Response of Texas Root Rot to an Application of a Soil Sterilant in Marana, 1988.

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ABSTRACT

Methyl bromide/chloropicrin (MB/C), a soil sterilant, was deep injected into cotton beds 6 days before planting in 1988. Application rates were zero, 300, 400, and 500 pounds of MB/C per acre, injected 18-inches deep into the sandy loam soil. Short staple lint yields in all of the MB/C treatments were significantly higher than the untreated check. MB/C at all application rates was 100% effective in preventing the plants from dying from the disease, while 86% of the plants in the untreated check plots died.

INTRODUCTION

In 1986, Safford farmer Ben Whitmer originated the idea of deep injecting a soil sterilant to control Texas Root Rot (Phymatotrichum omnivorum) in cotton. Clark and Cluff (2) conducted a field experiment with Mr. Whitmer, and reported significantly higher Pima cotton yields due to soil sterilization with methyl bromide/chloropicrin (MB/C). A follow-up report 1 year later noted that there was some carry-over of the sterilization treatments to the next year (3).

Thacker and Silvertooth (6) conducted a similar test in Marana in 1987, and also reported significant yield increases from MB/C injection in the Texas root rot infested areas of a field. A follow-up report on the carryover of the 1987 treatments is published along with this paper.

Another Marana test site was selected for a 1988 test, to see if the results from MB/C injection would be consistent.

MATERIALS AND METHODS

The 1988 test site is the field where deep injections of anhydrous ammonia and applications of sodium chloride were tried in the late 1970's without success (4,5). Known as the Cement Plant Farm, it lies north of Avra Valley Road on the west side of Interstate 10.

A very large kill pattern in the field allowed the simultaneous testing of 75% methyl bromide/25% chloropicrin (MB/C) at rates of zero, 300, 400, and 500 pounds per acre. Plots were 4 rows 38 inchs wide by 300 feet long. The plot design was three replications of randomized complete blocks.

On April 27, pre-irrigated cotton beds were ripped twice at 18- inches deep to prepare for the MB/C injection. The MB/C was then injected on the third ripping pass, at 18-inches deep. The very fine sandy loam soil was at a moisture content ideal for planting, and the soil temperature at 6 inches was 78 F. After the injection, the beds were immediately re-listed to seal the soil surface.

The test area was re-watered and planted to short staple cotton on May 3rd. Don Stokes, the cooperating grower, manages this farm for maximum earliness. Texas root rot usually kills much of the cotton on this farm by the second or third week of August.

The presence of nematodes was suspected, so soil samples were taken and analized for nematodes.

Yield data were collected by hand picking subplots. Lint yields were calculated based on the grower's gin turnout for the entire field. Live/dead plant counts were taken from the hand-picked subplots.

RESULTS AND DISCUSSION

We noted that the cotton in the MB/C treated plots was more vigorous than the check plots long before the Texas root rot became a factor. Analyses of soil samples showed that Meloidogyne nematodes were present in the check plots at populations ranging from detectable to very high (data not shown). None of these nematodes were present at detectable levels in any of the MB/C treated plots. Because the test area had a very complete infestation of both nematodes and Texas root rot, we had no way of measuring the damage of each pathogen separately.

Texas root rot began killing plants in mid-August. No plants in any of the MB/C treated plots died (except some in the guard rows). The 100% effectiveness (Table 1.) was in contrast to the response that we measured in the 1987 test, where some of the plants in all of the MB/C treated plots died (6). The difference may be due to soil type, with clay and clay loam at the 1987 site and a very fine sandy loam at the 1988 site. Ameri-Brom, Inc., the manufacturer of MB/C, stresses that the presence of large clods will effectively isolate some of the plant pathogen from the fumigation (1). We were unable to work the clay soils to a fine tilth to the depths at which we fumigated the 1987 plots. No clods were present when we fumigated the sandy loam soil in 1988.

Lint yields in all of the MB/C treatments were significantly higher than the untreated check (Table 1.). None of the MB/C treatment rates were significantly different from each other.

The economics of these treatments naturally depend on the price of cotton. The 75%/25% formulation of MB/C costs about $1.00 per pound, and application costs would probably be $30. per acre. Given these costs, the yield response in this test, and the assumption that this could be done on a spot-treat basis, the 300 pound per acre treatment of MB/C would break even at a lint price of $.59 per pound.

Other factors may improve the economics of the treatments. A cheaper formulation of MB/C is available, and may be as effective. The results also suggest that lower rates of MB/C may be effective in this soil type. There will probably be some carry-over of the fumigation treatment to the next crop. We will collect data from the next cotton crop at this site to measure the carry-over effects.

Table 1. Lint yield and plant mortality response to MB/C fumigation in Marana, 1988.

MB/C Application Rate	Lint Yield	Plant Mortality
----------pounds per acre----------		-percent-
500	1199a*	0a*
300	1166a	0a
400	1154a	0a
Check	610 b	86 b
Coefficient of Variation	17.6%	36.2%

* Means followed by the same letter within a column are not significantly different at the .05 level.

Crop History

Soil Type: Agua very fine sandy loam.
Planting: Stoneville 505 on May 3rd. Population 55,200 plants per acre.
Fertilizer: Water run 120 pounds of N per acre as UN32.
Herbicide: Preplant Caparol 1pt/Ac and Prowl 1pt/Ac. Layby with 1 pt/Ac Caparol.
Irrigation: Preplant plus a light re-watering of the plots after fumigation, then 5 more irrigations. Total water use in the test was 4.6 AF.
Insecticide: 6 applications for pink bollworm.
Defoliation: Twice with sodium chlorate.

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