

# Herbicide Options for Italian Ryegrass Control in Glyphosate-Tolerant Spring Canola

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A vibrant landscape photograph of a rolling hill covered in a dense field of bright yellow canola flowers. The sky above is a clear, bright blue with a few wispy white clouds. The foreground is filled with the intricate details of the yellow blossoms and their green stems.

# Spring Canola on the Palouse

Funding and Materials provided by:

The Washington Oilseed Commission and BASF Corporation

Special thanks to Frank Ankerson and Jeff Perkins, WSU Farm Management





# Italian ryegrass





## What is Italian ryegrass?

- *Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot
- Also known as annual ryegrass
- Cross-pollinated species with high genetic variability ( $2n=14$ )
- Cool season grass – annual, biennial, short-lived perennial
- Has developed resistance to many herbicides



## Our Objectives

- Evaluate herbicide control of Italian ryegrass in spring canola
- Evaluate mode-of-action combinations that do not rely solely on glyphosate





## Herbicide resistance in Italian ryegrass

- Common and widespread
  - Group 1 herbicides - clethodim, sethoxydim, quizalofop
  - Group 2 herbicides – imazamox (Clearfield system)
- Potential or reported
  - Group 9 – glyphosate
  - Group 10 - glufosinate





## Crop rotations in the high rainfall zone

- Prior to spring canola

- Winter wheat – spring wheat/barley – pulse crop (peas, lentils, chickpeas)  
(~6 glyphosate applications)

- Current

- Winter wheat – pulse crop or spring cereal – spring canola (~6 glyphosate)
- Winter wheat – spring canola – pulse crop (~7 glyphosate)
- Winter wheat – spring canola (~5 glyphosate)





# This is how resistance happens!



“Ryegrass wasn’t a problem 30 years ago, we just kept using Hoelon [diclofop-methyl] until it didn’t work anymore.”

*Chris Fleener – Pullman area farmer*





## Labeled herbicide mode of actions for canola still effective

- Group 3 – microtubule/mitosis inhibitors
  - trifluralin (Treflan), ethalfluralin (Sonalan), pendimethalin (Prowl)
- Group 9 – enolpyruvyl shikimate phosphate synthase (EPSPS) inhibitor
  - glyphosate (PowerMax) – TrueFlex™ and Roundup Ready® canola only
- Group 10 – glutamine synthase inhibitor (toxic ammonia build-up)
  - glufosinate (Liberty) – Liberty Link® canola only
- Group 13 – chlorophyll and carotenoid pigment inhibitors
  - clomazone (Clomate 3ME) – 12-month plantback to cereals or pulse crops





# Study methods

- Trials conducted in 2021, 2022, and two in 2023 (multiple-mode and Liberty)
- Experimental design – randomized complete block with 4 replications per treatment
- Cultivars
  - 2021 and 2022 – InVigor LR344PC stacked TruFlex™ and LibertyLink®
  - 2023 - InVigor LR345PC stacked TruFlex™ and LibertyLink®
- Fertilized / Seeded
  - 2021 – April 2 (75-10-0-10 N-P-K-S lb/A) / April 22 (10 seeds/ft<sup>2</sup>) (multiple mode)
  - 2022 – March 31 (140-25-25-31 N-P-K-S lb/A) / April 29 (12 seeds/ft<sup>2</sup>) (multiple mode)
  - 2023 – April 6 (100-0-0-20 N-P-K-S lb/A) / April 25 (15 seeds/ft<sup>2</sup>) (Liberty trial)
  - 2023 – April 6 (100-0-0-20 N-P-K-S lb/A) / May 15 (15 seeds/ft<sup>2</sup>) (multiple mode)



## Study methods

- **Herbicide rates**

- PowerMax (glyphosate) 22 or 44 oz/A
- Liberty 280 SL (glufosinate) 22 oz/A (2021 and 2022), 29 oz/A (2023)
- Treflan 10G (trifluralin) 7.5 lb/A (2021), 24 oz/A Treflan HFP (2022 and 2023)

- **Three herbicide application timings**

- PPI – preplant incorporated with harrow 2x (2021), cultivator 2x (2022 and 2023)
- EPOST – canola at 3-4 leaf stage
- LPOST – canola at 6 leaves to bolting

