

Stale Seedbed For Weed Management In Sugar Beet

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Background and the Problem

- ❦ Multiple herbicide-resistant kochia (*Bassia scoparia* (L.) A. J. Scott)
 - glyphosate, ALS, and dicamba
- ❦ Limited herbicide options in sugar beet
- ❦ Ecologically-based IWM strategies
 - “Stale Seedbed” technique

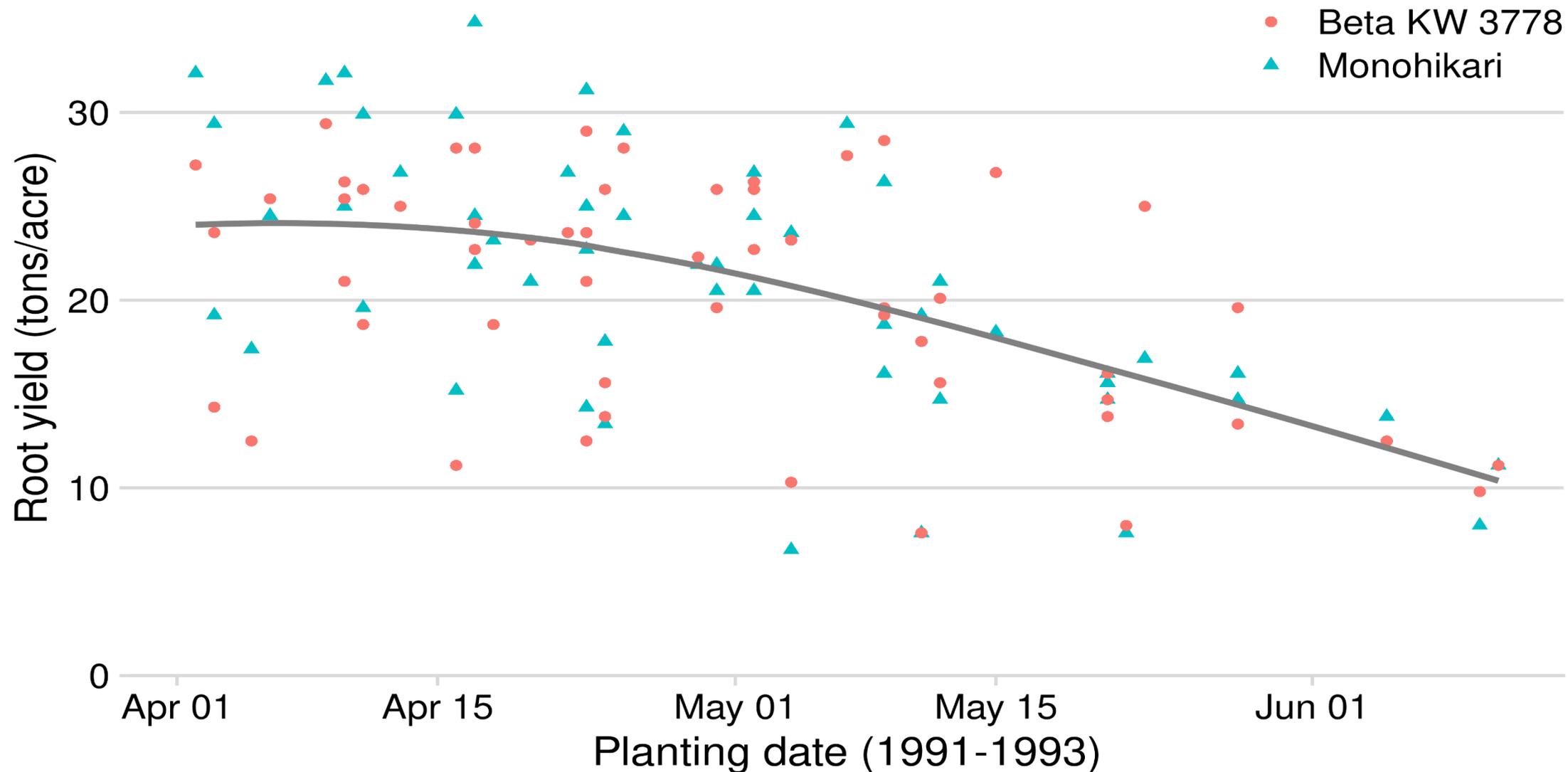


What is a 'Stale Seedbed'

- ❖ Weed seeds in the soil are stimulated to emerge early and seedlings are killed prior to planting the main crop.
- ❖ This reduces the number of weed seedlings emerging in the crop, but delays sugar beet planting date.



