Organic Intermediate Wheatgrass Grain (a.k.a. Kernza®)

2018

Contents

Initial Experience with Growing, Processing, and Marketing in Michigan, 2017

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Introduction

All of the grains consumed by humans (wheat, oats, barley, rice, sorghum, etc..) are currently harvested from annual plants. Yet, a number of scientists and consumers have recognized that perennial plants can provide a number of environmental and agronomic advantages compared to annual plants. The Land Institute (https://landinstitute.org/) in Salina, Kansas has been at the forefront of this discussion, and scientists have been working to identify and further develop perennial plants that produce significant quantities of nutritious and tasty grain for human consumption. Intermediate wheatgrass (*Thinopyrum intermedium*) is one of the species identified for such development, the grain of which is being sold under the trade name, Kernza® by The Land Institute (https://landinstitute.org/our-work/perennial-crops/kernza/).

MACON CREEK MALT HOUSE

MICHIGAN STATE UNIVERSITY | Extension

KBS W.K. Kellogg Biological Station Kellogg Farm

Production

Harvesting at W.K. Kellogg Biological Station (2017)

At the W.K. Kellogg Biological Station, we have been fortunate to support a number of projects related to intermediate wheatgrass, and are currently a host site of a Michigan State University project led by Dr. Sieglinde Snapp, Vicki Morrone and Dr. Kim Cassida who study the ability to grow intermediate wheatgrass using certified organic practices (Funded by the Ceres Trust). The team is also examining the ability of the crop to produce grain for human consumption and forage for livestock in the same growing season. The first grain harvest, in 2017, from the two acre plot produced approximately 1,600 lbs of unprocessed grain. Without a research need for all of the harvested grain, we wanted to explore the market potential of this novel grain crop.

The Land Institute has contracted with another organization, called Plovgh (pronounced “plow”), to help match Kernza® farmers to retailers, and to maintain the integrity of the grain so that consumers can be assured that the product they receive is actually Kernza®. Plovgh requires that all growers must have a license agreement and field inspection to ensure the purity of the crop. After conversations with Plovgh and The Land Institute, we decided to send a sample of our grain to the MSU Upper Peninsula Research and Extension Center (UPREC) for cleaning and grain analysis. Approximately 1,300 lbs of the grain was sent to the Macon Creek Malt House in Saline, MI, owned and operated by Megan Phillips Goldenberg, to be cleaned.

Cleaning & Processing

At Macon Creek Malt House, the Kernza® was run through an AT Ferrell 2B fanning mill first, bypassing the fan, to remove large debris and straw. Second, the grain was run through the Forsberg 7F Impact Huller at 90 rpm (80 and 100rpm were both tested, 80 rpm was less effective at hulling and 100 rpm resulted in greater shattering and pulverization of grain). During hulling there was some clogging resulting in loss of effectiveness of the impact huller.

Once hulled, the Kernza® was put through the fanning mill with the fall to separate detached hulls, dust, and smaller debris. After this step, approximately 70 to 80% of Kernza® kernels were dehulled. During this pass through the fanning mill, there was also a moderate loss of small grain due to their light weight.

The remaining Kernza® was run through the huller a second time, using the same steps but with significantly less clogging lending to increased dehulling and cleaner grain. After this third and final step the Kernza® was well-cleaned and ready for milling.

Of the approximately 1300 lbs harvested grain, there was an estimated 300 to 400 pounds of clean and dehulled Kernza® (23% to 30% of total harvest weight). Cleaning time was substantial (15hr) due to the size of the equipment and the amount of chaff and debris. Chaff and debris were given to a livestock farmer for bedding.

Austin Wertheimer, associate at Macon Creek Malt House, dehulling Kernza on a Forsberg 7F Impact Huller (2018)

Quality Evaluation

Dr. Lee DeHaan, lead Kernza® scientist at The Land Institute, reports that the grain quality can vary substantially based on growing, storage and cleaning conditions. For example, weed seeds can impart flavors into the Kernza® grain, or storage in too high of moisture can cause deterioration of the grain quality and flavor, though this is problem with all grains, particularly organically grown ones.

While weeds grow next to plants in the field, ergot, a fungal disease, infects the seed head and forms bodies that look like purple or black pods. They replace some of the Kernza® grain in the seed head and cause further contamination. Ergot can infect any grass except oats and lasts in the soil for one or two years. This disease is most infectious if the weather is cool and wet during the grain flowering. During harvest, the pods can break open and contaminate the soil and the kernels. Grain can be cleaned using a gravity table to remove some of the ergot bodies but this is an expensive process and never results in 100% clean-grain.

Upon closer examination of the cleaned grain, we decided to test for ergot contamination again, through Great Plains Lab. The test showed an ergot level of 0.1%.

	Field Harvested Grain	Cleaned Grain
Ergot Levels	1-2%	0.1%
Protein	15.4%	
Moisture	10.3%	
Testing Facility	UPREC	Great Plains Lab

Marketing & Consumer Use

Some bakers, with previous experience using Kernza® flour, report inconsistent flavors. Mostly this is due to the grain's flavor profile; it is reminiscent of "weedy", "grassy", and "dairy" flavors, better suited for savory applications like crackers and sourdough breads. Its small sized grain and bran to hull ratio make milling a consistent, fine flour a challenge. Grain product company, General Mills has announced intent to begin manufacture of a Kernza®-containing product within the next year.

Attempts to malt this grain have experienced limited success, and based on others' recommendations, we have decided that it is not suitable for this use. Brewers have found that when including this grain in beer recipes as 15-20% of the total grain bill, the enzymes from the malted barley are adequate to convert starches in the raw Kernza® into useable sugars during the brewing process.

Even though the ergot contamination was moderate in this year's harvest, and the Kernza® could still have been utilized as a partial ingredient in end use products, we chose not to pursue marketing the crop. The percent of ergot that can safely be present is 0.05% of the grain or based on the sum of all of the ingredients in the end use product. Thus, we could have produced a food safe end product by mixing 50% of our Kernza® grain with 50% ergot free grain, however, we did not do this. The remaining grain will be used for livestock feed.

Lessons Learned

After realizing that ergot is at a detectable level in that field, we need to take precautions. Avoiding planting grains in fields that have a history of ergot is a recommended best practice, but since this is a perennial crop that will grow in this field for a few more years, we need to take safeguard against infection in the following years' harvests. We are applying adequate nitrogen sources using dairy manure and a dried poultry manure to maximize the crop's health. Also we will adjust the copper and boron in the soil to improve the crop and reduce ergot infection rate. Bolstering the health of the crop will improve its ability to fight of the infection.

The challenges we have encountered so far in Michigan show that there is still a lot to learn about producing Kernza® in our region, so our research continues to identify better practices and alternative uses to maximize the economic and environmental return of this crop.

We are excited to see how the 2018 harvest will compare!

Screening out debris on the top screen of an AT Ferrell 2B (2018)