EVALUATION OF LOSSES TO SNAPDRAGON FROM SOILBORNE PESTS AND DISEASES

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Field production of cut flowers in Florida relies on soil fumigants such as methyl bromide for management of weeds, nematodes, and soilborne plant pathogens. Current work focuses on the development and performance of alternatives to methyl bromide, but little information is available on the potential losses to cut flowers if effective fumigation is not achieved. Such information can be critical to regulatory agencies and others in recognizing the importance of soil fumigants in cut flower production. A field experiment was conducted on a commercial site in Martin Co., FL, during the 2003-04 season to evaluate the performance of several alternatives to methyl bromide and the potential losses from soilborne pests in snapdragon (*Antirrhinum majus*) production.

Five treatments were established in a randomized complete block design with four replications; methyl bromide + chloropicrin, metam sodium, metam sodium + chloropicrin, solarization, and nontreated control. Individual plots were 10.5 ft wide x 45 ft long. Methyl bromide (98%) + chloropicrin (2%) was broadcast injected at 450 lbs/acre. Metam sodium was drenched onto 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. Fumigant treatments were applied on Aug. 20, 2003, and immediately after application, all fumigated plots and solarized plots were covered with clear plastic sheeting that remained in place until Sept. 30. Control plots were not covered.

Following removal of plastic, two beds, with centers 5 ft apart, were formed within each plot. Plugs with small (1 inch tall) seedlings were planted at a rate of 120 plants per 1.0 m (3.05 ft) of bed between Oct. 15-20. Several different 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. Snapdragons were harvested as cut flowers during December and January by cutting stems at about 1-2 in above ground level at peak bloom. Data on the number of plants that had been harvested or lost per m of row were collected over the growing season. On Oct. 2 and Nov. 20, all weeds were counted in a 1-m^2 quadrat from each plot. The percent of ground covered by weeds and the percent of dead plants within each plot were also rated on these dates.

Weed seedlings in control plots averaged 79.8/m^2 on Oct. 2, but were reduced ($P<0.05$) to zero by all fumigant treatments and by solarization. Weeds in control plots consisted primarily of pigweed (*Amaranthus* spp.) at 20.2 seedlings/m^2 and goosegrass (*Eleusine indica*) at 54.5 seedlings/m^2. After weeds were counted, weed growth was removed by the grower.

In early October, heavy rains washed surface soil from an untreated border area into many of the plots. This event aided in the distribution of weed seeds across all plots, with weed seedlings appearing even in fumigated plots by late Nov. On Nov. 20, many snapdragon plants were dead or showing symptoms attributed to a fungal disease, tentatively identified as *Fusarium* spp., causing wilting and destruction of vascular tissues in the crown and lower stem of the plants. Dead plants occurred in all plots, with no differences among treatments, but damage was more severe ($P<0.01$) in replications 3-4 (88-94% of plants dead) than in replications 1-2 (3-15% of plants dead). Harvest data were therefore limited to replications 1-2.

Based on a potential harvest of 120 stems per m of row, only 39.2 plants/m were harvested from control plots, whereas numbers harvested from fumigated or solarized plots ranged from 62.0-92.3 plants/m. Average losses by treatment were: 48.3% for methyl bromide + chloropicrin, 29.5% for metam sodium, 23.1% for metam sodium + chloropicrin, 35.5% for solarization, and 67.3% for the control.

Results indicate that all fumigants and solarization performed equally well in suppressing initial weed populations. In addition, data illustrate the losses to snapdragon production that can occur if soilborne diseases and weeds are not managed. Losses averaging 67.3% in control plots are conservative and based on two replications. If the two replications with 100% losses are included, the losses in control plots across the field averaged 83.6%. Removal of a heavy cover of weed seedlings from control plots early in the season may have prevented further losses. This study shows the magnitude of losses that can occur if soilborne pests are not managed in cut flower production, as well as the potential for crop infection from untreated areas bordering the production site.