

Effect of growth regulators on growth, yield and natural enemies of potato

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ABSTRACT

A field experiment on the effect of triacontanol (miraculan and vipul) on potato was conducted during 2002-2003 and 2003-2004 on farmers field at Surekalna, West Bengal. The treatments consisted of Miraculan (Triacontanol 0.05% EC) at 0.125 g.a.i. ha⁻¹, 0.250 g.a.i. ha⁻¹, 0.500 g.a.i. ha⁻¹ and 1.000 g.a.i. ha⁻¹, Vipul (Triacontanol 0.1%EC) at 0.250 g.a.i. ha⁻¹ and 0.500 g.a.i. ha⁻¹. The plot size was 10mX5m. The variety used was Kufri Jyoti. Application of Miraculan at 0.250 g.a.i. ha⁻¹, 0.500 g.a.i. ha⁻¹ and 1.000 g.a.i. ha⁻¹ and Vipul at 0.500 g.a.i. ha⁻¹ significantly increased dry matter production, LAI, tuber bulking rate, size of tubers and yield of potato. Three major groups of predators obynerus sp, chrysopids sp and coccinellids sp were found in potato field. There was no phytotoxic effect of Miraculan on potato and no detrimental effect on predators.

Key words : Triacontanol, miraculan, vipul, potato, predator

Potato is an unique crop that can supplement the food need of the world. Due to its high protein calorie ratio and short vegetative growth cycle, it can provide more edible energy, protein and dry matter per unit area time than other crops (Khuranas 2006). The Indo-gangetic plains account for 76% potato production in India (Praharaj et.al 2006). Potato is an important crop of rice based cropping system in Hoogly, Burdwan, Bankura and Howrah districts of West Bengal. The growth regulators are known to have beneficial effect on tuberization, bulking and hence yield. The GA3 gave significantly higher number and weight of seed size (20-80 g) tubers than rest of treatments. The increment in yield by number and weight was 22.1% and 18% with GA3 while it was 12.7% and 10% with NAA over control. (Birbal et.al 2005) The objectives of the experiment was (i) to study the effect of Triacontanol on dry matter production LAI, tuber bulking rate, size of tubers and yield of potato (ii) the effect of Triacontanol on predators in potato plant.

MATERIALS AND METHODS

A field experiment on Miraculan (Triacontanol 0.05%EC) and Vipul (Triacontanol 0.01% EC) was conducted on farmers field (Surekalna) in Burdwan district of West Bengal during 2002-2003 and 2003-2004 to evaluate Triacontanol on growth, yield and potato pests. The treatments consists of T1-Miraculan at 0.125 g.a.i. ha⁻¹, T2-Miraculan at 0.250 g.a.i. ha⁻¹, T3-Miraculan at 0.500 g.a.i. ha⁻¹, T4-Vipul at 0.250 g.a.i. ha⁻¹, T5-Vipul at .500 g.a.i. ha⁻¹, and T6- untreated control were replicated four times in randomized block . The soil of the experimental field had 0.08% total N, 35kg ha⁻¹ available P2O5 and 185 Kg ha⁻¹ available K₂O ha⁻¹. The crop was sown in the first week of December and harvested on middle of March. In both years, seed tubers of Kufri Jyoti. Were planted 50cm x 20cm. in plot size 10mX5m. The crop

received 100kg N, 50kg P2O5 and 50 kg K₂O ha⁻¹. Miraculan and Vipul were sprayed twice at 30 days after planting and 45 days after planting using Knapsac sprayer at high volume with 500L water ha⁻¹. Ten plants were selected at random and ten leaves were taken on third day after each spraying for counting the number of predators.

RESULTS AND DISCUSSION

Triacontanol (Miraculan and Vipul) at different rates of application were significantly superior over control plot in increasing growth and potato yield. Dry matter accumulation and LAI were significantly higher with application of Miraculan at 0.250 g.a.i. ha⁻¹, 0.500g.a.i. ha⁻¹ and 0.100 g.a.i. ha⁻¹ over Miraculan at 0.125g.a.i. ha⁻¹, Vipul at 0.250 g.a.i. ha⁻¹ and untreated control. Tuber bulking rate was also higher with application of Miraculan at higher rates and Vipul at 0.500 g.a.i. ha⁻¹. Application of Miraculan at 0.250 g.a.i. ha⁻¹, 0.500 g.a.i. ha⁻¹ and 1.000 g.a.i. ha⁻¹ and Vipul at 0.500 g.a.i. ha⁻¹ increased large size tuber (>75g). The results of the experiment are in conformity with the results of Birbal *et.al* (2002) who also reported that plant growth regulators make significant difference in number and weight of tubers. The application of triacontanol has increased dry matter production, LAI, improved tuber bulking rate, produced large size tubers and hence the potato yield. The population of predators have influence on the activity of aphids in potato plant therefore, in this study the effect of triacontanol on population of predators was studied. There was no significant difference in density of predators between the treated plots and untreated plots. Three major groups of predators were found in potato fields namely *obynerus sp*, *chrysopids sp* and *coccinellids sp*. There was no phytotoxic effect on potato due to application of Miraculan.

