

Evaluation of fungicides against late blight disease of potato

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Field trials conducted to study the effect of different fungicides on the intensity of late blight of potato and tuber yield demonstrated that disease can be effectively controlled by three spraying of Mancozeb (0.2%) at an interval of 10 days starting from the first appearance of the disease. Minimum disease incidence, greater tuber yield and maximum net benefit was obtained in plots sprayed with Mancozeb (0.2%).

Key words : Potato, Late blight disease, Control

INTRODUCTION

Late blight disease of potato caused by *Phytophthora infestans* (Mont.) de Bary is an economically important disease in the plains of West Bengal. Paharia (1961) reported that it might cause reduction in yield upto seventy five percent when severely infected. The loss in yield depends upon the potato variety, time of appearance and severity of blight. The loss in yield is due to defoliation and haulm destruction brought about by the disease. The disease appears annually from January onwards in the plain of West Bengal (Chattopadhyay, 1952).

The disease can be reduced to a great extent through the use of fungicides. This needs a careful selection of fungicide and timely application in right doses. Chattopadhyay (1952) reported that timely spraying of Dithane Z-78 prevents the spread of the disease. Singh *et al.* (1970) observed that Dithane M-45 gave good results for controlling the late blight disease in Pantnagar. De and Sengupta (1988, 1991 & 1992) reported that late blight disease of potato in the plains of West Bengal can be effectively controlled by Dithane M-45 at

2 kg/ha. Present studies were undertaken to evaluate performance of different newly released systemic fungicides for the control of late blight in West Bengal.

MATERIALS AND METHODS

The experiment with potato variety Kufri Chandramukhi was laid out in replicated randomized block design with four replications during rabi season of 1989-90 and 1990-91 in the University farm located at Kalyani of Bidhan Chandra Krishi Viswavidyalaya. The experiment consisted four replication with a plot size $4.2\text{ m} \times 2.4\text{ m}$ with a spacing of 60 cm between rows and 20 cm within the plants. The crop were sown in the second week of November, 1989 and first week of December, 1990 for the 1st and 2nd year trials respectively. The basal dose consisting of 75 kg N, 150 kg P_2O_5 and 150 kg K_2O per hectare were applied at the time of sowing in furrows as urea, single super phosphate and muriate of potash respectively. Another 75 kg N per hectare was applied during final earthing up. The crop was grown at irrigated condition following the normal cultural practices as per recommendation for the region. The treatment of fungicides were done as follows :

T_1 = Oxadixyl + Mancozeb (0.25%) as 1st spray ; after 15 days sprayed Oxadixyl + Mancozeb (0.25%) as 2nd spray ; after another 15 days, sprayed Mancozeb (0.2%) at every 10 days intervals.

T_2 = Metalaxyl + Mancozeb (0.25%) as 1st spray ; after 15 days sprayed Metalaxyl + Mancozeb (0.25) as second spray ; after another 15 days, sprayed Mancozeb (0.2%) at every 10 days intervals.

T_3 = Oxadixyl + Mancozeb (0.25%) as 1st spray ; after 15 days sprayed Mancozeb (0.2%) at every 10 day intervals.

T_4 = Metalaxyl + Mancozeb (0.25%) as 1st spray ; after 15 days sprayed Mancozeb (0.2%) at every 10 days intervals.

T_5 = Mancozeb (0.2%) at every 10 day intervals.

T_6 = Chlorothalonil (0.15%) at every 10 day intervals.

T_7 = Control (No spray).

First spraying of the fungicides done after first appearance of late blight disease in the field and there after, subsequent sprayings were carried out as per treatment, in all three spraying were done. During the time of spraying each plot was surrounded by hessian cloth to prevent drift of spray from one plot to another. Disease intensity was recorded at 7 day intervals after the 1st

appearance of disease in the field by following the method described by Western (1971). The yield per plot was also recorded and statistically analysed.

RESULTS AND DISCUSSION

Results of the trials conducted during 1989-90 and 1990-91 are presented in the Tables 1 and 2 respectively, in the form of germination percentage, late blight disease intensity and yield of potato.

Table 1 : Effect of fungicides on the germination, disease intensity of late blight and yield of potato (1989-90)

Treat- ments	Germina- tion (%)	Disease intensity (%) at 7 days intervals after appearance of disease					Yield in (q/ha)
		7 day	14 day	21 day	28 day	Final 45 day	
T ₁	96	0.00	0.02	0.03	0.06	4.75	333
T ₂	97	0.00	0.02	0.04	0.30	6.45	307
T ₃	97	0.00	0.03	0.61	1.25	5.23	306
T ₄	97	0.01	0.03	0.68	0.93	7.25	321
T ₅	98	0.01	0.05	0.73	1.08	5.85	330
T ₆	98	0.00	0.02	0.05	0.72	6.13	300
T ₇	97	0.02	0.05	0.48	1.48	14.30	255
S. E. (diff)	0	0.00	0.01	0.16	0.28	1.07	13
C. D. (5%)	NS	0.01*	NS	0.33*	0.59*	2.24*	27*

