# Weed Control and Corn Yield Following Preemergence and Sequential Applications of Mesotrione-based Premixtures

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## Summary

All herbicides evaluated provided good control of Palmer amaranth, kochia, and Russian thistle at Garden City and Palmer amaranth and common sunflower at Manhattan early in the season. Control of Russian thistle at Garden City, sunflower at Manhattan, and Palmer amaranth at both locations remained high with all treatments throughout the season. Trivolt at 20 oz/a controlled entireleaf morningglory 73% at Manhattan early in the season. Morningglory control was greater than 92% with all treatments except Storen at 2.4 qt/a plus atrazine or Acuron preemergence (PRE) later in the season. Minor (<10%) corn injury was observed at Manhattan, but grain yields did not differ by the end of the season. At Garden City, grain yields were highest when Acuron plus atrazine or Storen plus atrazine were applied PRE, and when split applications of Lumax EZ or Storen were applied PRE followed by postemergence (POST). Producers need to be aware that below-labeled rates of herbicides can increase the risk of herbicide resistance development, and control of late-emerging weeds is important.

## Introduction

The use of residual herbicides containing multiple modes of action as a PRE treatment is an important practice for early-season weed management. If additional residual herbicide is applied later as a planned POST application, the weed-free period can be extended, protecting corn yield potential. The objective of these trials was to compare single and sequential applications of residual herbicides for weed control and crop response in corn.

## Experimental Procedures

Experiments at Manhattan and Garden City compared the premixtures of Lumax EZ, Acuron, and Storen as preemergence or sequential applications for efficacy in corn in 2024. All herbicides were applied using either a tractor-mounted, compressed-$CO_2$ sprayer delivering 19.4 gpa or a backpack compressed-$CO_2$ sprayer delivering 15 gpa. Application, environmental, and plant information is shown in Table 1. Plots were 10 by 30 or 35 feet, and arranged in a randomized complete block design replicated four times. Visual weed control at Garden City was determined on June 14 and July 11, 2024. These dates were 28 and 55 days after POST applications (DAB), respectively. Weed control at Manhattan was determined visually on May 8 and July 2, 2024. These dates were 14 days after the preemergence treatments (DAA) and 55 DAB, respectively. Corn injury at Manhattan was visually rated on May 8 and May 16, 2024 (14 and

20 DAA). Corn yields were determined on September 18, 2024, at Manhattan and at Garden City on October 18, 2024, by mechanically harvesting the center two rows of each plot and adjusting grain moistures to 15.5%.

## Results and Discussion

Herbicide treatments differed between the two locations, so results are presented separately (Tables 2 and 3). All PRE treatments controlled kochia, Russian thistle, and Palmer amaranth more than 95% at the time the POST applications were made at Garden City (data not shown). Kochia control was 96% or more with all herbicides except Lumax EX applied PRE at 28 DAB (Table 2). By 55 DAB, only Acuron applied PRE or PRE and POST and Storen applied PRE and POST controlled kochia 95% or more. Russian thistle control did not differ between treatments at 28 DAB (93 to 100%) and remained above 90% with all herbicides except Zidua SC plus atrazine PRE at 55 DAB. Similarly, Palmer amaranth control was essentially complete with all treatments at 28 DAB. By 55 DAB, only Bicep Lite II Magnum plus Callisto PRE provided less than 95% Palmer amaranth control. All herbicide treatments at Garden City increased grain yields relative to the nontreated controls. However, yields were greatest when Acuron plus atrazine or Storen plus atrazine were applied PRE, and when split applications or Lumax EZ or Storen were applied PRE followed by POST.

At the Manhattan location, common sunflower control was complete with all herbicides regardless of evaluation date (data not shown), and all PRE herbicides controlled Palmer amaranth completely at 14 DAA (Table 3). By 53 DAB, Palmer amaranth control was 98 to 99% regardless of herbicide. Entireleaf morningglory control was similar among all herbicides except Trivolt at 20 oz/a plus atrazine PRE (73%) at 14 DAA. However, all herbicides except Storen at 2.4 qt/a plus atrazine or Acuron preemergence PRE controlled morningglory more than 92% later in the season. Corn injury was observed with some Storen applications applied PRE and with Resicore at 14 DAA, and some injury persisted through 20 DAA. However, injury was less than 10%. At harvest, corn yields at Manhattan did not differ between any herbicide treatments (data not shown).

If a planned split-application of residual herbicides is to be used, producers should be aware that low rates of these products can be a risk factor for resistance development. As a best management practice, producers should ensure that the second application of these products is applied, or that any weed escapes are controlled.

