



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(6): 721-724

© 2018 IJCS

Received: 05-09-2018

Accepted: 10-10-2018

A ChakrabortyAICRP on Potato, Directorate of
Research, BCKV, Kalyani,
Nadia, West Bengal, India**S Murmu**Survey Selection & Mass
Production of Nodule Bacteria,
BCKV, Mohanpur, Nadia, West
Bengal, India

Bio-efficacy of amisulbrom 20% SC (Kirari) against Late blight disease (*Phytophthora infestans*) of potato under West Bengal condition

A Chakraborty and S Murmu

Abstract

The experiment was conducted with new molecule fungicide Amisulbrom 20% SC (Kirari) against late blight of potato and its phytotoxicity for two crop seasons i.e. 2013-14 and 2014-15. The test fungicides at 500 ml/ha exhibited highest disease controlling ability in terms of percent incidence and percent disease intensity as compared to other available fungicides and control treatment. The percent disease incidence and intensity were 15.35 and 15.10 and 10.10 and 11.45% respectively during 2013-14 and 2014-15 crop season as compared to control treatment where percent disease incidence and intensity were 92.10 and 94.67 and 16.25 and 18.25% respectively. The test fungicides also proved its efficacy at lower dose also. The test fungicide amisulbrom 20% sc @ 500 ml/ha exhibited higher yield (30.25 and 32.50 t/ha) in both the crop season i.e. 2013-14 and 2014-15. Therefore amisulbrom 20% sc @ 500 ml/ha can be employed in the management of late blight of potato.

Keywords: amisulbrom, control, late blight, phytotoxicity, potato

Introduction

Late blight caused by *Phytophthora infestans* had been and continues to be the most dreaded disease of potato world over including India. It is one of the most serious diseases of potato in West Bengal also. In the plains of West Bengal the disease appears in moderate to severe form every year because congenial weather conditions (i.e. daily temp. Ranges between 10-22^oc, relative humidity (RH) ranges between 80-100 % and cloudy / foggy weather with intermittent rain continue for 2-3 days). Yield loss due to late blight in plains had shown steep increase or decrease depending upon the varieties grown, growth stage of the plant at which disease appears and favourable weather conditions. Depending upon all the parameters the yield loss varies to the tune of 10-80%. Management of the late blight of potato by using fungicides is most effective and widely used method. But indiscriminate use of systemic fungicides causes development of resistance in the pathogens. Therefore, it is necessary to change the existing fungicides by newer molecules against such pathogens like *Phytophthora infestans* to avoid the development of resistance. Therefore keeping these views in mind the present investigation using Amisulbrom 20 % SC (Kirari) was undertaken with the following objectives: to evaluate the efficacy of test fungicide against late blight of potato, to find out the most effective dose and number of sprays required for management of the disease, to find out whether the test fungicide has got any phytotoxic effect or not.

Materials and Methods

The experiment was conducted in the two consecutive years (2013-2014 & 2014-2015) in the same ways at Adisaptagram Block Seed Farm, Hooghly. During the cultivation the land was prepared by giving three ploughing and cross ploughing by tractor drawn plough. The recommended doses of fertilizers (N:P:K=200:150:150 kg/ha) was applied at the time of final land preparation out of which 50 % of N₂ was applied during final land preparation and rest 50% during earthing up. The planting was done during first week of November in both the years. The layout was made following RBD (Randomized Block Design) with 6 treatments and 4 replications. The size of individual plot was 5m×2m. The planting was done at a spacing of 60 cm ×20 cm. The Kufri Chandramukhi was selected for the experiment because this variety is susceptible to late blight disease. The first spray was given after the onset of the disease and thereafter two sprays were given at 7 days interval and the incidence and severity

Correspondence**S Murmu**Survey Selection & Mass
Production of Nodule Bacteria,
BCKV, Mohanpur, Nadia, West
Bengal, India

of the disease was recorded before every spray and 7 days after 3rd spray on randomly selecting three leaves per plant, (one upper leaf, one middle leaf and one lower leaf) in 50 plants per plot, following 1-9 scale. But these spray schedules were same for the two consecutive years of trial.