* Significant

Above 96 percent germination noted in all the treatments in both the years. All the fungicides reduced the late blight disease intensity significantly over control. Data presented in the Table 1 indicated that incidence of late blight was minimum in plots treated with Oxadixyl+Mancozeb two times plus Mancozeb once followed by Oxadixyl+Mancozeb once plus Mancozeb two times, Mancozeb alone three times, Chlorothalonil three times, Metalaxyl + Mancozeb two times plus Mancozeb once and Metalaxyl+Mancozeb once plus mancozeb two times. Initially disease intensity was low and gradually increased upto 14.30 percent in the control plot at the final time of recording (45 days after appearance). Results presented in the Table 2 revealed that minimum disease intensity was observed in the plot treated with Oxadixyl+Mancozeb two times plus Mancozeb once followed by Metalaxyl+Mancozeb two times plus Mancozeb once, Oxadixyl+Mancozeb once plus Mancozeb two times and Mancozeb alone three times.

Table 2 : *Effect of fungicides on the germination, disease intensity of late blight and yield of potato (1990-91)*

Treat- ments	Germina- tion (%)	Disease intensity (%) at 7 days intervals after appearance of disease					Yield in (q/ha)
		7 day	14 day	21 day	28 day	Final 45 day	
T ₁	96	0.00	0.03	0.06	0.12	3.03	192
T ₂	97	0.02	0.05	0.07	0.13	3.98	181
T ₃	98	0.00	0.03	0.09	0.19	4.35	180
T ₄	98	0.03	0.06	0.10	0.11	5.13	189
T ₅	98	0.00	0.03	0.09	0.15	5.08	184
T ₆	97	0.01	0.05	0.10	0.30	6.15	183
T ₇	97	0.04	0.31	0.85	2.00	10.93	169
S. E. (diff)	0	0.02	0.07	0.12	0.30	0.42	11
C.D.at(%) NS		0.04*	0.16*	0.25*	0.62*	0.91*	23*

* Significant

Yield of potato significantly increased over control by the fungicide treatment in both the years. Average yield of potato during the year 1990-91 was low in comparison to the year 1989-90 due to delayed planting. Maximum yield was obtained in plots treated with Oxadixyl+Mancozeb two times plus Mancozeb two times plus Mancozeb once followed by Mancozeb alone three times. It was evident that Oxadixyl+Mancozeb (0.25%) two times plus Mancozeb (0.2%) once or Mancozeb (0.2%) alone three times provided most effective control of the disease and increased the tuber yield to the maximum extent. High efficiency of fungicides might be due to its persistence for longer period on potato leaves. High efficiency of Dithane M-45 against the late blight disease was also reported earlier by De and Sengupta (1988, 1991). Statistical analysis of data for percentage of infection of late blight and yield (for different treatments) were significant, which indicated fungicidal treatments were always better for controlling the disease. The data in Table 3 showed economics of spraying of different fungicides; which indicated that three spraying of Mancozeb (0.2%) gave maximum net benefit followed by Metalaxyl+Mancozeb (0.25%) once plus, Mancozeb (0.2%) two times respectively.

The cost benefit of treatments T₁ and T₃ could not be worked out as the price of the product was not known.

Based on the data of disease control, yield and economics of spraying Mancozeb (0.2%) could be recommended for effective control of late blight to get higher yield and benefit from potato in the plains of West Bengal.

Table 3 : Economics of different fungicide treatments against late blight disease of potato

Treatment	No. of spray	Average yield of tuber (q/ha)	Increase in yield over control (q/ha)	Cost of chemicals + labour/3 spray/ha (Rs.)	Value of increased yield (Rs.)	Net benefit (Rs.)	Cost Benefit Ration
T ₁ =Oxadixyl + Mancozeb (0.25%) —2 spray and Mancozeb (0.2%) —1 spray	3	262.5	50.5	Cost of chemical not know	6312	—	—
T ₂ =Metalaxyl + Mancozeb (0.25%) —2 spray and Mancozeb (0.2%) —1 spray	3	244.0	32.0	3200	4000	800	1:0.25
T ₃ =Oxadixyl + Mancozeb (0.25%) —1 spray and Mancozeb (0.2%) —2 spray	3	243.0	31.0	Cost of chemical not known	3875	—	—
T ₄ =Metalaxyl + Mancozeb (0.25%) —1 spray and Mancozeb (0.2%) —2 spray	3	255.0	43.0	1960	5375	3415	1:1.7
T ₅ =Mancozeb (0.2%) —3 spray	3	257.0	45.0	720	5625	4905	1:6.8
T ₆ =Chlorothalonil (0.15%) —3 spray	3	241.5	29.5	1980	3687	1707	1:0.86
T ₇ =Control	—	212.0	—	—	—	—	—

Economics of spray were calculated on the basis of average yield during two years trials. The average selling price of potato at harvest was Rs. 125/- per quintal. The prevailing market price of Mancozeb, Metalaxyl + Mancozeb and Chlorothalonil were Rs. 90/-, Rs. 568/- and Rs. 400/- per kilogram respectively. Selling price of Oxadixyl + Mancozeb is not known. Three labours per spraying of one hectare plot at the rate of Rs. 20/- per day per head were engaged.

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