**Would you Consider these Glufosinate-Tank Mix Combinations for Waterhemp Control in your Soybean System?**

Achieving effective weed control in soybean cropping systems has become a challenge for farmers because of widespread resistance to many commonly used POST herbicides. As a result, glufosinate (e.g., Liberty) has shown potential to play an important role in POST broadleaf weed control in glufosinate-resistant soybean systems (e.g., XtendFlex, Enlist E3). However, the efficacy of glufosinate applied alone can be impacted by several factors such as weed size, application methods, and the environmental conditions during and shortly after application (time of the day, temperature, and relative humidity; please see: FIND GLUFOSINATE PSOT) (**Figure 1**). In some of our previous experiments and according to recent results reported in the weed science literature (**Takano et al XX**), PPO-inhibitor herbicides (Group 14) were presented as good candidates for tank-mix partners with glufosinate, as together they helped enhance waterhemp and Palmer amaranth control. Moreover, having more than one herbicide site-of-action in the tank brings value to delaying herbicide resistance evolution.

This blog post uncovers the results of two field experiments conducted in 2020 and 2021 in southern Wisconsin by the WiscWeeds team (2 sites) and western Illinois (1 site; collaboration with Dr. Mark Bernards Weed Science program at Western Illinois University) that evaluated the influence of glufosinate tank-mix combinations with PPO-inhibitors (flumiclorac , fluthiacet-methyl, fomesafen, and lactofen; Group 14), and also with other herbicides (2,4-D choline, Group 4; bentazon, Group 6) on waterhemp control (study #1) and on soybean development and yield (study #2). Herbicide treatment information is presented in Table 1.

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| **Table 1.** Glufosinate tank-mix partners and their application rates. | | | |  | |
| **Herbicide Treatment \*** | **Application Rate (ac-1) \*\*** | **Trade Name** | [**Herbicide Group**](https://iwilltakeaction.com/uploads/files/2020-take-action-herbicide-classification-chart.pdf) | |
|  |  |  |  | |
| 2,4-d choline (1x) | 32 pt | Enlist One ® | 4 | |
| bentazon (1x) | 1.6 pt | Basagran ® | 6 | |
| flumiclorac (1x) | 8 fl oz | Resource ® | 14 | |
| fluthiacet-methyl (1x) | 0.9 fl oz | Cadet ® | 14 | |
| fomesafen (1x) | 1 pt | Flexstar ® | 14 | |
| lactofen (1x) | 12.5 fl oz | Cobra ® | 14 | |
| glufosinate (1x) | 32 fl oz | Liberty ® 280 SL | 10 | |
| \* **Ammonium-sulfate** was added as a water conditioner at 2 lbs/a; COC (1% v/v) was added to herbicide groups 14 and 6, when applied solely. Carrier volume = **15 GPA**; Spray nozzles = **AIXR110015** | | | | | |

PRE herbicides were applied in both experiments (except in nontreated control) within 3 days of soybean planting. For the waterhemp response study #1, Valor (flumioxazin) was applied at 2 oz/a, whereas in the soybean response study #2, Fierce (flumioxazin +pyroxasulfone) was applied at 3 oz/a. All POST applications were applied between V4-V6 soybean growth stage, depending on experimental site-year. Different PRE herbicides were chosen for each study due to the different objectives (soybean response study #2 needed a stronger PRE to help maintain the plots weed-free whereas for study #1 we wanted waterhemp to establish to evaluate its control with our POST-emergence treatments).

**Study #1: Waterhemp Control**

14 days after POST application (DAT) a visual assessment of waterhemp control was taken. The results from 6 experimental site-years (3 sites x 2 growing seasons) indicated that waterhemp control was generally enhanced when glufosinate was tank mixed with fomesafen, lactofen, flumiclorac, **MISSING A PPO?,** bentazon, and 2,4-D choline. The enhancement of waterhemp control seems appealing, but the important aspect of this and the main question we have received from farmers and agronomists when presenting these results is: “what about soybean crop response and yield?”. That was the focus of the second experiment, which we will discuss next.

**Study #2: Soybean Development and Yield**

Soybean farmers are often concerned if their herbicide programs can impact the productivity of their crops, as at the end of the day, that's what we are after (optimizing weed control, crop yield, and profits). Study #2 focused on crop response to glufosinate tank-mix combinations in the absence of weeds (the study was kept weed-free). At 14 DAT we collected herbicide injury ratings, both visual and camera based (using the [Canopeo software](https://canopeoapp.com/#/login)) assessments. Across site-years, the highest injury was observed with lactofen and glufosinate + lactofen treatments, the latter being one of the top-ranked treatments for waterhemp control. This was expected, as lactofen (Cobra ®) is known to "burn" the soybeans more than other PPO-inhibitor counterparts (**Figure 2**). Across the 6 site-years, only at one site-year the soybean yield was impacted by the glufosinate + lactofen treatment. This could be due to a delayed POST application at this site-year (V6 soybean growth stage).

**Take Home Messages**

In a nutshell, glufosinate-based herbicide programs seem promising for POST-emergence broadleaf weed control in glufosinate-resistant soybean cropping systems. It is important to note that several of these weed management programs can be a relatively expensive investment and we encourage weed management decision makers to evaluate the costs associated with these programs and how they fit on a field-by-field basis. Mixing glufosinate with a PPO-inhibitor herbicide would be advised in a scenario where waterhemp may be out of control early season in a soybean crop (hopefully that is not happening often out there).

* Tank-mixing glufosinate with other herbicides, such as PPO-inhibitors, bentazon, or 2,4-D choline, can enhance waterhemp control without impact on soybean yield.
* The soybean response study (study #2) was maintained weed-free, and potential herbicide injury might outweigh the loss of soybean yield if soybeans were competing with weeds.
* It is important to note that certain combinations may result in higher crop phytotoxicity risk (e.g., lactofen); therefore, it is crucial to follow label recommendations to determine the most effective and safe herbicide combinations for your specific field conditions.



**Figure 1.** Waterhemp plants showing regrowth from a POST application of glufosinate.

A screenshot of a video game

Description automatically generated with medium confidence

**Figure 2**. Herbicide injury assessed via Canopeo software. Nontreated (top left), lactofen (upper mid), and fomesafen (upper right). Percentages refer to the average green cover percentage (**higher value** = less herbicide injury).