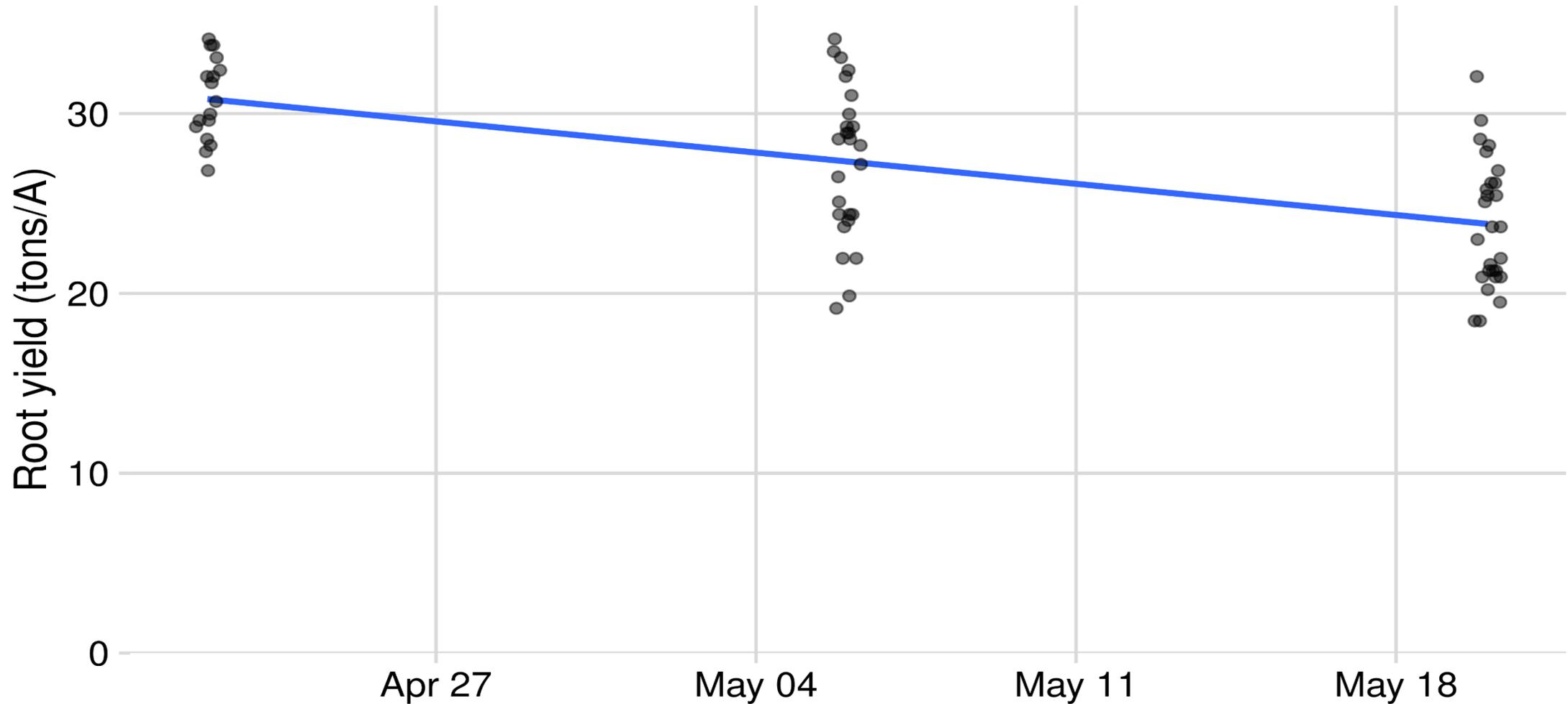
Delayed Sugar beet Planting Reduces Yield Potential



Data source:
Yonts et al. (1999) J Sugar Beet Res 36(3):1-14

Delayed Sugar beet Planting Reduces Yield Potential

Lingle, 2009



Source:
Kniss (2009) Unpublished Data

Why Stale Seedbed

- ❏ Kochia is the main weed of interest currently.
- ❏ Kochia seedlings emerge early in the season.
- ❏ About 95% of kochia active seed bank germinates in the first season.¹
- ❏ Minimum tillage implement are readily available.
- ❏ This reduces the number of kochia seedlings emerging during the main crop.

¹Dille et al. (2017) *Weed Science*, 65(5):614–625

Hypothesis:

Benefits of delayed sugar beet planting may outweigh the yield loss if there are no available POST herbicides.



