A DOSIMETRIC STUDY ON THE HERBICIDAL ACTIVITY OF ACROLEIN [2-PROPENAL]

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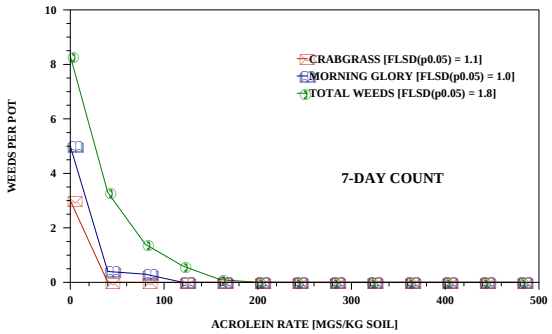
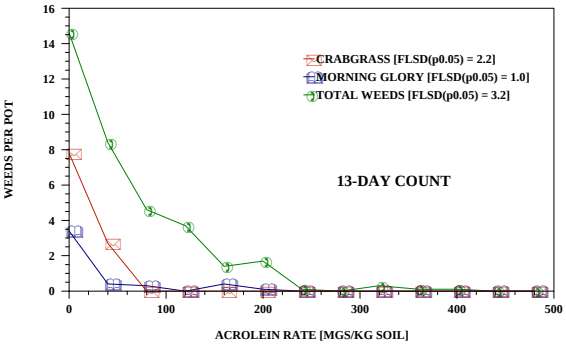
A dosage study on the herbicidal properties of acrolein [2-propenal] was conducted with greenhouse and microplot experiments. Greenhouse experiments were with a sandy loam soil [pH 6.5; org. matter <1%; C.E.C.< 10 meq./100 gms soil] from a cotton field. The soil was infested with a variety of weed species principal among which were: crabgrass [*Digitaria sanguinalis*] and other gramineae, pigweed [*Amaranthus* spp.], morning glories [*Ipomea* spp.], sicklepod [*Cassia tora*], and yellow nutsedge [*Cyperus esculentus*]. In a first experiment acrolein was delivered as a drench in water equivalent to 1" acre at rates [R] $40 \leq R \leq 480$ mgs a.i./Kg soil in 40 mgs increments [1 mg/kg soil = 2 lbs/A]. The experiment included a no-treatment control. Each treatment was represented by 7 replications [pots] in a randomized complete block design. Each pot contained 1 kg soil. The pots with soil were covered with transparent polyethylene bags [1 mil] immediately after treatment. The bags were removed after 7 days and the number of weeds were counted at weekly intervals for 3 weeks. Crabgrass, morning glories, and all other weeds in the experiment but nutsedge were controlled by rates $\geq$ 200 mgs [Fig.1]. Nutsedge required doses > 200 mgs for complete control [Fig.2]; the two lowest rates resulted in increased numbers of the weed. Results from a second greenhouse experiment of identical design and procedures but with rates $5 \leq R \leq 60$ mgs confirmed that nutsedge was not controlled by these rates but that there was an inverse linear relationship between numbers of other weed species and doses [Fig.3]. In a microplot experiment [microplot = 1 ft^2 x 2 ft deep] acrolein was applied by drenching in 1" acre of water at rates of $100 \leq R \leq 300$ lbs/A in 50 lbs increments. The experiment had a no treatment control and a treatment with 60 gal/A of metam Na [Vapam HL] applied as for acrolein. Each treatment and controls were represented by 7 replications [plots] arranged in a randomized complete block design. Soil in the microplots was the same as used in the greenhouse experiments. Results from the microplot experiment [Fig. 4] agreed with those obtained in the greenhouse study; effective control of all weeds required acrolein rates $\geq$ 200 lbs. At these rates weed control with acrolein was equivalent to that obtained with metam Na at 60 gal/A. Data from all experiments indicate that acrolein has potential for development as an alternative to methyl bromide for soil fumigation.


