ALTERNATIVES TO METHYL BROMIDE FIELD RESEARCH EFFORTS FOR NEMATODE CONTROL IN FLORIDA

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Each year, field research continues to explore new products, application technologies, and treatment regimes to serve as alternatives to soil fumigant uses of methyl bromide. In this paper we will try to address only some of the current research on alternative management tactics which can have an impact on nematode control in the post methyl bromide era.

Methyl Bromide / Chloropicrin Formulation & Application Rate:
Previous research has demonstrated that methyl bromide (Mbr) is the component with principal nematicidal activity and chloropicrin (Pic) is only weakly nematicidal. Given the changes which have occurred in cost, availability and formulation of methyl bromide, field microplot experiments were conducted to evaluate differences in pest control efficacy and tomato yield response to reduced application rates of three formulations of methyl bromide and chloropicrin. During spring 2001, two experiments were conducted to evaluate three formulations of methyl bromide and chloropicrin and three application rates. The different formulations included 1) 98% methyl bromide and 2% chloropicrin; 2) 75% methyl bromide / 25% chloropicrin, and 3) 50% methyl bromide / 50% chloropicrin. Application rates of 50, 75, and 100% of the maximum broadcast equivalent were evaluated within each formulation. All formulations and application rates were evaluated for control of the southern root-knot nematode (*Meloidogyne incognita*) and yellow nutsedge (*Cyperus esculentus*), and resultant impacts on 'Florida 47' tomato plant growth, development, and yield . In general, the results of these microplot trials clearly showed :

- **All formulations and application rates of methyl bromide and chloropicrin provided significant control of nematode and nutsedge compared to the untreated control.**

- **Incremental loss of nematode and nutsedge control with reduced methyl bromide and chloropicrin rate.**

- **Compared to a formulation of 98% methyl bromide and 2% chloropicrin, nematode and nutsedge control decreased with increased chloropicrin content of the methyl bromide formulation.**

These results appear to validate field observations of increased severity and incidence of weed and nematode problems associated with the change in methyl bromide formulation from 98/2 to 67/33, and with reduced rates of methyl bromide field application. It also suggests a further erosion of nematode and weed control if chloropicrin content of methyl bromide formulations is increased further from the current 67/33 formulation (ie., 50/50).

Virtually Impermeable Plastic Mulches:
During the past two years, field studies were conducted to evaluate and validate the feasibility of using virtually impermeable plastic mulch films (VIF) to reduce methyl bromide field application rates without serious loss of crop yield or pest control efficacy. Large scale grower field demonstration trials were conducted in west central (Parrish & Plant City, FL) and south Florida (Immokalee) to compare possible methyl bromide and chloropicrin (67/33) rate reductions of 25 to 50% compared with a full grower standard rate using the standard low density polyethylene plastic mulch. In addition, a field microplot experiment was conducted on the use of the VIF plastic mulch to evaluate the extent to which field application rates can be reduced without compromise of nematode control or tomato yield. Differences in plant growth, including comparisons of plant size, height, vigor, consistency, mortality, and nematode and disease incidence and severity, were evaluated in all trials. In general, the results of the grower field demonstration trials indicated:

- **No significant loss of pest control efficacy or crop yield (tomato, pepper, cantaloupe, or strawberry) when applications rates of methyl bromide were reduced as much as 50% <u>when</u> reduced rates were accompanied by the use of a VIF mulch.**

- **Some problems were incurred during the plastic laying operation, in that tractor speeds needed to be reduced as low as 3 mph to properly install the plastic.**

Alternative Fumigant Evaluations:
During fall 2000 and spring 2001, single preplant applications of Propargyl bromide (40-120 lb/A), Telone II (12 gal/A) , Telone C17 (17 gal/A), Telone C35(26 gal/A), Propylene oxide (50,75 gal/A), Vapam (75 gal/A), and Basamid (400 lb/A) were evaluated for control of the southern root-knot nematode *(Meloidogyne incognita)* and yellow nutsedge (*Cyperus esculentus),* and resultant impacts on tomato plant growth, development, and yield in field microplots. Three biorational or new systemic acquired resistance compounds (SAR) also were evaluated and compared for nematode and nutsedge control. Biorational treatments included Armorex (30 gal/A) and repeated foliar applications of Messenger and Rezist. In general, all fumigant treatments significantly reduced root gall severity caused by *M. incognita* (Figures 3 and 4);

however, no fumigant treatment completely eliminated final harvest root galling , and treatment responses in tomato yield were generally a direct reflection of nematicidal efficacy and root gall severity. Use of Vapam and Basamid reduced root gall severity to only an intermediate level compared to the untreated control and most other fumigant treatments . Little or no reduction in root gall severity was achieved with Messenger, Resist, or Armorex. Of all the treatments, only Telone II, Messenger, and Resist failed to provide significant control of yellow nutsedge compared to the untreated control.