Experimental Methods

- Two locations:
 - Lingle, Wyoming
 - Scottsbluff, Nebraska
- Split-plot factorial RCBD with four replicates
 - Whole-plot: planting date
 - Split-plot: herbicide treatment

Experimental Methods

Whole-plot: Planting date

Planting Date	Lingle, WY	Scottsbluff, NE
1	April 22	April 23
2	May 03	May 06
3	May 20	May 16
4	May 31	May 28

Experimental Methods

Split-plot: Herbicide Treatment

Herbicide treatment

Weed-free	PRE metamitron + ethofumesate POST glyphosate Hand-weeded
PRE only	PRE metamitron + ethofumesate ¹
Weedy	No herbicide ¹

¹Lingle study over-sprayed with glyphosate June 21 to remove non-GR weeds

Experimental Methods

Data Collection:

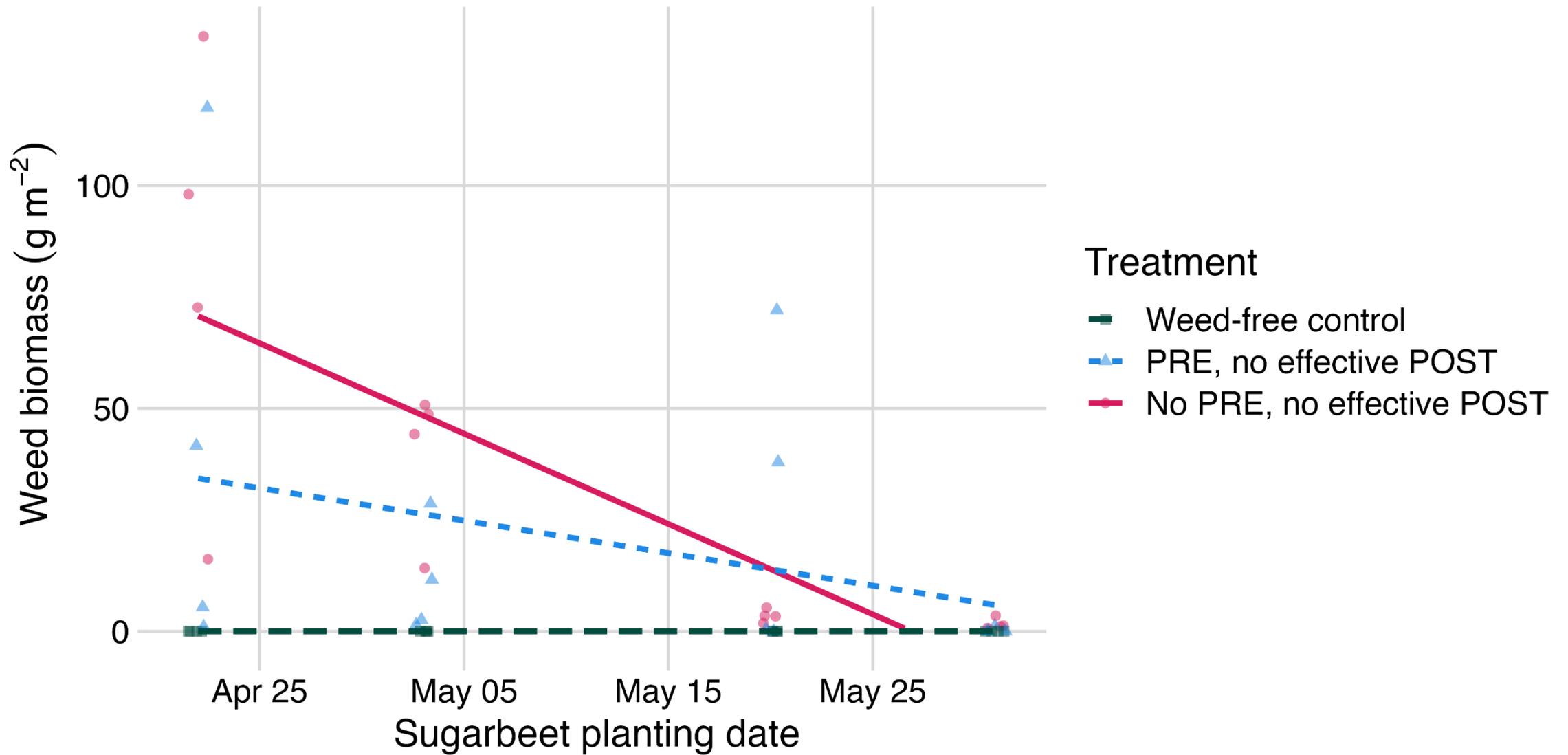
- Weed biomass harvested July mid-July
- Sugarbeets harvested end of September

Data Analysis:

