AN OVERVIEW OF ACROLEIN (2-PROPENAL) RESEARCH CONDUCTED AT AUBURN UNIVERSITY

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In efforts to develop novel alternatives to methyl-bromide, -enal compounds with pesticidal effects similar to that of methyl-bromide, were tested at Auburn University for efficacy. Several compounds from this group have potential as pesticides, however acrolein was chosen for further investigation and development. Acrolein is currently labeled as an aquatic herbicide for use in irrigation canals, however little has been done to explore the nematicidal effects of acrolein or to develop strategies and methods to use it in agriculture as an alternative to methyl-bromide. Primary areas of focus in preliminary testing were herbicidal effects on a variety of difficult agronomic weeds and nematicidal effects on two economically important nematodes of Alabama: root-knot nematode (*Meloidogyne* spp.) and reniform nematode (*Rotylenchulus reniformis*). Greenhouse and microplot studies allowed initial assessment of efficacy and development of potential rates and methods of application. Subsequent field research has provided a view of acrolein in real agricultural use situations.

Herbicide efficacy: In greenhouse trials, morningglory (*Ipomoea lacunosa/I.hederacea*), sicklepod *(Senna obtusifolia*), jimsonweed *(Datura stramonium*), crabgrass (*Digitaria sanguinalis*), and yellow foxtail (*Setaria glauca*) were controlled with acrolein rates ≤100 mg ai/ kg soil, while yellow nutsedge (*Cyperus esculentus*) required rates ≥250 mg ai/ kg soil for complete control. Since approximately 150% more acrolein was required to control this species, it was decided to explore combinations of acrolein with yellow nutsedge-specific herbicides in attempts to reduce rates. Combinations of acrolein with halosulfuron, EPTC, and propionic acid were successful for reducing rates; however, it was also found that when applied in combinations, metam sodium and acrolein were antagonistic.

Nematicide effects: Results from greenhouse trials indicate that drench applications of acrolein at rates 50 to 100 mg ai/ kg soil effectively controlled the reniform nematode. Control of root-knot by drench application in greenhouse studies required rates of 60 to 150 mg ai/ kg soil. Field results showed that in an area of heavy root-knot infestation acrolein drip-applied at 400 mg ai/ kg soil (or 800 lb ai/acre) was inferior to control received with methyl-bromide/chloropicrin. Results indicate that for root-knot nematode control, more efficient methods of applications need to be developed or combinations of acrolein with other nematicides should be explored to help reduce rates and improve nematode efficacy.

Conclusions: Acrolein exhibits potential as an alternative to methyl-bromide; however, very high rates or combinations with other pesticides are needed to obtain equivalent pest control to that of traditional methyl-bromide/chloropicrin applications.