CONTROL OF NUTSEDGE BY DIFFERENT DIMETHYL DISULFIDE APPLICATION COMBINATIONS

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Introduction

The ban on methyl bromide has forced vegetable producers to use alternative fumigants that are often less efficacious, leading to increased pest incidence, and subsequently, decreased yield and profits. Dimethyl disulfide (DMDS) is an alternative fumigant with good to excellent nutsedge control (*Cyperus rotundus* and *C. esculentus*) when mixed with chloropicrin (Pic). Unfortunately for producers in some locations, the use of Pic is restricted or prohibited. A potential alternative in these areas is to supplement metam sodium (MNa) for Pic. In order to determine the legitimacy of replacing Pic in DMDS:Pic combinations, various rates of MNa were applied alone and in combination with DMDS by two application methods and efficacy was evaluated based on nutsedge population data and muskmelon yield.

Materials and Methods

All experiments were conducted at the North Florida Research and Education Center in Quincy, Florida and arranged as a randomized complete block design with four replications. During spring 2016 and spring 2017, treatments consisted of 34 GPA DMDS, 40 GPA 79:21 DMDS:Pic (w:w), 40 GPA MNa, 50 GPA MNa, 34 GPA DMDS + 40 GPA MNa, 34 GPA DMDS + 50 GPA MNa, and a non-treated control. Treatments were applied using a single row combination bed press with three back-swept shanks. DMDS and DMDS:Pic were released 8 inches below the bed surface. DMDS:MNa treatments were applied using three back-swept shanks with dual release ports deploying DMDS 8 inches below the bed surface and MNa 4 inches below the bed surface. MNa treatments were deployed with three back-swept shanks with fumigant deployed at 4 inches below the bed surface. Experimental plots were covered with 1.25 mil white-on-black Berry Total Blockade totally impermeable film (TIF).

An experiment was implemented in fall 2017 with treatments including 40 GPA 79:21 DMDS:Pic (w:w), 40 GPA 90:10 DMDS:Pic (w:w), and 40 GPA DMDS + 40 GPA MNa with each treatment being applied via drip tape or three back-swept shanks under TIF. Also included in the treatments was 250 GPA of a 39:60 1,3-dichloropropene and chloropicrin mixture (Pic-60) shank applied under low density polyethylene (LDPE) and a non-treated control under TIF. This experiment was implemented in the same manner as the aforementioned experiment with DMDS:Pic being applied with three back-swept shanks 8 inches below the bed surface and DMDS:MNa applied with three dual port shanks allowing DMDS to be deployed 8 inches below the surface and MNa deployed 4 inches below the bed surface. Treatments applied through the drip tape were applied over 45 minutes followed by a 30 minute flush. Drip tape used for application was 8mil, 5/8 inch with a flow rate of 0.5 GPM per 100 feet with emitters spaced 12 inches apart.

Nutsedge data was collected for all experiments at 30, 60, and 90 days after treatments (DAT). Muskmelon were harvested at appropriate intervals, counted, and weighed for yield data.

Results

Results for experiments conducted in spring 2016 and spring 2017 showed that nutsedge populations at 60 DAT in treatments consisting of DMDS, alone or in combination, were significantly lower than the non-treated control. DMDS applied alone was not different from 40 and 50 GPA MNa and both MNa treatments were not significantly different than the control. By 90 DAT, All DMDS combinations had significantly lower nutsedge populations than all other treatments. DMDS and MNa applied alone did not have lower populations than the control. In 2016, muskmelon yield showed DMDS combinations resulting in significantly greater yields than plots treated with DMDS alone, MNa alone, and the control. MNa and DMDS applied alone produced yields similar to the control. In 2017, there were no significant differences in muskmelon yield.

Only 30 day nutsedge population data for the fall 2017experiment is available for this summary. At 30 DAT, Pic-60 had nutsedge populations similar to the control, while all other treatments had significantly lower nutsedge populations than Pic-60 and the control.

These data illustrate the strong potential of combining DMDS and MNa for controlling nutsedge species in locations where the use of Pic is limited or prohibited. It is uncertain how DMDS:MNa mixtures will perform when other yield limiting factors are present, such as soil-borne pathogens and plant parasitic nematodes. It is imperative that the performance of DMDS:MNa combinations against plant pathogens and nematodes be investigated before extensive adoption of this fumigant combination.

