Adaptation of Kernza to temperate regions in south America

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Lucía Gutiérrez
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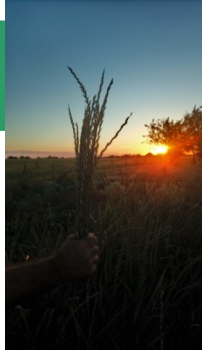
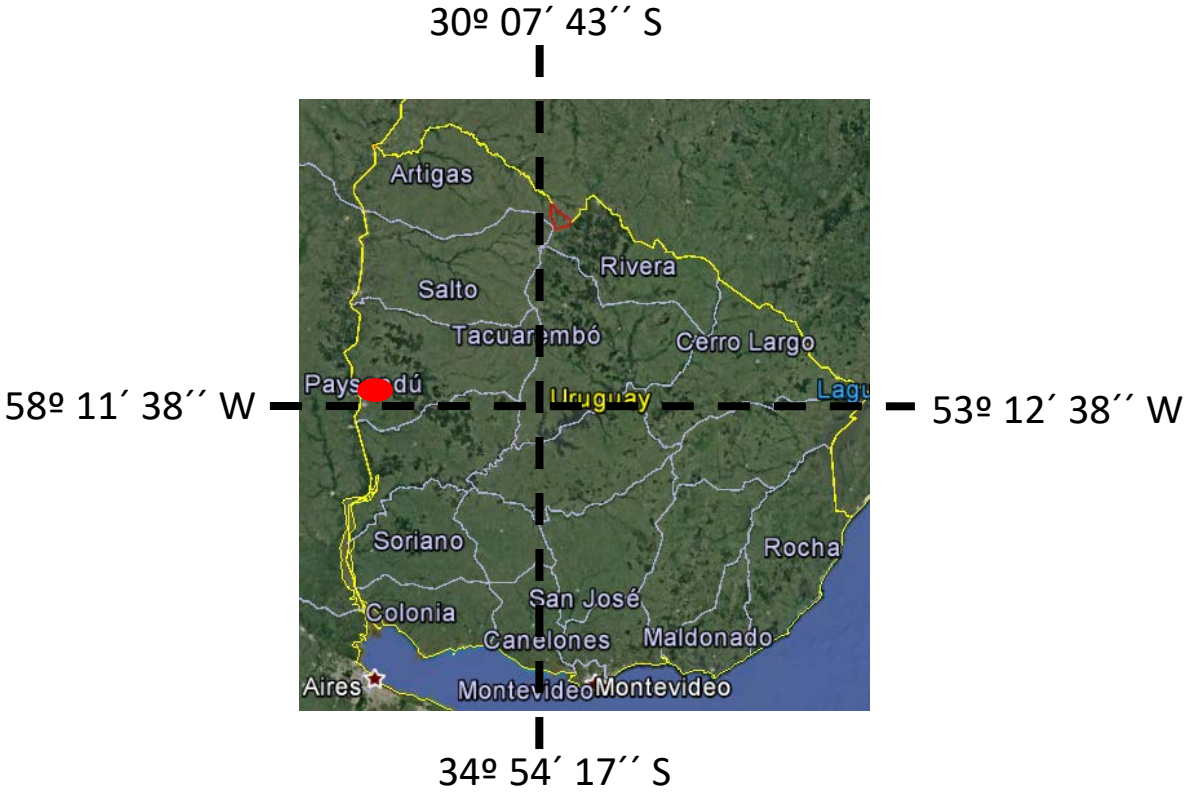
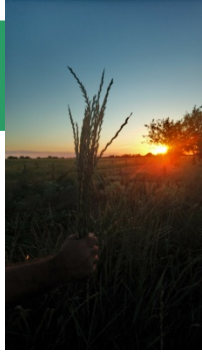
Sections



- Vernalization requirements
- Agronomic adaptation
- Breeding



Vernalization requirements



Objetives

- Explore *T. intermedium* possibilities to produce grain in temperate geographic regions
    - determinate primary induction cold requirements on germplasm moderately adapted to winter cold areas

Vernalization requirements

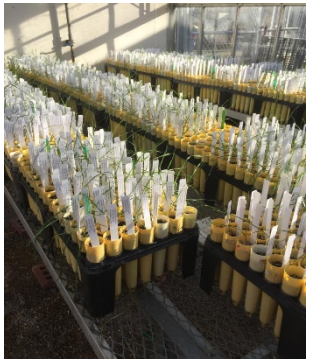
Materials and Methods

Emergence → 3 leaves → Growth chamber (4ºC – 16 hs)

Greenhouse (25ºC – 16 hs)

GERMPLASM

- TLI Cycle 5
- TLI Cycle 4 (MN)
- TLI Cycle 4 (AK1)
- MN1501-Syn2
- MN1502-Syn2
- MN1503-Syn2
- MN1504-Syn2
- MN1505-Syn2

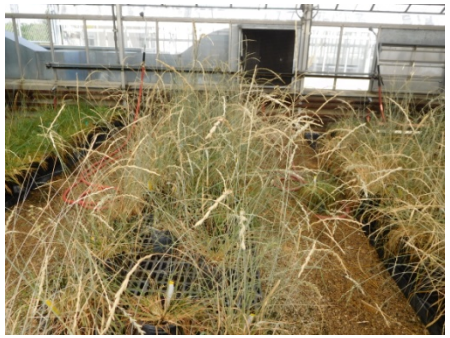


Weeks

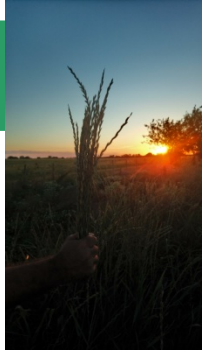
1	2	3	4	5	6	7

Greenhouse (25ºC – 16 hs)

