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Effect of Seed Tuber Treatment in Controlling Late Blight of Potato

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Abstract: The experiment was conducted during 1996-97 and 1997-98 crop season with a view to determine the effectiveness of two systemic fungicides as seed treatment against late blight of potato caused by Phytophthora infestans. Potato seeds were used as whole and cut tuber and fungicides were applied on seed as dipping and spray. There were 10 treatments, each having three replications. Among the treatments, T_1 (Whole+Ridomil dip.) appeared the best, which+ exhibited delaying on disease appearance, reduced foliage blight and increased yield significantly over control.

Key words: Potato, seed tuber, late blight, ***Phytophthora infestans***, Ridomil mz 72 and acrobat mz

Introduction

Potato is the third largest food crop in Bangladesh after rice and wheat, occupies 0.86% of about 0.14 million hectare and produces 1.6 million tons (Akhtar, 1999). Per hectare yield is only 11.0 tons, which is comparatively low than other countries. In Bangladesh, the disease is considered to be the major limiting factor to increased potato and potato seed production (Ali and Khan, 1990 and Ali and Dey, 1999). Late blight caused by ***Phytophthora infestans*** is a very common and most destructive disease of potato throughout the world among 200 diseases (Thurston and Schultz, 1981 and Ali ***et al.***, 1999). The fungus affects the foliage, stems and tubers of potato plant and cause a severe damage to the crop resulting about 30.11 and 22.97% yield loss during 1992-93 and 1993-94, respectively (Ali and Dey, 1999). The disease is managed only through the application of contact and systemic fungicides. But fungicides are costly and sometimes not available in time of need. Moreover use of systemic fungicides might lead to development of fungicide resistance in ***P. infestans*** (Davidse ***et al.***, 1983; Bhattacharjya ***et al.***, 1990 and Ali and Dey, 1999). Literatures indicate that seed tuber treatment with systemic fungicides delay the onset of the disease which reduces the yield loss significantly (Khanna, 1989 and Sharma, 1994). In seed tuber treatment, very low quantities of fungicides are required compared to foliar application. Moreover, it reduces the risk of environment pollution, health hazard and not costly to growers. Such type of works against late blight is completely absent in Bangladesh. So, this study was undertaken to evaluate the performance of systemic fungicides as seed treatment against ***P. infestans*** and its effect on yield.

Materials and Methods

The present study was conducted at Tuber Crops Research Centre, ARS, BARI, Bogra during 1996-97 and 1997-98 crop seasons with the potato variety cardinal. The tubers were used in two forms viz. whole tubers and cut tubers (one tuber cut into two equal halves). Two systemic fungicides namely Ridomil Mz-72 (Metalaxyl) @ 0.2% and Acrobat Mz (Dimethomorph) @ 0.2% were used in two forms: (I) dipping the tubers in fungicidal solution for twenty minutes and (ii) spraying on seed tubers, which were scheduled before 24 hours of planting. The experiment was laid out in randomized complete block design (RCBD) with three replications. The unit plot size was 3.0×3.0 m. Fertilizers and intercultural operations were done as recommended by Tuber Crop Research Centre, BARI. No fungicides were sprayed for foliar application in the crop. The total number of treatments were 10 including two control viz., T_1=Whole tuber+Ridomil Mz 72 dip., T_2=Whole tuber+Ridomil Mz 72 spray, T_3=Cut tuber+Ridomil Mz 72 dip., T_4=Cut tuber+Ridomil Mz 72 spray, T_5=Whole tuber+Acrobat Mz dip., T_6=Whole tuber+Acrobat Mz spray, T_7=Cut tuber+Acrobat Mz dip., T_8=Cut tuber+Acrobat Mz spray, T_9=Control (whole tuber) and T_{10}=Control (cut tuber). Data were recorded on first appearance of visible disease symptom, foliage infection (%) and yield (tha^{-1}). Foliage infection was recorded three times (60, 70 and 80 days after planting-DAP) at an interval of 10 days using 1-9 scale (Heufling, 1979). Finally data were analysed statistically using Duncan's multiple range test (DMRT).

Results and Discussion

Results of 1996-97 indicate that the first leaf blight disease symptom appeared on 49 days after planting in T_6 (Whole tuber+Acrobat Mz spray) while last detected in T_1 (Whole tuber+Ridomil dip) and T_3 (Cut tuber+Ridomil dip) after 60 days of planting (Table 1). After 60 days of planting, the minimum foliage infection (%) was recorded in T_1 (5.0%) which was statistically similar with T_2 (Whole tuber+Ridomil spray), T_3, T_4 (Cut tuber+Ridomil spray) and T_7 (Cut tuber+Acrobat Mz dip.) but differed significantly with rest treatments. In T_9 (Control-whole tuber) and T_{10} (Control-cut tuber) showed the higher foliage infection and they were statistically similar. Data indicate that the maximum leaf blight incidence was reduced by T_1 with 30.00% followed by T_7 (43.00%) and T_3 (42.22%) compared to T_9 and T_{10} at 70 days after planting. In case of 80 days after planting, there was no statistical difference among the treatments regarding foliage infection where it ranged from 69.09 to 93.00%. Although numerically higher yield was harvested from T_1 but it was statistically at par with rest treatments except T_3, T_9 and T_{10}. The control treatment T_{10} appeared as the lowest yielder but it showed statistically insignificant with all the treatments except T_1 and T_5. Yield increased the maximum over control (T_{10}) by T_1 followed by T_2, T_5, T_6, T_3, T_4 and T_7.