CRABGRASS [FLSD(p0.05) = 1.1]
MORNING GLORY [FLSD(p0.05) = 1.0]
TOTAL WEEDS [FLSD(p0.05) = 1.8]
7-DAY COUNT
WEEDS PER POT
ACROLEIN RATE [MGS/KG SOIL]


CRABGRASS [FLSD(p0.05) = 2.2]
MORNING GLORY [FLSD(p0.05) = 1.0]
TOTAL WEEDS [FLSD(p0.05) = 3.2]
13-DAY COUNT
WEEDS PER POT
ACROLEIN RATE [MGS/KG SOIL]

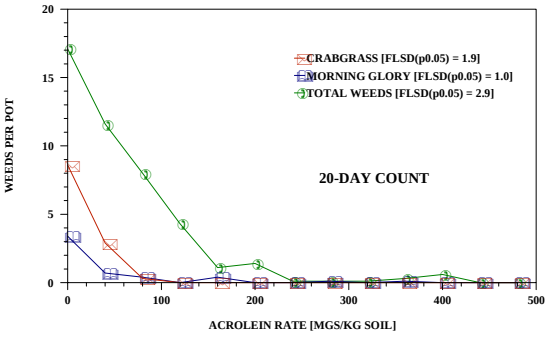

CRABGRASS [FLSD(p0.05) = 1.9]
MORNING GLORY [FLSD(p0.05) = 1.0]
TOTAL WEEDS [FLSD(p0.05) = 2.9]
20-DAY COUNT
WEEDS PER POT
ACROLEIN RATE [MGS/KG SOIL]

Figure 1. Herbicidal activity of acrolein applied by drenching in 1 acre-inch of water in the first greenhouse experiment with a sandy loam soil from a cotton field.

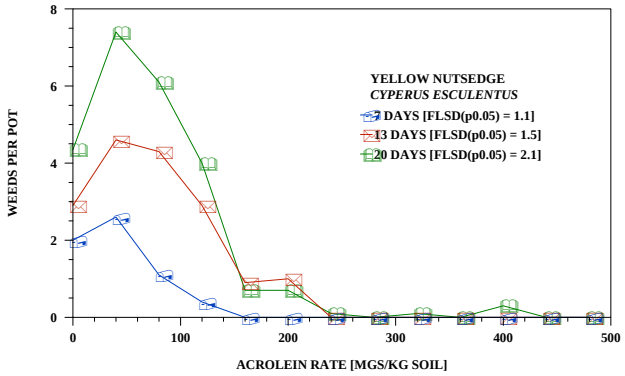


Figure 2. Activity of acrolein applied by drenching in 1 acre-inch of water against yellow nutsedge in the first greenhouse experiment with a sandy loam soil from a cotton field.

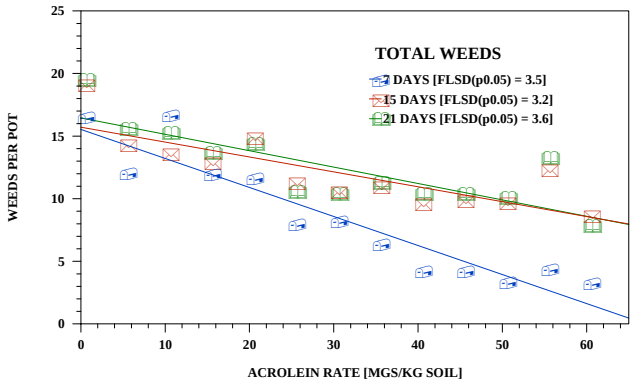


Figure 3. Herbicidal activity of reduced rates of acrolein applied by drenching in 1 acre-inch of water in the second greenhouse experiment with a sandy loam soil from a cotton field.

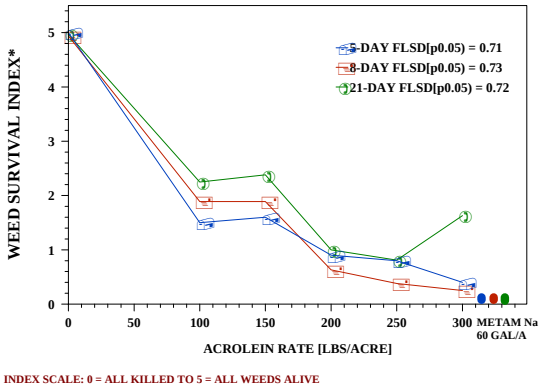


Figure 4. Relation between application rate and weed survival in a microplot experiment with acrolein and metam Na [Vapam HL].