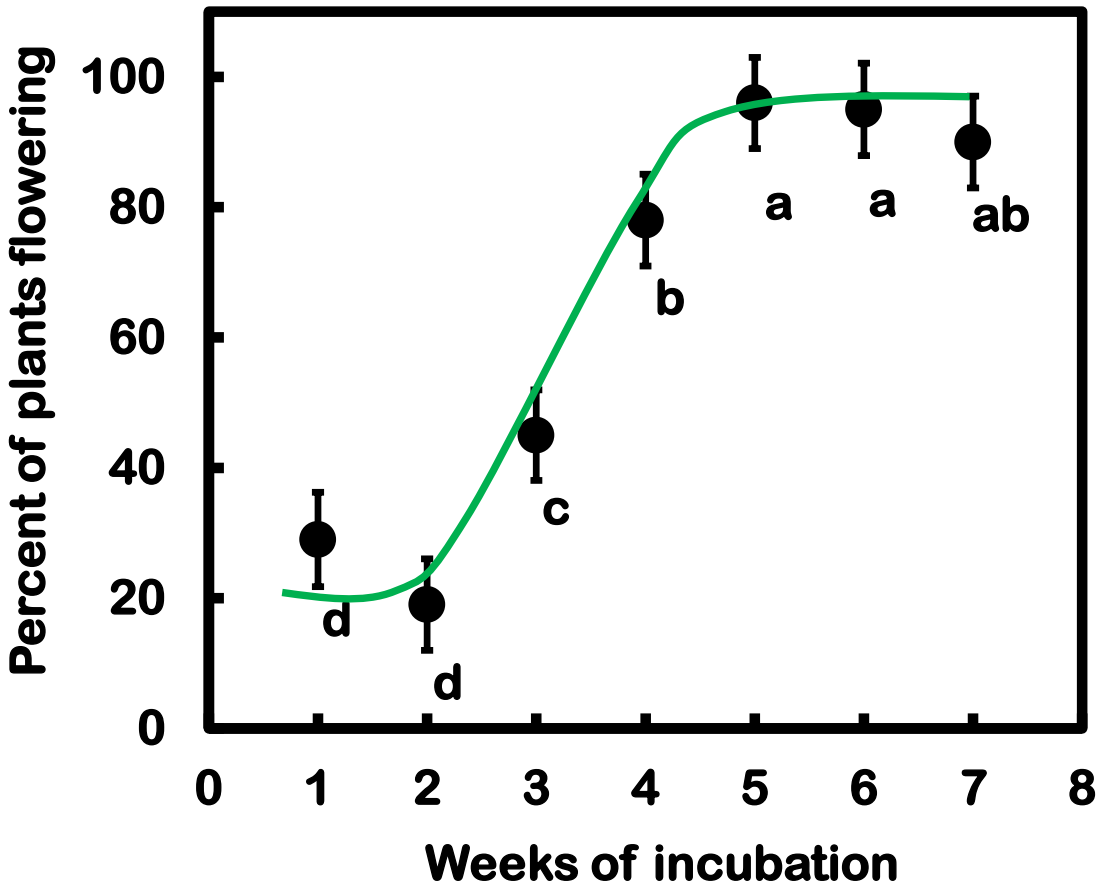
- Flowering
- Dry weight
- Spikes per plant
- Spikelets per spike
- Spikelets per plant
- Plant height
- Harvest index



