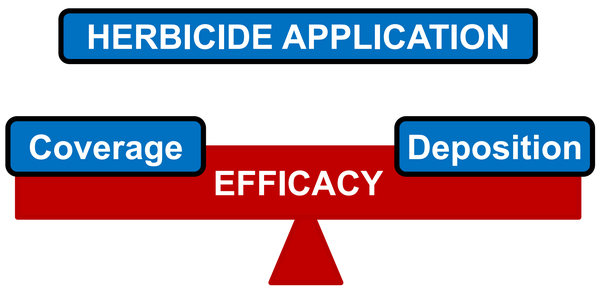
Glufosinate Control and Physical Properties with Different Adjuvants on *Chenopodium album* and *Bassia scoparia*

João Victor Oliveira[1], Antonio A. C. Tavares[1], Estefânia G. Polli[1], Leandro H. S. Guimarães[1], Jesaelen G. Moraes[1], Rone B. Oliveira[2], and Greg R. Kruger[1]

[1]University of Nebraska-Lincoln, West Central Research, Extension and Education Center, North Platte, NE
[2]State University of Northern Paraná, Bandeirantes, PR, Brazil

INTRODUCTION



- Physical properties of the herbicide solutions can influence the herbicide performance depending on the leaf surface and leaf surface morphology (Hess and Falk 1990).
- Adjuvants are capable of modifying the physical properties of the herbicide solutions affecting the solution-plant interaction (McMullan 1996).

HYPOTHESES: The adjuvants will change the physical properties of the herbicide solution and affect weed control but results will be adjuvant- and weed species-dependent.

OBJECTIVE: Determine how different adjuvants will impact the physical properties of glufosinate solutions and consequent impact on the control of common lambsquarters (*Chenopodium album L.*) and kochia [*Bassia scoparia* (L.) A. J. Scott].

MATERIALS AND METHODS

- Greenhouse study
- Completely randomized design
  - 4 replications
- Factorial (10x2)
  - 10 spray solutions (Table1)
  - 2 weed species (16 cm)
    - Common lambsquarters
    - kochia
- Spray application
  - Three-nozzle spray chamber
  - 140 L ha^{-1}
  - TT11002, 276 kPa, 51-cm nozzle spacing.
- Plants were harvested at 28 days after treatment and dried to constant mass at 65°C.
- Dry biomass was recorded and converted into percent biomass reduction.
- Density and viscosity analyses were performed with 4 replications each.

Table 1. Spray solutions and rates for each tretment.

Trt#	Spray solutions	Rate g ai ha^{-1} or v v^{-1}
1	Untreated	0
2	Glufosinate (Glu)	328
3	Glu + Nonionic surfactant	328 + 0.37
4	Glu + Organo-silicone surfactant	328 + 0.18
5	Glu + High surfactant oil concentrate	328 + 0.50
6	Glu + Modified vegetable oil	328 + 0.50
7	Glu + Drift reduction adjuvant	328 + 0.50
8	Glu + Crop oil concentrate	328 + 1.67
9	Glu + Humectant	328 + 0.50
10	Glu + Ammonium sulfate	328 + 5.00

Figure 1. (a) weed species and (b) density meter and microviscometer.

- **STATISTICAL ANALYSIS:** Data from dry weight, density, and viscosity were analyzed separately and subjected to ANOVA with mean separations made at α = 0.05 level using Fisher's protected LSD test and Tukey adjustment.

