2017-2018 Interaction of Lactofen with Glyphosate or Glufosinate for Weed Control as Affected by Adjuvants and Droplet Size

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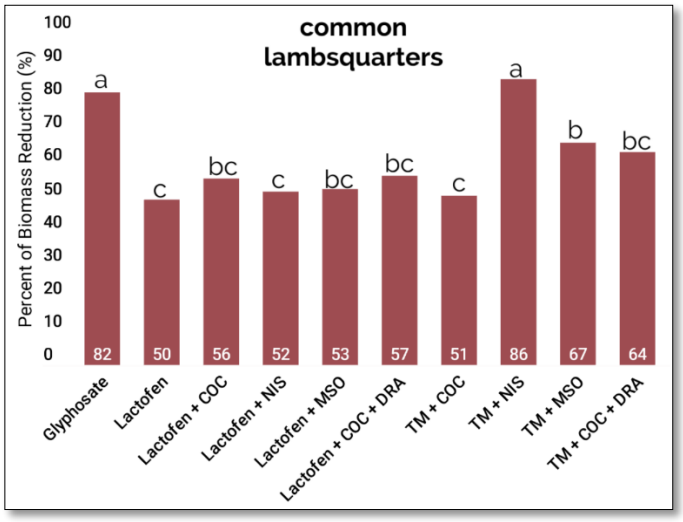
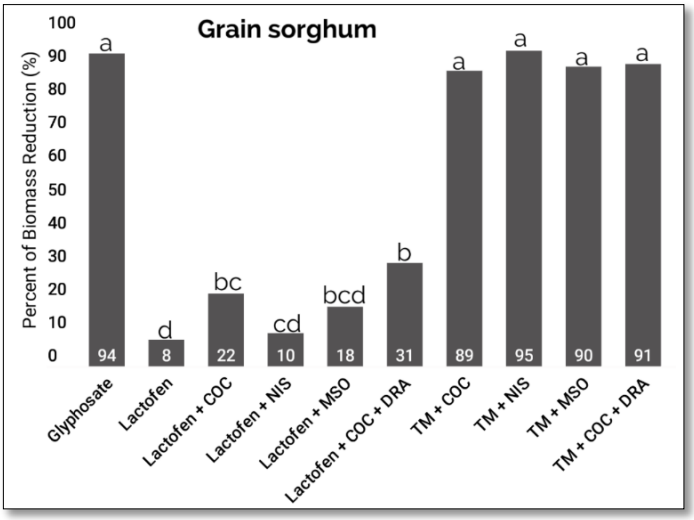
Funding:

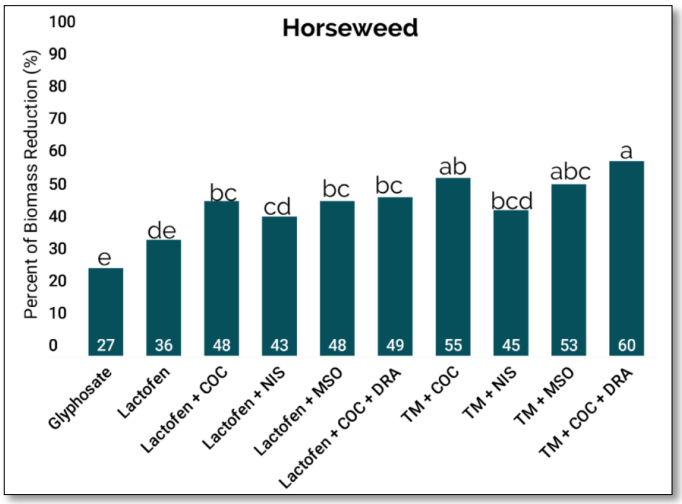
Study Outline: Greenhouse studies were conducted at the Pesticide Application Technology Laboratory - West Central Research and Extension Center, in North Platte, NE, using four plant species: kochia (*Kochia scoparia (L.)* Schrad.), horseweed (*Conyza canadensis (L.) C*ronq.), common lambsquarters (*Chenopodium album L.*), and grain sorghum (*Sorghum bicolor (L.)* Moench ssp. *Bicolor*). Treatments were arranged in a 10 x 2 factorial consisting of ten spray solutions and two nozzle types (XR11004 and TTI11004). Spray treatments consisted of postemergence applications of glyphosate at 16 fl oz/ac, glufosinate at 14.5 fl oz/ac, lactofen at 6.25 fl oz/ac, or lactofen with crop oil concentrate (COC) at 1% v v^{-1}, non-ionic surfactant (NIS) at 0.25% v v^{-1}, methylated seed oil (MSO) at 1% v v^{-1}, or a drift reducing agent (DRA) at 0.5% v v^{-1}, and either glyphosate or glufosinate with lactofen in combination with each of the adjuvants aforementioned. All applications were performed at 40 psi and 6 mph to deliver 20 gpa using a three-nozzle laboratory track sprayer. Droplet size spectra were also recorded using a laser diffraction system. The objective of this study was to determine the interaction of lactofen with glyphosate or glufosinate for weed control as affected by adjuvants and nozzle selection

