CONCENTRATIONS AND EFFICACY OF INLINE AND VAPAM IN RAISED PLASTIC-MULCHED BEDS

Byron Candole*[1], Alexander Csinos[1] and Dong Wang[2], [1]Department of Plant Pathology, University of Georgia Coastal Plain Experiment Station, Tifton, GA 31793 and [2]Environmental Biophysics Department, University of Minnesota, St. Paul, MN 55108.

Field studies were conducted during the fall season of 2004 at Black Shank Farm, Tifton, GA to determine the concentrations and efficacy of InLine® (60.8% 1,3-dichloropropene [1,3-D] and 33.3% chloropicrin [Pic] and Vapam (42% metam sodium EC) against the survival of *Phytophthora capsici*, *Rhizoctonia solani* and yellow nutsedge in plastic-mulched raised beds of Fuquay loamy sand (loamy, siliceous, thermic Arenic Plinthic Paleudults). Gas levels of 1,3-D and MITC (the precursor of which is metam sodium) were monitored at different times after drip irrigation application from the soil atmospheres at different locations within the raised plastic-mulched beds treated with InLine® (at 10, 20, and 30 gallons per acre) and Vapam (at 25, 50, and 75 gallons per acre), respectively. The treatments were arranged in a randomized complete block design with five replications. Higher 1,3-D concentrations were observed at 10 cm below the drip tape than at 20.3 cm away from the drip tape (Fig. 1A). On the other hand, the highest MITC concentrations were observed at 20 cm below the drip tape while the lowest concentrations were observed at the air space between the plastic mulch and the soil surface of the raised bed (Fig. 1B). Concentrations of gases decreased significantly within 24-48 hrs after application (Figs. 1 and 4A). Survival of *Phytophthora capsici* and *Rhizoctonia solani* AG-4 from artificially infested beet seeds embedded for 10 days in the soil was reduced from 87-98% 10 cm below the drip tape for 1,3-D (Fig. 2) and MITC (Fig. 3) but only by 28-62% at 10 cm depth, 20.3 cm away from the drip tape. Yellow nutsedge tuber survival under both chemicals was reduced by an average of 69% 10 cm below the drip tape and by 20% at 10 cm depth, 20.3 cm away from the drip tape. *P. capsici*, *R. solani*, and yellow nutsedge survival was reduced by 95%, 80%, and 77%, respectively, after 24 hrs of exposure in the soil atmosphere (at 10 cm depth, 20.3 cm from the drip tape) of beds treated with Vapam at 75 gallons per acre (Fig. 4B). The results demonstrated: (1) the poor ability of these methyl bromide alternatives to diffuse at toxic concentrations beyond the point of application reduces their efficacy against soilborne pathogens and weeds, (2) propagules have to be killed within 24 hrs of exposure after application for treatments to be effective due to rapid decline in concentrations of these chemicals in the soil atmosphere over time, and (3) improved application techniques will be required to improve the efficacy of these alternatives.

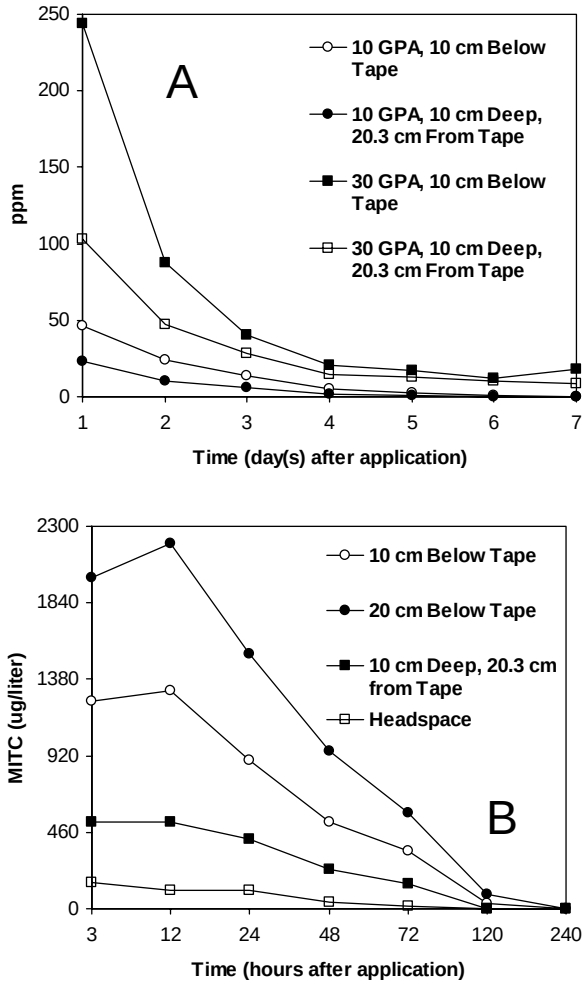

Figure 1. The concentrations of 1,3-D and MITC in the soil atmosphere over time at different locations within the raised plastic mulched bed after drip application.