RESULTS AND DISCUSSION

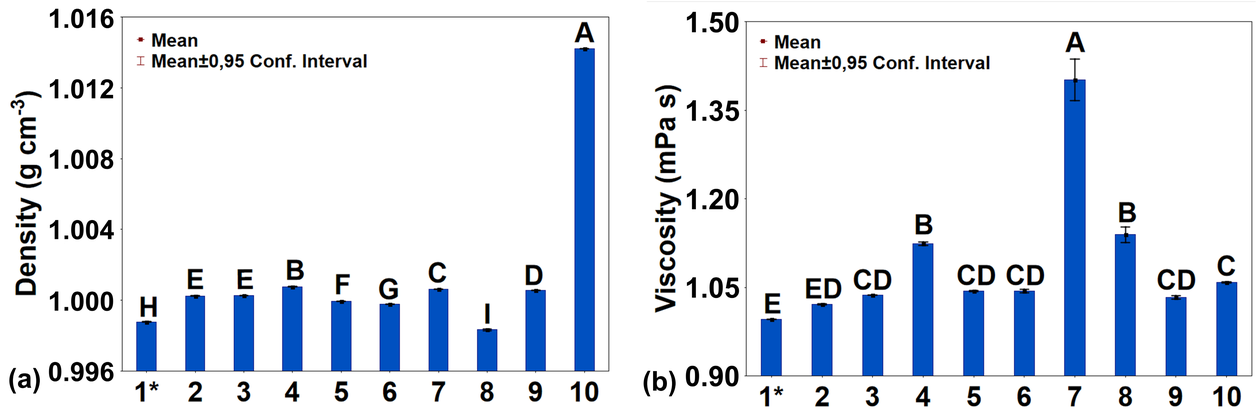


Figure 2. Results of (a) density and (b) viscosity of glufosinate solutions tank-mixed with different adjuvants. Means with the same letter do not differ using Tukey's test at α = 0.05. *Water alone.

- Density: the greatest difference (1.57%) was observed when comparing glufosinate plus ammonium sulfate (1.0142 g cm^{-3}) with glufosinate plus crop oil concentrate (0.9983 g cm^{-3}).
- Viscosity: the greatest difference (26.22%) was observed when comparing glufosinate plus drift reduction adjuvant (1.38 mPa s) with glufosinate alone (1.02 mPa s).

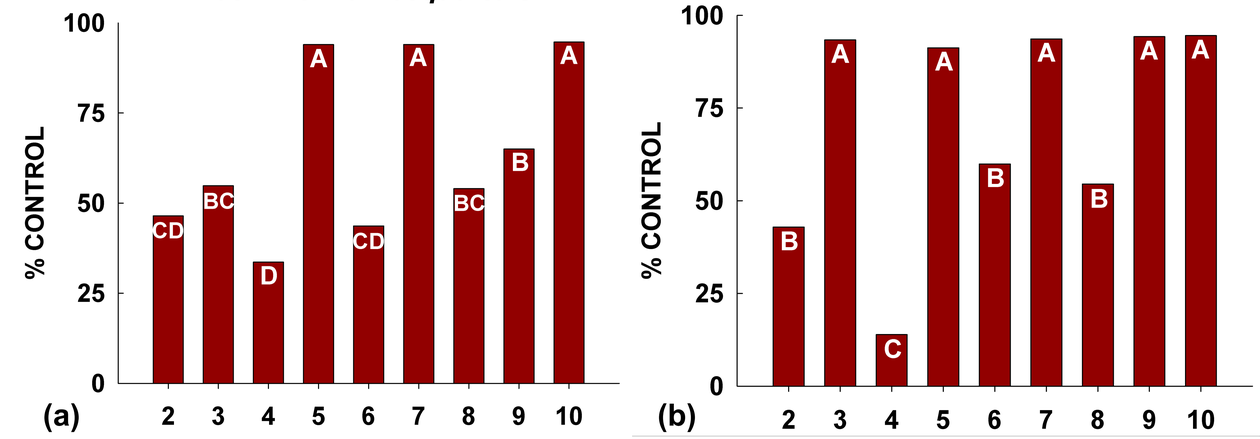


Figure 3. Responses of (a) common lambsquarters and (b) kochia as percent control to glufosinate solutions tank-mixed with different adjuvants. Bars with the same letter do not differ using Tukey's test at α = 0.05.

- For both weed species, the greatest control was with glufosinate plus ammonium sulfate (95% for c. lambsquarters and kochia).
- For both weed species, the lowest control was with glufosinate plus organo-silicone surfactant (14% for c. lambsquarters and 34% for kochia).

CONCLUSIONS

- The treatments with the greatest density and viscosity values obtained resulted in control greater than 90% in both species.
- Different adjuvants tank-mixed with glufosinate changed the physical properties of the spray solution but an association with weed control was not observed.

REFERENCES

F. Dan Hess, and Richard H. Falk. "Herbicide Deposition on Leaf Surfaces." Weed Science, vol. 38, no. 3, 1990, pp. 280–288.

Patrick M. McMullan. "Grass Herbicide Efficacy as Influenced by Adjuvant, Spray Solution PH, and Ultraviolet Light." Weed Technology, vol. 10, no. 1, 1996, pp. 72–77.

FUTURE RESEARCH

Investigate the impact of these adjuvants on other physical (surface tension and contact angle) and chemical (pH) properties when tank-mixed with glufosinate.