

EFFECT OF ETHOPROP, CARBOFURAN AND ALDICARB ON FLUE-CURED TOBACCO INFECTED WITH THREE SPECIES OF *MELOIDOGYNE*.

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ABSTRACT

Nordmeyer, D., J.R. Rich and D.W. Dickson. 1982. Effect of ethoprop, carbofuran and aldicarb on flue-cured tobacco infected with three species of *Meloidogyne*, *Nematropica* 12:199-204.

Ethoprop, carbofuran and aldicarb were applied at 6.7 kg a.i./ha broadcast to field microplots (76 cm diam) separately infested with *Meloidogyne javanica*, *M. incognita* or *M. arenaria*. Initial population densities of the three species averaged 70, 120 and 170 nematodes per 250 cm³ of soil, respectively. Two flue-cured tobacco seedlings ('McNair 944') were transplanted into each microplot, and each treatment was replicated six times. Aldicarb significantly increased yields of tobacco infected with all nematode species, whereas ethoprop failed to increase yields of tobacco infected with *M. javanica*. Carbofuran did not significantly increase yields. Numbers of nematodes of the three species taken at 11 and 15 weeks after planting were reduced by aldicarb and ethoprop, but not by carbofuran. All three nematicides increased plant heights up to 70 days after planting with the exception of carbofuran for plants infected with *M. javanica*. Gall index ratings at final harvest were high and did not differ among the treatments.

Additional key words: root-knot nematodes, chemical control, nonfumigant nematicides.

RESUMEN

Nordmeyer, D., J.R. Rich y D.W. Dickson. Efecto de ethoprop, carbofuran y aldicarb en tabaco estufado infectado con tres especies de *Meloidogyne*, *Nematrópica* 12:199-204.

Ethoprop, carbofurán y aldicarb fueron aplicados en dosis de 6.7 kg i.a./ha sobre toda la superficie de microparcels (76 cm diam) infestadas con *Meloidogyne javanica*, *M. incognita* o *M. arenaria*. Las densidades iniciales de población de las tres especies fueron de 70, 120 y 170 nematodos/250 cm³ de suelo, respectivamente, como promedio. Dos plántulas de tabaco estufado ('McNair 944') fueron trasplantadas en cada microparcels, y cada tratamiento fué repetido seis veces. Aldicarb incrementó

significativamente los rendimientos de plantas infectadas con cualquiera de las tres especies, mientras que ethoprop no aumentó el rendimiento de las plantas infectadas con *M. javanica*. Carbofurán no incrementó significativamente los rendimientos. Las densidades de nematodos a las 11 y 15 semanas después del trasplante fueron reducidas por aldicarb y ethoprop, pero no por carbofurán. Los tres nematicidas aumentaron la altura de las plantas en diferentes mediciones hechas hasta los 70 días después del trasplante, excepto carbofurán en plantas infectadas con *M. javanica*. Los índices de agallamiento fueron altos pero no fueron significativamente diferentes entre tratamientos.

Palabras claves adicionales: nematodos noduladores, combate químico, nematicidas no-fumigantes.

INTRODUCTION

Three root-knot nematode species, *Meloidogyne arenaria*, *M. incognita*, and *M. javanica*, are serious pests on tobacco (*Nicotiana tabacum* L.) (13,6). Root-knot nematodes are important in Florida tobacco production, and nematode management practices generally include the use of nematicides (10). Yield responses from the control of *Meloidogyne* spp. with nematicides, are often variable due to the interactions of nematicides, nematode species, and population levels (11,14). Variable yield responses are more prevalent following treatment with nonfumigant than fumigant nematicides. Also root-knot nematode species have been shown to respond differently to non-fumigant nematicides (2,12). The following study was initiated to compare the efficacy of ethoprop, aldicarb, and carbofuran on tobacco individually infected with *M. arenaria*, *M. incognita*, and *M. javanica*.

MATERIALS AND METHODS

Field microplots (4) established in a Lakeland fine sand (93.1% silt, 3.9% clay) contained residual populations of *M. arenaria*, *M. incognita*, or *M. javanica* from a previous tobacco test. The initial population (Pi) levels of *M. arenaria*, *M. incognita*, and *M. javanica* averaged 170 (± 39), 120 (± 16), and 70 (± 40) nematodes/250 cm³ of soil, respectively.

