Herbicide options for use in Kernza® perennial grain: IR-4 trials

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What is Kernza®?

- **Intermediate wheatgrass** (*Thinopyrum intermedium)* bred for larger seed size and yield for ~15 yrs
- First perennial grain brought to market in the US
- Produces grain for ~3 yrs, maybe longer depending on environment
  - Needs to vernalize
  - Forage stand can last longer

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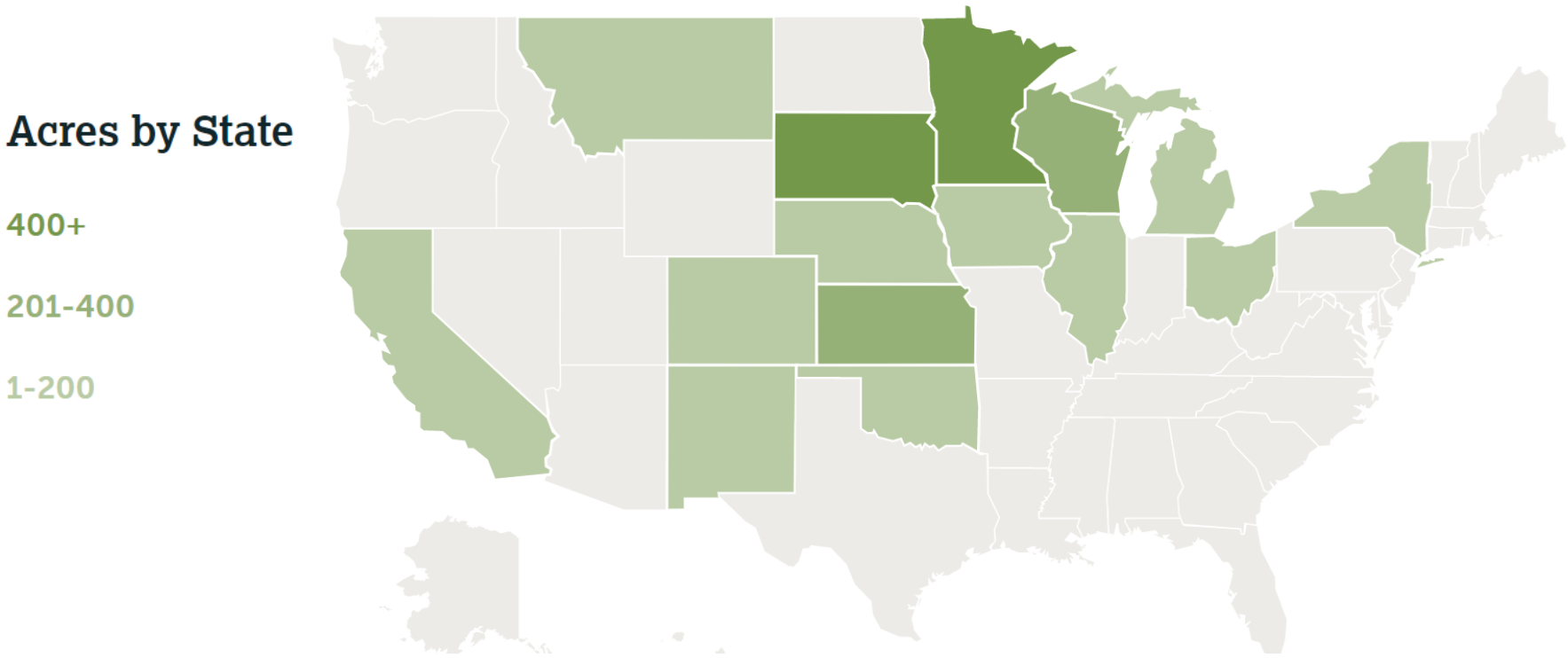
~2,000 ac Kernza in US in 2020



Source: kernza.org

BANG
BREWING

Does anyone really care about Kernza?

- **Yes!** Food companies & consumers excited for environmentally friendly grain
  - 2017 General Mills $500K donation to TLI
- State of MN investments: UMN Forever Green Initiative, Clean Water Fund
  - Well head protection projects
- Small-scale bakers and brewers using it

Has all the challenges of bringing a new crop to market!

GM limited release cereal 2019

No herbicides currently labeled for food-use Kernza grain

- Most on organic farms or transitioning to organic but goal is to have Kernza grown by both conventional and organic producers
- Need broadleaf weed control during establishment
- UMN leading the effort to label
  - 2,4-D
  - Clopyralid
  - MCPA

IR-4 trial sites

- Williston, ND
- Rosemount, MN
- Arlington, WI
- Aurora, NY

Herbicide treatments applied to old (>12 mo) or new (<3 mo) Kernza stands in fall and spring

- MN
  - Old: fall & spring
  - New: fall & spring
- WI
  - Old: spring
  - New: spring
- ND
  - New: fall & spring
- NY
  - New: fall & spring

Seedling Kernza 2 WAA with 2,4-D 2X in ND

Herbicide treatments applied to old or new Kernza stands in fall and/ or spring

Treatment	MN	WI	ND	NY
MCPA 561 g ae ha^{-1}	X	X	-	-
MCPA 1,122 g ae ha^{-1}	X	X	-	-
2,4-D amine 1,065 g ae ha^{-1}	X	X	X	X
2,4-D amine 2,130 g ae ha^{-1}	X	X	X	X
Clopyralid 101 g ae ha^{-1}	X	X	X	X
Clopyralid 202 g ae ha^{-1}	X	X	X	X
Clpyr 1X + MCPA 1X	X	X	-	X
Clpyr 2X + MCPA 2X	X	X	-	X
Untreated	X	X	X	X

