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Bio-efficacy of Eugin 5EC against Late blight and Antirot 10DP against soil and tuber borne diseases of potato in West Bengal

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An experiment was conducted at Adisaptagram Block Seed Farm, Mogra, Hooghly, West Bengal, India during 2011-2012 and 2012-2013 crop season. Bio-efficacy of different doses of Eugin 5EC (based on garlic extract) and in combination with other fungicides against Late blight of potato and bio-efficacy of Antirot 10DP (jojoba seed extract) and in combination with other fungicides against soil and tuber borne diseases of potato such as brown rot, common scab and soft rot were evaluated. Application of Eugin 5EC @2.0 ml / L of water in combination with Mancozeb 75WP @1.5 g / L of water showed effective results against Late blight of potato in terms of per cent reduction of disease (80.98%) over control and yield (18.60 t/ha). On the other hand, soil application of Antirot 10DP + mixed fertilizer @(7.5 + 75.0) Kg/ ha showed effective results against soil and tuber borne diseases of potato like brown rot, common scab and soft rot in terms of per cent reduction of disease over control *i.e* 56.78%, 58.66% and 41.97% respectively.

Key words: PDI, Eugin 5EC, Antirot 10DP, Late blight and tuber borne diseases

INTRODUCTION

Potato is an important cash crop of West Bengal. To increase the production of the crop, attempts have been made to introduce many high yielding varieties suitable for different agro-climatic zones of West Bengal. which has helped to increase the productivity of crops, but on the same time it has invited many common diseases to a greater extent. Recent initiatives to popularize cultivation of potato in this state through the use of different inputs of biological source already draw the attention of innovative farmers of the state.

The present investigation has been carried out to evaluate the bio-efficacy of Eugin 5EC (based on garlic extract) against potato Late blight disease and to evaluate the bio-efficacy of Antirot 10DP (Jojoba seed extract) against major soil and tuber borne diseases of potato such as brown rot, common scab and soft rot in West Bengal.

Little information is available on the effect of biological source in controlling disease infestation in potato cultivation. In view of the above and lack of work done on this aspect, it has been considered worthwhile to undertake the present investigation in the alluvial soil of West Bengal in order to evaluate the effect of some new molecules of biological source as plant protection measures against Late blight and soil and tuber borne diseases like brown rot, common scab and soft rot of potato.

MATERIALS AND METHODS

The experiment was conducted at Adisaptagram

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Block Seed Farm, Mogra, Hooghly, West Bengal, India at 9.75 m above sea level during 2011-2012 and 2012-2013 crop season following Randomized Block Design (RBD). The potato variety Kufri Chandramukhi was planted during 1st week of November in both the years. To study the bio-efficacy of Eugin 5EC against potato Late blight disease,field experiment was set by taking six treatments *viz.* Eugin 5EC @2.5 ml /L of water (T_1); Eugin 5EC + Mancozeb 75WP @(2.0 ml + 1.5 g) / L of water (T_2); Eugin 5EC + Mancozeb 75WP @(2.0 ml + 2.0 g) /L of water (T_3); Mancozeb 75WP @3.0g /L of water (T_4); Cymoxanil + Mancozeb 75WP @3.0 g /L of water (T_5)and untreated control (T_6). In every treatment severity of the disease was recorded at every seven days interval starting from first appearance of the disease following the scale of Horsfall and Barrett (1945) as used in modified form (0-11) by a number of scientists (Shields *et al.*, 1984; Tek *et al.*, 2004; Bock *et al.*, 2009).

Finally, per cent disease intensity (PDI) values were calculated by using the formula developed by McKinney (1923).

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total no. of compound leaves observed} \times \text{maximum ratings}} \times 100$$

For observing the bio-efficacy of Antirot 10DP against major soil and tuber borne diseases of potato, field experiment was conducted by taking six treatments *viz.* Antirot 10DP @7.5 Kg/ ha (T_1); Antirot 10DP + urea @(7.5 + 15.0) Kg /ha (T_2); Antirot 10DP + mixed fertilizer @(7.5 + 75.0) Kg/ ha (T_3); Carbendazim 50 WP @1.0 g /L of water (T_4); Bleaching powder @20 Kg/ ha (T_5) and untreated control (T_6). At the time of harvesting, disease incidence per cent of major soil and tuber borne diseases of potato *viz.* brown rot, common scab and soft rot was calculated. Four replications were considered for each treatment in both experiments.

RESULTS AND DISCUSSION

From the data presented in Table 1 it is evident that in case of Late blight of potato maximum reduction of disease over control (80.98%) was achieved in treatment T_2 *i.e* Eugin 5EC + Mancozeb 75WP @(2.0 ml + 1.5 g) / L of water. This was followed by treatment T_5 *i.e* Cymoxanil + Mancozeb 75WP @3.0 g / L of water and T_1 *i.e* Eugin 5EC @2.5 ml / L of water where per cent reduction of disease was 79.54% and 78.99% respectively.

No work has so far been done with this formulation against potato late blight disease. But the effect of garlic extract against potato diseases was evaluated by a number of scientists. Portz *et al* (2008) observed that garlic extract successfully control the Late blight. Cao and van Bruggen, (2001) and Wang *et al.* (2001) also observed that garlic extract effectively control the disease in *in vitro* condition.

From yield data presented in Table 1, it is observed that highest tuber yield (18.60 t /ha) obtained by T_2 where Mancozeb 75WP @1.5 g / L of water was added to Eugin 5EC @2.0 ml / L of water followed by treatment T_1 (16.45 t /ha) where Eugin 5EC @2.5 ml / L of water was applied.