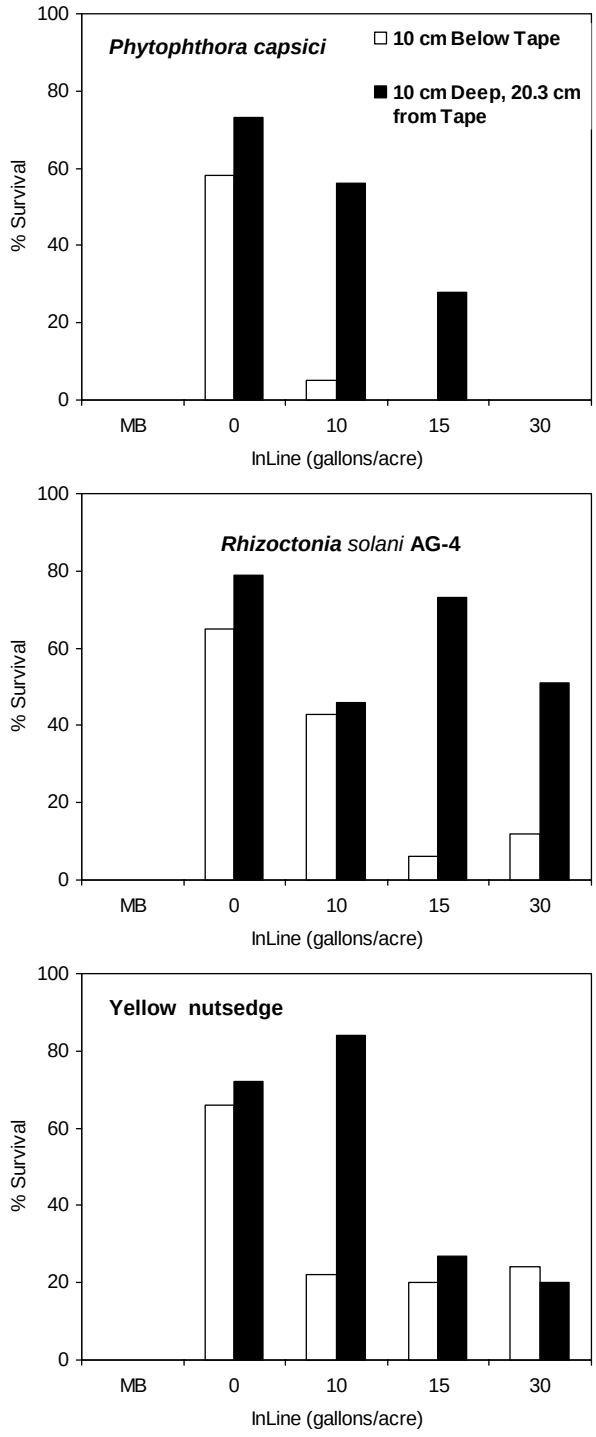

Figure 2. The survival of *Phytophthora capsici*, *Rhizoctonia solani* and yellow nutsedge at different locations or distances from the point of application of InLine. Bars are means of five replications from two experiments.