Table 1: Disease intensity scoring scale

Per cent area affected	Score
No infection	1
Up to 3 %	2
Up to 10 %	3
Up to 25 %	4
Up to 50 %	5
Up to 75 %	6
Up to 90 %	7
Up to 97 %	8
Up to 100 %	9

Ref: International Potato Centre (CIP)

The percent Disease Intensity (PDI) was calculated by the formula developed by McKinney (1923) [4].

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

Observation on Phytotoxicity effect of fungicide, Amisulbrom 20% SC (Kirari) at different concentrations was observed after 3rd spray treatment. Observation on chlorosis, necrosis, wilting scorching, hyponasty and epinasty were recorded at 1, 3, 5, 7, 10 and 15 days after 3rd spray treatment by visual

observations based on 0-10 scale as given below:

Table 2: Phytotoxicity scoring scale

Scale	% Crop health Affect
0	No phytotoxicity effect
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	91-100

Results and Discussion

Per cent plant infection: From these two years consecutive trial it was found that before spray treatment, late blight disease infected plants ranged from 9.25 to 12.20 % (Table 3) in the first season and 10.50 to 12.52% (Table 6) in the second season in different treatments and control plots in which they did not differ significantly. Disease infected plants gradually increased in all the fungicidal treatment before 2nd spray and 3rd and 7 days after 3rd spray treatment as against severe increase in plant infection in untreated control. However, the increase was minimum in amisulbrom 20 %SC@500 ml/ha.

Table 3: Percent plant incidence of Late blight of potato in different treatments (2013-14)

Treatment	Fungicides	Dose/ha		% Plant incidence of disease at different interval			
		G a. i.	Formulation(ml)	Pre-treatment	Before 2 nd spray	Before 3 rd spray	7 days after 3 rd spray
T1	Amisulbrom 20% SC (Kirari)	60	300	10.35 (18.76)*	13.45 (21.49)	16.52 (23.97)	19.62 (26.28)
T2	Amisulbrom 20% SC (Kirari)	80	400	9.72 (18.14)	12.30 (20.50)	15.40 (23.10)	17.30 (24.60)
T3	Amisulbrom 20% SC (Kirari)	100	500	9.25 (17.64)	10.62 (19.01)	13.85 (21.80)	15.35 (22.98)
T4	Famoxadone 16.6% + Cymoxanil 2.1% (Equation Pro Sc)	210	500	11.36 (19.69)	13.46 (21.52)	16.75 (24.16)	18.30 (25.32)
T5	Metiram 55% + Pyraclostrobin 5% (Cabrio Top WG)	1050	1750	12.20 (20.41)	14.20 (22.13)	16.84 (24.22)	18.75 (25.66)
T6	Control			10.10 (18.20)	59.50 (50.48)	75.35 (62.27)	92.10 (73.72)
SEm (±)				(0.54)	(0.35)	(0.37)	(0.365)
CD(P=0.05)				(NS)	(1.040)	(1.099)	(1.084)

*Figures in the parenthesis are transformed angular values.

Table 6: Percent plant incidence of Late blight of potato in different treatments (2014-15)

Treatment	fungicides	Dose/ha		% Plant incidence of disease at different interval			
		G a. i.	Formulation(ml)	Pre-treatment	Before 2 nd spray	Before 3 rd spray	7days after 3 rd spray
T1	Amisulbrom 20% SC (kirari)	60	300	12.35(20.57)*	14.70(22.53)	17.65(24.84)	20.18(26.27)
T2	Amisulbrom 20% SC (kirari)	80	400	10.83(19.21)	13.62(21.66)	15.87(23.46)	18.30(25.32)
T3	Amisulbrom 20% SC (kirari)	100	500	10.50(18.90)	12.18(20.42)	14.32(22.23)	15.10(22.87)
T5	Metiram 55% + Pyraclostrobin 5% (Cabrio Top WG)	1050	1750	11.36(19.69)	14.57(22.44)	17.78(24.94)	19.83(26.44)
T6	Control			12.52(20.71)	56.15(48.54)	76.45(60.97)	94.67(76.67)
SEm (±)				(0.33)	(0.35)	(0.37)	(0.93)
CD (P=0.05)				(NS)	(1.07)	(1.14)	(2.83)

*Figures in the parenthesis are transformed angular values.

