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Photo credit: Ledoux Grange

FARMER-LED TRIALS REPORT

LEDOUX GRANGE

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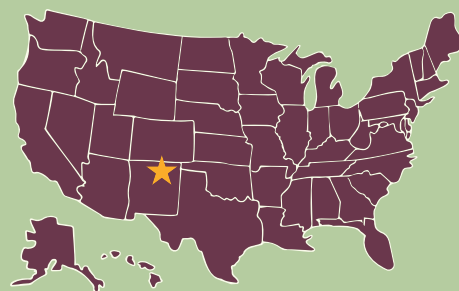
Farmer-Led Trials: Evaluating Teff Accessions for Lodging Resistance and Performance at High Altitude

IN A NUTSHELL

Farmer Kristin Swoszowski-Tran conducted an on-farm trial to evaluate 14 teff accessions: 12 of Ethiopian origin sourced from the Western Regional Plant Introduction Station, and two commercially available varieties, for their performance under the farm's characteristically windy, high-altitude conditions.

The trial measured a range of traits including days to emergence, days to maturity, plant height, seed yield, and aboveground biomass.

Significant differences among accessions were found for days to emergence, days to maturity, height, seed yield, and aboveground biomass. A strong negative correlation between days to maturity and seed yield ($r = -0.8$) emerged as the key finding: earlier-maturing accessions consistently produced greater seed yields. PI 196851 was the top performer for seed yield (0.53 g/row), while PI 494429 produced the highest aboveground biomass (65.8 g/row), making it a candidate for forage or cover crop use.



2025

Farmer-Researcher:
Kristin Swoszowski-Tran,
Ledoux Grange
Mora, NM



Kristin Swoszowski-Tran, Ledoux Grange

ABOUT THE FARM

Ledoux Grange is a certified organic, 34-acre operation nestled at 7,400 feet in the mountains of Mora, New Mexico. Kristin Swoszowski-Tran, the farm's owner, brings decades of plant expertise to her work, as she has been breeding *Lilium* species since the 1980s, with novel cultivars registered with the Royal Horticultural Society in Great Britain.

As a member of the Southwest Grain Collaborative, Ledoux Grange specializes in drought-tolerant, high-altitude pulses, legumes, grains, and cover crops, with a deep



Teff accession sample PI494242.

An accession is a distinct sample of germplasm representing a cultivar, breeding line, or a wild or cultivated population, maintained in a genebank for conservation and use.

Source: GRIN Global <https://www.grin-global.org/>

commitment to bringing culturally rich, locally grown produce to the surrounding community. The farm practices regenerative soil management and has transitioned to small-scale equipment to reduce soil compaction and address challenges from recent fires and erosion.

The farm's location presents both opportunities and challenges: the high elevation and short growing season demand crops that can emerge quickly, mature before frost, and withstand strong winds.

WHAT WAS THE ON-FARM TRIAL ABOUT?

Teff (*Eragrostis tef*) is an ancient annual grass native to the Ethiopian Highlands and one of earliest domesticated crops in the world. Its versatility, as human food, palatable fodder, and drought-tolerant cover cropping,

makes it a promising fit for farms like Ledoux Grange. However, teff's slender stems make it vulnerable to lodging, where plants lean or fall flat due to wind, rain, or excessive plant height, reducing both yield and harvestability.

Kristin had observed that teff performed well in her area in previous seasons, but a strong gust of wind could flatten an entire planting. She hypothesized that some accessions, particularly those with shorter or thicker stems, might be more resistant to lodging than others. She also wanted to characterize how different accessions grow and perform in her specific environment of high altitude, short season, and variable rains. She hoped this trial would help her to increase her seed supply of the most promising types for future plantings.

The central research question for this trial was: **Which teff accessions perform best in terms of yield, maturity, and lodging resistance, under the growing conditions in the high desert?**



HOW WAS THE TRIAL DONE?

The trial was planted in late June of 2025, following thorough bed preparation. It was arranged as a randomized complete block design with four replications. The 14 treatments consisted of 12 teff accessions of Ethiopian origin sourced from the USDA Western Regional Plant Introduction Station, plus two commercially available varieties: 'Bolosso' from Experimental Farm Network and teff from Great Basin Seeds.

Each plot consisted of a one-meter row, hand-planted with approximately 50 seeds



Beds prepped for the trial planting.

planted evenly along the row. Rows were spaced 12–18 inches apart to prevent cross-contamination and allow access for data collection. Border rows were included at each end of the blocks.