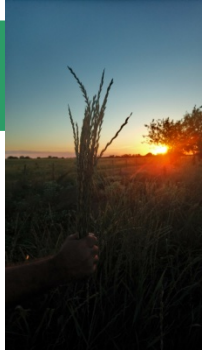
Results



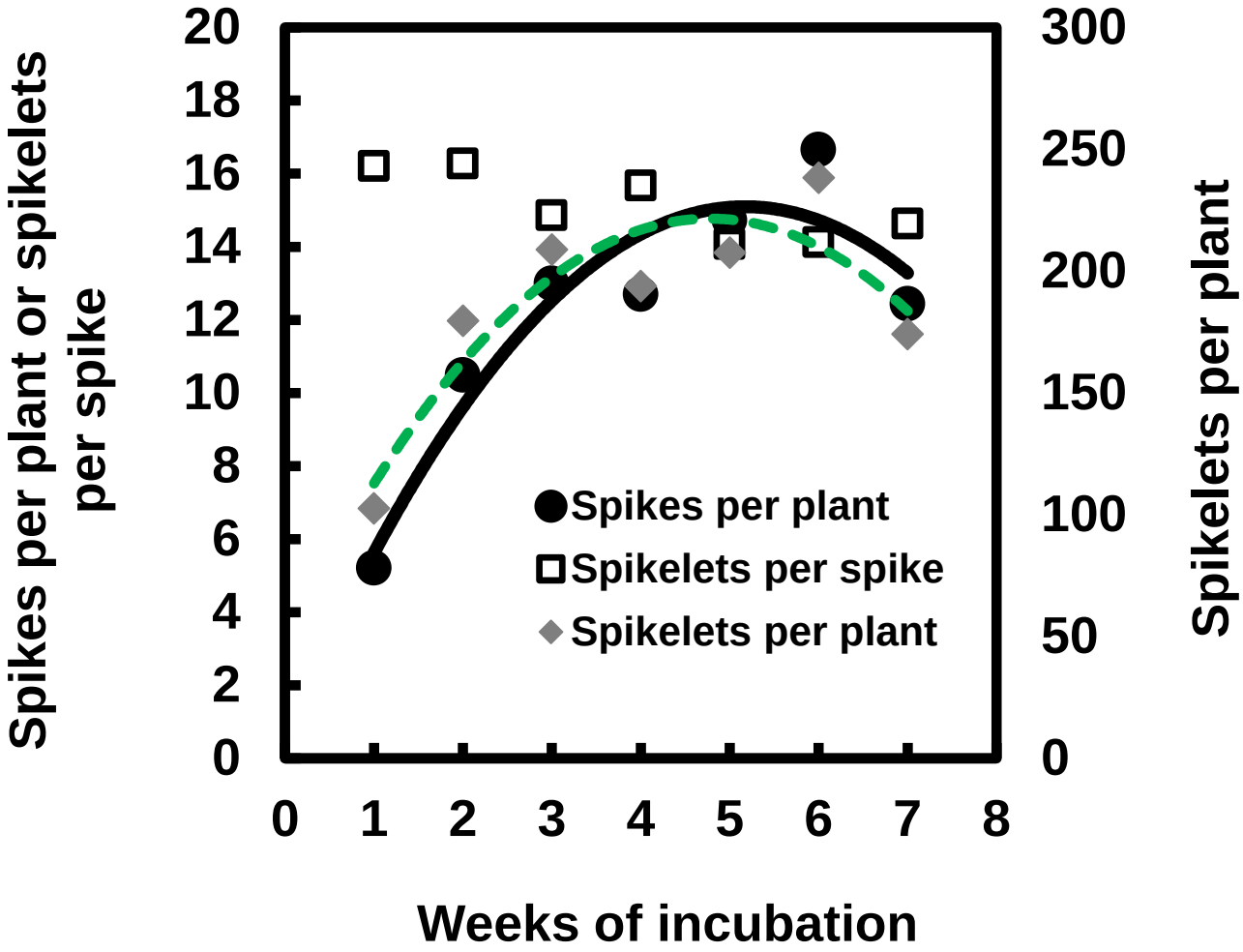
Cold requirements for flowering



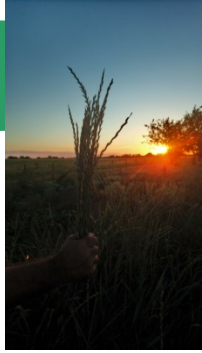
Results



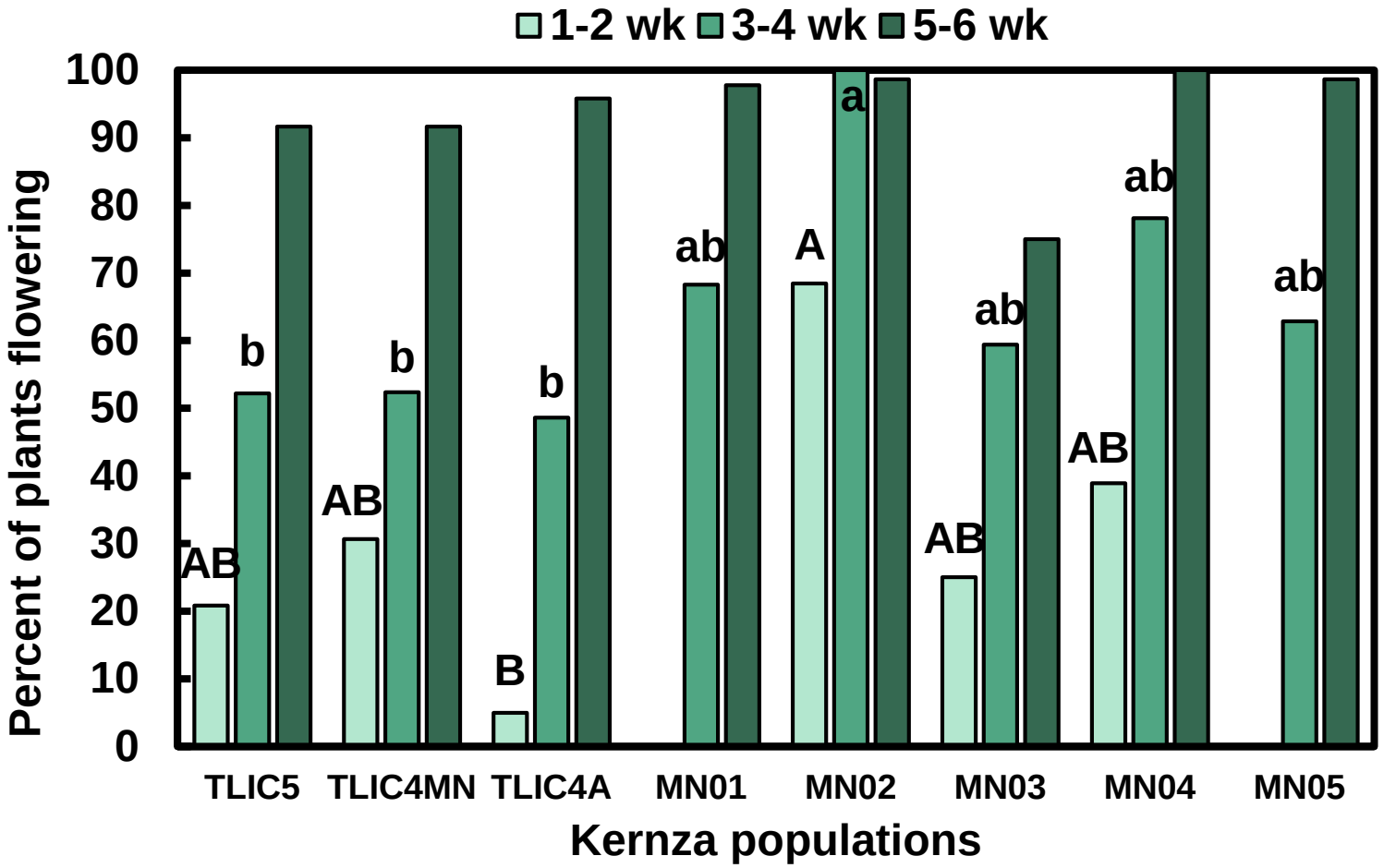
Grain yield components



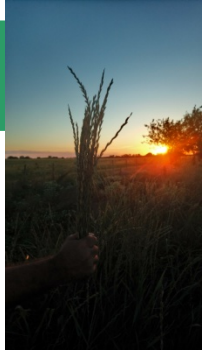
Results



Germplasm response to vernalization



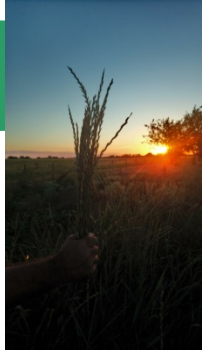
Agronomic adaptation



Objetives

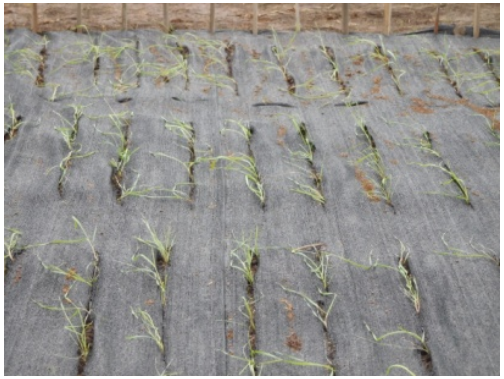
- Evaluate the agronomic performance of *T. intermedium* in South America conditions (Uruguay)
