Fluroxypyr Efficacy as Affected by Relative Humidity and Soil Moisture

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Introduction

- The efficacy of postemergence herbicides is often influenced by environmental conditions.
- Fluroxypyr is a pyridine-based herbicide currently registered for use in small grain cereal crops and fallow. It effectively controls several annual broadleaf weed species found in grain sorghum.
- Evidence suggests that environmental factors such as relative humidity and soil moisture may influence fluroxypyr efficacy.

Objective

- Evaluate the effects of relative humidity and soil moisture on postemergence phytotoxicity of fluroxypyr to kochia and Palmer amaranth.

Materials and Methods

- Kochia and Palmer amaranth were planted in 11.4 cm-diameter pots filled with 1300 g of sand-amended silt loam soil and later thinned to two plants per pot.
- Plants were grown in environmental chambers at constant 35 or 90% ± 5% relative humidity (RH), 28/23 C, and 16/8 hr day/night photoperiods.
- Within each RH, soil moisture determined as described by Klute (1986) was maintained at -20 or -40 kilopascals (kPa) throughout the study by weighing pots daily and replenishing water to desired weights (-40 kPa was the dryer soil).
- When plants were 10 cm tall, fluroxypyr was applied at 0, 26, 53, 79, or 105 g ae ha^{-1} in water at 185 L ha^{-1}.
- Control was estimated visually at 7, 14, and 21 days after treatment (DAT).
- Experimental design was a split-plot with relative humidity as the main-plot factor and weed species by soil moisture regime by fluroxypyr rate as the sub-plot factor.
- Treatments were replicated four times and the experiment was repeated.
- Data were arcsine transformed and subjected to analysis of variance and means were separated at P = 0.05.

Results and Discussion

- Kochia control was consistently less under conditons of 35% RH and -40 kpa soil moisture compared to other combinations, for which control was similar (Figures 1 and 2).
- Kochia control differed between -20 and -40 kPa soils only at 35% RH, with greater control at -20 kPa.
- Palmer amaranth control was consistently greatest under conditions of 90% RH and -20 kPa soil compared to other combinations. Low soil moisture (-40 kpa) affected control more than low RH.
- Palmer amaranth control differed between -20 and -40 kPa soil moistures only at 90% RH, with greater control at -20 kPa .

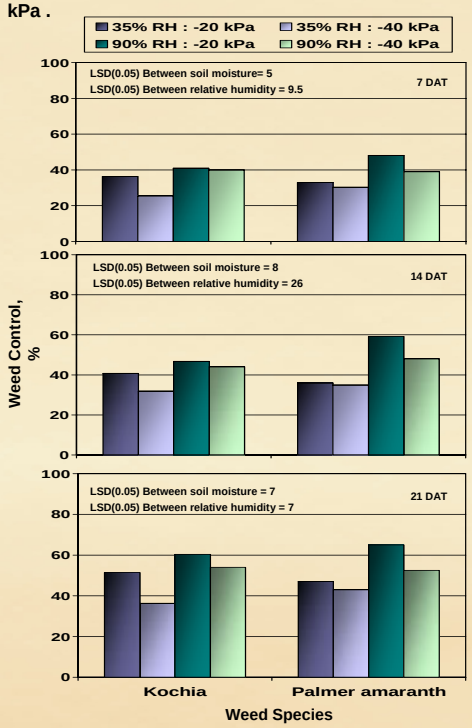

Figure 1: Comparison of kochia and Palmer amaranth control 7, 14 and 21 DAT. Means were averaged across fluroxypyr rates.

Results and Discussion

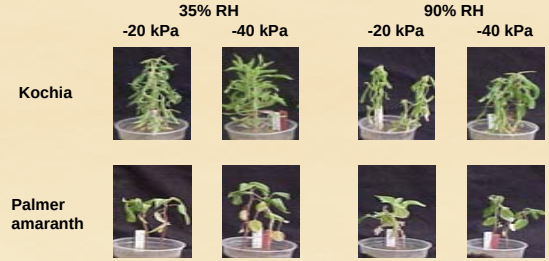

Figure 2: Effects of RH and soil moisture on weed control with 105 g ha^{-1} fluroxypyr at 21 DAT.

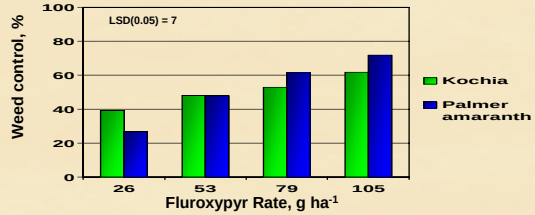

Figure 3: Kochia and Palmer amaranth control with increasing rates of fluroxypyr at 21 DAT, averaged over RH and soil moisture.

- Fluroxypyr at 26 g ha^{-1} controlled kochia more than Palmer amaranth. However, at 79 and 105 g ha^{-1} Palmer amaranth was controlled more than kochia.

Conclusions

- Control of kochia and Palmer amaranth with fluroxypyr generally was higher at 90% RH compared to 35% RH, regardless of soil moisture.
- Control differences between soil moistures occurred for kochia at 35% RH and for Palmer amaranth at 90% RH; control of both was best in moist soil.
- Kochia was less sensitive than Palmer amaranth to increased rates of fluroxypyr.

Reference

Klute, A. 1986. Water Retention: Laboratory Methods. Page 647 *in* Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods. Madison, WI: American Society of Agronomy.