ACROLEIN AND PROPYLENE OXIDE: ALTERNATIVES TO METHYL BROMIDE FOR WEED CONTROL IN TURF

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Sod producers and turfgrass managers have traditionally relied upon methyl bromide to control troublesome weeds and unwanted turf cultivars during field renovation or establishment. Weed species typically include common bermudagrass (*Cynodon dactylon*), perennial sedges (*Cyperus and Kyllinga* spp.) and several annual grass and broadleaf species. Acrolein (2-propenal) and propylene oxide are two potential replacements for methyl bromide. Preliminary research by Rodriguez-Kabana showed that acrolein rates (applied as drench) were similar to those used for methyl bromide and these rates were effective in controlling yellow nutsedge (*Cyperus esculentus)*. Rates in our initial studies were 224, 448, and 896 kg ai/ha injected. Our objective in this research was concentrate on rates in the 448 to 896 kg range since the lower 224 kg rate was ineffective when injected.

Micro-chamber experiments were conducted utilizing 10-cm diameter plastic (PVC) pipe cut to a length of 25-cm. Bottoms were sealed while the tops were removable. An injection port was constructed 5-cm from the bottom. Chambers were filled with one kg of sandy loam soil (pH 5.8) at 50% of field capacity. Five yellow nutsedge nutlets and 10 annual morningglory seeds (*Ipomoea* spp.) were placed in separate nylon mesh bags and were buried 2.5 cm below the soil surface. Propagules were placed in the mesh bags in order to retrieve them from the chambers for germination tests. Acrolein rates were; 0, 448, 560, 672, and 784 kg ai/ha while rates of propylene oxide: 0, 227, 454, 683, and 912 kg ai/ha. Acrolein and propylene oxide were evaluated in separate experiments. Chemicals were injected through the bottom port of each chamber using a glass syringe. Chambers were kept sealed for 5 days, unsealed, and soil removed to a 1-L styrafoam cup on day 6. This soil was used to determine plant-back interval. Retrieved (1 day after unsealing) yellow nutsedge nutlets were placed in 0.5-L cups containing 90% washed sand and 10% sedge peat. Cups were placed on a mist table and shoot counts were taken over 3 weeks. Morningglory seed were individually inspected to determine whether they were dead, alive or hard-seeded the day after unsealing. Plant-back intervals for each treatment were 1, 3, and 5 weeks after treatment. Bioassay species for acrolein was soybeans *(Gylcine max*) and perennial ryegrass (*Lolium perenne*) for propylene oxide. Different bioassay species were used due to differential temperature regimes in the greenhouse. Experiments for each compound were conducted twice and data pooled for analysis.

Acrolein. No germination of either weed species occurred at the 672 or 784 kg ai/ha rates of acrolein. When soybean were planted 2 days after unsealing, no germination occurred at rates higher than 448 kg ai/ha, and a significant reduction in germination and dry weight was observed at this lower rate. However, soybeans replanted 2 weeks later showed no differences among treatments for either germination or dry weights.

Propylene oxide. Germination of morningglory was eliminated at rates higher than 406 kg ai/ha. No germination of yellow nutsedge was observed for any rate of propylene oxide. No evidence of perennial ryegrass phytotoxicity was observed at any plant-back date.

Results from these studies indicate that both acrolein and propylene oxide have potential to be used as methyl bromide alternatives. Field studies are underway to substantiate results obtained from micro-chamber studies.