## Acknowledgments

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**Table 1. Application, environmental, and plant information at two locations for the mesotrione-based herbicide studies in 2024**

| Location: | Garden City | | Manhattan | |
|---|---|---|---|---|
| **Application timing:** | **PRE[1]** | **POST[1]** | **PRE** | **POST** |
| Application date | April 24 | May 17 | April 24 | May 10 |
| Air temperature (F) | 56 | 60 | 67 | 77 |
| Relative humidity (%) | 34 | 66 | 41 | 43 |
| Soil temperature (F) | 54 | 59 | 59 | 80 |
| Wind speed (mph) | 4 to 7 | 1 to 3 | 1 to 2 | 1 to 2 |
| Wind direction | East | South | Southeast | Northwest |
| Soil moisture | Fair | Good | Wet | Wet |
| Corn | | | | |
| Height (inches) | --- | 3 to 5 | --- | 3 to 5 |
| Leaves (no.) | 0 | 1 to 2 | 0 | 2 |
| Kochia | | | | |
| Height (inches) | --- | 0.75 to 2 | --- | --- |
| Density (plants/ft$^2$) | 0 | 0.1 | 0 | 0 |
| Russian thistle | | | | |
| Height (inches) | --- | 1 to 2 | --- | --- |
| Density (plants/ft$^2$) | 0 | 0.1 | 0 | 0 |
| Palmer amaranth | | | | |
| Height (inches) | --- | 0.5 to 1 | --- | 0.5 |
| Density (plants/ft$^2$) | 0 | 0.1 | 0 | 0.1 |
| Common sunflower | | | | |
| Height (inches) | --- | 0.5 to 1 | --- | 1 |
| Density (plants/ft$^2$) | 0 | 0.1 | 0 | 0.1 |
| Entireleaf morningglory | | | | |
| Height (inches) | --- | --- | --- | 0.5 to 1 |
| Density (plants/ft$^2$) | 0 | 0 | 0 | 0.1 |

[1] PRE is preemergence, POST is postemergence.

**Table 2. Weed control and grain yield at Garden City in the mesotrione-based premixture study in corn**

| | | | Kochia | | Russian thistle | | Palmer amaranth | | |
|---|---|---|---|---|---|---|---|---|---|
| Treatment | Rate | Timing[1] | 28 DAB[2] | 55 DAB[2] | 28 DAB | 55 DAB | 28 DAB | 55 DAB | Grain yield |
| | qt/a | | ---------- % visual ---------- | | | | | | bu/a |
| Untreated control | --- | --- | --- | --- | --- | --- | --- | --- | 50.3 |
| Lumax EZ | 2.7 | PRE | 91 | 89 | 100 | 100 | 99 | 98 | 106.6 |
| Atrazine | 0.5 | PRE | | | | | | | |
| Acuron | 3.0 | PRE | 100 | 98 | 100 | 100 | 99 | 98 | 115.7 |
| Atrazine | 0.5 | PRE | | | | | | | |
| Storen | 2.4 | PRE | 98 | 94 | 100 | 100 | 100 | 98 | 109.9 |
| Atrazine | 1.25 | PRE | | | | | | | |
| Lumax EZ | 1.35 | PRE | 96 | 91 | 100 | 100 | 100 | 99 | 113.4 |
| Atrazine | 0.25 | PRE | | | | | | | |
| Lumax EZ | 1.35 | POST | | | | | | | |
| Atrazine | 0.25 | POST | | | | | | | |
| Glyphosate | 25 oz | POST | | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | | |
| Acuron | 1.5 | PRE | 100 | 99 | 100 | 100 | 100 | 100 | 91.7 |
| Atrazine | 0.25 | PRE | | | | | | | |
| Acuron | 1.5 | POST | | | | | | | |
| Atrazine | 0.25 | POST | | | | | | | |
| Glyphosate | 25 oz | POST | | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | | |
| Storen | 1.2 | PRE | 100 | 100 | 100 | 100 | 100 | 100 | 120.7 |
| Atrazine | 0.63 | PRE | | | | | | | |
| Storen | 1.2 | POST | | | | | | | |
| Atrazine | 0.63 | POST | | | | | | | |
| Glyphosate | 25 oz | POST | | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | | |
| Zidua SC | 3.5 oz | PRE | 98 | 85 | 93 | 90 | 98 | 95 | 90.8 |
| Atrazine | 1.25 | PRE | | | | | | | |
| Fultime NXT | 3.0 | PRE | 99 | 91 | 100 | 100 | 100 | 100 | 74.2 |
| Callisto | 5.0 oz | PRE | | | | | | | |
| Bicep II Lite Magnum | 1.9 | PRE | 98 | 89 | 99 | 96 | 98 | 91 | 88.2 |
| Callisto | 5.0 oz | PRE | | | | | | | |
| LSD (0.05) | | | 5 | 10 | NSD | 5 | NSD | 6 | 10.8 |

[1] PRE is preemergence, POST is postemergence.
[2] DAB is days after the postemergence treatments.

