

CONTROL OF BLIGHT DISEASES OF POTATO IN WEST BENGAL PLAINS BY VARIOUS SPRAY FUNGICIDES

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Eight fungicides *viz.*, Cuman, Copex-50, Flit-406, Dithane M-45, Dithane Z-78, Blitane, Duter and Hexathane, which were tested as prophylactic sprays against early and late blight of potato, gave good control of the diseases concerned. In the two years' trial (1964-65 and 1965-66), Flit 406, Cuman and Dithane M-45 showed better result than the rest of the fungicides used. The sprayed crop remained green a little longer and gave higher yield than the unsprayed crop.

INTRODUCTION

Potato is an important tuber crop of West Bengal. The present average acreage of potato in West Bengal is about 1,70,000 acres, of which Hooghly District has about 54,000 acres, and Burdwan District about 34,000 acres. At present its cultivation deserves more attention due to the virtual stoppage of imported Burma seed tubers. Also, in the present food shortage, potatoes may go a long way to improve our predominantly rice diet and at the same time potato can produce the greatest amount food crop per unit area of land cultivated. It has also the advantage that it is a short term and paying crop, besides being storable for some time.

Potato production in West Bengal is, however, somewhat limited by the ravages of diseases and pests. Among the important diseases of potato the late and early blights due to *Phytophthora infestans* (Mont.) de Bary and *Alternaria solani* (Ell. and Mart.) Jones and Grout respectively are prevalent in West Bengal.

Choudhuri (1959), reported the results of spray tests for the control of late blight disease of potato in the hill areas of West Bengal. Trials were carried out by him with six different fungicides namely Coppesan, Copper Sandoz, Copravit, Shell Copper, Perenox and Dithane compound of which Copravit and Coppesan gave significantly higher yields over shell copper. Chattopadhyay (1957) reported that of the four fungicides, Perenox, Soltosan, Dithane Z-78 and Bordeaux mixture used against the early blight of potato, better result was obtained by spraying with Perenox and Soltosan. Grainger (1962) used Copper oxychloride, Copper oxide, and a Captan compound against the late blight of potato.

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Potato spraying is done regularly in the more important potato growing areas as a valuable prophylactic measure. In recent years shortage of copper has led to the trying out of other fungicides, either singly or in combination with some copper fungicides, against the blight diseases of potato.

MATERIAL AND METHODS

The well known commercial variety Royal Kidney was selected for the trial and sown during the middle of November in the fairly fertile sandy loam soil of Adisaptagram Farm (District Hooghly) in randomised block design with four replications, for the years 1964-65 and 1965-66. Individual plot size was 8×3 sq. meter. The space between block to block was 0.6 m, while the space between plot to plot was 0.4 m. The distances between the plant to plant and row to row were 0.15 m and 0.25 m. respectively. All the plots were given the same fertilizer, interculture and irrigation.

- A) Seed treatment : Prior to sowing, the potato seed tubers were treated in 0.12% Aretan-6 solution for 2 minutes and dried in shade. Aretan-6 is an organo mercurial wettable compound containing 6% mercury.
- B) To prevent the appearance of blight diseases the following prophylactic spray fungicides were tried:—
- (i) *Copex-50*.—It contains 50% wettable copper oxychloride; the dilution rate was 2 kg. in 450 litres of water.
 - (ii) *Blitane*.—It is a wettable powder containing a unspecified mixture of copper oxychloride and Dithane Z-78 for spraying, the concentration used was 1.5 kg/450 litres of water.
 - (iii) *Duter*.—It is a wettable powder contains 20% Triphenyltin hydroxide, sprayed at the rate of 1 kg in 450 litres of water.
 - (iv) *Cuman*.—It contains Ziram i.e., Zinc-dimethyldithio-carbamate; it is applied at the rate of 450 gm/450 litres of water.
 - (v) *Dithane M-45*.—The product contains Manganese ions (16%), Zinc ions (2%) and ethylene bis dithiocarbamate (62%); the dilution rate was 1 kg in 450 litres of water.
 - (vi) *Dithane Z-78*.—This chemical contains about 75% Zinc ethylene bisdithiocarbamate and is employed for spraying at the rate of 1 kg in 450 litres of water.
 - (vii) *Flit 406*.—It is purely an organic captan compound (i.e., N-trichloromethyl mercapto-4 cyclohexane-1,2-dicarboximide) and is used at the rate of 1 kg in 450 litres of water.
 - (viii) *Hexathane*.—In this chemical the active ingredient is 65% Zinc ethylene bisdithiocarbamate. The normal application rate is 1 kg in 450 litres of water.

The dilution rates given above usually cover one acre of land per spray but for the present experiment it was calculated according to the size of the plot.