From the data presented in Table 2 it is evident that the highest per cent reduction of disease over control of brown rot and common scab (56.78% and 58.66% respectively) was observed when soil application of Antirot 10DP in combination with mixed fertilizer @(7.5 + 75.0) Kg /ha (*i.e* T_3) was done followed by treatment T_1 (52.46% and 50.20% respectively) where Antirot 10DP @7.5 Kg /ha and T_2 (52.46 and 42.32% respectively) where Antirot 10DP + urea @(7.5 + 15.0) Kg /ha was applied. Whereas highest per cent reduction of disease over control of soft rot (41.97%) was observed when soil application of Antirot 10DP in combination with mixed fertilizer @(7.5 + 75.0) Kg /ha (*i.e* T_3) was done followed by treatment T_2 (38.32%) where Antirot 10DP + Urea @(7.5 + 15.0) Kg /ha and T_1 (30.66%) where Antirot 10DP @7.5 Kg /ha was applied.

No work has been done with the formulation of Antirot 10DP as well as any other formulation of jojoba seed extract against any potato disease. But fungicidal activity of jojoba seed extract and jojoba oil was observed by a number of scientists against fungal diseases mainly powdery mildew (Reynolds, 2005; Moharam and Obiadalla Ali, 2012).

From Table 2 it is also observed that highest tuber yield (16.88 t /ha) obtained from T_3 where combination of Antirot 10DP and mixed fertilizer @(7.5 + 75.0) Kg /ha was applied followed by T_2 (16.56t / ha) where Antirot 10DP + urea @(7.5 + 15.0) Kg /

Table 1 : Effect of Eugin 5EC on management of Late blight of potato.

Treatments	Doses	PDI[1] of Late blight of potato (%) 7 DAI[2]	14 DAI	21 DAI	Per cent reduction of disease over control (%)	Tuber yield (t/ha)	Per cent increase of yield over control (%)
T_1	Eugin 5EC @2.5 ml / L of water	11.00 (19.82)[†]	12.86 (21.44)	14.09 (22.46)	78.99	16.45	49.55
T_2	Eugin 5EC + Mancozeb 75WP @ (2.0 ml + 1.5 g)/L of water	9.28 (18.22)	11.82 (20.55)	12.75 (21.35)	80.98	18.60	69.09
T_3	Eugin 5EC + Mancozeb 75WP @ (2.0 ml + 2.0 g)/L of water	11.02 (19.84)	13.05 (21.60)	14.64 (22.90)	78.17	15.60	41.82
T_4	Mancozeb 75WP @3.0 g / Lof water	17.18 (24.86)	21.45 (27.94)	23.22 (29.15)	65.37	14.22	29.27
T_5	Cymoxanil + Mancozeb 75WP @ 3.0 g / L of water	10.33 (19.21)	12.42 (21.07)	13.72 (22.15)	79.54	15.80	43.64
T_6	Control	13.51 (29.34)	37.90 (38.29)	67.05 (55.27)		11.00	
SEm (±)		0.53	0.35	0.27		0.43	
CD (5%)		1.60	1.06	0.80		1.31	

[1]PDI- Per cent Disease Intensity [2]DAI- Days After Initiation
[†]Values in parentheses are arcsine-transformed values.

Table 2 : Effect of Antirot 10DP against soil and tuber borne diseases of potato.

Treatments	Doses	Disease Incidence (%) Brown rot	Common scab	Soft rot	Per cent reduction of disease over control (%) Brown rot	Common scab	Soft rot	Tuber yield (t/ha)	Per cent increase of yield over control (%)
T_1	Antirot 10DP @7.5 Kg /ha	3.19 (11.07)[†]	5.06 (13.64)	1.90 (8.91)	52.46	50.20	30.66	16.13	51.74
T_2	Antirot 10DP +Urea @ (7.5 + 15.0) Kg/ha	3.19 (11.07)	5.86 (14.61)	1.69 (8.51)	52.46	42.32	38.32	16.56	55.79
T_3	Antirot 10DP +Mixed fertilizer @(7.5 + 75.0) Kg /ha	2.90 (10.63)	4.20 (12.52)	1.59 (8.31)	56.78	58.66	41.97	16.88	58.80
T_4	Carbendazim 50 WP @ 1.0 g / L of water	6.48 (15.33)	8.81 (17.77)	2.49 (9.96)	3.43	13.29	9.12	14.81	39.32
T_5	Bleaching powder @ 20.0 Kg/ha	3.50 (11.54)	7.30 (16.22)	2.19 (9.44)	47.84	28.15	20.07	14.75	38.76
T_6	Control	6.71 (15.58)	10.16 (19.06)	2.74 (10.37)	–	–	–	10.63	– –
SEm (±)		0.27	0.34	0.26				0.17	
CD (5%)		0.80	1.02	0.78				0.52	

[†]Values in parentheses are arcsine-transformed values.

ha was applied and T_1 (16.13 t /ha) where Antirot 10DP was applied@7.5 Kg /ha.

Therefore, it can be concluded from the above findings that Eugin 5EC + Mancozeb 75WP @(2.0 ml + 1.5 g) / L of water can be applied for control of Late blight of potato and for management of tuber borne diseases of potato (*i.e* brown rot, common

scab and soft rot) soil application of Antirot 10DP in combination with mixed fertilizer @(7.5 + 75.0) Kg /ha has been found to be highly effective.

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