

EFFICACY OF ETHANDINITRILE TO CONTROL ROOT KNOT NEMATODES IN YELLOW MELON CULTIVATION

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Traditionally physical methods have been adapted in Korea for the control of root knot nematodes including use of resistance varieties and grafting, mulching, adding soil amendments, water management, solarization etc. However, the changed agricultural system in Korea (increasing green house cultivation, labor saving requirement, valuable and non-rotation crop production) requires the old system to meet new effective and labor saving systems. Using fumigants with occasionally physical treatments is currently one of the solutions for controlling soil borne pests and pathogens. However the economical and valuable fumigant, methyl bromide (MB), cannot be used because it is an ozone depletor and is being phased out under the Montreal Protocol. Basamid is a registered soil fumigant in Korea but there are there are issues with application, cost and effectiveness in some applications. Ethanedinitrile (EDN), a potential alternative for methyl bromide was patented by CSIRO (1995) because of its rapid response to insects and minimum of environmental problems. Ren et al reported efficacy of EDN to several soil pests, pathogens and nematode, *Steinernema carpocasiae* in laboratory test. This study showed the effectiveness of EDN to control root knot nematode, *Meloidogyne spp* a serious nematode pest in Korea.

This study evaluated one laboratory trial and two field trials (Seongju and Suwon). The field studies showed the potential of ethanedinitrile to control pine sawyer and pine nematode in infested PWD pine trees in practical conditions in Korea.

Materials and Methods

Ethanedinitrile (purity=97%) supplied from BOC Australia was applied at 50 and 100kg per ha. Two types of applications were used: In the 1st field trial at Seongju, EDN mixed with nitrogen was directly connected through the drip irrigation system covered with LDPE film. In the 2nd field trials at Suwon, EDN in water was applied through the drip irrigation system (2L/m²) and also covered with LDPE film. Nematode mortality was monitored post-fumigation and scheduled after 1day, 1, 2, &

4 months. Randomly fumigated soil in each plot was sampled and nematodes extracted using the modified Baermann funnel procedure (Southey, 1985).

Experiment

Experiment 1. Small plots in greenhouse: In this experiment yellow melon plants were planted. When this research started in 2006, the population of root knot nematode was high (194 larvae and adult/ 100cc of soil). This soil was blended with other soil. The soil was collected from a Seongju yellow melon field infested by root knot nematode. The Seongju field soil had many years of cultivation. Each greenhouse plot consisted of one bed 41cm long, 25cm wide and 19cm height. Two young yellow melon plants in each plots.

Transplanting date: 16 July 2006.

Evaluation of harvest: 18 September 2006.

Method of application: Direct into LDPE film covered plots

Applied doses: 25kg/ha EDN & 25kg/ha MB

Fumigation / Planting: 1 day (Temp. 25±2°C) / post-fumigation 3 days.

Experiment 2. Field trial in greenhouse in Seongju. In this experiment yellow melon plants were planted. When this research started in 2006, the population of root knot nematode was normal (67 larvae and adult / 100cc of soil). This greenhouse had many years of cultivation. The sandy loam soil contained 12.5% of moisture and each plot consisted of one bed 2.3 m wide by 15 m long. There was one row of yellow melon per bed And the plants in the row were 30 cm apart.

Transplanting date: 27 December 2006.

Evaluation of harvest: 9 April 2007.

Method of application : EDN mixed with Nitrogen applied through the drip irrigation system covered with LDPE film

Applied dose : 50kg/ha & 100kg/ha EDN

Fumigation / Planting : 7 days (10±5°C) / post fumigation 14days.

Experiment 3. Field trial in greenhouse at Suwon. In this experiment yellow melon plants were planted. When this research started in 2006, the population of root knot nematode was high (275 larvae and adult/ 100cc of soil). This soil was blended as in experiment 1. The loamy sand soil contained 16.2% of moisture. Each plot consisted of one bed 2.5 m wide by 18 m long. There was one row of yellow melon per bed. Plants in rows were 30cm apart.

Transplanting date: 17 April 2007.

Evaluation of harvest: 24 August 2007.

Method of application: EDN applied in water (2L/m²) through the drip irrigation system covered with LDPE film.

Applied dose: 53.6 kg/ha EDN

Fumigation/Planting: 7days (25±5°C) / post-fumigation 7days

Results

Table 1. The efficacy of EDN and MB to root knot nematode

	Treatment (kg/ha)	Pre- treatment	After planting		
			1 day	1 mth	2 mth
Nematodes / 300g soil	Control	432	568	1104	5640
	MB 25	711	72	216	1840
	EDN 25	600	0	88	1312
Inhibition rate (%) of nematode density	Control	–	0.0	0.0	0.0
	MB 25	–	87.3	80.4	67.4
	EDN 25	–	100.0	92.0	76.7

Table 2. The efficacy of EDN to root knot nematode in Seongju

	Treatment (kg/ha)	Pre- treatment	After planting			
			1 day	2 wks	1 mth	4mth
Nematodes / 300g soil	Control	222	291	668	1289	1332
	EDN 50	180	3	16	520	384
	EDN 100	200	0	2	432	588
Inhibition rate(%) of nematode density	Control	–	0.0	0.0	0.0	0.0
	EDN 50	–	99.0	97.6	59.7	71.2
	EDN 100	–	100.0	99.7	66.5	55.9

Table 3. The efficacy of EDN to root knot nematode in Suwon

	Treatment (kg/ha)	Pre- treatment	After planting		
			1 day	1 mth	2 mth
Nematodes / 300g soil	Control	690	549	616	1410
	EDN 53.6	960	55	120	137
Inhibition rate(%) of nematode density	Control	–	0.0	0.0	0.0
	EDN 53.6	–	90.0	80.5	90.3