PHYTOPATHOLOGICAL NOTES

Response of Meloidogyne incognita, Xiphinema index, and Dorylaimus sp. to Methyl Bromide Fumigation

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ABSTRACT

Meloidogyne incognita in soil exposed to flowing 600 ppm methyl bromide (MeBr) became progressively less motile (Baermann funnel extraction) during 38 hr. Infectivity (tomato bioassay) remained high for 30 hr, then dropped sharply. These effects indicate a gradual "narcotization" of the nematode. *Xiphinema index* adult and larvae similarly exposed to MeBr retained motility for 27 and 43 hr, respectively. The reaction of *Dorylaimus* sp. was intermediate. No evidence of gradual narcotization of *X. index* or *Dorylaimus* sp. was obtained. None of the nematode species studied was either motile or infective after 48 hr of exposure to MeBr.

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Additional key words: soil fumigation.

Dosage responses of *Pythium ultimum* Trow and *Rhizoctonia solani* Kuehn to methyl bromide (MeBr) fumigation in soil were accurately determined under controlled laboratory conditions by Munnecke et al. (3). Comparable data for nematodes have not been reported. Therefore, the precision fumigation procedures of Kolbezen & Abu-el-Haj (2) were applied to mixed populations of *Meloidogyne incognita* Kofoid & White, *Xiphinema index* Thorne & Allen, and *Dorylaimus* (Dujardin) sp. in the same soil samples.

The nematodes were cultured in a lath house for 1 year on common fig (*Ficus carica* L.) cuttings grown in steam-sterilized Ramona sandy loam in 20-liter glazed crocks. For each experiment, soil from three crocks was combined and thoroughly mixed by being heaped into a cone-shaped pile 3 times in succession, then passed through a 3.16-mm (1/8-inch mesh) screen. Approximately 1-liter (1,300 g) aliquants were placed in each of ten 5.9 X 35.5-cm glass cylinders. Each cylinder was closed at either end with a tight fitting one-hole rubber stopper pressed firmly against the soil surface to eliminate all headspace. Moisture contents of the composited nematode-infested soil were 9.2% (MHC = 31.3) in the first experiment and 9.5% (MHC = 29.6) in the second. In each experiment, two control cylinders received only air; one was processed for nematodes midway in the experiment and the other at the end. Methyl bromide (600 ± 30 ppm) in air was injected 20 cc/min at the bottom of each of the remaining eight cylinders for 8, 12, 20, 27, 43, 61, 92, or 132 hr in the first experiment, and for 8, 13, 19, 23, 28, 33, 38, or 48 hr in the second experiment. Each MeBr-treated cylinder was flushed 2-9 hr with air (20 cc/min) and stored 6-48 hr at 20 C in a polyethylene bag before being processed for nematodes.

Gas-chromatographic monitoring of each cylinder effluent by the method of Kolbezen & Abu-el-Haj (2) showed that both MeBr injection and flushing were 90% complete after 70 min, and that the desired fumigant concentration was maintained for the indicated intervals. Moisture loss per cylinder was 2 g maximum.

Nematode response to MeBr was evaluated in terms of motility and infectivity (the latter for *M. incognita* only). Soil (500 cc) from each cylinder was

TABLE 1. Motility and infectivity of *Meloidogyne incognita* larvae following exposure to 600 ppm methyl bromide (MeBr) in Ramona sandy loam in two experiments

MeBr exposure (hr)	% Motility		Infectivity
	Observed[a]	Baermann funnel[b]	Galls/tomato seedling[c]
0	50	65.0	188
8-12	30	37.0	137
16-19	19	17.0	182
23-28	7	11.0	185
23-28 (No MeBr)	100	56.0	139
33	0	0.1	23
38	0	0.0	1
43	0	0.4	3
48	0	0.0	0
48 (No MeBr)	100	25.0	82
61	0	0.0	2
91	0	0.0	0
132	0	0.0	0
132 (No MeBr)	100	75.0	96

[a] Determined while counting the nematodes.
[b] Modified Baermann extraction for 48 hr.
[c] After 35 days' growth in a mixture of 250 cc of treated soil and 250 cc of steam-sterilized soil.