Per cent Disease index (PDI): Per cent Disease index (PDI) before spray treatments ranged from 6.80 to 8.20 % (Table 4) in the first season and 8.28 to 9.45% (Table 7) in second season in different fungicidal treatments and control and data did not differ significantly. Though there was an increase in PDI in all the fungicidal treatments, but it was minimum in

Amisulbrom 20% SC (Kirari) @ 500 ml / ha. The increase in PDI was found to be very high in untreated control. In fungicidal treatments, Amisulbrom 20 % (Kirari) recorded significantly less PDI in comparison to remaining treatments before 2nd and 3rd spray and 7 days after 3rd spray treatments (Table-4 & Table 7) in two seasons.

Table 4: Percent Disease Index of late blight of potato and yield in different treatments (2013-14)

Treatment	Fungicides	Dose/ha		% Plant incidence of disease at different interval				Yield (t/ha)
		G a. i.	Formulation (ml)	Pre-treatment	Before 2 nd spray	Before 3 rd spray	7days after 3 rd spray	
T1	Amisulbrom 20% SC (kirari)	60	300	7.15 (15.48)	9.32 (17.76)	11.70(20.00)	13.65(21.68)	27.75
T2	Amisulbrom 20% SC (kirari)	80	400	7.62 (16.00)	8.60 (17.00)	11.80(20.10)	12.50(20.70)	28.25
T3	Amisulbrom 20% SC (kirari)	100	500	6.80 (15.08)	7.25 (15.58)	9.46(17.85)	10.10(19.10)	30.25
T4	Famoxadone 16.6% + Cymoxanil 2.1% (Equation Pro Sc)	210	500	8.20 (16.60)	9.25 (17.70)	11.60(19.88)	13.74(21.74)	27.50
T5	Metiram 55% + Pyraclostrobin 5% (Cabrio Top WG)	1050	1750	7.40 (15.80)	10.80 (19.17)	12.32(20.54)	14.25(22.17)	26.35
T6	Control			7.10 (15.40)	46.30 (42.88)	66.15 (54.43)	78.81 (62.61)	16.25
SEm (±)				(0.526)	(0.526)	(0.651)	(0.522)	(0.693)
CD (P=0.05)				(1.563)	(1.563)	(1.934)	(1.551)	(2.059)

*Figures in the parenthesis are transformed angular values.

Table 7: Percent Disease Index of late blight of potato and yield in different treatments (2014-15)

Treatment	fungicides	Dose/ha		% Plant incidence of disease at different interval				Yield (t/ha)
		G a. i.	Formulation (ml)	Pre-treatment	Before 2 nd spray	Before 3 rd spray	7days after 3 rd spray	
T1	Amisulbrom 20% SC (kirari)	60	300	9.45(17.90)	11.83(19.40)	12.49 (20.69)	14.25(22.17)	28.60
T2	Amisulbrom 20% SC (kirari)	80	400	8.50(16.92)	11.50(19.44)	12.45(20.66)	13.52(21.56)	29.75
T3	Amisulbrom 20% SC kirari)	100	500	8.28(16.70)	9.10(17.56)	10.56(18.96)	11.45(19.77)	32.50
T4	Famoxadone 16.6% + Cymoxanil 2.1% (Equation Pro Sc)	210	500	8.70(17.15)	10.35(18.76)	12.18(20.42)	13.70(21.72)	28.50
T5	Metiram 55% + Pyraclostrobin 5% (Cabrio Top WG)	1050	1750	9.26(17.69)	11.25(19.60)	12.88(21.03)	14.82(22.64)	27.65
T6	Control			8.30(16.70)	48.54(44.17)	58.24(49.75)	72.48(58.36)	18.25
SEm (±)				(0.40)	(0.64)	(0.45)	(0.27)	(0.46)
CD (P=0.05)				(NS)	(1.93)	(1.36)	(0.82)	(1.40)

*Figures in the parenthesis are transformed angular values.