- **Evaluations**

- Visual ratings after treatments were applied
- Canola yield





Nontreated  
check

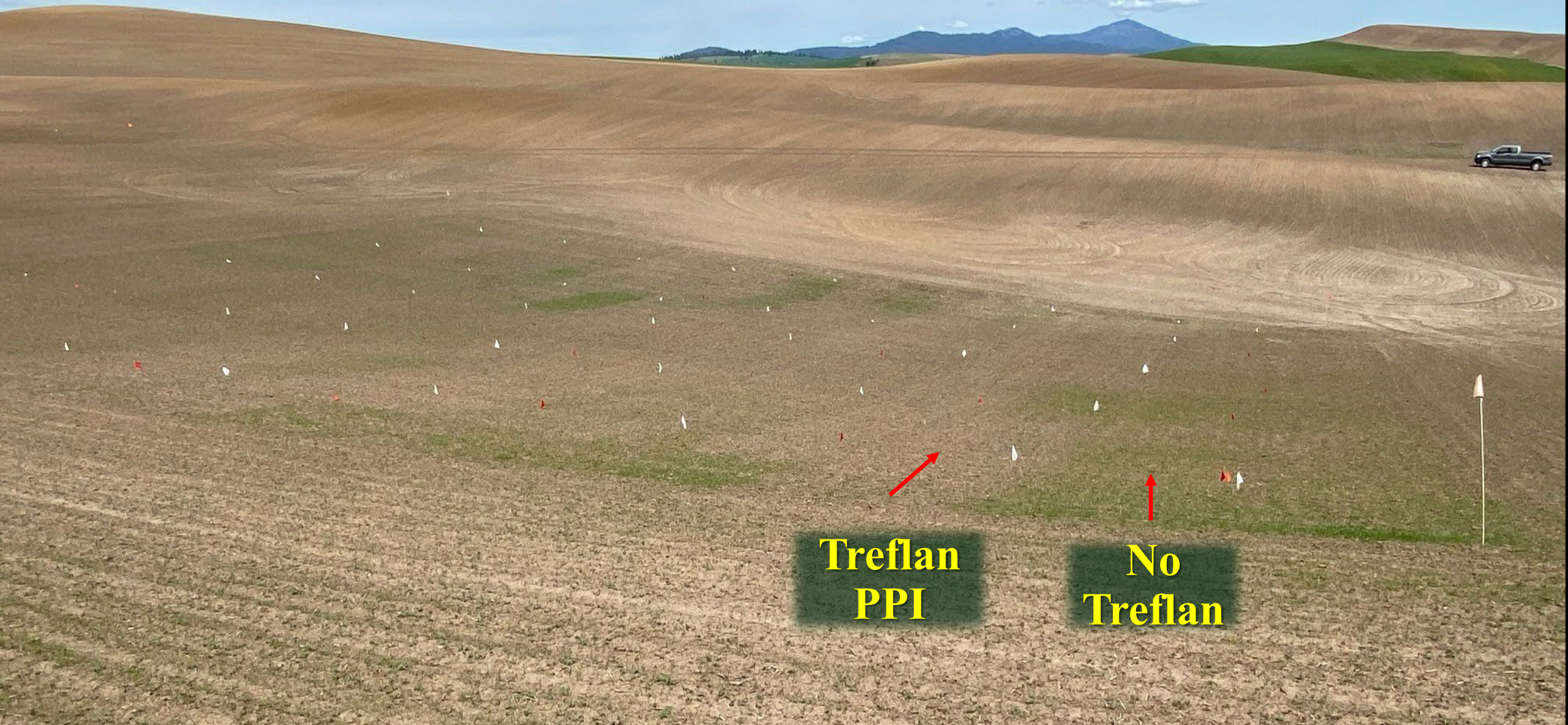


Glyphosate  
treated





# Canola trial 2022



Treflan  
PPI

No  
Treflan

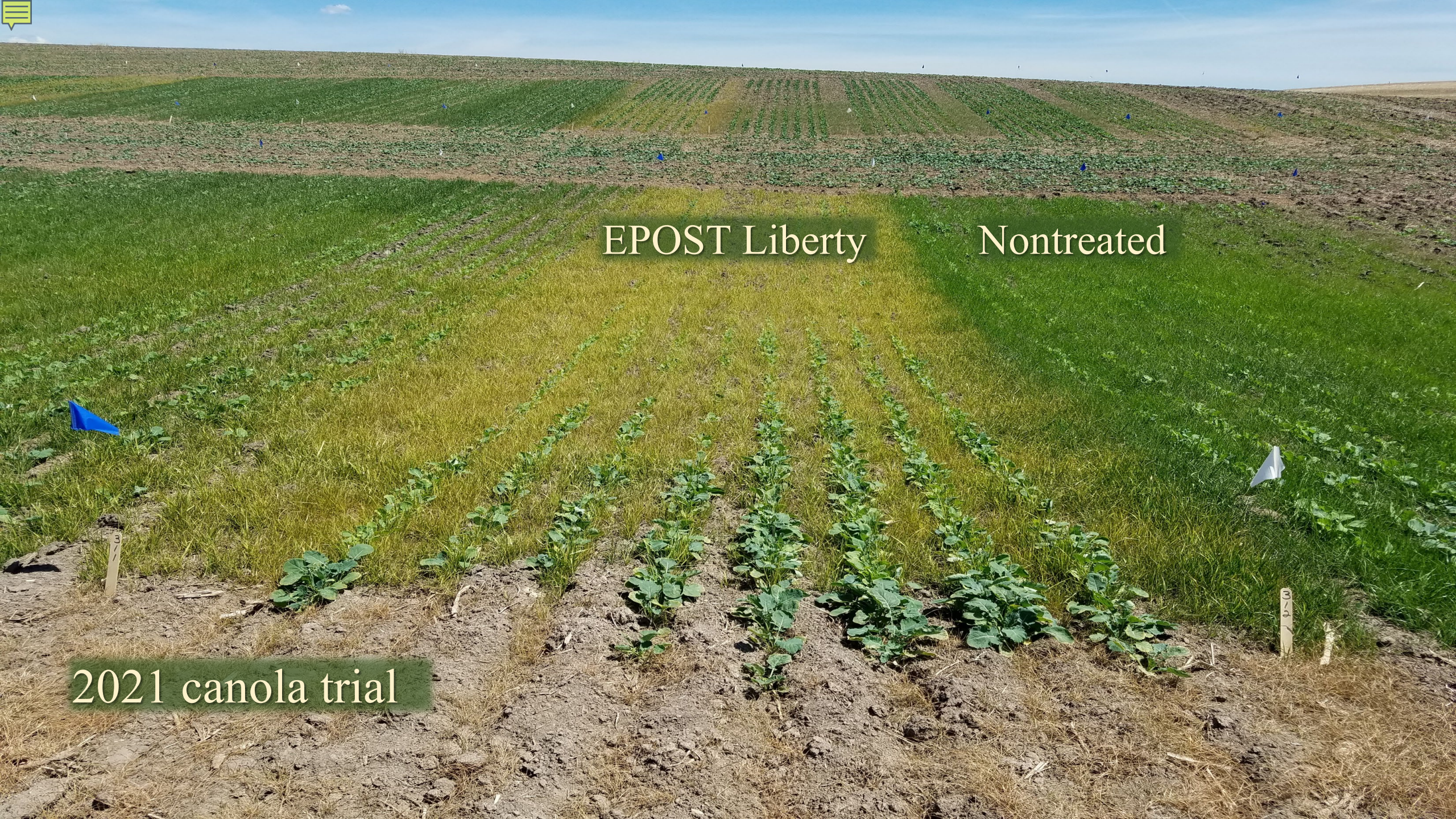




EPOST Liberty

Nontreated

2021 canola trial





A photograph of a field plot showing a dense, healthy stand of green plants, likely a cover crop, growing in a field. The plants are small and numerous, covering the ground. The text "Early seeding – nontreated check" is overlaid in a yellow font on a semi-transparent dark green background in the upper left corner.

