

AREA-WIDE DEMONSTRATION OF CHEMICAL ALTERNATIVES TO METHYL BROMIDE FOR FLORIDA ORNAMENTALS

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The studies reported here are part of the USDA-ARS Areawide Pest Management Program for Alternatives to Methyl Bromide South Atlantic Area and involve a cooperative effort between Florida in-ground ornamental producers, fumigant industry representatives, and researchers from the USDA, ARS and University of Florida. Fumigation with methyl bromide: chloropicrin (Pic), 98:2 or 89:11 formulations, has been the standard method for production of high quality cut flowers, tubers, and bulbs. This material has allowed these industries to grow a large number of highly diverse crops and has addressed the need for control of multiple pests as well as for the control of propagules of previous crops as rogues in following seasons. Selection of species and varieties to produce is highly market driven, and methyl bromide has allowed the flexibility needed to make rapid decisions on planting schedules. The studies reported here were designed to test the efficacy of the most readily available chemical alternatives, methyl iodide: Pic (now registered as MIDAS[®], Arysta LifeScience Corp.) and dimethyl disulfide: Pic (EUP available as Paladin[™] + Pic, United Phosphorous, Inc. King of Prussia, PA), applied with standard equipment utilized by commercial applicators with currently available plastic films and application technology.

Studies were designed as replicated, randomized complete blocks with multiple cultivars. Trials are on-going and conducted over multiple seasons. Two locations were selected for these trials. The first, in Hobe Sound, FL, included a methyl bromide standard application of 400lb/A (98:2), MIDAS[®] (50:50) at 300 lb/A, and Paladin[™] + Pic (79:21) at 74 gal/A. The trial consisted of three replications per treatment with each main plot replicate representing a full lateral (26' x 110'). Plots were split to contain two rows each of delphinium cultivars 'Belladonna' and 'Bellamosum'. All materials were applied on August 8, 2007 by Hendrix and Dail using standard broadcast application equipment and 1mil clear plastic mulch. At the second site, located in Zolfo Springs, FL, the producer initiated a trial prior to the formal start of the Areawide project in which a standard application of methyl bromide (360 lb/A of 89.5:10.5 methyl bromide: Pic) was compared to MIDAS[®] (50:50 at 300 lb/A) and Paladin[™] + Pic (79:21 at 74 gal/A). All materials were applied using standard broadcast tarping procedures (1 mil) and had a previous deep shank application of Telone C-35 at 12-14" (18 gal/A). The Telone application was made by the grower with equipment provided by Hendrix and Dail.

Application of the methyl bromide, MIDAS[®], and Paladin[™] + Pic was made by Hendrix and Dail. Each treatment was replicated four times and each replicate consisted of a full lateral with size ranging from 0.23 to 0.28 A per lateral. The trial was planted to the caladium cultivar 'Candidum Senior'. The Areawide trial initiated at the Zolfo Springs site included two formulations of MIDAS[®] (98:2 at 100 lb/A and 50:50 at 160 lb/A), Paladin[™] + Pic (79:21 at 60 gal/A), and methyl bromide (98:2 at 180 lb/A) all applied by the grower under high barrier, Blockade[®] plastic mulch (Pliant Corp., Chippewa Falls, WI) using raised beds. All test material applications were preceded by a deep shank application of Telone C-35 as previously described. Each treatment was replicated four times with a full lateral representing a main plot treatment. Each lateral contained four sub-plots (one 600ft row each) and each was planted to a different caladium cultivar.

Nematode and fungal populations at each field site were assessed prior to fumigation, two-to-five days following tarp removal, at mid-season of the crop, and at the initiation of harvest. Ten soil cores were taken per plot using a 2.5-cm-diam soil probe. These were combined, and a subsample was used to extract nematodes using the Baermann funnel technique. Nematodes from the subsample were identified as either root-knot, other parasitic, or free-living nematodes and counted using an inverted microscope. Survival of fungal propagules was assessed by dilution plating of soil samples onto media selective for *Fusarium* and *Pythium*. In-field disease ratings were performed as needed beginning with seedling damping off and continuing through root condition ratings following the final harvest. Sub-plots were used to identify dominant weed species. Time-to-weed data were collected by the growers based on the main plot treatment. Root galling was assessed using a root gall index based on a scale of 1 to 10, with one representing no galls and 10 representing severe (100%) galling. At the end of the season, nematodes were also extracted from plant root tissue, counted, and identified as described above. Plots were harvested by the grower as appropriate, depending on crop maturity.

In the caladium trial conducted by the grower cooperator, there were no differences among methyl bromide, methyl iodide, and dimethyl disulfide treatments with respect to weeds per acre, rogues per acre, and total hours of labor dedicated to weed removal. The numbers of root-knot nematodes per 100cc of soil just prior to harvest were similar in all treatments. Total yield per acre was higher in methyl bromide compared to dimethyl disulfide. Based on both quantity and quality of bulbs, only methyl bromide provided a profitable return. Data collection from the current caladium trial is in progress.

In the first season delphinium trial, there were no significant differences among treatments with regard to total weeding time. There were no significant treatment differences in germination, but delphinium cultivar 'Bellamosum' had significantly higher germination than the cultivar 'Belladonna'. 'Bellamosum' plants in the MIDAS[®] treatments were the fastest growing plants, but early in the season there were a greater number of cut stems harvested from the methyl bromide and Paladin[™] + Pic 'Bellamosum' plots than in the MIDAS[®] plots. This trend did not continue to the end of the season, when total cuts and average number of cuts per plant were not significantly different in any treatment comparisons. The second year of the delphinium trial has been fumigated and is currently underway.