Data collection focused on the following traits:

- **Days to Emergence:** Date recorded when the majority of plants in each plot had emerged.
- **Vigor:** Rated on a custom scale developed by Kristin, incorporating leaf thickness and color, plant density, water-holding capacity, and overall appearance.
- **Days to Flowering:** Date recorded when the majority of plants reached anthesis.
- **Days to Maturity:** Date recorded when the majority of plants had reached harvestable maturity.
- **Plant Height:** Measured from the node separating root and shoot to the tip of the panicle.
- **Lodging:** Rated on a 0–5 visual scale, where 0 = no lodging and 5 = completely prostrate; a Lodging Index was calculated as the sum of (lodging score × relative area) / 5.
- **Tillers per Plant:** Average number of tillers recorded across representative plants per plot.
- **Seed Yield:** Weight of seed collected from each row.
- **Aboveground Biomass:** Total above-ground plant material harvested per row.
- **Seed Color:** Recorded as a descriptive color category (white, tan, dark).



"This trial was instrumental in helping me to decide which varieties to explore further given that time, money and labor are always a significant factor for field trials on any size farm."

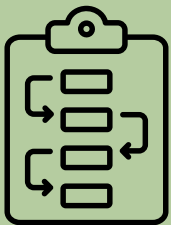
- Kristin Swoszowski-Tran

Layout for the teff trial pre-planting

The 2025 season brought unusual weather conditions that shaped the trial. Heavy rain began the day after planting, which likely caused some seed migration and variable germination. A prolonged monsoon season extended through September, followed by a heat wave in early August, and a killing frost on October 28. Teff seeds and vegetative growth were harvested on October 23. Notably, the season had lower-than-typical wind, which meant that lodging conditions were not as

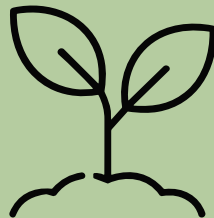
severe as Kristin typically experiences, an important context for interpreting the lodging data.

The Great Basin Seeds commercial variety failed to germinate in all four replications within the trial plots, though the same lot of seeds germinated successfully in other areas on the farm. This variety was excluded from the statistical analysis.



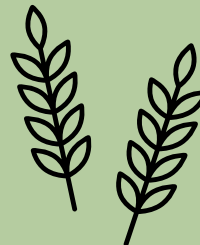
Trial Design

MAY



Bed Prep & Planting

JUNE



Harvesting

OCTOBER



Data Analysis

DECEMBER



Teff plants growing in the trial plots

“Learning about the correlation between the early seed emergence rate and later success was unexpected, but logical. I’m looking forward to exploring those varieties (and especially the wild accession) in future trials, and thanks to this opportunity with OFRF, I am now poised to channel my energy and efforts into identifying worthy prospects for differing product outcomes like hay or seed production.”

- Kristin Swoszowski-Tran

FINDINGS

Significant differences among accessions were found for days to emergence, days to maturity, plant height, seed yield, and aboveground biomass ($p < 0.05$). Vigor, days to flowering, lodging scores, and tillers per plant did not differ significantly among accessions, likely reflecting the relatively calm wind and high-moisture conditions of the 2025 season.

Overall, seed yields from the meter long rows were relatively low (average 10 lb/ac) compared with typical field-scale teff yields in the southwestern US (1,000-1,500 lb/ac). PI 196851 was the clear standout for seed yield at 0.53 g/row; more than double the trial mean of 0.17 g/row, and was also notable as the only wild-collected accession in the trial, originally gathered in Ethiopia in 1951 (Figure 1).

It was one of the earliest to emerge (24 days) and among the earliest to reach maturity (106 days), reinforcing the strong negative correlation between days to maturity and seed yield ($r = -0.8$).

In other words, accessions that matured earlier consistently produced more seed. This is a critical finding given the short growing season and early frost risk at Ledoux Grange's elevation.

PI 494429 stood out as the top candidate for forage or hay use, producing the highest aboveground biomass at 65.8 g/row, more than three times the trial mean of 21.2 g/row, while also having the tallest average plant height (65.8 cm).

Accessions PI 494201 and PI 494384 were among the lowest performers across multiple traits, showing shorter, spindly growth habits and low yields.



Seed color varied across accessions, with the majority producing white seeds, which are generally preferred for human consumption. PI 494201 was the only accession to produce dark (black/grey) seeds, while 'Bolosso' produced seeds of varied color.

Because the 2025 season experienced lower wind and higher rainfall than typical, lodging scores were low across all accessions and did not differ significantly.