Early seeding –  
nontreated check

A photograph of a field plot showing a sparse stand of green plants, likely a cover crop, growing in a field. The plants are larger and more developed than those in the early seeding plot, but there is a significant amount of bare, brown soil visible between the plants. The text "Delayed seeding – nontreated check" is overlaid in a yellow font on a semi-transparent dark green background in the upper right corner.

Delayed seeding –  
nontreated check



## Results –Multiple Mode of Action Trials

| Herbicide Treatments, Rates (oz/A), and Timing* |               |               | Italian ryegrass control 2 weeks after LPOST applications (% of nontreated check) |       |       |
|---|---------------|---------------|---|-------|-------|
| PPI   | EPOST         | LPOST         | 2021  | 2022  | 2023  |
| none  | PowerMax (44) | none          | 100 a   | 100 a | 100 a |
| Treflan   | PowerMax (44) | none          | 100 a   | 97 a  | 100 a |
| none  | PowerMax (44) | Liberty       |   |       | 100 a |
| none  | none          | PowerMax (22) | 88 bc   | 100 a | 98 b  |
| Treflan   | none          | PowerMax (22) | 93 b  | 100 a | 100 a |
| none  | PowerMax (22) | PowerMax (22) | 100 a   | 100 a | 100 a |
| Treflan   | PowerMax (22) | PowerMax (22) |   | 100 a | 100 a |
| Treflan   | Liberty       | Liberty       |   |       | 100 a |
| Treflan   | Liberty       | none          | 84 c  | 79 b  | 100 a |
| Treflan   | none          | none          |   | 83 b  | 99 ab |
| none  | Liberty       | Liberty       |   | 73 b  |       |
| none  | Liberty       | none          | 68 d  |       | 90 c  |
| Treflan   | none          | Liberty       | 59 d  |       |       |
| Nontreated check                                |               |               | 0   | 0     | 0     |

\*PPI=preplant incorporated; EPOST=early postemergence; LPOST=late postemergence. Treflan applied at 7.5 lb dry granules/A in 2021 and 24 fl oz/A in 2022 and 2023. Liberty applied at 22 fl oz/A in 2021 and 2022, and 29 fl oz/A in 2023.

## Results – Liberty Trial 2023

| Herbicide Timing, Rates, Timing* |                            |                            | Italian ryegrass control**<br>(% of nontreated check) |       |         |
|----------------------------------|----------------------------|----------------------------|---|-------|---------|
| PPI                              | EPOST                      | LPOST                      | 2 WAE   | 2 WAL | Harvest |
| none                             | PowerMax (22)              | PowerMax (22)              | 92 c  | 100 a | 100 a   |
| none                             | Liberty +<br>PowerMax (22) | Liberty +<br>PowerMax (22) | 88 d  | 99 a  | 100 a   |
| none                             | PowerMax (44)              | none                       | 96 b  | 98 a  | 100 a   |
| none                             | Liberty                    | PowerMax (22)              | 72 e  | 93 b  | 100 a   |
| Treflan                          | PowerMax (22)              | none                       | 99 a  | 99 a  | 99 ab   |
| Treflan                          | Liberty                    | none                       | 96 b  | 91 b  | 97 b    |
| none                             | Liberty                    | Liberty                    | 68 e  | 79 c  | 90 c    |
| Nontreated check                 | ---                        | ---                        | 0   | 0     | 0       |

\*PPI=preplant incorporated; EPOST=early postemergence; LPOST=late postemergence.

Treflan applied at 24 oz/A. Liberty applied at 29 oz/A.

\*\*2 WAE = 2 weeks after EPOST applications, 2 WAL = 2 weeks after LPOST applications.