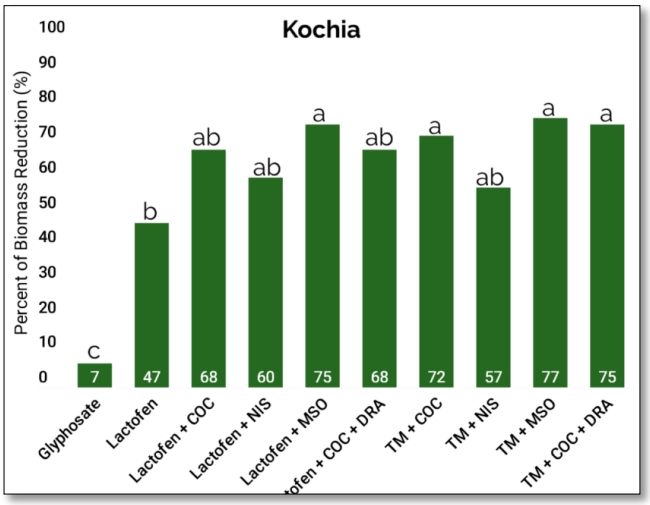
Results:

A) Study 1 - Glyphosate

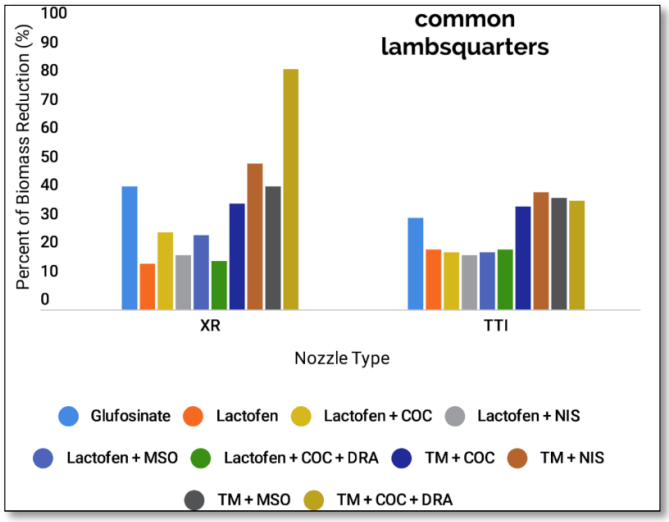


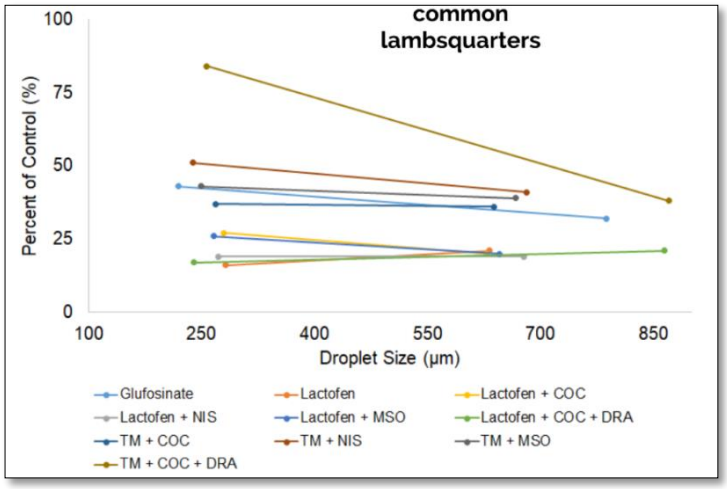


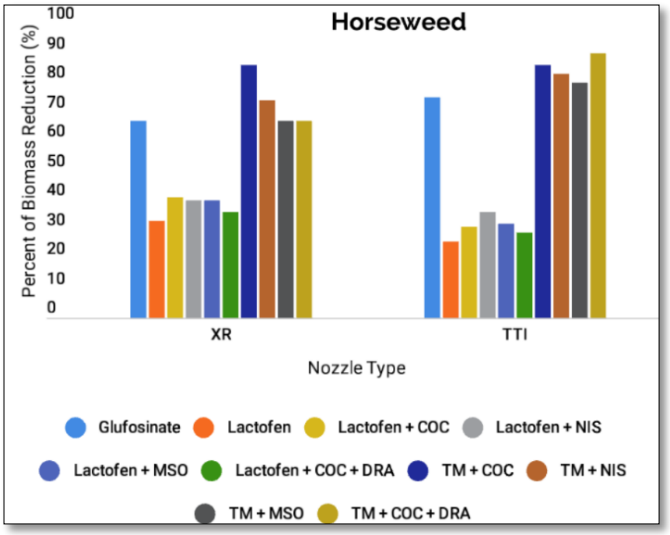


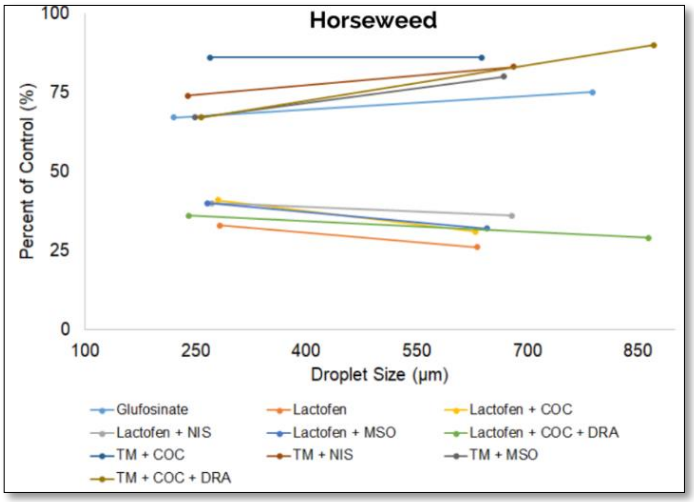


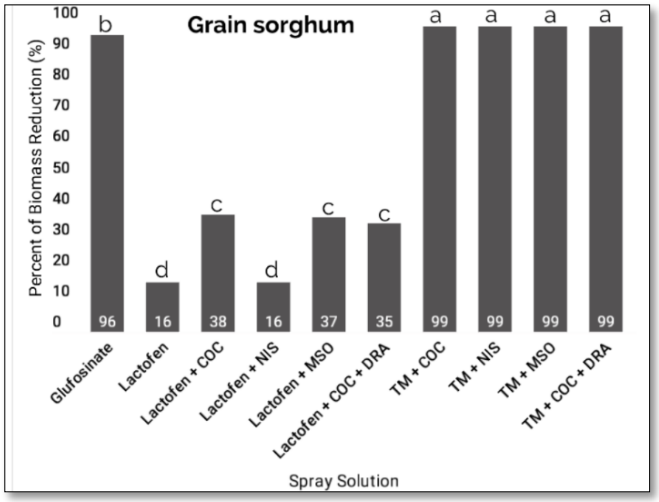
B) Study 2 – Glufosinate

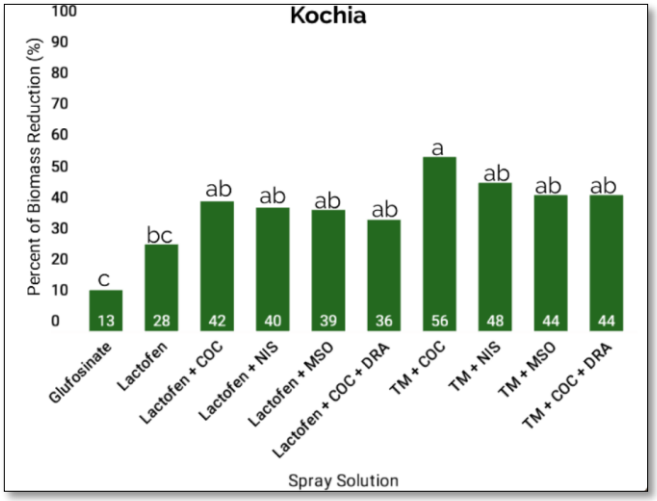












Results: Nozzle selection was not the major contributing factor on herbicide efficacy when using glyphosate whereas XR nozzle improved weed control when glufosinate was applied. Herbicides, adjuvants, and plant species must be taken into consideration in selection of the nozzle type. Larger droplets could be used to minimize drift when applying glyphosate. It may reduce time and increase penetration depending on the foliar structure. Reduced activity of glyphosate is weed-species specific whereas glufosinate is species and nozzles specific. A greater impact on droplet size and on herbicide efficacy was observed when using the adjuvants NIS and the drift reducing agent.