  - measure grain yield and dry matter yield during 2-3 years

Agronomic adaptation



Materials and Methods

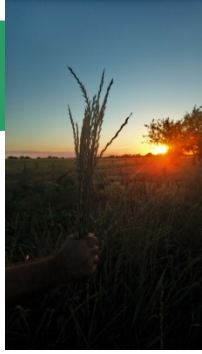
Conetainers → Field transplant



Paysandú Aug 2018

- Sowing date: 04/18
- Trasplant date: 05/18
- Distance among plants: 20 cm
- 25 plants per plot
- 36 plot

Agronomic adaptation



Treatments

2 germplasm types of TLCI4

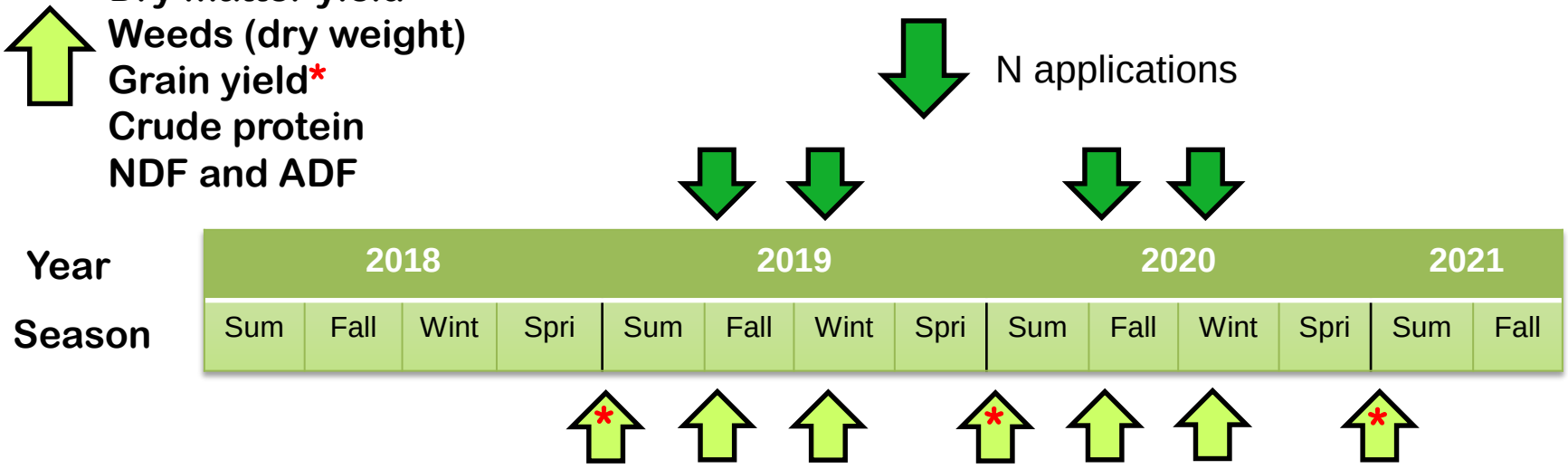
- **Spring** (seed harvested without a winter in wisconsin)
- **Vernalized** (seed harvested after a winter in Wisconsin)