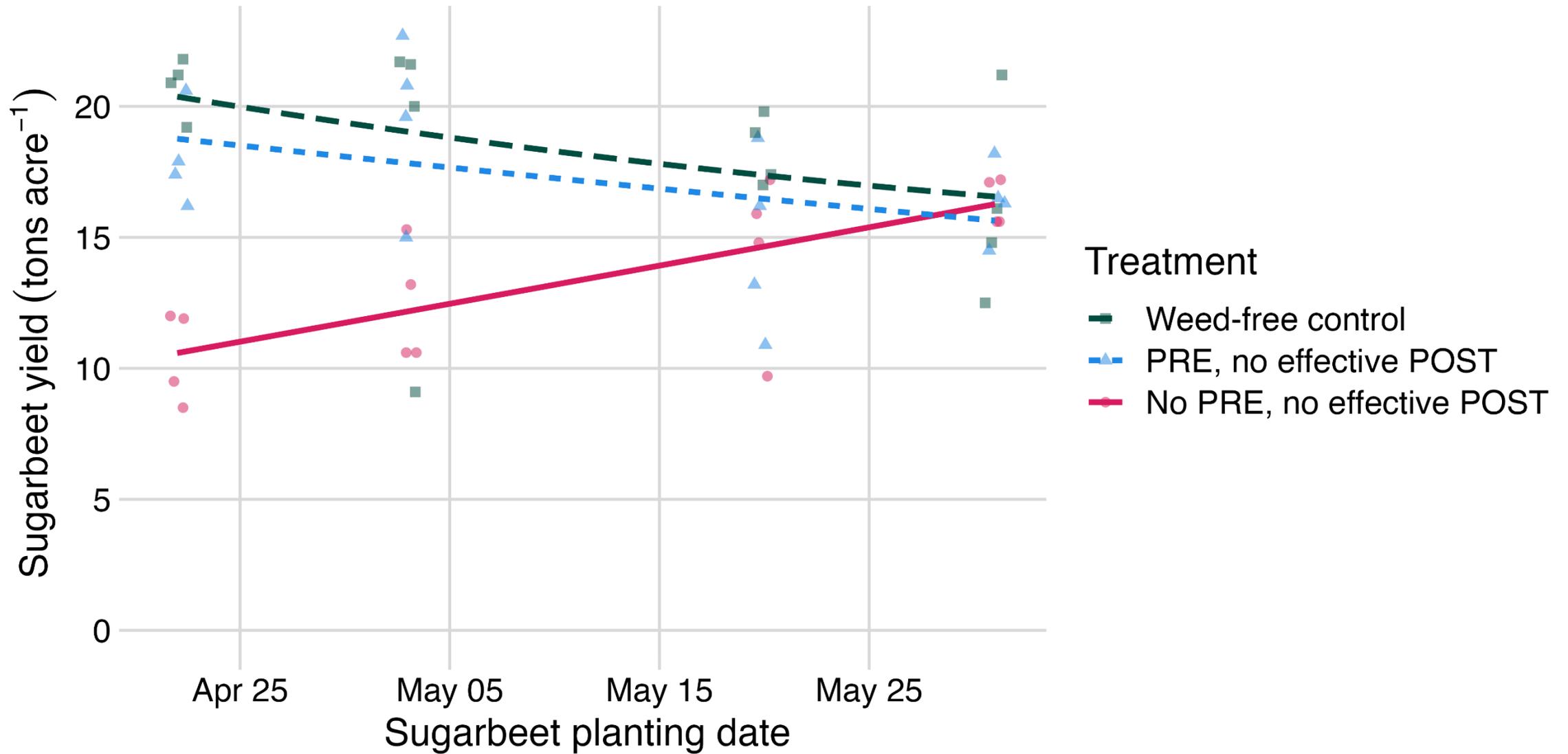
- Linear regression – planting date as independent variable