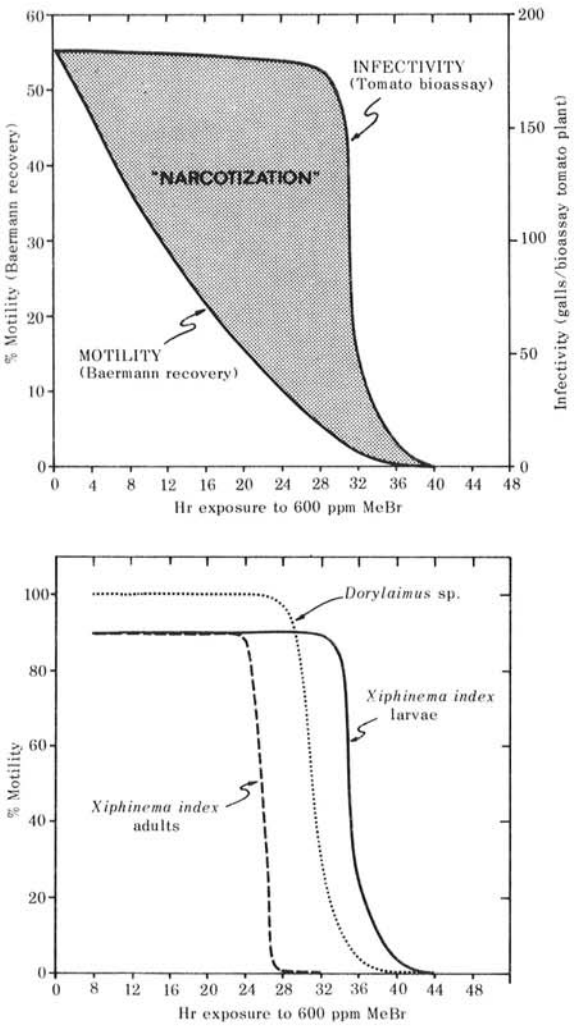

Fig. 1. (Above) Narcotization of *Meloidogyne incognita* larvae by methyl bromide. (Below) Motility (48 hr Baermann funnel recovery) of *Xiphinema index* larvae and adults and *Dorylaimus* sp. following exposure to methyl bromide in soil.

wet-screened by Cobb's method (1); *X. index* and *Dorylaimus* sp. were recovered on a 170-mesh screen, and *M. incognita*, on a 325-mesh screen. Motility was estimated visually and in terms of the number recovered during a 48-hr modified Baermann extraction. Infectivity of the *M. incognita* population was rated by bioassay. Two 250-cc aliquots of the remaining 500 cc of soil from each cylinder were each mixed with 250 cc of similar steam-sterilized sandy loam and planted with a 12- to 15-day-old tomato (*Lycopersicon esculentum* 'Pearson') seedling. The index of infectivity was rated by average numbers of root galls counted on the seedling roots after 35 days.

In both tests, motility of *M. incognita* was reduced by lower dosages than those that affected infectivity (Table 1). This indicated a persistent "narcotization" which extended beyond the time periods of air-flushing in the cylinders and storage in polyethylene bags (Fig. 1, above). This suggests that dosage response data based upon infectivity might be more reliable than those based on motility. No infectivity data were obtained for either *X. index* or *Dorylaimus* sp. Exposure to 600 ppm MeBr immobilized *X. index* adults after 27 hr and larvae after 43 hr (Fig. 1, below). That the curves for *X. index* motility closely resemble the curve for infectivity of *M. incognita* does not justify inferences concerning the infectivity of *X. index*. It is not likely, however, that *X. index* was narcotized by MeBr fumigation.

LITERATURE CITED

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