3 N applications per year

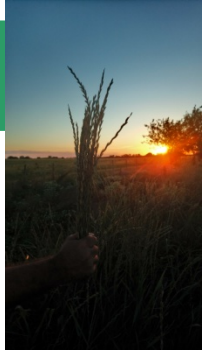
- 0 Kg ha $^{-1}$
- 80 Kg ha $^{-1}$
- 160 Kg ha $^{-1}$

Traits to evaluate

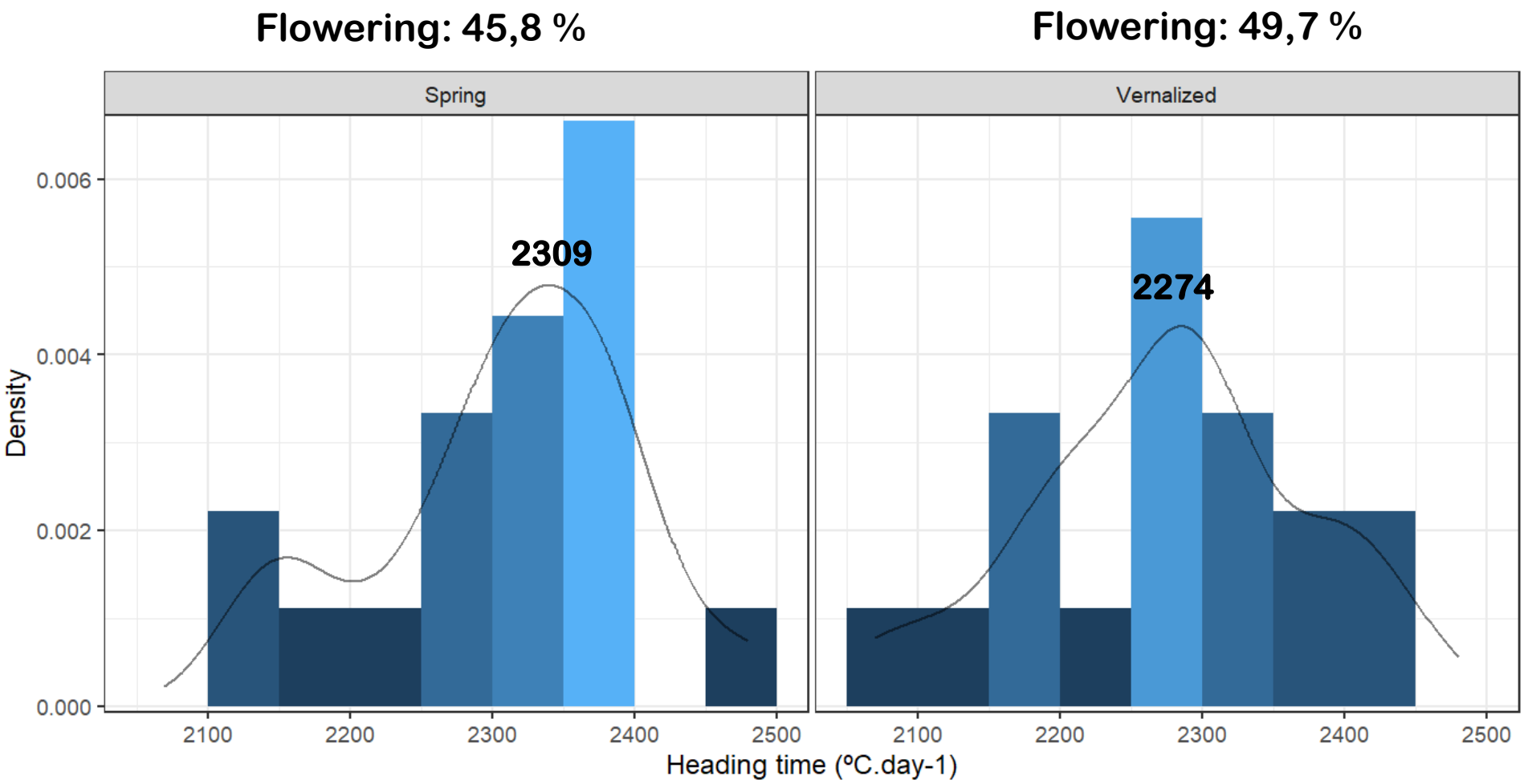
Dry matter yield
Weeds (dry weight)
Grain yield*
Crude protein
NDF and ADF