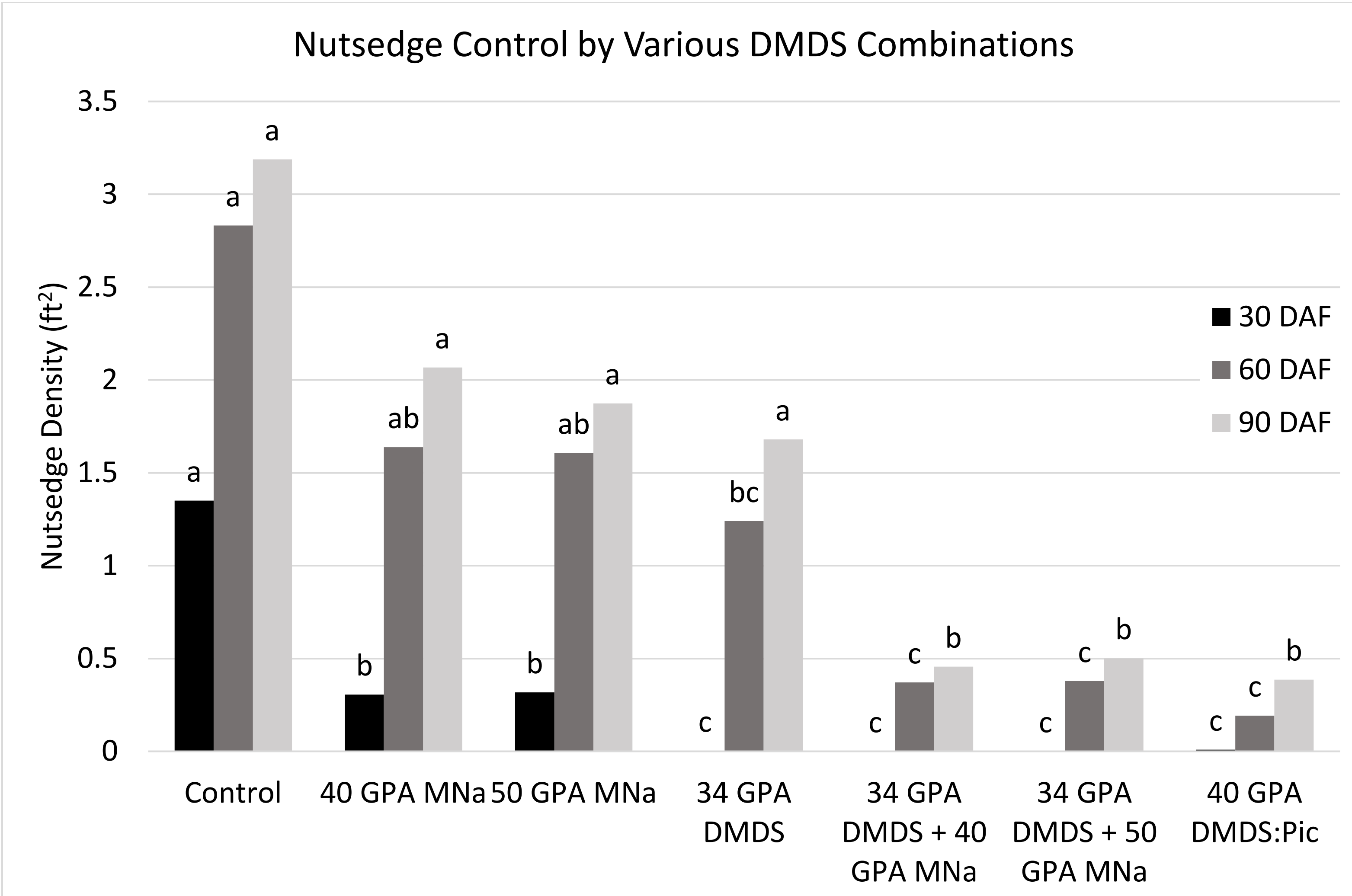

Figure 1. Combined data on the control of nutsedge by DMDS, DMDS:Pic, DMDS:MNa, and MNa in Quincy, Florida during spring 2016 and spring 2017. Means followed by the same letter are not significantly different at $P<0.05$ by least significant difference. Means are compared within the same sampling date. DMDS=dimethyl disulfide, MNa=metam sodium.

