COMPARISON OF ALTERNATIVE FUMIGANTS IN CUT FLOWER PRODUCTION

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Florida is an important producer of ornamental cut flowers in the United States. Flower crops can be produced directly in the field provided that problems with weeds, nematodes, and soilborne plant pathogens are managed by soil fumigation. Phase-out or reduction of methyl bromide usage poses a risk to production unless a suitable alternative to methyl bromide is found. However in comparison to vegetable production, research on alternatives in production of cut flowers and other ornamentals has been relatively limited. A field experiment was conducted on a commercial site in Martin Co., FL, during the 2002-03 season to evaluate the performance of several fumigant alternatives to methyl bromide in cut flower production, using snapdragon (*Antirrhinum majus*) as a test crop.

Four treatments were established in a randomized complete block design with four replications: methyl bromide + chloropicrin, metam sodium, metam sodium + chloropicrin, and nonfumigated control. Individual plots were 10.5 ft wide x 45 ft long. Methyl bromide (98%) + chloropicrin (2%) was injected in broadcast fashion at 450 lbs/acre. Metam sodium was drenched on to the soil surface at 75 gal/acre and rototilled to a depth of 8-12 in. For the metam sodium + chloropicrin treatment, chloropicrin was injected at 150 lbs/acre immediately after rototilling of metam sodium. Treatments were applied on Aug. 21, 2002, and immediately after application, all plots (including the controls) were covered with clear plastic sheeting that remained in place until Sept. 4. Therefore, the control plots were actually solarized for about two weeks.

Following removal of plastic, two beds, with centers 5 ft apart, were formed within each plot. Plugs with small (1 inch tall) snapdragon seedlings were planted at a rate of 120 plants per 1.0 m (3.05 ft) of bed between Sept. 30 and Oct. 23. Several different planting dates and cultivars of snapdragon were used, as typical in commercial production to provide a range of colors and maturity. The crop was fertilized, irrigated, and maintained according to standard grower practices. Cut flower harvest began in December and extended into April depending on cultivar and planting date. A section of one bed, 25 ft long, was used for data collection within each plot. All weeds per 25 ft section were counted on Oct. 9 and Nov. 14, and soil samples for nematode analysis were collected five times during the growing season. Data on the number of plants that had been harvested or lost per m of row were collected over the growing season.
Pigweed (*Amaranthus* spp.) populations in control plots averaged 3.25 plants/25 ft

of row on Oct. 9 and 15.75 plants/25 ft on Nov. 14, but were reduced ($P<0.05$) to levels $\leq$ 1.0 plant/25 ft of row by all fumigant treatments on both sampling dates. Goosegrass (*Eleusine indica*) averaged 10.5 plants/25 ft on Oct. 9 and 19.5 plants/25 ft on Nov. 14 in control plots, but was reduced ($P<0.05$) in all fumigated plots to $\leq$ 0.5 plant/25 ft on Oct. 9 and $\leq$ 3.75 plants/25 ft on Nov. 14. Occurrence of root-knot nematodes (*Meloidogyne* spp.) was sporadic, but stubby-root nematodes (*Paratrichodorus* spp.) were present in control plots throughout the season. Stubby-root nematode levels averaged 13.2/100 cc soil in control plots on Oct. 9, but were reduced ($P<0.05$) to zero on that date by all soil fumigants. In Jan., Feb., and April, nematode numbers in all fumigated plots had resurged to levels similar to control plots.

Of a possible 120 plants/m, an average of 117-118 flower stems were cut from fumigated plots, significantly greater ($P<0.05$) than the 109.6 plants/m harvested from control plots. Stems lost or not harvested averaged 1.8% for methyl bromide + chloropicrin, 1.7% for metam sodium + chloropicrin, 2.7% for metam sodium, and 8.7% for the nonfumigated control.

In summary, the three fumigant treatments (methyl bromide + chloropicrin, metam sodium + chloropicrin, and metam sodium alone) performed similarly under the conditions of this test in their reduction of weeds and plant-parasitic nematodes and improvement in harvest yield of cut snapdragon flowers. This experiment was conducted for one season (2002-03) in a site that had been treated with methyl bromide the year before (2001). Further research is needed to determine whether these alternatives fumigants would still compare favorably with methyl bromide when used over several seasons.