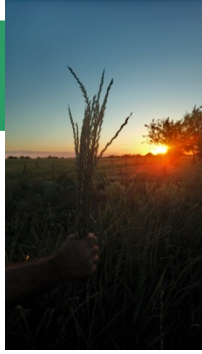
Agronomic adaptation



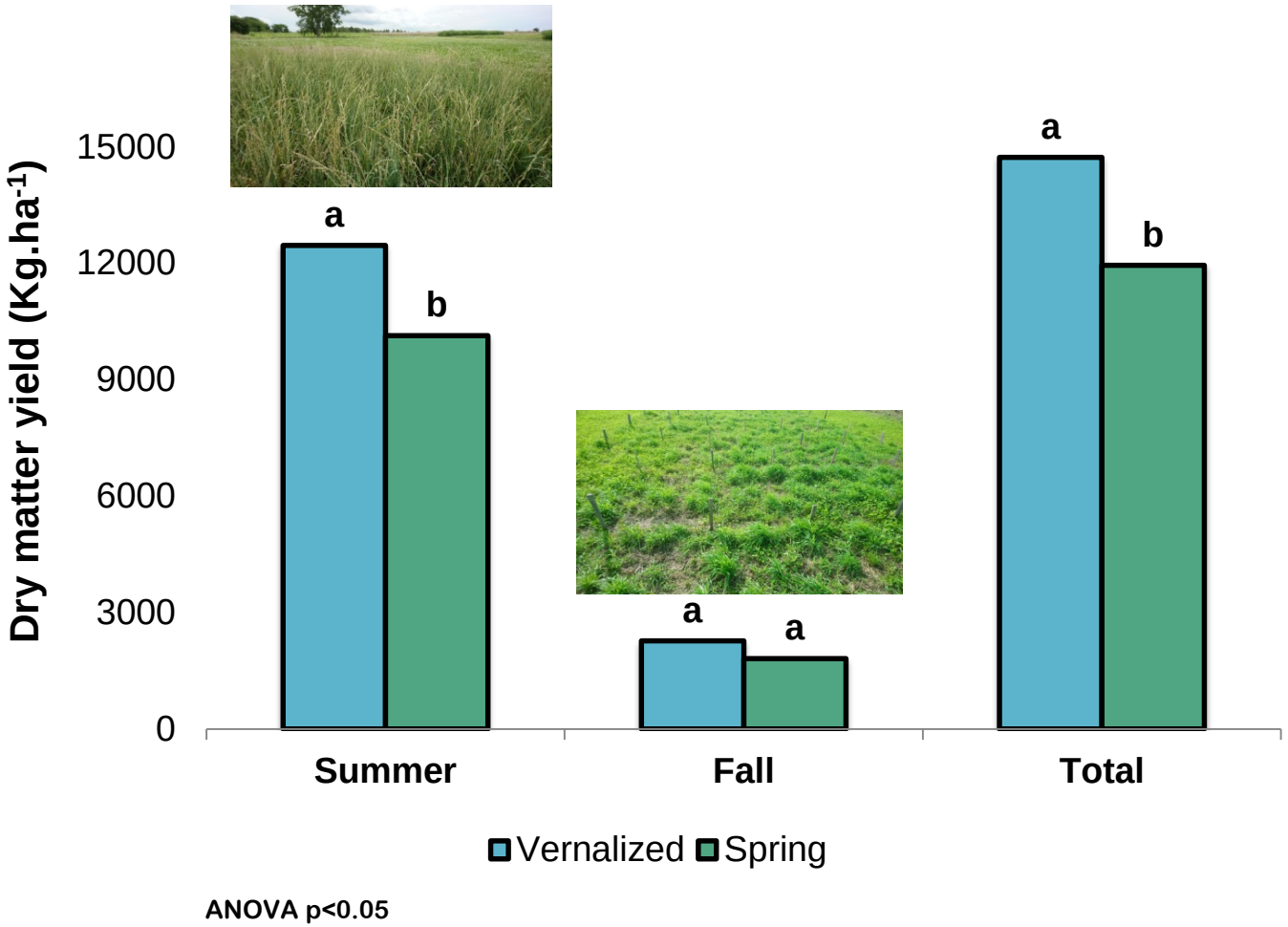
Flowering and Heading time- Preliminary results