In the plains of West Bengal, blight diseases appear generally during the first to last week of January. During the year 1964-65, the potato seed tubers were shown on the 10th November, 1964 and the symptoms appeared first in the third week of December, 1964. Three sprayings were applied at 15 days' interval. The symptoms appear on the leaves as small grey to brown patches; under unfavourable conditions the disease increases rapidly so as often to involve the whole leaf surface; the stems are also quickly attacked in warm muggy and cloudy weather, often with a ground fog or rain. First spraying was applied on the 15th December, 1964, when the plants were 8"-12" high. Second spraying was given on 30th December, 1964 and the last spraying was done on the 15th January, 1965. The crop was harvested on the 11th February, 1965.

In the second year's trial potato seed tubers were planted on the 12th November, 1965 and the spraying was employed when plants were 8"-12" high. First spraying was applied on the 22nd December, 1965 and it was continued upto 3rd spraying at 15 days' interval.

The number of diseased plants and the percentage of infected leaves were estimated on an average of 4 replicated plots taking 100 plants from each plot. Observations were made before each application of the fungicide in the respective plots. The yields of different plots subjected to different treatments were recorded separately.

In both the trials blight diseases were not severe in the plains of West Bengal as weather condition was not very favourable for the spread of the disease.

RESULTS

The trial experiments were conducted with a view to test efficacy of the spray fungicides. These chemicals (namely Flit 406, Cuman, Dithane M-45, Dithane Z-78, Blitane, Duter, Copex-50 and Hexathane) were tested under the natural conditions.

The Table I shows the effectiveness of different fungicides against damage due to the blight diseases. In the Table II efficiency of each fungicide against blight diseases was determined by its effect on yield. From Table I and II it is seen that the Flit-406, Cuman and Dithane M-45 control the disease as well as increase the yield to a great extent. Untreated control plots were considerably more damaged than the treated plots. It can be generalized from the observation that the sprayed crop as greater longevity than the unsprayed crop.

DISCUSSION

It has been found that the tested fungicides are quite effective against the foliar damage due to the attack of early and late blight diseases. Continued prophylactic application of such fungicides considerably minimise both the diseases. Spraying usually started from the second week of December and were restricted to three in number at an interval of 15 days. It is presumable that in severe blight years more sprays may be necessary and at closer intervals. In the years of these trials the natural intensity of the diseases was only moderate.

Table 1. Data showing the number of diseased plants and percentage of infected leaves after various fungicidal treatments

(Average of four replicated plots taking 100 plants from each replication)

Treatments	1964-65				1965-66				
	Number of infected plants		% of infected leaves		Number of infected plants		% of infected leaves		
	1st Spray- ing on 15-12- 1964	2nd Spray- ing on 30-12- 1964	3rd Spray- ing on 15-1- 1965	1st Spray- ing on 15-12- 1964	2nd Spray- ing on 30-12- 1964	3rd Spray- ing on 15-1- 1965	1st Spray- in on 22-12- 1965	2nd Spray- ing on 7-1- 1966	3rd Spray- ing on 22-1- 1966
Cumari	21	46	85	5.2	11.5	21.2	6	14.5	24.2
Hexathane	20	54	102	5	13.5	25.5	6.7	15	28
Dithane Z-78	24	58	110	6	14.5	27.5	6.5	16	31
Blitane	31	72	123	7.7	18	30.7	8.7	18.7	36.5
Duter	27	67	115	6.7	16.7	28.7	7.2	17.2	32.5
Flit 406	19	43	79	4.7	10.7	19.7	5.5	12	22
Copex-50	22	52	90	5.4	13	22.5	6.2	15.2	25.2
Dithane M-45	23	49	88	5.7	12.2	22	5.5	13	24.5
Control	45	98	168	11.2	24.5	42	13	28.2	53.2

Table 2. *Data showing the yield per acre during 1964-65 and 1965-66 after treatment with various fungicides*

Chemicals	1964-65		1965-66	
	Average yield per plot (size 8 × 3 sq.m.) (in kg.)	Net yield per acre (in kg.)	Average yield per plot (size 8 × 3 sq.m.) (in kg.)	Net yield per acre (in kg.)
Flit 406	42.600	7186.20	44.300	7481.70
Cuman	37.200	6275.30	38.800	6554.60
Dithane M-45	35.600	6008.00	35.900	6056.60
Copex-50	35.000	5919.00	27.600	4659.90
Blitane	32.400	5473.60	32.500	5497.90
Duter	31.400	5311.70	31.200	5279.30
Dithane Z-78	30.600	5161.90	31.200	5267.20
Hexathane	28.600	4838.00	30.400	5133.60
Control	26.100	4412.90	26.900	4538.30

These prophylactic sprays were given by hand compression, high volume sprayers. Other things being equal, similar results are expected with low volume knapsack power sprayers.

Though significant control of disease and higher yields are obtained by giving prophylactic sprays, it is doubtful if highly significant better performance of one fungicide can be obtained over that of other, by such simple trials.

All the same, such trials give a working idea of the usefulness of any new fungicide against potato blight disease under field conditions in the plains of West Bengal.

ACKNOWLEDGEMENT

The authors express their gratitude to Dr S. K. Mukherji, Mycologist, Government of West Bengal for kindly going through the manuscript and for his guidance.

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(Received for publication 10 September 1966)