## Results –Multiple Mode of Action Trial - 2021

| Herbicide Treatments, Rates (oz/A), and Timing* |               |               | Canola<br>yield lb/A |
|---|---------------|---------------|----------------------|
| PPI   | EPOST         | LPOST         |                      |
| none  | Liberty       | none          | 1570 a               |
| Treflan   | Liberty       | none          | 1560 ab              |
| Treflan   | none          | Liberty       | 1360 abc             |
| Treflan   | PowerMax (44) | none          | 1330 bc              |
| Treflan   | none          | PowerMax (22) | 1330 c               |
| none  | none          | PowerMax (22) | 1210 c               |
| none  | PowerMax (22) | PowerMax (22) | 1180 c               |
| none  | PowerMax (44) | none          | 1150 c               |
| Nontreated check                                | ---           | ---           | ---                  |

\*PPI=preplant incorporated; EPOST=early postemergence; LPOST=late postemergence.  
Treflan rate = 7.5 lb dry granules/A. Liberty applied at 22 oz/A.



## Results –Multiple Mode of Action Trial - 2022

| Herbicide Treatments, Rates (oz/A), and Timing* |               |               | Canola<br>Yield (lb/A) |
|---|---------------|---------------|------------------------|
| PPI   | EPOST         | LPOST         |                        |
| none  | PowerMax (44) | none          | 2590 a                 |
| Treflan   | PowerMax (44) | none          | 2160 ab                |
| Treflan   | none          | none          | 2020 abc               |
| none  | Liberty       | Liberty       | 1930 bcd               |
| Treflan   | PowerMax (22) | PowerMax (22) | 1910 bcd               |
| Treflan   | Liberty       | none          | 1810 bcd               |
| none  | PowerMax (22) | PowerMax (22) | 1730 bcd               |
| none  | none          | PowerMax (22) | 1540 cd                |
| Nontreated check                                | ---           | ---           | 1500 cd                |
| Treflan   | none          | PowerMax (22) | 1400 d                 |

\*PPI=preplant incorporated; EPOST=early postemergence; LPOST=late postemergence.  
Treflan applied at 24 oz/A, Liberty applied at 22 oz/A.





# Results – Multiple Mode of Action Trial - 2023

| Herbicide Treatments, Rates (oz/A), and Timing* |               |               | Canola<br>Yield lb/A |
|---|---------------|---------------|----------------------|
| PPI   | EPOST         | LPOST         |                      |
| Nontreated check                                | ---           | ---           | 1790 a               |
| none  | Liberty       | none          | 1790 a               |
| Treflan   | Liberty       | none          | 1770 a               |
| Treflan   | Liberty       | Liberty       | 1730 a               |
| Treflan   | none          | none          | 1590 abc             |
| Treflan   | PowerMax (44) | none          | 1510 bcd             |
| none  | PowerMax (44) | none          | 1370 cde             |
| Treflan   | none          | PowerMax (22) | 1370 cde             |
| none  | PowerMax (44) | Liberty       | 1350 d               |
| none  | none          | PowerMax (22) | 1330 de              |
| none  | PowerMax (22) | PowerMax (22) | 1290 de              |
| Treflan   | PowerMax (22) | PowerMax (22) | 1210 e               |

\*PPI=preplant incorporated; EPOST=early postemergence; LPOST=late postemergence.  
Treflan applied at 24 oz/A, Liberty applied at 29 oz/A.

## Results – Liberty Trial - 2023

| Herbicide Treatments, Rates (oz/A), and Timing* |                            |                            | Canola<br>Yield lb/A |
|---|----------------------------|----------------------------|----------------------|
| PPI   | EPOST                      | LPOST                      |                      |
| Treflan   | PowerMax 22                | none                       | 1770 a               |
| none  | Liberty                    | Liberty                    | 1720 a               |
| Treflan   | Liberty                    | none                       | 1680 a               |
| none  | PowerMax (44)              | none                       | 1680 a               |
| none  | Liberty +<br>PowerMax (22) | Liberty +<br>PowerMax (22) | 1620 a               |
| none  | PowerMax (22)              | PowerMax (22)              | 1540 a               |
| none  | Liberty                    | PowerMax (22)              | 1530 a               |
| Nontreated check                                | ---                        | ---                        | 1160 b               |