Agronomic adaptation

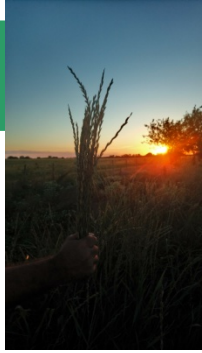


Forage production - Preliminary results

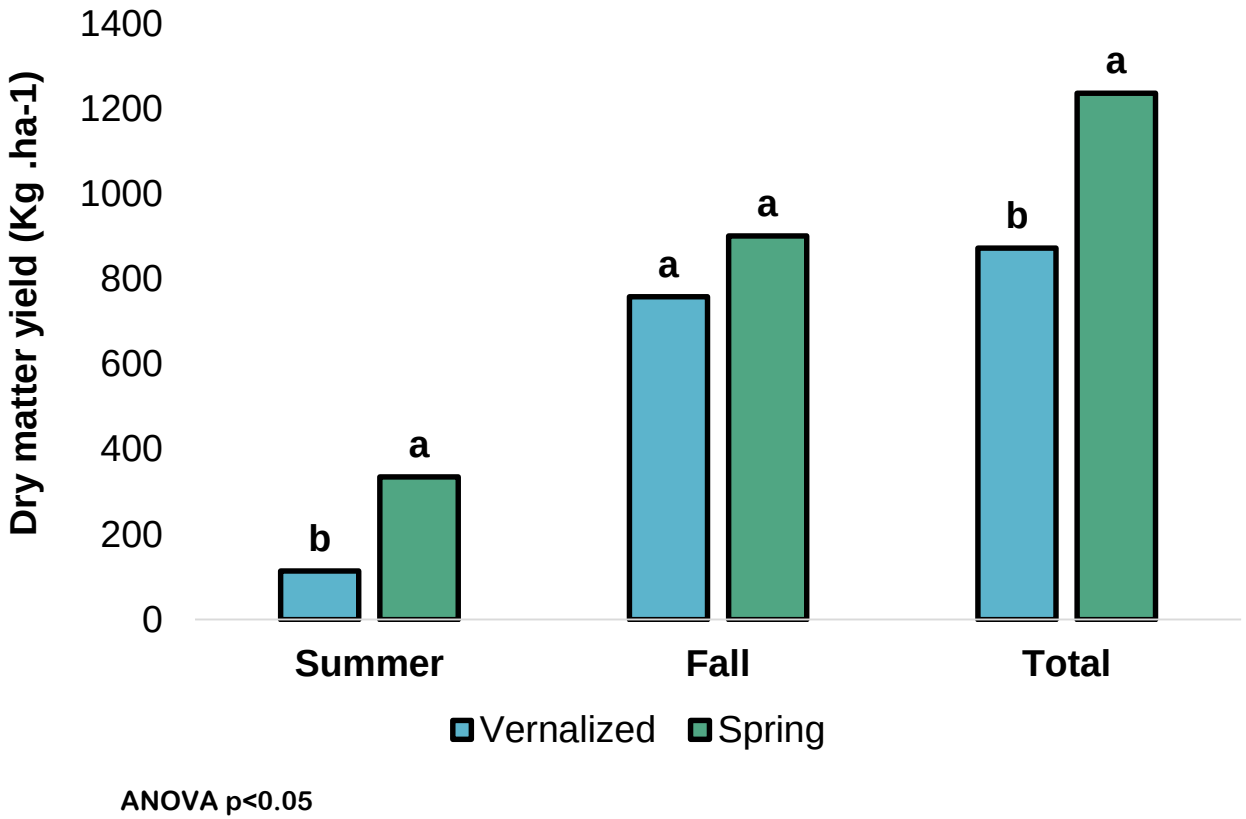


ANOVA $p<0.05$

Agronomic adaptation

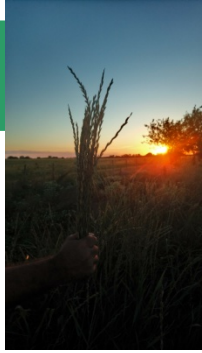


Weeds- Preliminary results



ANOVA p<0.05

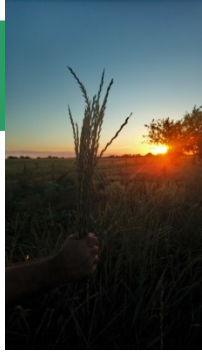
Agronomic adaptation



Nutritive value parameters – Preliminary results

Parameter	Germplasm	Summer 18/19		Fall 19	
NDF (%DM)	Spring	68.4	a	63.4	b
	Vernalized	67.6	a	64.2	b
ADF (%DM)	Spring	40.5	a	33.1	b
	Vernalized	40.3	a	34.1	b
CP (%DM)	Spring	8.4	b	14.4	a
	Vernalized	8.0	b	14.0	a

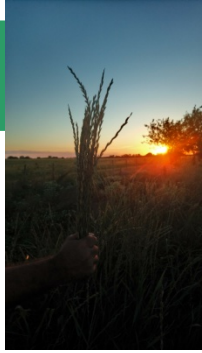
Tukey $p<0.05$



Objetives

- Measure genetic components and response to selection on agronomic traits
  - estimate additive variance, heredability and response to classical/phenotipyc recurrent selection on different agronomic traits
  - estimate response to selection mediated by genomic selection

Breeding– Material and Methods

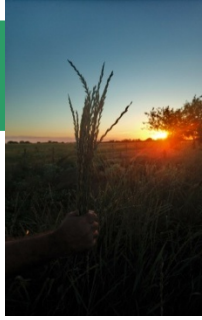


Two half sib experiments

Arlington, Wisconsin (EEUU)

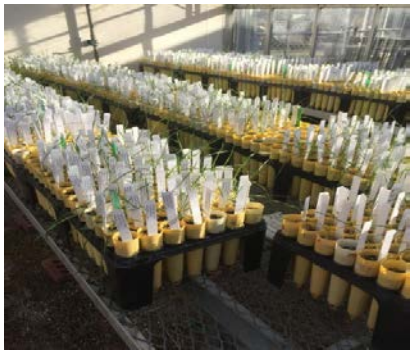
Paysandú (Uruguay)

Breeding

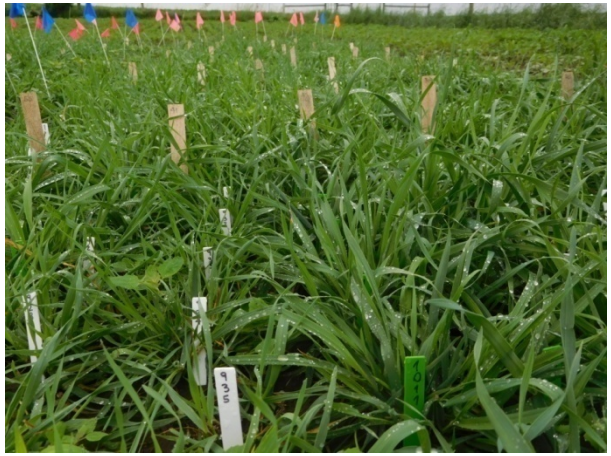


Experiment 1 (Wisconsin, EEUU)

TLIC4MN - 54 Half Sib families



Arlington (WI)

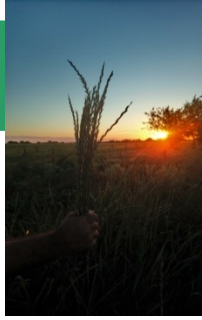


Traits evaluated per plant

Flowering time
Plant height
Spikes per plant
Spikelets per spike
Spike weight

Spike lenght
Spikelets per plant
Dry matter yield

Breeding



Experiment 2 (Paysandú, Uruguay)