Results and Discussion

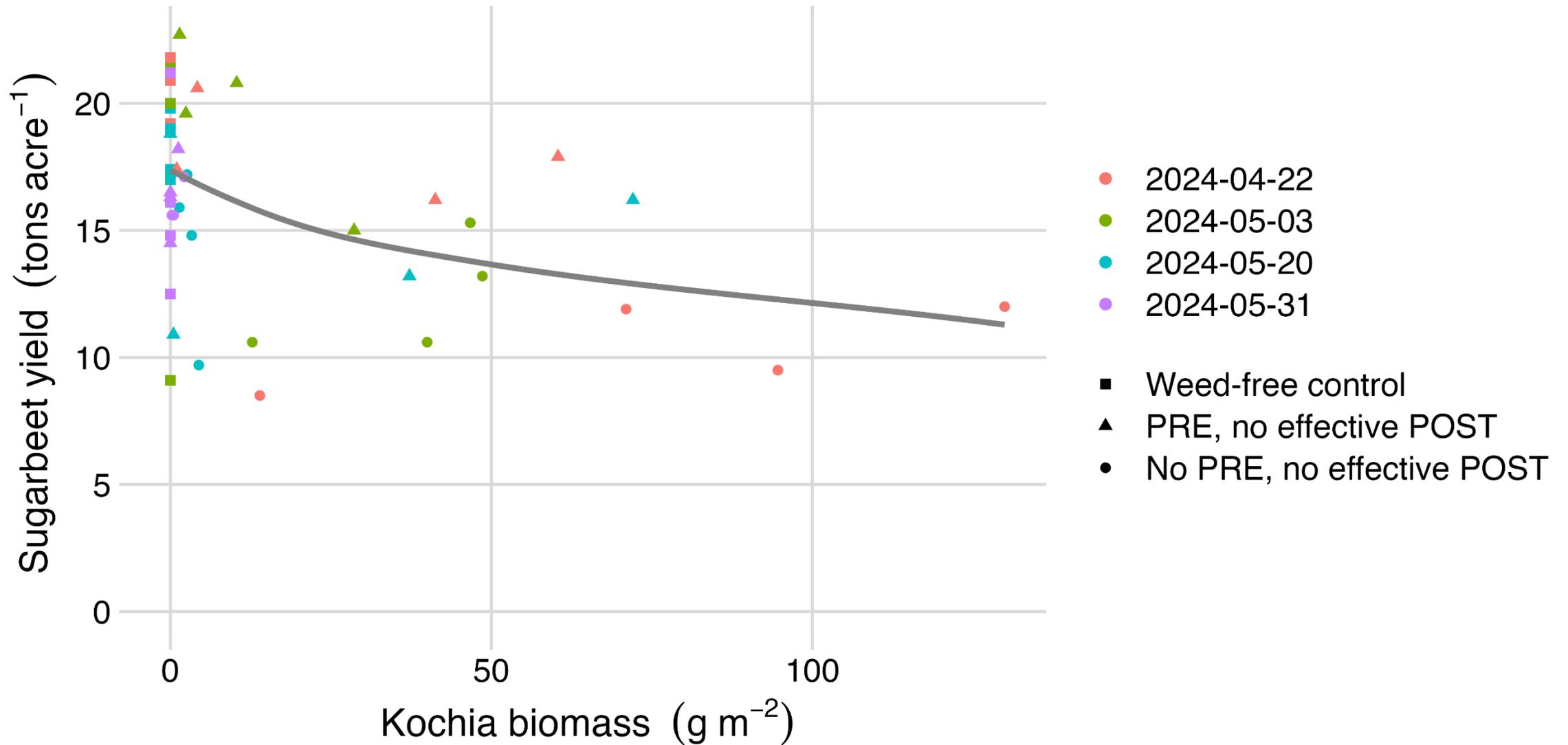
Effect of Planting Date on Kochia Biomass