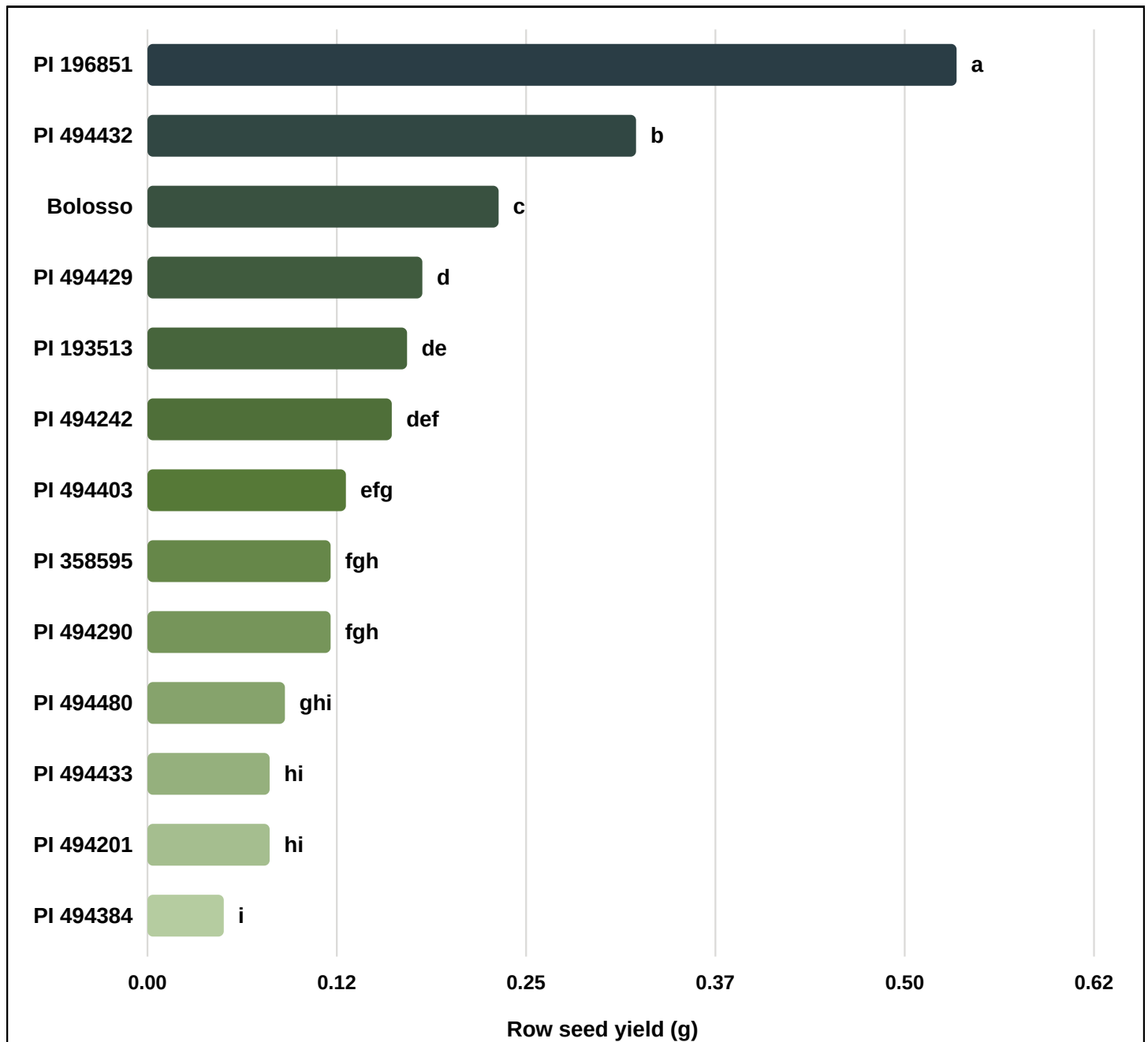


Figure 1. Row Seed Yield by Accession

Means followed by a common letter are not significantly different (Tukey's test, $p = 0.05$).



TAKE HOME MESSAGES

Early maturity is an important trait for seed production at this elevation. The strong negative correlation ($r = -0.8$) between days to maturity and seed yield was the most consistent finding of this trial. At 7,400 feet, the growing season is short and frost comes early. Accessions that mature in roughly 106 days, like PI 196851 and PI 494432, were able to complete their cycle and produce seed before conditions deteriorated.

PI 196851 is the top candidate for seed production. This wild-collected Ethiopian accession from 1951 yielded nearly twice as much seed as the next-best accession, emerged quickly, matured early, and demonstrated strong field performance consistent with Kristin's observations. Its wild origin may contribute to its adaptability under challenging conditions.

