
Cardinal	0.66 a	0.33 b	0.33 b	0.24
TPS 9803	1.00 a	0.66 b	0.33 c	0.29
SH-5	2.00 a	1.66 b	1.66 b	0.24
FD-1-3	0.66 a	0.33 b	0.33 b	0.24
394007-55	0.66 a	0.66 a	0.66 a	0.00
332825	2.00 a	2.44 a	2.33 a	0.46
332826	2.00 a	1.33 b	1.33 b	0.48
332827	1.33 a	1.33 a	1.33 a	0.00
332828	0.66 a	0.66 a	0.66 a	0.00
332829	2.00 a	1.33 b	1.33 a	0.24

Means sharing different letters in each column are significantly different at p 0.05

Metalaxyl + mancozeb and Ridomil Gold reduced the early blight disease severity significantly compared to untreated control on 393574-61, FD 23-1, FD 1-7, Diamont and 391202-40 (Table I). Score 250 and Banko 500 SC reduced the disease severity in sprayed plots of cardinal, TPS 9803 SH-5 FD 1-3, 332826 and 332829 compared to check. According to Dahmen and Staub, (1992) difenoconazole (Score 250) was found to be very effective against early blight because of its protectant, curative and eradicator mode of action and especially its long lasting protective activity (up to 3 weeks) it provided great flexibility in number and timing of sprays. Thus the genetic potential of these varieties was greatly exploited by the application of fungicides. The fungicide treated plots of some varieties/lines although had less disease severity compared to untreated control, however, the treatment differences were statistically non-significant. This may be attributed to differential response of varieties/lines to fungicides.

Thus all the fungicides controlled early blight on some varieties/lines significantly compared to untreated control. Since the disease pressure was not so high so these fungicides were not applied second time in order to reduce the cost of inputs. In fact tolerant or resistant varieties/line play a crucial role to combat early blight and the number of fungicide application could be reduced by growing resistant varieties but there is not much information on potato varieties resistant to early blight. Moderate resistance in potato cultivars has been reported (Khan *et al.*, 2001). Combination of such varieties and systemic fungicides like Metalaxyl + Mancozeb, Ridomil Gold and Acrobit will be much cheaper and more effective management of early blight of potato than repeated sprays of a single fungicide. This strategy will also reduce the chances of evolution of

new races of *Alternaria solani* against the systemic fungicides.

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