

EVALUATION OF AUTUMN OR SPRING APPLICATIONS OF ETHOPROP FOR THE MANGEMENT OF *MELOIDOGYNE CHITWOODI* ON POTATO

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Summary. A field experiment was conducted to evaluate whether autumn or spring application of ethoprop is effective for the control of *Meloidogyne chitwoodi* on potato. Application of ethoprop (19 or 14 l/ha) together with metam sodium (37 l/ha) during autumn or spring significantly reduced nematode infestation of potatoes compared with the untreated control. Per cent nematode infestation was reduced to 0.2% and 2.7% by autumn or spring application, respectively. Application of ethoprop and metam sodium together in autumn or spring reduced the nematode infestation and increased the clean yield and marketable yield.

Nematode infestation of potato results in yield decline and quality reduction thereby contributing economic loss to the industry. Though more than 68 species of plant parasitic nematodes belonging to 24 genera are associated with potato fields from different parts of the world (Jensen *et al.*, 1979) root-knot nematodes (*Meloidogyne* spp.) have been recognized as a major pest on potato in Idaho along with *Pratylenchus neglectus* (Hafez and Sundararaj, 2000a). Several species of root knot nematodes occur in Idaho and eastern Oregon but the most common is the Columbia root knot nematode *Meloidogyne chitwoodi*.

Chemical nematicides are the regular management options to maintain nematode populations below the economic threshold level and thereby reduce yield loss and quality damage (Santo *et al.*, 1985b; Hafez and Sundararaj, 2000b). In addition, other management tactics such as green manure crops alone (Al-Rehiayani and Hafez, 1999) or along with bacterium (Al-Rehiayani *et al.*, 1999) have been used to control *M. chitwoodi* under microplot and field conditions. To meet increased production demands chemical nematicides still continue to be the foremost practice to control root knot nematodes on potato. The objective of the study was to determine if autumn or spring applications of a combination of ethoprop and metam sodium are effective for the control of *M. chitwoodi* on potato.

MATERIALS AND METHODS

A field experiment was conducted in a randomized block design with six replications of the plot size of 12 x 70 m. The field, infested with the Columbia root knot nematode, *M. chitwoodi* Golden, O'Banon, Santo *et al.* Finley was pre-plant treated with ethoprop (19 or 14 l/ha) on 23 October 1998 or 17 March 1999 during au-

tumn and spring respectively. Metam sodium was applied at the rate of 37 l/ha. Combination of the treatments was applied as given in Table I. Pre-treatment nematode population in the plots was recorded on 10 October, 1998 (Autumn) and 17 March, 1999 (Spring). Immediately following application the field was disked once, harrowed with a Triple K implement twice, planted on 3 m rows with potato (*Solanum tuberosum* L.) cv. Russet Burbank on April 21 at 25 cm spacing within the row. Weeding and other normal cultural practices were followed. Tubers were harvested on 27 September; yield data were recorded and graded into five categories for size and appearance. The tubers were graded and evaluated for nematode infestation.

RESULTS AND DISCUSSION

Pretreatment nematode population (Table I) indicated a uniform population in all plots. Evidence of phytotoxicity or other unusual symptoms caused by treatment were not observed at any time during the season. Data presented in the Table II indicated that autumn or

Table I. Population density of *Meloidogyne chitwoodi* before application of ethoprop and metam sodium on potatoes.

Treatment and rate per hectare	J ₂ /500 cc soil	
	Autumn	Spring
Ethoprop 6EC 19 l	20	42
Ethoprop 6EC 14 l	13	57
Ethoprop 6EC 19 l + Metam sodium HL 37 l	27	112
Ethoprop 6EC 14 l + Metam sodium HL 37 l	32	78
Metam sodium HL 37 l	18	67
Untreated check	47	50
LSD (<i>P</i> <0.05)	NS	NS

Table II. Efficacy of ethoprop and metam sodium after autumn application on the potato yield.