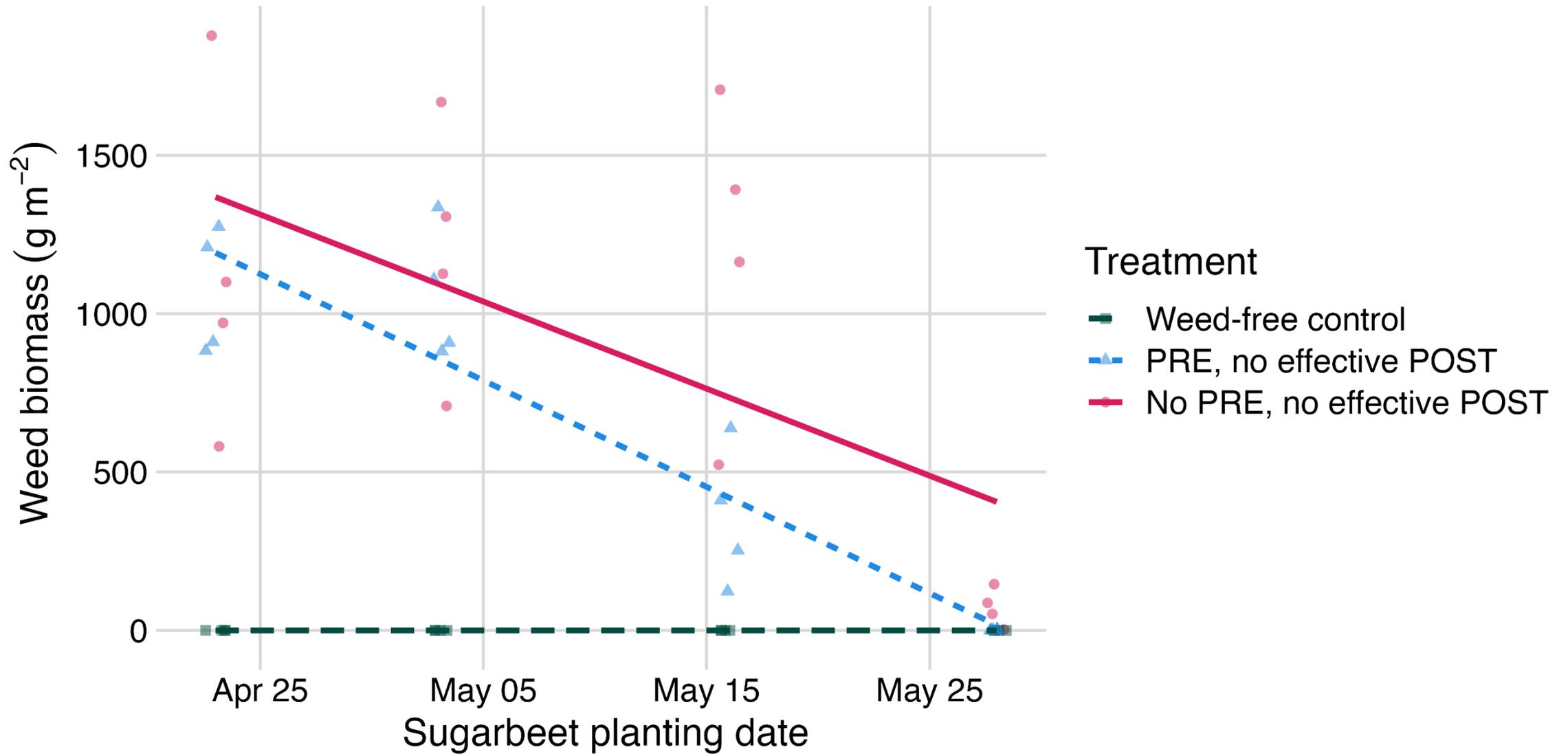
Effect of Planting Date on Beet Yield



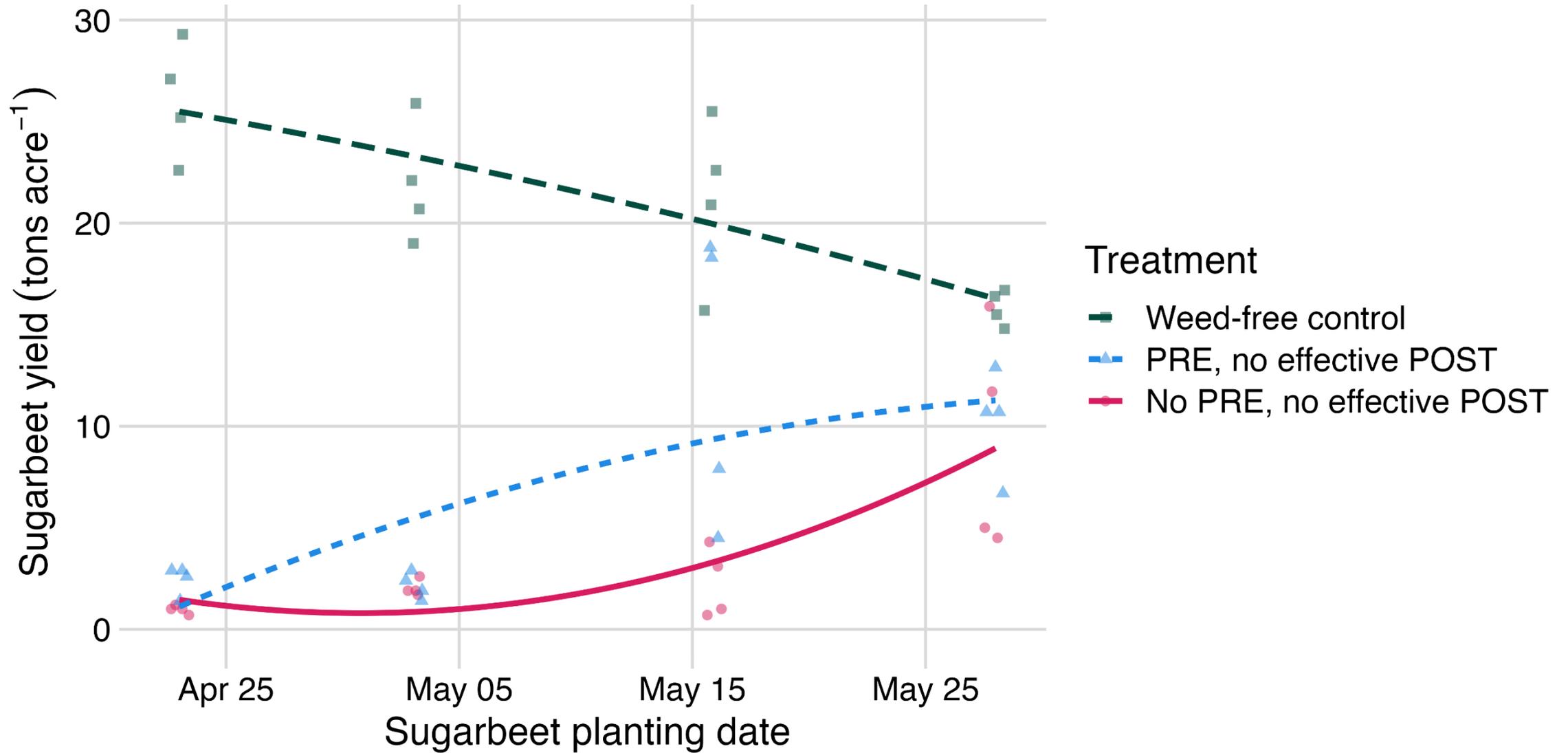