In 1997-98 crop season, the first late blight disease symptom appeared on 44 days after planting in T_{10} while last detected in T_1 after 59 days of planting i.e., 15 days after first disease appearance. The treatments can be arranged in order of descending on late appearance of disease symptoms as : T_1, T_3, T_2, T_4, T_6, T_5, T_7, T_8, T_9 and T_{10} (Table 2). After 60 days of planting, the minimum foliage infection (%) was recorded in T_1 (9.33%) which was statistically similar with all other treatments except T_6 (30.0%), T_7 (20.0%), T_8 (26.67%), T_9 (31.67%) and T_{10} (33.33%). At 70

Table 1: Effect of seed tuber treatment against late blight of potato during 1996-97

Treatments	First disease symptom visible after planting	Foliage infection (%) after planting at			Yield (t ha^{-1})	Yield increased over control (Cut tuber) (%)
		60 days	70 days	80 days		
T_1= Whole tuber+Ridomil Mz 72 dip.	60 days	5.00a	30.00a	69.09	28.18a	23.19
T_2= Whole tuber+Ridomil Mz 72 spray	56 days	5.30a	55.00b	74.56	27.60abc	22.10
T_3= Cut tuber+Ridomil Mz 72 dip.	60 days	6.00ab	42.22ab	72.08	25.80abc	16.66
T_4= Cut tuber+Ridomil Mz 72 spray	58 days	5.30a	45.60b	75.61	25.60abc	16.01
T_5= Whole tuber+Acrobat Mz dip	57 days	8.17b	50.0b	75.18	27.10a	20.66
T_6= Whole tuber+Acrobat Mz spray	49 days	11.00b	50.00b	78.11	26.00abc	17.30
T_7= Cut tuber+Acrobat Mz dip.	58 days	7.60ab	43.00ab	74.21	25.30abc	15.02
T_8= Cut tuber+Acrobat Mz spray	57 days	11.60b	46.60b	75.95	25.10bc	16.74
T_9= Control (Whole tuber)	54 days	25.00c	70.00c	90.03	22.00c	2.27
T_{10}= Control (Cut tuber)	52 days	26.50c	72.00c	93.00	21.50c	--

Table 2: Effect of seed tuber treatment against late blight of potato during 1997-98

Treatments	First disease symptom visible after planting	Foliage infection (%) after planting at			Yield (t ha^{-1})	Yield increased over control (Cut tuber) (%)
		60 days	70 days	80 days		
T_1= Whole tuber+Ridomil Mz 72 dip.	59 days	9.33d	16.00e	43.33e	25.33a	20.44
T_2= Whole tuber+Ridomil Mz 72 spray	56 days	11.00cd	45.00d	58.33d	23.33ab	10.93
T_3= Cut tuber+Ridomil Mz 72 dip.	57 days	12.33cd	23.33e	51.67de	22.77ab	8.27
T_4= Cut tuber+Ridomil Mz 72 spray	53 days	10.66d	21.67e	53.37de	24.88a	18.30
T_5= Whole tuber + Acrobat Mz dip	49 days	15.00cd	55.00cd	78.33c	23.77ab	13.02
T_6= Whole tuber+ Acrobat Mz spray	50 days	30.00ab	71.33b	90.33ab	23.70ab	12.69
T_7= Cut tuber+ Acrobat Mz dip.	49 days	20.00bc	65.0bc	86.67bc	21.11bc	0.38
T_8= Cut tuber+ Acrobat Mz spray	48 days	26.67ab	72.67ab	90.33ab	21.81bc	3.70
T_9 = Control (Whole tuber)	45 days	31.67a	73.33ab	93.33ab	21.29bc	1.24
T_{10} = Control (Cut tuber)	44 days	33.33a	75.0ab	95.53a	21.03bc	--

Means bearing same letter(s) within same column do not differ significantly at 5% level of significance

DAP, T_1 proved the best treatments to suppress the foliage infection but it was statistically insignificant with T_3 and T_4. At 80 DAP, more or less similar trend on foliage infection as 70 DAP become evident. Regarding yield, significantly higher yield was achieved by T_1 and it differed significantly with rest treatments except T_7, T_8, T_9 and T_{10}. About 20.44% yield was increased over control (T_{10}) by T_1 followed by T_4, T_5, T_6, T_2 and T_3.

The results of the present investigation indicates that Ridomil as seed treatment was found promising in delaying onset of late blight disease symptoms compared to Acrobat Mz as well at control whether applied on seed in form of spray or dipping. Seed tuber dipping in Ridomil solution appeared more effective compared to spray on seed tuber under both the crop seasons whatever seed tuber used as whole or cut. Between the two fungicides, effectiveness of Ridomil in suppressing the disease incidence and its subsequent spread was more pronounced compared to Acrobat Mz in all dates of data recording in all the two crop seasons except 80 DAP during 1996-97. Although there was no significant difference between the two fungicides whether use as cut and whole tuber and as dipping and spray on tuber but Whole tuber+Ridomil dipping gave the highest yield numerically. The treatment, Whole tuber+Ridomil dip. increased 23.19 and

20.44% more yield compared to Control (cut tuber) respectively in 1996-97 and 1997-98 crop season. From this discussion it appears that amongst all the treatments, whole-Ridomil dip. reduced foliage infection significantly and increased tuber yield significantly against control. More or less similar observations have been reported by Khanna (1989) and Sharma (1994). Sharma (1994) claimed that Ridomil dip-cut tubers gave maximum germination, reduced foliage blight, lowered tuber rottage and increased tuber yield significantly over control. Khanna (1989) illustrated that tuber treatment delayed blight appearance and slowed rate of spread of the disease. He also mentioned that in treated tuber fungicides translocated to growing plant in a concentration toward off the infection and persisted there in for 25-30 days depending on the concentration used for treatment. Results of these trials opened a new hope in management of late blight under Bangladesh condition.

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