Visual injury assessments

- WI: no injury observed in old or new stand after spring application
- NY: no injury observed in new stand after fall or spring application
- ND: low levels of injury observed 2 wk after fall application in new stand but grew out of symptoms; no injury after spring application
- MN: low to moderate levels of injury observed after fall application in old and new stands, very little injury after spring application

ND visual injury ratings in new Kernza stand

Scale 0 - 10

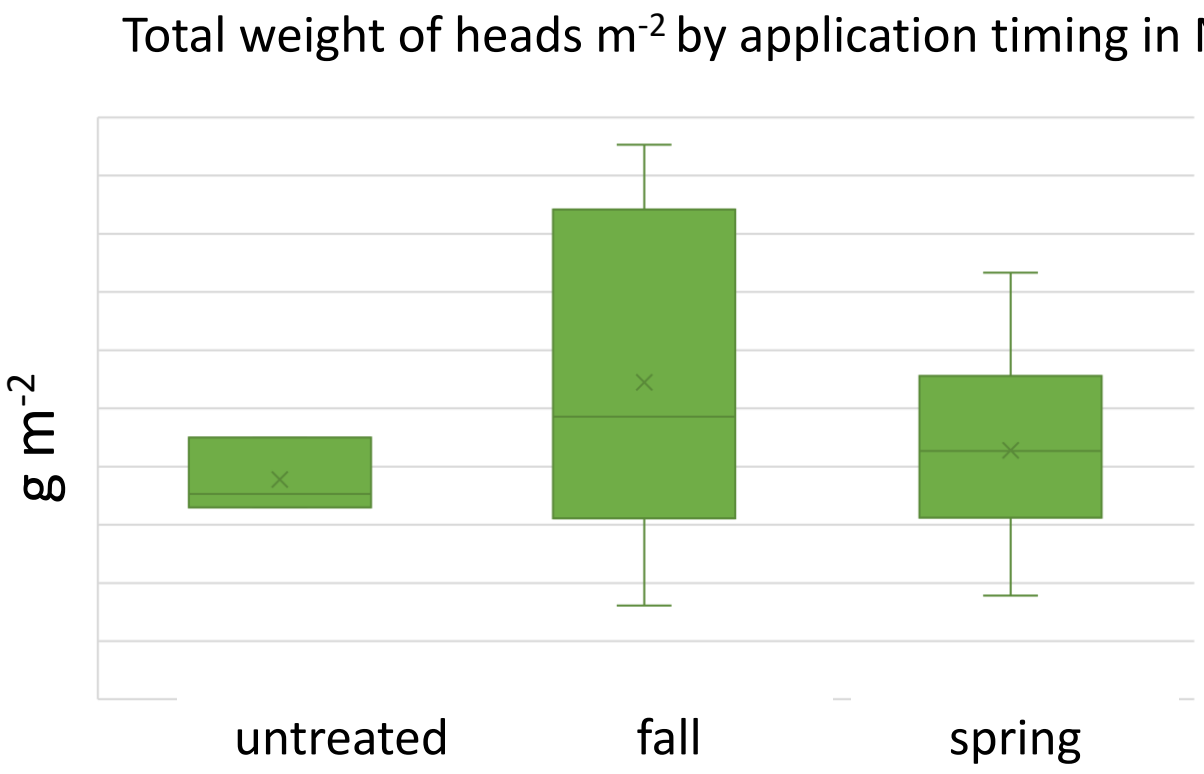
Application	Fall 2019			Spring 2020		
Observation	2 WAA	7 MAA	Pre Hrv	2 WAA	4 WAA	Pre Hrv
Treatment						
2,4-D 1X	1	0	0	0	0	0
2,4-D 2X	2.7	0.3	0	0.3	0	0
Clopyralid 1X	1	0.3	0	0	0	0
Clopyralid 2X	1.3	0.3	0	0	0	0
Untreated	1	0	0	0	0	0

MN visual injury ratings in old Kernza stand (Scale 0 -10)

Application	Fall 2019			Spring 2020	
Observation	2 WAA	7 MAA	Pre Hrv	2 WAA	4 WAA
Treatment					
2,4-D 1X	3	0	0	0	0
2,4-D 2X	3.7	0	0	0.3	0
Clopyralid 1X	2	0	0	0.3	0
Clopyralid 2X	4.7	0	0	0.7	0
MCPA 1X	1.7	0.3	0	1	1.3
MCPA 2X	4.3	0.3	0	0	0
Clpyr + MCPA 1X	4.7	0	0	0.7	0.7
Clpyr + MCPA 2X	5	0.7	0	0	0
Untreated	0	0	0	0	0

Biomass production

- No effect of herbicide treatment on whole plant biomass at ND and NY
- Fall timing increased head weight at ND where dominant weeds were winter annuals



Kernza grain yield at ND

Treatment	Grain yield lb/ac
Untreated	178
2,4-D 1X fall	353
2,4-D 2X fall	250
Clopyralid 1X fall	258
Clopyralid 2X fall	279
2,4-D 1X spring	215
2,4-D 2X spring	240
Clopyralid 1X spring	220
Clopyralid 2X spring	225

Fall treatment avg 285 lb/ac

Spring treatment avg 225 lb/ac

Dominant weeds at the site: Horseweed, NLHB, and downy brome

Current IR-4 status

- 2,4-D label expected in 2021
  - Likely in time for late summer/ fall planting
- Clopyralid and MCPA possibly 2021 or 2022

Thank you for your attention

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