\*PPI=preplant incorporated; EPOST=early postemergence; LPOST=late postemergence





2022 - delayed flowering



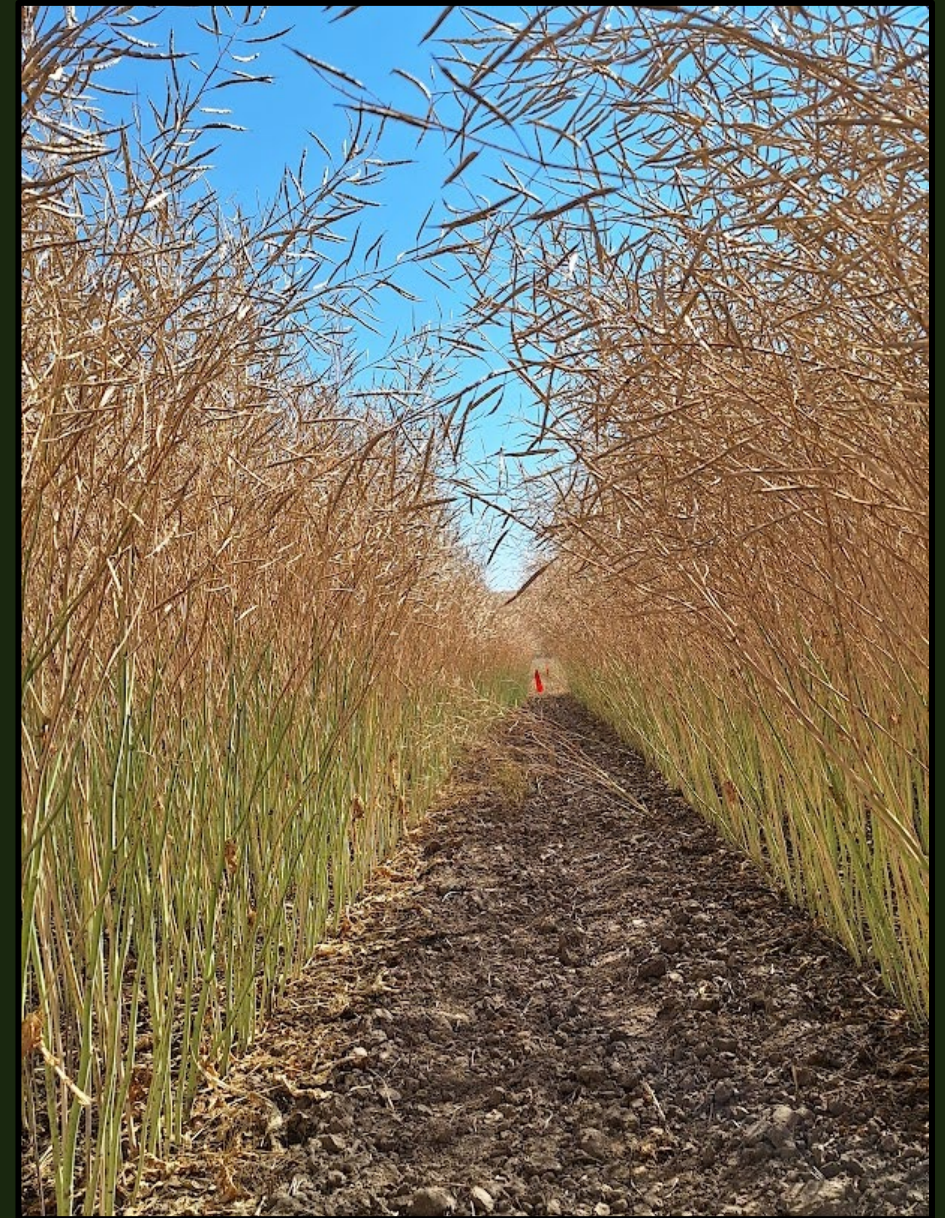
2023 - Poor pod fill





## Conclusions

- Herbicide options for Italian ryegrass control are limited to three or four modes of action
- Glyphosate is still effective on Italian ryegrass, but there is a potential for canola yield reduction.
- Group 3 herbicides, e.g., Treflan, are effective when incorporated and there is adequate precipitation for activation.
- Treflan followed by Liberty EPOST can be an effective non-glyphosate option.
- Delayed planting may also be an effective tool.



## Off-Label and Experimental Use Disclaimer

Some of the pesticides discussed in this presentation may have been tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.