PI 494429 is the top candidate for forage and cover crop use. With the highest above ground biomass of any accession tested, PI 494429 offers strong potential for hay production and soil coverage. Its later maturity means it is less ideal for seed production in this environment, but for farms prioritizing biomass, it is a clear standout.

The lodging question remains open and worth pursuing. The unusually mild wind conditions in 2025 meant that lodging differences among accessions could not be fully characterized. Kristin's original hypothesis that shorter-stemmed accessions might resist lodging better was not tested under the typical windy conditions of her site.

The Great Basin Seeds variety is worth retesting. Its failure to germinate in the trial plots (while germinating elsewhere on the farm) likely reflects site-specific conditions rather than poor seed quality. Excluding it from this year's analysis leaves an incomplete picture of commercial variety performance.

In future trials, Kristin plans to prioritize seed increases of PI 196851 and PI 494429, and is interested in exploring how seeding timing relative to the monsoon season affects crop performance, as well as the potential for a cut-and-regrow hay system with teff at her elevation.

ACKNOWLEDGEMENTS

This report is made possible by OFRF's Farmer-Led Trials program. In this program, farmers receive technical support to address their challenges through structured on-farm trials. To learn more about OFRF Farmer-Led Trials Program, visit our website page at <https://ofrf.org/research/farmer-led-research-trials/>

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United States Department of Agriculture
Agricultural Marketing Service
National Organic Program
Transition to Organic Partnership Program





Farmer-Led Trials Program Spotlight: Ledoux Grange

Can teff handle high winds? This on-farm trial aims to find out.

Written by Mary Hathaway, OFRF's Research & Education Program Manager

Ledoux Grange, situated at 7,400 feet in Mora, New Mexico, is an organic-certified, 34-acre operation focused on regenerative agriculture. Farmer Kristin Swoszowski-Tran has been cultivating Liliaceae species (a genus of herbaceous flowering plants growing from bulbs, including lilies) and hybrids – since the 1990s, registering novel cultivars with the Royal Horticultural Society in Great Britain. As a member of the Southwest Grain Collaborative, Ledoux Grange also specializes in growing drought-tolerant, high-altitude pulses, legumes, grains, and cover crops, and is committed to bringing culturally rich, locally-grown produce to their community.

Testing Teff for Lodging Resistance

One of the grains that Ledoux Grange grows is Teff, an annual grass, a species of lovegrass native to Ethiopia, where it first originated in the Ethiopian Highlands. It was one of the earliest plants to be domesticated and is one of the most important staple crops in Ethiopia. Ledoux Grange is currently testing 14 teff accessions rated for their lodging resistance in its characteristically windy location. Teff's versatility as human food, livestock fodder, and a drought-tolerant cover crop suited for high altitudes makes it a promising addition to their operation. The farm owner, Kristin, is enthusiastic about experimenting with various accessions, drawing inspiration from past successes with teff in the area. She has a broader interest in lovegrass species and is eager to observe their growth, hoping to identify types that will flourish and resist lodging in her environment.

Terminology Touch Point

ACCESSION: a distinct sample of germplasm representing a cultivar, breeding line, or a wild or cultivated population, maintained in a genebank for conservation and use. Its genetic stability is optimally preserved through careful monitoring and multiplication.

Source: GGCE

On-Farm Trial Plan

The plot layout includes 12 accessions from a western regional station, all of Ethiopian origin, alongside two commercially available varieties: 'Bolorosso' from Experimental Farm Network and teff from Great Basin Seeds. The experiment includes four replications, and is laid out in the field as four blocks border rows on each end. Each packet contains 200 seeds, with 50 seeds per plot, weighed out for accuracy. Rows will be one meter long, with seeds distributed evenly within each plot area. Planting is scheduled for late June, following thorough bed preparation.

Twelve accessions selected; Origin Ethiopia			
PI 196851	PI 494432	PI 494433	PI 494384
PI 494290	PI 358595	PI 193513	PI 494403
PI 494201	PI 494242	PI 494480	PI 494429
2 commercially available varieties:			
'Bolorosso' from Experimental Farm Network		Teff from Great Basin Seeds	



Farmer-researcher Kristin Swoszowski-Tran

"I believe that it is crucial to conduct trials in diverse agricultural ecotypes so that we can perpetuate and ensure suitable, local production to idiosyncratic conditions. It is an honor and privilege to work with OFRF staff members, Mary and Heather, to organize this trial. They've made an easy and seamless process to plan the implementation. My hope is that we can identify drought-tolerant candidates that can withstand our windy conditions here at this elevation. I'm eager to see what this trial produces!"

– Kristin Swoszowski-Tran, Ledoux Grange



Teff trial layout.



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