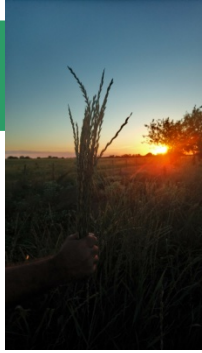
TLIC4 / TLIC4MN / TLIC4A

6/15/19

Traits to evaluate

- Flowering time
- Plant height
- Spikes per plant
- Spikelets per spike
- Spike weight
- Spike lenght
- Spikelets per plant
- Dry matter yield

Breeding



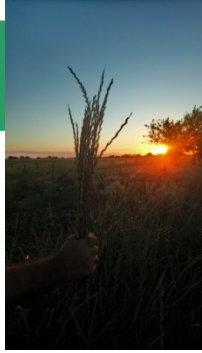
Experiment 2 (Paysandú, Uruguay)

Characteristics of the experiment

- 30 Half Sib families
- 1080 plants (30 families x 12 plants per plot x 3 replications)
- Individual plant evaluation for two years (2019 – 2020)
  - flowering time
  - Dry matter yield (Summer and Winter)
  - Grain yield

  } Va, h^2
- Genomic selection
  - selection of 200 genets at the en of 2020 (training population)
  - Selection of 400 genets under next generation (tested population) (April 2021)
  - Early genomic selection under next generation

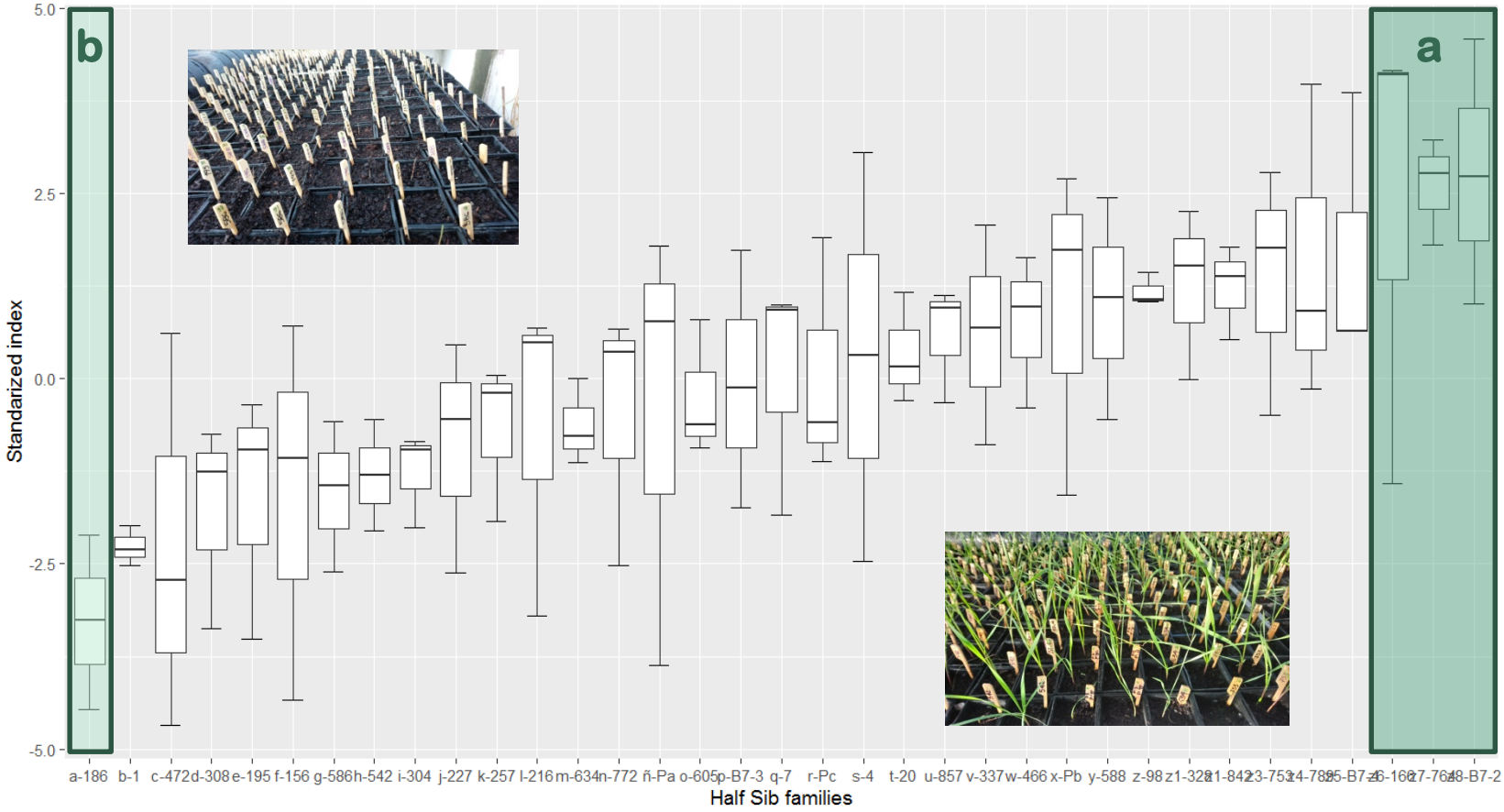
Breeding – Experiment 2



Seedling vigor

- Emergence date (°C.day^{-1})
- Measure of plant height and Haun 30 days after planting

} Index



Tukey $p<0.05$