Ethoprop (10G), aldicarb (15G) and carbofuran (10G) were applied at 6.7 kg a.i./ha broadcast to the microplots and incorporated into the top 8 cm of soil. Two tobacco plants, ('McNair 944'), were transplanted 25 cm apart in each microplot the following day. Each treatment was replicated six times in a completely randomized design. The tobacco production practices have been described (1).

Plant heights were measured 30 days after transplanting and every ten days thereafter until flowering. Mature tobacco leaves were harvested four times during the season and dry weights recorded. Soil samples for nematode analysis were taken 11 and 15 weeks after planting and 250 cm³ were pro-

cessed with a modified centrifugation-sugar-flotation technique (5). A root-gall index was determined immediately after the final harvest. The rating system used for the index was: 0 = no visible galls; 1 = up to 25%; 2 = up to 50%; 3 = up to 75%; 4 = more than 75% of the tobacco root system galled.

A covariance analysis was performed for the yield data because the Pi levels varied for the three nematode species.

RESULTS

All three nematicides significantly increased heights of *M. arenaria* and *M. incognita* - infected plants 70 days after planting whereas growth of plants infected with *M. javanica* was not significantly increased by the carbofuran treatment (Fig. 1). In general, plant heights were greatest with aldicarb, followed by ethoprop and carbofuran.

Aldicarb significantly increased the yield of tobacco infected with all three root-knot nematode species, whereas ethoprop failed to increase the yield of plants infected with *M. javanica* (Table 1). Yield of carbofuran-treated plants did not differ from control plants for any of the three nematode species. Aldicarb lowered the number of nematodes for all species from the Pi levels after 11 weeks but populations increased afterwards. Treatments with etho-

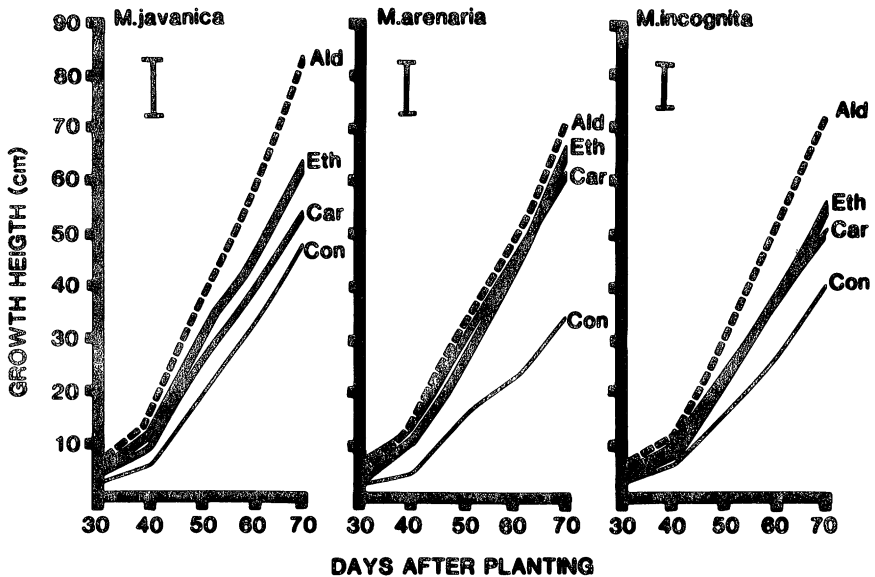


Fig. 1. The effect of aldicarb, ethoprop, and carbofuran on plant growth of tobacco infected with *Meloidogyne javanica*, *M. arenaria* and *M. incognita*. (Ald = aldicarb, Eth = ethoprop; Car = carbofuran; Con = control; bars represent the LSD_{0.05} at day 70).

Table 1. Effect of nematicides on the yield of tobacco infected with three *Meloidogyne* species.

Treatment	Yield (g dry weight/plot) ^x		
	<i>M. javanica</i>	<i>M. arenaria</i>	<i>M. incognita</i>
Control	163.0 a	121.5 a ^y	129.5 a
Carbofuran	135.6 a	141.9 a	142.6 ab
Ethoprop	193.8 ab	221.2 b	179.6 bc
Aldicarb	248.0 b	232.0 b	200.6 c

^x Mean of 6 observations.