Treatment and rate per hectare	Metric tons/ha				
	Clean yield	Nematode infested yield	Total yield	Market yield	Nematode infested tubers (%)
Ethoprop 6EC 19 l	37.2 b	3.1 ab	40.3 b	25.4 b	7.7
Ethoprop 6EC 14 l	45.4 ab	4.5 ab	49.9 ab	32.8 ab	9.0
Ethoprop 6EC 19 l + Metam sodium HL 37 l	53.0 a	0.1 a	53.1 a	39.0 a	0.2
Ethoprop 6EC 14 l + Metam sodium HL 37 l	52.4 a	0.1 a	52.5 a	38.7 a	0.2
Metam sodium HL 37 l	53.1 a	0.2 a	53.2 a	40.1 a	0.3
Untreated check	39.9 b	7.5 b	47.4 b	28.5 b	15.8
LSD ($P < 0.05$)	10.7	5.0	4.7	8.1	

Means followed by the same letters within a column are not significantly different at $P = 0.05$.

Table III. Efficacy of ethoprop and metam sodium after spring application on the potato yield.

Treatment and rate per hectare	Metric tons/ha				
	Clean yield	Nematode infested yield	Total yield	Market yield	Nematode infested tubers (%)
Ethoprop 6EC 19 L	37.1 ab	6.2 abc	43.3	26.7 b	14.4
Ethoprop 6EC 14 L	32.0 b	11.3 ab	43.3	23.9 b	26.1
Ethoprop 6EC 19 L + Metam sodium HL 37 L	46.0 a	2.0 c	48.0	34.2 ab	4.1
Ethoprop 6EC 14 L + Metam sodium HL 37 L	48.1 a	1.3 c	49.4	38.0 a	2.7
Metam sodium HL 37 L	46.5 a	3.0 bc	49.4	37.5 a	6.0
Untreated check	31.7 b	13.0 a	44.7	24.0 b	29.2
LSD ($P < 0.05$)	12.2	8.5	NS	10.1	

Means followed by the same letters within a column are not significantly different at $P = 0.05$.

spring application of ethoprop (19 or 14 l/ha) along with metam sodium (37 l/ha) significantly reduced the nematode infested potatoes as compared to the untreated check. There is a significant difference in the clean yield, total yield, marketable yield and nematode-infested tubers due to the autumn application of ethoprop. Previous studies indicated that among the nematicides tested to *M. chitwoodi* on potato the most effective treatments were aldicarb along with ethoprop or oxamyl alone (Hafez, 1983). Further, Santo *et al.* (1985a and 1985b) also found that ethoprop in combination with 1,3-D gave excellent control of *M. chitwoodi* on potato compared with other chemicals tested. Application of ethoprop (19 or 14 l/ha) alone or along with metam sodium significantly increased the clean yield, total yield or marketable yield of potato. Such a combination effect was demonstrated in earlier studies conducted on potato under field conditions. Santo *et al.* (1985a) proved that application of either ethoprop or oxamyl or application of ethoprop in combination with 1,3-D (Santo *et al.*, 1985b) are effective in increasing the potato yield and control of *M. chitwoodi*, respectively. Also, the application of ethoprop along with nitrogen fertilizer significantly increased tuber yield as compared to treatment without nitrogen (Hafez and Sundararaj, 2000b).

Application of metam sodium alone or together with ethoprop significantly reduced the nematode infested

tubers as compared to the untreated check. Earlier studies proved that application of ethoprop at planting decreased populations of root-knot nematodes (Gill *et al.*, 1979), tuber infestation (Sharma and Raj, 1987) and increased tuber yield. Per cent nematode infestation reduced in all the treatments as compared to the control. It ranged from the lowest level of 0.2% in the combination of ethoprop and metam sodium treatment to 7.7% in the ethoprop (19 l/ha) alone treatment.

Application of ethoprop in spring significantly increased the clean yield and marketable yield of potato (Table III). However the difference observed in the total yield due to the treatments was not statistically significant. Nematode infested tubers also showed difference due to the treatments as compared to the control. Per cent nematode infestation was reduced in all the treatments as compared to the control. It ranged from the lowest level of 2.7 in the ethoprop and metam sodium treatment to the highest level of 26.1 in the ethoprop (14 l/ha) alone treatment as compared to the untreated control (29.2%)

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