Yield (T/ha): All fungicidal treatments recorded significantly more yield in comparison to untreated control. The treatment Amisulbrom 20 % SC (Kirari) @ 500 ml / ha. Recorded significantly highest yield (30.25 t/ha. in 1st year & 32.50 t/ha. in the 2nd season) in comparison to other doses of Amisulbrom 20 % SC (Kirari) and remaining fungicidal treatments (Table 4 & table 7).

This result was very similar to Lal *et al.* (2017) [3] where they used different fungicides in management of the late blight disease of potato. Less PDI and highest yield were found in the treated plot with mancozeb 75% WP followed by Mancozeb 75% WP + Dimethomorph 50% WP.

The similar result was also reported by Rahman *et al.* (2008) [5] where Less PDI and highest yield were found in the treated plots with Dithane M-45 and Filthane M-45 respectively. The other similar type of result was also found by

Chakraborty and Majumdar (2012) [1] who reported that the sever late blight can be effectively managed with prophylactic spray of mancozeb @0.25% followed by cymoxanil + mancozeb @0.3% at the onset of disease and one more spray of mancozeb @ 0.25% seven days after application of systemic fungicides.

This finding is also in line with Khadka *et al.* (2016) [2] who reported that Dimethomorph and Fenamidone + mancozeb showed less disease incidence against late blight of potato.

Phytotoxicity: No phytotoxic symptoms like necrosis, vein clearings, wilting, epinasty, hyponasty etc. were observed in fungicidal treatments with Amisulbrom 20% SC @ 500 ml/ha and even in its double dose during experimentation for two seasons (Table 5).

Table 5: Phytotoxicity of different fungicidal treatments on Potato (2013-14 & 2014-15)

Sl. No.	Treatments	Dosage / ha		Necrosis (Days after spray)						Vein Clearing (Days after spray)						Wilting (Days after spray)						Epinasty and Hyponasty (Days after spray)					
		G a. i.	Formulation (ml)	1	3	5	7	10	15	1	3	5	7	10	15	1	3	5	7	10	15	1	3	5	7	100	15
T ₁	Amisulbrom 20%SC (Kirari)	60	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T ₂	Amisulbrom 20%SC (Kirari)	80	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T ₃	Amisulbrom 20%SC (Kirari)	100	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T ₄	Amisulbrom 20%SC (Kirari)	200	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T ₅	Famoxadone 16.65+Cymoxanil 22.1% (Equation Pro SC)	210	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T ₆		1050	1750	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T ₇	Control			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Conclusion

Amisulbrom 20% SC (Kirari) @ 500ml / ha was found to be significantly more effective against Late blight disease of potato in comparison to check fungicides. Amisulbrom 20% SC (Kirari) @500 ml / ha also recorded significantly more potato yield in comparison to remaining treatments. No phytotoxicity of Amisulbrom 20% SC (Kirari) was observed at normal and 2x dose (500 and 1000 ml / ha) in potato crop. Therefore Amisulbrom 20% SC (Kirari) can be employed safely in controlling of late blight disease of potato.

Acknowledgement

The authors are thankful to Dhanuka Agritech Limited for financial assistance during the entire course of study.

References

1. Chakraborty A, Mazumdar D. Development of spray schedule for the management of late blight of potato in plains of west Bengal. *Potato journal*. 2012; 39(1):92-94.
2. Khadka, RB, Rawal R, Marasaini M, Shrestha GK, Chapagain T, Gautam IP, Khatri BB. Evaluation of different fungicides and clones against potato late blight (*Phytophthora infestans*) in Western Nepl. 5th International Conference on Agriculture, Environment and Biological Sciences (ICAEBS-16) April 28-29, 2016; Pttaya (Thailand).
3. Lal M, Yadav S, Singh BP. Efficacy of New Fungicides against Late Blight of Potato in Subtropical Plains of India. *Journal of Pure and Applied Microbiology*. 2017; 11(1):599-603.
4. Mckinney HH. Influence of soil temperature and moisture and infection of wheat seedling by *Helminthosporium sativum*. *Journal of Agricultural Research*. 1923; 26:195-217.
5. Rahman MM, Dey TK, Ali MA, Khalequzzaman KM, Hussain MA. Control of Late Blight Disease of Potato by Using New Fungicides. *International Journal of Sustainable Crop Production*. 2008; 3(2):10-15.