^y Means with the same letter within each column are not significantly different ($P = 0.05$).

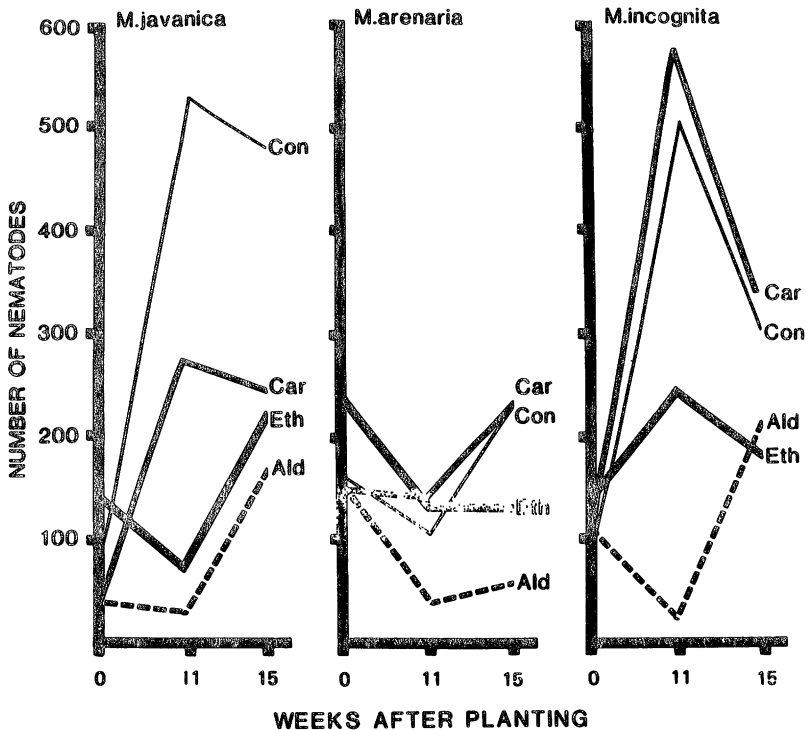


Fig. 2. The number of juveniles of *M. javanica*, *M. arenaria* and *M. incognita* recovered from 250 cm³ soil 0, 11, and 15 weeks after planting.

prop resulted in decrease in numbers of *M. javanica* and *M. arenaria* after 11 weeks, and an increase for *M. javanica* afterwards. The number of *M. incognita* increased the first 11 weeks then decreased slightly. Nematode numbers in microplots treated with carbofuran increased for all three species. A dramatic increase occurred for *M. incognita* and *M. javanica* during the first 11 weeks.

Root gall indices of 4 to 5 were found at final harvest in all microplots with no differences among treatments.

DISCUSSION

The aldicarb treatment reduced population levels of the three *Meloidogyne* species and produced good tobacco growth and yields whereas ethoprop and carbofuran were less effective. However, differences in yields between aldicarb and ethoprop were not significant for either nematode species. Numerous interacting factors can influence the efficacy of the different nematicides in field tests such as this. These data agree with *in vitro* studies on the biological activity of these compounds on *Meloidogyne* spp. (7).

Carbofuran has proven effective in field tests for other nematode genera (3, 9). However, the interaction of the individual nematicides and *Meloidogyne* spp. support the hypothesis of less biological activity of carbofuran than aldicarb on these *Meloidogyne* spp. Also, the differences in plant height 70 days after planting indicated that carbofuran was less effective in the control of *M. javanica* than the other two species. Although differences in yield did not verify these data, results in a similar study with carbofuran showed that the material was significantly less effective on *M. javanica* than on *M. incognita* (8). The failure of ethoprop to significantly increase yields of tobacco infested with *M. javanica* also indicated a differential effect of this compound on the three *Meloidogyne* spp. Ethoprop was more effective in the control of *M. arenaria* than on the other two species. However, results contrary to these indicated (2) that ethoprop was less effective in the control of *M. arenaria* than on *M. javanica* or *M. incognita*.

Data from this experiment confirm field tests on the relative efficacy of aldicarb, ethoprop and carbofuran on root-knot nematode disease in tobacco (14). The efficacy of each chemical on control of individual species of *Meloidogyne*, however, should be further investigated. These data indicate that a prescription management approach for the control of individual *Meloidogyne* spp. is needed.

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