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Evaluation of Management Practices Against Late Blight Disease of Potato and Their Adoption by the Farmers

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Abstract

potato is one of the basic vegetable of mass consumption in India. It is prone to many diseases, but the incidence and severity of late blight caused by a fungus *Phytophthora infestans* is high in Burdwan district of West Bengal. Therefore, an experiment as on farm trial was conducted with three treatments (T_1, T_2 and T_3) in randomized block design with seven replications during *rabi* season of 2006-07. The research results showed that seed tuber treatment with mancozeb followed by soil application of *Trichoderma viridae* at the time of earthing up and two foliar spray of mancozeb after initial appearance of disease symptoms with interval of 15 days (T_3) performed better to manage the disease as was also high. It was further found that 76.66% of farmers adopted the technology in subsequent years.
Key words : Potato, Late blight, Disease management, Adoption.

Potato is one of the basic vegetable of mass consumption in India and abroad and become fourth important staple food after rice wheat and maize. In India, both the area and production have increased manifolds during the past decades. The area under potato is 1.27 million hectare and the production is 23.12 million tones, with an average yield of 18.2 tones per hectare (1). Potato is prone to many diseases, particularly early and late blight. The incidence and severity of early and late blight is generally high in crop receiving imbalanced nutrition and devoid of disease control measure. Late blight caused by a fungus *Phytophthora infestans* has historically been an important disease of potatoes and tomatoes worldwide. The disease has become a major biotic factor in limiting crop production across the country including the plains. The losses caused by late blight are reported between 25 to 85% in terms of yield (2). Many farmers of the country are unaware of this disease panicked and did not take up timely measures for its control. Krishi Vigyan Kendra has one of its main objectives is to assess and refine the technology through on farm trials. Keeping the severity and losses caused by this disease in view the present on farm trial was conducted in burdwan district of West Bengal with following specific objectives : To evaluate location specific management practices against late blight disease of potato, and to assess adoption of these identified management practices among the farmers.

Methods

The research was conducted in Keten village of Burdwan district of west Bengal during *rabi* season of 2006-07. The incidence of disease is severe in the area due to favorable temperature range (15 to 30 C) along with one or two intermittent rainfall during crop season i.e. November to February. The trial was laid out in randomized block design using three treatments

Table 1. Effect of management practices on disease incidence (%) of potato late blight at different time interval. T : Treatment, d : Date of interval, Td : Treatment × Date of interval.

Treatments	d1	d2	d3
T_1	12.2286	24.7429	31.1857
T_2	17.4286	17.7571	20.0143
T_3	5.0857	6.7286	11.6714
	SED	CD (0.05)	CD (0.01)
T	0.66367	1.33446	1.78036
d	0.66367	1.33446	1.78036
Td	1.14950	2.31136	3.08368

Table 2. Analysis of variance for yield and yield attributing character. **Significant at 0.01.

Characters	Range	Coefficient of variation	Mean sum of square Treatment	Replication	Error
Number of tuber/plant	6.8-13.4	10.77	16.88**	1.54	1.12
Weight of tuber/plant	540-800	4.48	56352.33**	1265.66	849.83
Yield (t/ha)	26.8-36.2	3.92	66.36**	1.59	1.46

with seven replications and individual plot size of 80 sq m. In each treatment seed tubers were treated with mencozeb before sowing. Two sprays of mencozeb at 15-day intervals was done after initial appearance of disease symptoms in treatment-1 (T_1). In treatment-2 (T_2) instead of mencozeb, combine product of metalaxyl and mencozeb was used. In treatment-3 (T_3) *Trichoderma viridae* was applied in soil at the time of earthing up followed by two foliar spray of mancozeb in the same manner. Recommended agronomic practices were adopted for raising the crop.

Three observations on disease severity were recorded at 15-day intervals starting from 15 days of last spray. To calculate disease severity, five sampling areas of 1 m^2 were fixed in each plot at random. Ten randomly selected plants from each sample were considered for scoring using the 1—9 scale. Percent disease index (PDI) was calculated based on the formula given by McKinney (3).