Miraculan at 0.250 g.a.i. ha⁻¹ and 0.500g ai ha⁻¹ or vipul at 0.500g. ai ha⁻¹ may be recommended for improving the productivity of potato crop. This product is safe as it has no phytotoxic effect on potato and no detrimental effect on insect predators.

Table 1 : Effect of Triaccontanol on dry matter production, LAI and tuber bulking rate of potato

Treatments		Dose g.a.i ha ⁻¹	Dry matter accumulation at 60DAP(g m ⁻²)		Leaf area index at 60DAP		Tuber bulking rate (g m ⁻² day ⁻¹)			
			2002-2003	2003-2004	2002-2003	2003-2004	45-60DAP		60-75DAP	
T ₁	Miraculan	0.125	408	426	4.2	4.6	10.2	11.5	25.5	26.3
T ₂	Miraculan	0.250	472	494	4.8	5.4	14.8	17.2	24.6	28.4
T ₃	Miraculan	0.500	480	490	4.8	5.6	15.2	17.6	25.4	26.5
T ₄	Miraculan	1.000	478	498	5.2	5.6	13.9	16.8	26.2	28.8
T ₅	Vipul	0.250	445	472	4.2	5.0	12.1	15.1	21.8	24.5
T ₆	Vipul	0.500	466	491	4.7	5.4	14.6	16.9	26.4	28.1
T ₇	Untreated		388	396	3.7	4.2	6.9	7.8	19.2	20.5
C.D (P=0.05)			10.2	9.2	0.72	0.96	3.18	2.92	2.52	2.11

DAP= days after planting, Miraculan (Triaccontanol 0.05%EC), Vipul(Triaccontanol 0.1%)

Table 2 Effect of Triaccontanol on Tuber grade and yield of Potato

Treatments	Dose g.a.i ha ⁻¹	Size of tubers (percent)						Potato tuber yield (q ha ⁻¹)			
		>75g		50-75g		<50g		2002-2003	2003-2004	2003-2004	
T ₁	Miraculan	0.125	44(41.5)	58(49.6)	37(37.5)	28(32.0)	19(25.8)	14(22.0)	311.3	327.8	327.8
T ₂	Miraculan	0.250	64(53.1)	72(58.0)	21(27.3)	16(23.6)	15(22.7)	12(20.3)	329.4	341.6	341.6
T ₃	Miraculan	0.500	65(53.7)	76(60.4)	19(25.8)	12(20.3)	16(23.6)	12(20.3)	330.5	343.2	343.2
T ₄	Miraculan	1.000	63(52.0)	72(51.9)	22(28.0)	18(25.1)	16(23.6)	10(18.4)	324.1	340.1	340.1
T ₅	Vipul	0.250	58(59.6)	72(51.9)	28(32.0)	26(30.7)	14(22.0)	12(20.3)	318.5	334.8	334.8
T ₆	Vipul	0.500	65(53.7)	68(55.5)	15(22.7)	23(28.7)	20(26.6)	9(17.5)	326.3	342.1	342.1
T ₇	Untreated		37(37.5)	42(40.4)	46(43.0)	34(35.7)	17(24.4)	24(29.3)	296.8	303.6	303.6
C.D.(P=0.05)			2.81	3.56	3.17	4.32	2.56	4.12	5.14	4.40	4.40

Figures in parenthesis are angular transformation values

Table 3 : Effect of triaccontanol (miraculan) on some important insect predator in potato field

Treatments	Dose g.a.i ha ⁻¹	Number of predators per ten plants						
		Obynerus sp.		Chrysopids sp		Coccinellids sp		
		2002-2003	2003-2004	2002-2003	2003-2004	2002-2003	2003-2004	
T ₁	Miraculan	0.125	1.8	2.0	2.2	1.9	1.6	1.9
T ₂	Miraculan	0.250	1.8	2.0	2.2	1.8	1.6	1.8
T ₃	Miraculan	0.500	1.7	2.0	2.2	1.8	1.6	1.9
T ₄	Untreated		1.9	2.0	2.4	2.0	1.7	1.9
			NS	NS	NS	NS	NS	NS

NS= Not significant

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