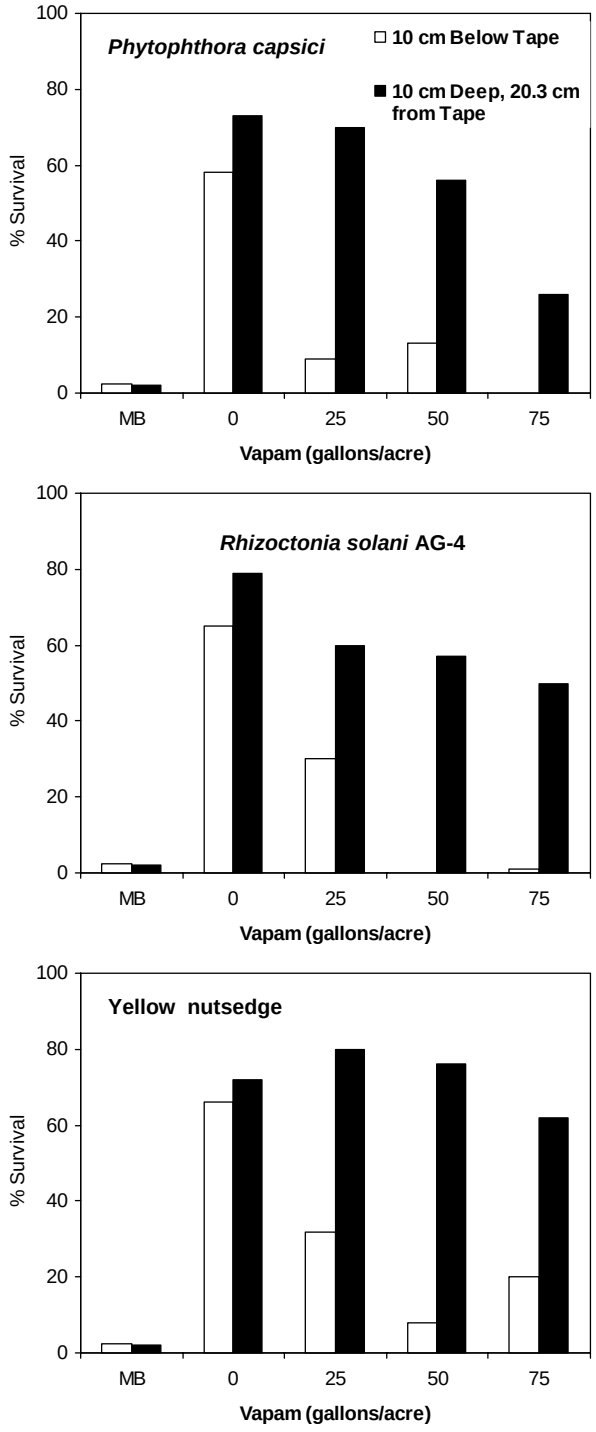

Figure 3. The survival of *Phytophthora capsici*, *Rhizoctonia solani* and yellow nutsedge at different locations or distances from the point of application of Vapam. Bars are means of five replications from two experiments.

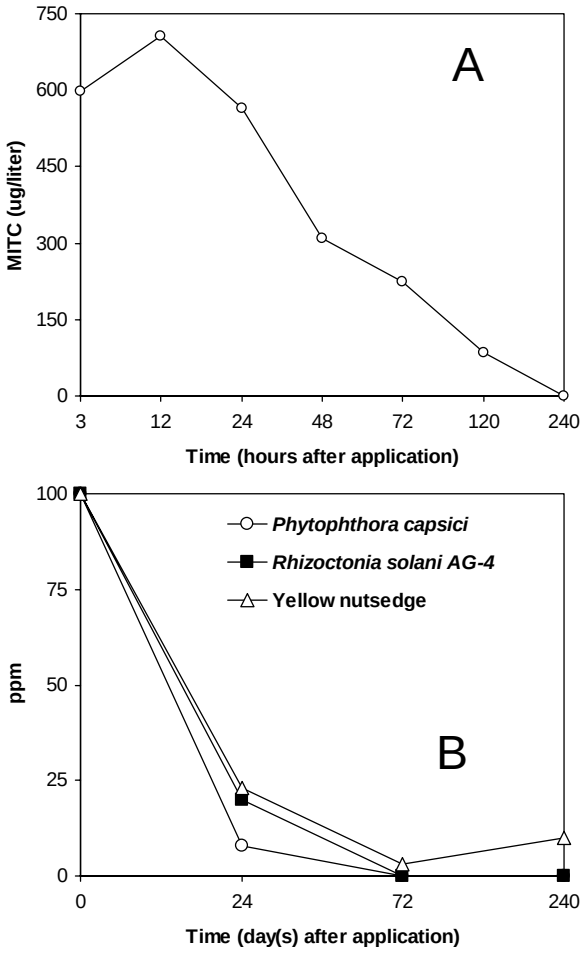

Figure 4. The concentrations (A) of MITC in the soil atmospheres of plots applied with Vapam at 75 gallons per acre and the survival (B) of *Phytophthora capsici*, *Rhizoctonia solani* and yellow nutsedge over time at 10 cm depth 20.3 cm away from the point of Vapam application.