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Evaluation of Several Soil Fumigants in the Production of Watermelon in North Florida 2001-04

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Objective

As part of the wok on methyl bromide alternatives conducted in FL, the objective of this research was to evaluate the effect of selected fumigants on nutsedge control, root-knot nematode control and yield of watermelon.

Materials and Methods

Plots were established in a Lake land fine sand at the North Florida Research and Education Center – Suwannee Valley near Live Oak, FL. Preplant soil tests (Mehlich 1 extract) showed 86 ppm P, 41 ppm K, 29 ppm Mg, and 447 ppm Ca. Soil pH was 6.3 using a 1:2 (soil:water) mixture. The soil was prepared by rototilling to a depth of eight inches and was fertilized with 500 lbs/A of 13-4-13 (N-P_2O_5-K_2O) with micronutrients. Fertilizer was applied in a band 18 inches wide where the beds would be formed. The fertilized soil was then hilled-up to form the bed area on 7.5 ft centers.

Fumigation treatments listed in Table 1 were applied on March 2. Metam sodium and metam potassium (K-PAM) treatments were applied as a 6-ft wide broadcast spray in front of a 6-ft wide rototiller. Those treatments were immediately incorporated to a depth of 6 inches and the soil was then packed with a roller. All chloropicrin, Telone C-35, and methyl bromide/chloropicrin (67:33) treatments were applied via fumigation shanks. Two shanks, on 12-inch centers, injected the fumigant 7 to 8 inches below the top of the bed. The final beds were 24 inches wide and 6 inches high and had drip tape placed in a 2 inch deep groove in the center of the bed top. The beds were covered with Sonoco 0.6 mil high-density black polyethylene film.

Plots were 50 ft in length and treatments were arranged in a randomized complete block design with four replications. 'Mardi Gras' watermelon plants were transplanted on March 28 in a single row per bed and 36 inches between plants.

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Plots were drip irrigated using granular matrix blocks (Watermark®) as a scheduling aid. Soil moisture tension of 8 to 12 centibars at a 12-inch depth was used as a target range. Weekly injections of N and K_2O were made beginning three weeks after transplanting. The total season N and K_2O (including the preplant application of 13-4-13) was 150 lbs of N and K_2O.

Yellow nutsedge (Cyperus esculentus L.) counts were made in each plot within a randomly selected 2 x 2-ft area on April 4, 2001. A root-knot nematode (Meloidogyne sp.) soil sample (10 cores per plot at 6 inches deep) was taken at the end of the season on June 28.

Plots were harvested only once on June 8, 2001. All data were subjected to analysis of variance procedures.

Results and Discussion

The highest number of marketable fruit and marketable yields were found in the three metam sodium plus chloropicrin and the metam potassium (K-PAM) plus chloropicrin treatments with yields in the range of 40,000 to 46,000 lbs per acre (Table 1). The lowest yields were found in untreated control, Telone C-35, methyl bromide, and chloropicrin treatments with yields in those plots in the range of 10,000 to 22,000 lbs per acre. There was no significant difference found in mean fruit weights between 15 and 19 lbs with all treatments.

Yellow nutsedge populations in this experimental area were very high. Early season yellow nutsedge counts in the mulched area of the plots were highest in Telone C-35 and untreated control treatments with near 10 plants per square foot. Intermediate populations of 5 per square foot were found in the methyl bromide and chloropicrin treatment and this treatment was not significantly differently from any other treatment for nutsedge populations. The lowest early season nutsedge populations were found in the three metam sodium plus chloropicrin treatments and the metam potassium (K-PAM) plus chloropicrin treatment. The early season nutsedge competition in this experiment seemed to be the most important factor in reducing yield. Methyl bromide and chloropicrin treatments are expected to give excellent control of nutsedge. In this experiment, the rate of 350 lbs per treated acre and using the 67:33 formulation, resulted in below the recommended level of methyl bromide for such a high population of nutsedge. Soil moisture at time of treatment application and in the three weeks prior to application was sufficient to have induced active nutsedge rhizomes. Nutsedge populations increased in the metam sodium and metam potassium (K-PAM) treatments beginning in late April. Competition from the later season break of nutsedge did not appear to compete as significantly with yield as the early season nutsedge populations. However, the overall extremely high nutsedge populations limited the crop to only one harvest.

Root knot nematode populations at the end of the season ranged from 1 to 28 nematodes per 100 cc of soil. Even with this large range in means, no significant differences were found between treatments. The trend in the experiment was the highest level of nematodes in the untreated control and the lowest with metam plus chloropicrin treatments.

Table 1. Effect of several fumigants and combinations on the production of mulched watermelon and the control of yellow nutsedge and root-knot nematodes at Live Oak, FL.

Treatment	Rate/A	Chloropicrin At 150 lbs/A	Total Mkt. No. (No./A)	Total Mkt. Wt. (lbs/A)	Mean Fruit Wt. (lbs/fruit)	Early Nutsedge Count No./sq-ft	Root Knot Nematode 6/28/01 No./100 cc
Control	untreated	No	581 c[z]	10,237 c	17	9 a	28
Metam potassium	60 gal	Yes	2,251 ab	40,257 ab	18	0 b	11
MB/CP (67:33)	350 lbs	No	1,307 bc	22,433 bc	16	5 ab	13
Metam sodium	50 gal	Yes	2,178 ab	42,217 ab	19	1 b	1
Metam sodium	62.5 gal	Yes	2,505 a	46,101 a	18	O b	3
Metam sodium	75 gal	Yes	2,178 ab	40,039 ab	18	0 b	6
Telone (C-35)	26 gal	No	799 c	12,415 c	15	10 a	19
Significance (P≤0.05)[y]			**	**	NS	**	NS

[z] Mean separation in columns by Duncan's multiple range test, 5% level.

[y] Significance was either not significant (NS), significant at the 5% level (*) or significant at the 1% level (**).