Effect of Kochia Biomass on Beet Yield



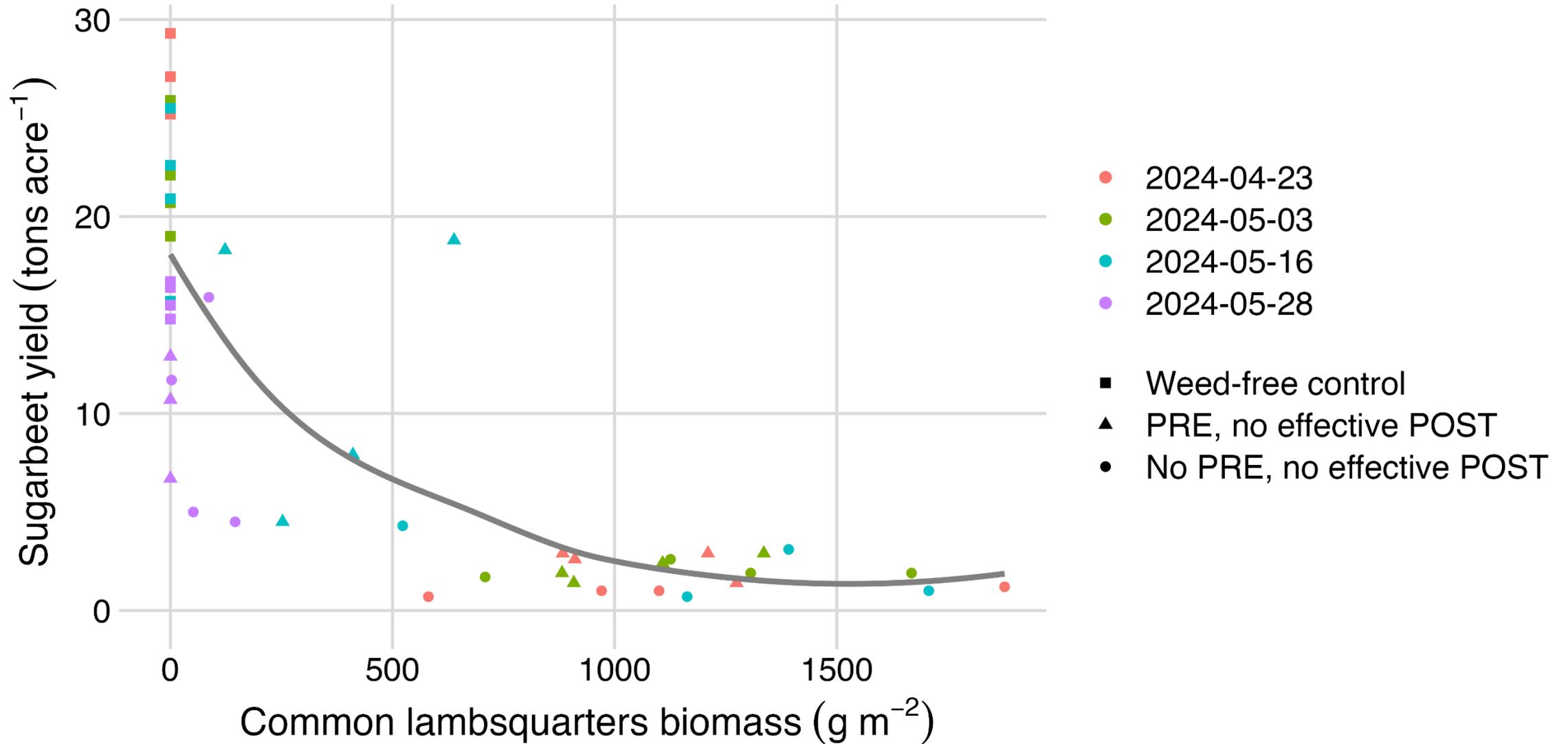
Effect of Planting Date on Lambsquarters Biomass