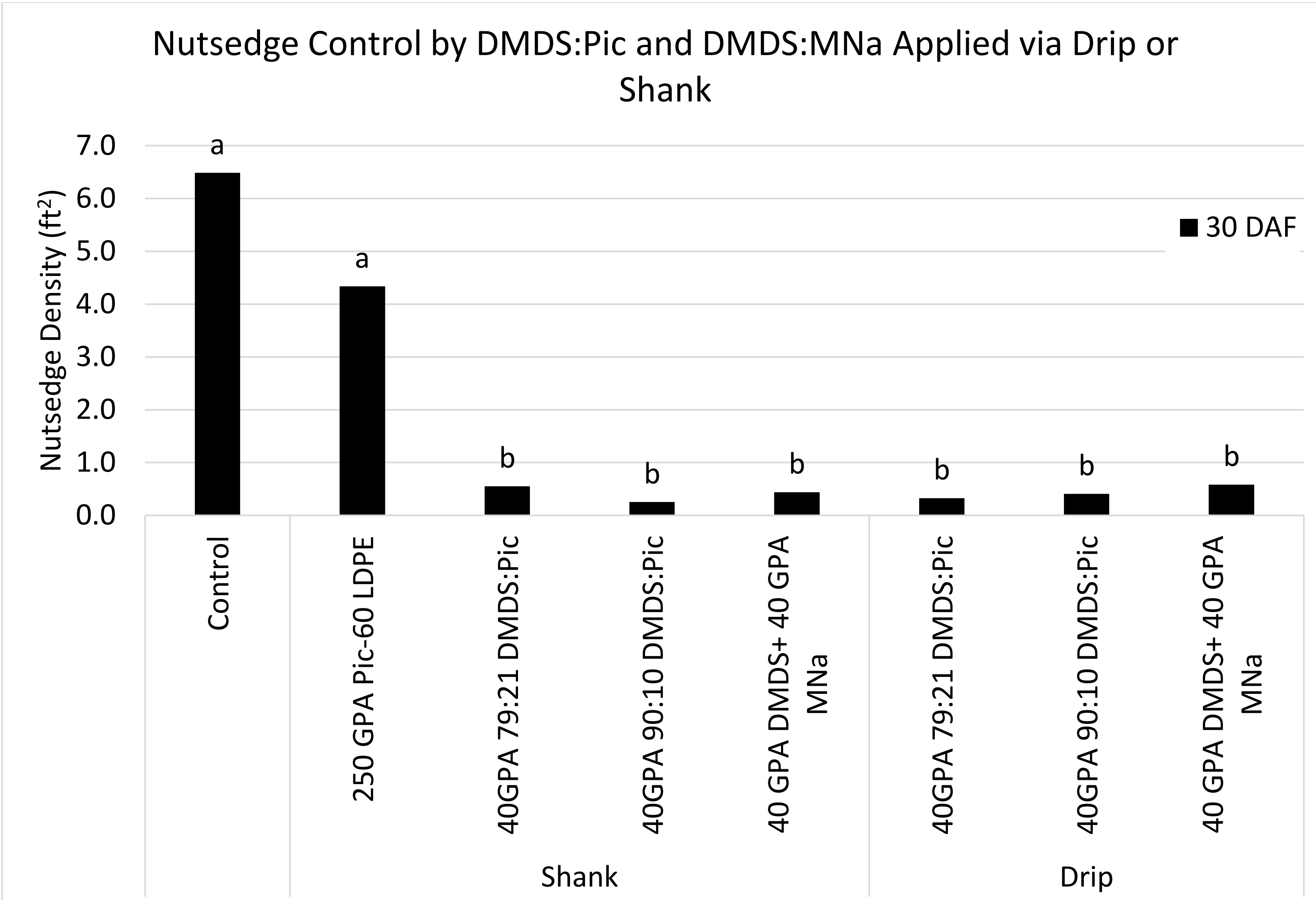

Figure 2. Nutsedge population control by two DMDS:Pic combinations and a single DMDS:MNa combination applied via drip and shank at the North Florida Research and Education Center in Quincy, Florida during fall 2017. Means followed by the same letter are not significantly different by $P<0.05$ by least significant difference. DMDS=dimethyl disulfide, Pic=chloropicrin, MNa=metam sodium.