Kernza® Perennial Grain as a Cereal Grain

Agricultural Utilization Research Institute

Introduction

Kernza® perennial grain (Kernza) is a new domesticated grain introduced by The Land Institute that is now being developed for commercial use in Minnesota. It originates from a forage grass called intermediate wheatgrass (*Thinopyrum intermedium*) and is a relative of wheat. In 2019, the University of Minnesota released its first named Kernza® variety: MN-Clearwater.

As a close relative of wheat, Kernza has application opportunities in the food industry. It contains a higher protein and dietary fiber content versus wheat but lacks in some gluten components that limit its functionality in some applications. Besides the potential for food applications, Kernza also provides environmental benefits. According to University of Minnesota Researchers, its deep roots can protect soil from erosion, improve soil health, and reduce nitrogen leaching, protecting water resources from nitrate contamination.

Nutritional Comparison to Wheat

Kernza contains more protein, dietary fiber and bioactive compounds such as carotenoids versus wheat but certain characteristics limit its use as a stand-alone flour. Although Kernza contains gluten, it is deficient in one of the gluten components (high molecular weight glutenin).

***Values in table based on 100g sample**

Types of Grain		Kernza Whole Grain[a]	White Wheat Berries[b]	Kernza Refined Flour[a]	All Purpose White Flour[c]
Moisture	%	8.6	13.75	8.1	11.9
Ash	%	2.4	N/A	0.6	0.47
Calories	-	368	318	368	364
Protein	g	19.2	9.24	17.5	10.3
Carbohydrates	g	67.3	73.7	73.2	76.3
Dietary Fiber	g	18.0	10.3	4.3	2.7
Soluble Fiber	g	3.6	N/A	1.0	0.9
Sugar	g	1.7	1.1	N/A	0.3
Total Fat	g	2.9	2.3	1.2	1.0
Sat Fat	g	0.5	0.4	0.3	0.2
Mono Fat	g	0.5	0.3	0.1	0.1
Poly Fat	g	1.9	1.6	0.7	0.4
Trans Fat	g	0	0	0	0
Cholesterol	mg	0	0.10	0	0
Calcium	mg	120.0	25.0	50.0	15.0
Iron	mg	5.5	2.6	3.7	1.2
Potassium	mg	480.0	N/A	140.0	107.0
Sodium	mg	0	13.0	0	2.0

Characteristics

- Kernels are 80% smaller than Hard Red Wheat (breeding efforts are underway at the UMN and The Land Institute to increase kernel size)
- Hull/Kernel weight Ratio: 25-35% Hull to 65-75% Kernel
- Amber/Mahogany color

Bakers Field toasted the grain to assist in milling the product, which led to an enhanced flavor and a more consistent particle size for the flour.

—Steve Horton- Bakers Field Flour and Bread

a: *Source: Results are directional only, data represents analysis of one sample of Clearwater Variety, MVTL, New Ulm, MN*
b: *ESHA Database: Star of the West Milling Company*
c: *ESHA Database: USDA Composition Data*

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Suggested Application Opportunities

Whole Grain
Granola or other cereal
Pilaf style side dish
Brewing (malted or unmalted)
Puffed or Sprouted

Flour	
Bread and Flatbreads	Pretzels
Biscuits	Pasta
Pancake/Waffle Mix	Crackers
Cupcakes	Brewing

Processing and Grain Stability

- On average 30-50% of the harvested material will be dehulled usable grain
- Inconsistent grain sizes could lead to inefficient dehulling and/or the need to regularly modify processing settings
- Mold/Mycotoxins: Kernza can be tested using existing methods for molds and mycotoxins
- Food Grade Storage and Handling: Kernza does not present any unique challenges for food grade storage and handling
- Higher fat content increases overall rancidity potential, but higher antioxidant content may offer protective effect
- Kernza showed reduced levels of peroxide formation during storage versus Hard Red Wheat which points to an increased resistance to oxidative rancidity
- Microbiological Spoilage: Kernza does not require special preventative measures
- Whole grain Kernza is stable when stored under typical grain storage conditions, though once hulled, the grain may benefit from refrigerated storage to help extend its shelf life

References

1. The Land Institute, 2020, https://landinstitute.org/our-work/perennial-crops/kernza/
2. *"Kernza in Southern Minnesota: Assessing Local Viability of Intermediate Wheatgrass"* Erik Muckey, January 2019, University of Minnesota Extension
3. Marti et al, "*Structural characterization of proteins in wheat flour doughs enriched with intermediate wheatgrass (Thinopyrum intermedium) flour"*, 2015, Journal of Food Chemistry
4. *"Evaluation of the Chemical and Functional Stability of Intermediate Wheatgrass (Thinopyrum intermedium) over Storage and in Response to Steam Treatment"* Amy Mathiowetz, December 2018, University of Minnesota

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