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total number of leaves observed} \times \text{maximum rating}} \times 100$$

Scale 1-9 for late blight of potato

Scale	Blight (%)	Description
1	0	Not seen on field
2	0.1	Only few plants affected here and there; up to 1 or 2 spots in 12 yard's radius
3	1	Upto 10 spots per plant, or general light spotting
4	5	About 50 spots per plant or up to 1 leaflet in 10 attacked.
5	25	Nearly every leaflet with lesion, plants still retaining normal form; field may smell of blight but looks green, although every plant is affected.
6	50	Every plant affected and about half of the leaf area destroyed by blight; field looks green flecked with brown.
7	75	About $^3/_4$ th of leaf area destroyed by light; fields looks neither predominantly brown nor green.
8	95	Only a few leaves left green but stems green
9	100	All leaves dead, stems dead or dying.

For comparison of yield and yield attributing character all the plants were harvested at a time and sample yield and other parameters were computed per hectare basis. To disseminate this technology, training programmes and demonstrations were conducted for the farmers, out of which 80 farmers were selected to know the adoption behavior of farmers regarding this technology. The data of the experiment were statistically analyzed and presented below.

Results and Discussion

Effect of different treatments on late blight in respect of percent disease index (PDI) at different time interval is presented in Table 1. Soil application of *Trichoderma viridae* along with two foliar spray of mancozeb (T_3) was best in managing the disease

Table 3. Effect of different disease management practices on yield, yield attributing characters and economy of the crop.

Treatments	Mean No. of Tuber/plant	Mean Wt. of tuber/plant (g)	Yield (t/ha)	Gross return (Rs)	Net return (Rs)	Benefit-cost ratio
T_1	8.70	576	28.20	157300	95400	2.54
T_2	9.20	625	30.00	168200	106100	2.70
T_3	11.60	750	34.20	192100	132200	3.20
CD (0.05)	1.23	33.59	1.40			
CD (0.01)	1.72	47.59	1.97			
EMS	1.12	849.83	1.46			

Table 4. Adoption of management practices by the farmers.

	No. of farmers trained/ demonstrated	No. of farmers adopted technology	Percent adoption
1	120	92	76.66

throughout the crop duration in comparison to T_1 and T_2. Higher disease infestation was observed in later stage of crop indicating reducing efficacy of protection measures.

This investigation also presented the range of variations for three characters i.e. yield, no. of tubers/ plant and weight of tuber/plant. Mean sum of squares for the above mentioned characters and their significance are presented in Table 2. All these characters showed highly significantly variation among the treatments indicating their importance in the present study.

Yield of potato was found significantly higher in T_3 (34.20 tonnes/ha) compared to T_1 (28.20 t/ha) and T_2 (30.00 t/ha). Yield attributing characters i.e. no. of tuber/plant and weight of tuber/plant also followed the same pattern. Highest tuber no./plant (11.60) and weight of tuber (750 g) were recorded in treatment-3 followed by treatment-2.

This pattern indicated that better management of the disease allowed the plant to compile its full and healthy crop growth stage which reflected in terms of better number and weight of tubers and finally higher yield. Benefit-cost ratio of the treatment-3 (3.20) was also found most suitable as compared to other treatments (Table 3).

Thus the seed tuber treatment with mencozeb followed by soil application of *Trichoderma viridae* along with two foliar spray of mancozeb (T_3) was best management practice against late blight of potato both in respect of minimizing the disease incidence and yield and economy of the crop cultivation.

To disseminate this identified i.e. technology/ management practices, Krishi Vigyan Kendra Burdwan has conducted training programs and demonstrations on treatment-3 (seed tuber treatment + soil application of *Trichoderma viridae* + two foliar spray of mancozeb after initial appearance of disease sympotoms with interval of 15 days) and adoption was measured in terms of percentage and results as presented in Table 4.

Table 4 reveals that 120 farmers were trained and these management practices were demonstrated to them to show production potential of the technology. Out of this 92 farmers adopted the technology in subsequent seasons, i.e., 76.66% farmers adopted the technology. These findings are similar with findings of Kumar et al. (4).

Conclusion

It was concluded that seed tuber treatment followed by soil application of *Trichoderma viridae* and two foliar spray of mancozeb after initial appearance of disease symptoms with interval of 15 days (treatment-3) performed better to manage the disease as minimum number of plants were infested by the disease in this treatment and per hectare yield was also high. Further, 76.66% of the farmers adopted the technology in subsequent years.

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