**Table 3. Weed control and crop injury at Manhattan in mesotrione-based premixture study in corn**

| | | | Palmer amaranth | | Entireleaf morningglory | | Corn injury | |
|---|---|---|---|---|---|---|---|---|
| Treatment | Rate | Timing[1] | 14 DAA[2] | 53 DAB[2] | 14 DAA | 53 DAB | 14 DAA | 20 DAA |
| | qt/a | | % visual | | | | | |
| Untreated control | | | --- | --- | --- | --- | 0 | 0 |
| Storen | 2.1 | PRE | 100 | 99 | 100 | 96 | 5 | 1 |
| Atrazine | 0.75 | PRE | | | | | | |
| Storen | 2.4 | PRE | 100 | 99 | 98 | 88 | 4 | 4 |
| Atrazine | 0.75 | PRE | | | | | | |
| Acuron | 3.0 | PRE | 100 | 99 | 100 | 86 | 0 | 0 |
| Resicore | 2.5 | PRE | 100 | 99 | 100 | 93 | 4 | 3 |
| Atrazine | 0.75 | PRE | | | | | | |
| Resicore | 3.0 | PRE | 100 | 98 | 90 | 96 | 8 | 8 |
| Atrazine | 0.75 | PRE | | | | | | |
| Trivolt | 17.5 oz | PRE | 100 | 98 | 100 | 96 | 0 | 0 |
| Atrazine | 0.75 | PRE | | | | | | |
| Trivolt | 20 oz | PRE | 100 | 98 | 73 | 95 | 1 | 0 |
| Atrazine | 0.75 | PRE | | | | | | |
| Maverick | 0.75 | PRE | 100 | 99 | 100 | 98 | 0 | 0 |
| Atrazine | 0.75 | PRE | | | | | | |
| Maverick | 1.0 | PRE | 100 | 99 | 100 | 98 | 1 | 4 |
| Atrazine | 0.75 | PRE | | | | | | |
| Storen | 1.05 | PRE | 100 | 98 | 83 | 98 | 1 | 3 |
| Atrazine | 0.37 | PRE | | | | | | |
| Storen | 1.05 | POST | | | | | | |
| Atrazine | 0.37 | POST | | | | | | |
| Glyphosate | 24 oz | POST | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | |
| Storen | 1.2 | PRE | 100 | 99 | 90 | 98 | 3 | 9 |
| Atrazine | 0.37 | PRE | | | | | | |
| Storen | 1.2 | POST | | | | | | |
| Atrazine | 0.37 | POST | | | | | | |
| Glyphosate | 24 oz | POST | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | |
| Storen | 1.7 | PRE | 100 | 99 | 100 | 99 | 1 | 4 |
| Atrazine | 0.37 | PRE | | | | | | |
| Halex GT | 1.8 | POST | | | | | | |
| Atrazine | 0.5 | POST | | | | | | |
| Nonionic surfactant | 0.25% | POST | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | |
| Storen | 2.1 | POST | 33 | 99 | 0 | 93 | 0 | 9 |
| Atrazine | 0.75 | POST | | | | | | |
| Glyphosate | 24 oz | POST | | | | | | |
| Dicamba | 4.0 oz | POST | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | |

*continued*

**Table 3. Weed control and crop injury at Manhattan in mesotrione-based premixture study in corn**

| | | | Palmer amaranth | | Entireleaf morningglory | | Corn injury | |
|---|---|---|---|---|---|---|---|---|
| Treatment | Rate | Timing[1] | 14 DAA[2] | 53 DAB[2] | 14 DAA | 53 DAB | 14 DAA | 20 DAA |
| | qt/a | | % visual | | | | | |
| Storen | 1.6 | PRE | 100 | 98 | 100 | 95 | 4 | 4 |
| Atrazine | 0.37 | PRE | | | | | | |
| Storen | 0.8 | POST | | | | | | |
| Atrazine | 0.37 | POST | | | | | | |
| Glyphosate | 24 oz | POST | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | |
| Storen | 1.6 | PRE | 100 | 99 | 100 | 98 | 1 | 0 |
| Atrazine | 0.37 | PRE | | | | | | |
| Lexar EZ | 2.0 | POST | | | | | | |
| Glyphosate | 24 oz | POST | | | | | | |
| Ammonium sulfate | 2.5% | POST | | | | | | |
| LSD (0.05) | | | 12 | NSD | 20 | 8 | 3 | 5 |

[1] PRE is preemergence, POST is postemergence.

[2] DAA is days after the preemergence applications, DAB is days after the postemergence applications.