Effect of Planting Date on Beet Yield



Effect of Lambsquarters Biomass on Beet Yield





April
22

< No
PRE

Pre >

July
18





May
03

< No
PRE

Pre >

July
18





May
20

< No
PRE

Pre >

July
18





May
31

< No
PRE

Pre >

July
18

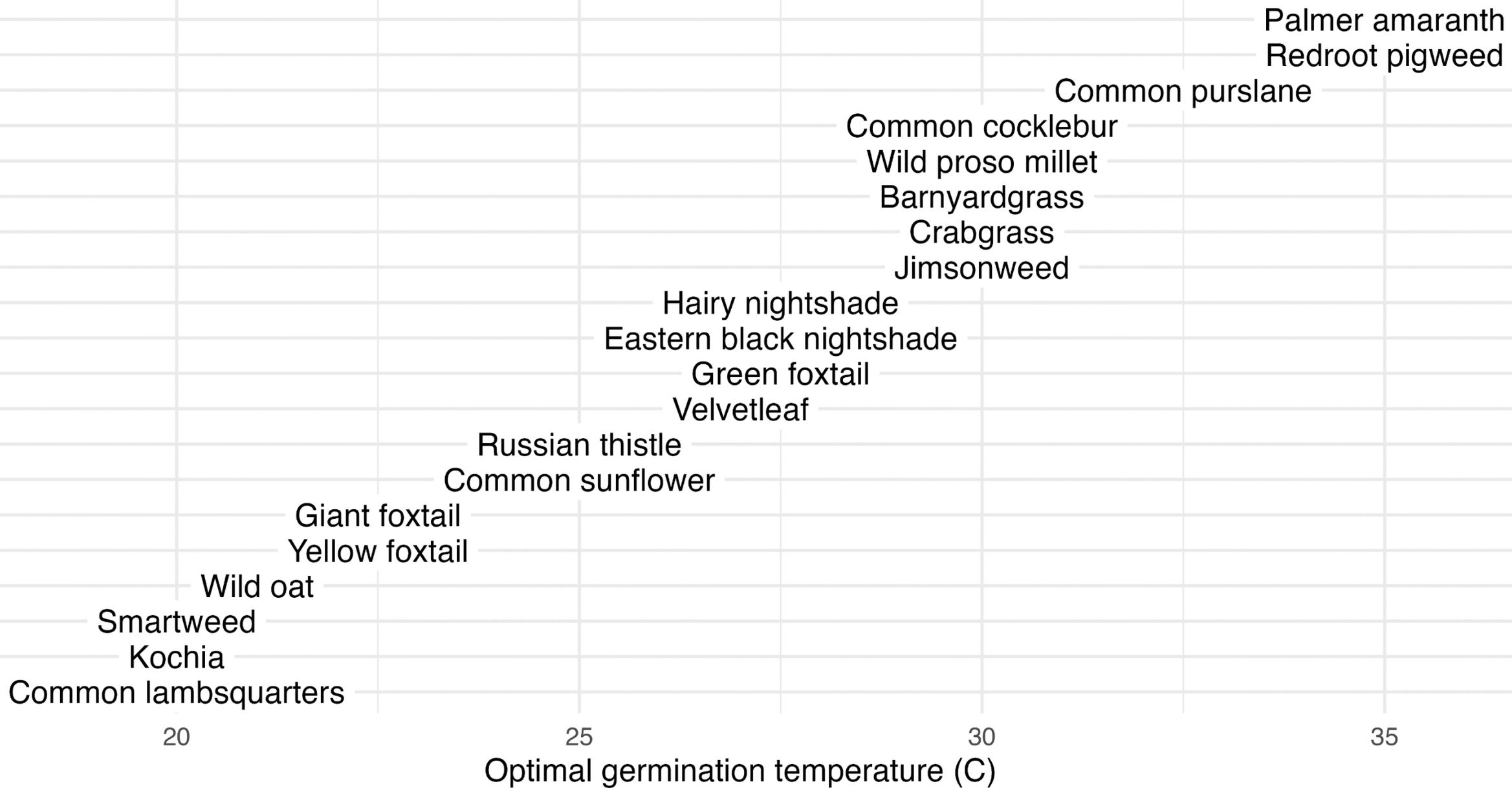


Conclusion

- The effect of planting date on sugar beet yield depends on the ability to control weeds after crop emergence:
 - If the crop is kept weed-free (with herbicides, hand-weeding, etc.) we observed the expected yield reduction from delayed planting.
 - If weeds cannot be controlled after crop emergence, delayed planting increased sugar beet yield.

Conclusion

- Delayed planting significantly reduced kochia (Lingle) and common lambsquarters mid-season biomass (Scottsbluff)
 - Stale seedbed can suppress early-emerging weeds in the absence of effective postemergence herbicides



Data source: *Andersen's Guide (Buhler and Hoffman 1999)*

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Questions ?



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