2018 Effect of Adjuvants on Physical Properties of Glyphosate and PPO-Inhibiting Herbicide Spray Mixtures

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Abstract: Adjuvants are known to enhance spray droplet retention on leaf surfaces and penetration of herbicide active ingredients through cuticles due to changes in physical properties such as density, viscosity, surface tension (SFT), and contact angle (CA) increasing leaf wettability. However, previous research has shown that the performance of an adjuvant is dependent on the herbicide with which it is applied, the plant species, and environmental conditions. The objectives of this study were to determine the effect of adjuvants on these physical properties when glyphosate and lactofen are applied alone and in combination and to determine if these changes can be correlated to herbicide efficacy. The impact of the addition of the adjuvants into the treatment solutions was greater on viscosity than on density values. Overall, adjuvants significantly decreased the SFT of treatment solutions when compared to either water or herbicides alone. In addition, reduced CA was observed due to the reduction in surface tension. However, results were adjuvant- and species-dependent. Herbicide efficacy was only partially explained by the changes in these physical properties. Observations from this study highlighted the importance of adjuvants on reducing SFT and CA properties of spray solutions; however, further investigation is needed to better understand the factors influencing herbicide uptake and how they are correlated in order to maximize herbicide efficacy.

In press: J. G. Moraes, J. D. Luck, U. R. Antuniassi, W. C. Hoffmann, and G. R. Kruger, "Effect of Adjuvants on Physical Properties of Glyphosate and PPO-Inhibiting Herbicide Spray Mixtures," in Pesticide Formulation and Delivery Systems: 39th Volume, Innovative Formulation, Application, and Adjuvant Technologies for Agriculture, ed. D. J. Linscott (West Conshohocken, PA: ASTM International, 2019), 64–74. http://doi.org/10.1520/STP161920180130

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Funding:

Study Outline: The study was conducted in two XtendFlex® Soybean fields located in North Platte and Brule, NE. Spray treatments consisted of postemergence applications of glyphosate (32 fl oz/ac) and dicamba (22 fl oz/ac) both alone and in combination and both herbicides in tank-mixture with glufosinate (32 fl oz/ac), or clethodim (16 fl oz/ac), or clethodim plus glufosinate, or clethodim plus acetochlor (48 fl oz/ac), or clethodim plus s-metolachlor (16 fl oz/ac). Tank-mixtures containing two or more herbicides were tested with two different drift reducing agents at 0.5 % v/v. A control plot (no herbicide) was included for a total of 16 treatments. Each treatment was sprayed with a backpack sprayer calibrated to deliver 15 gpa at 40 psi and at 4 mph using the TTI11002 nozzle on a 20 inches nozzle spacing. Two rectangles (30.5 x 12.5 in) were placed in each plot allowing visual estimations of herbicide injury in-row and between-row in addition to the entire plot. The objective of this research was to observe the response of troublesome weeds to tank-mixtures containing two or more herbicide sites-of-action as affected by drift reducing agents.

Results yet to be reported: Data were collected at 7, 14, 21, and 28 days after application (DAA). At 35 DAA, the number of weeds in each rectangle was counted and harvested. Plants were placed in a dryer until reached constant mass and dry biomass was recorded. Results from are being analyzed and will help to predict and recommend the most appropriate tank-mixtures to be used with this new soybean trait.

2019-2020 Soybean Symptomatology and Yield Response to Sub-Labeled Doses of Dicamba and 2,4-D

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Funding:

Study Outline: The experiment was conducted at the West Central Research and Extension Center, in North Platte, NE, during the summer of 2019. Main plots consisted of eight soybean cultivars (Hoegemeyer 2511NRR, Hoegemeyer 2811NR, Asgrow 2636, Pionner P27T59R, Pioneer P22T41R2, Syngenta S26-F4L, Syngenta S28-6L, Bayer CZ2312LL), and sub-plot consisted of five doses (1/10, 1/100, 1/1000, 1/10000, and 1/100000) of dicamba (22 fl oz/ac) and 2,4-D (32 fl oz/ac) applied as late POST (~R1). Herbicide applications (15 gpa) were made using a commercial sprayer equipped with 15 independently spray booms using the TTT11003 nozzle at 40 psi and a travel speed of 6 mph. A control plot (no herbicide) was included for a total of 88 treatments. Plots were kept weed free from planting to harvest. The objective of this study was to investigate the herbicide injury and consequent impact on yield caused by exposition of plants to sub-labeled doses of two auxin herbicides (dicamba and 2,4-D) on the most commonly used soybean cultivars in Nebraska.

Results yet to be reported: Visual estimation of injury was collected at 7, 14, 21, and 28 d after application (DAA). Plant heights were collected at 14, 28 DAA, and before harvesting. Number of pods per plant, number of seeds per pod, 100 seed weight, and total seed mass were recorded for six plants from each plot at harvest, as well as soybean grain yield. Results from 2019 are being analyzed and same study will be conducted in two more locations next year (2020).