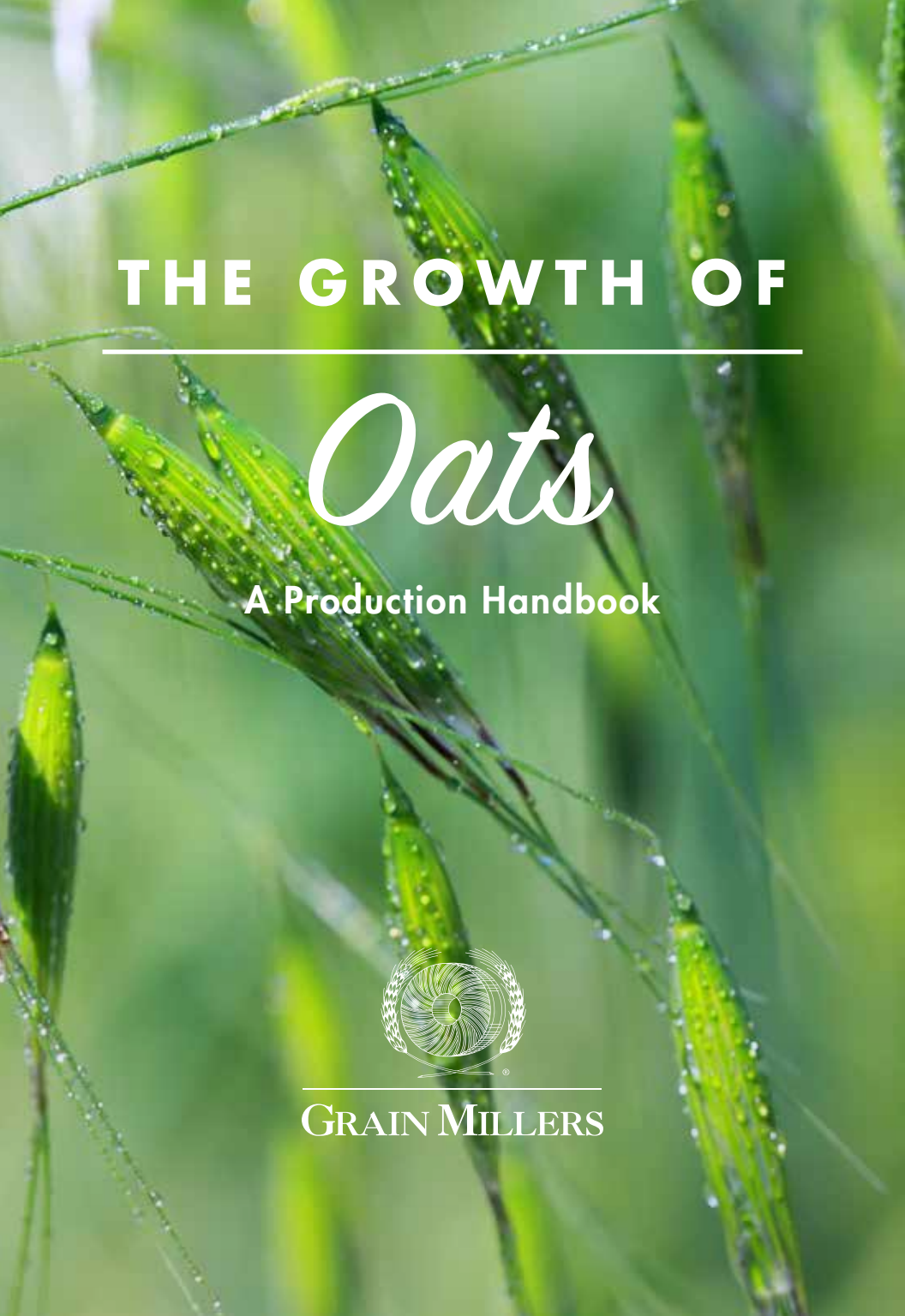
THE GROWTH OF
Oats
A Production Handbook
GRAIN MILLERS

OVERVIEW

Since 1986, Grain Millers, Inc. has been a leading manufacturer of whole grain ingredients used in cereals, breads, bars, snacks, and many other food products served around the world. Over the last 30 years we have experienced significant growth and expansion. This growth requires the support of our growers through the production of a food-grade oat crop.

Food-grade oats are grains that are destined to become an ingredient for human consumption. It is important that we buy "an ingredient" and not a commodity. These oats need to be clean with plump, high test-weight kernels.

Over the years we have been approached by growers asking what needs to be done to produce food-grade oats. In an effort to help growers meet these needs, Grain Millers introduced a crop sciences group in 2012. This group is dedicated to helping farmers produce a crop of the greatest quality and quantity. It is important that growers are able to produce the best crop and ingredient. This guide is designed to be used as a resource for growers to help them achieve these quality specifications and goals.

VARIETY & FIELD SELECTION

Varietal selection is one of the most important considerations when producing oats destined for human consumption. Varieties will differ in many characteristics including yield, lodging resistance, test weight, hull percentage, hull color, maturity, and disease resistance. In general, later maturing varieties may produce greater yields. However, there may be some negative agronomic characteristics that offset the yield potential. There is not one single variety that is deemed "best" for all situations.

There are different environmental factors to consider when selecting an oat variety for use on your farm. Environmental factors include previous crops, disease problems, fertility, season length, rainfall, temperature, and soil types. Once these factors have been identified, a Grain Millers merchandiser or agronomist can assist you in identifying what varieties will be best for your growing conditions and market.

Oats are a resilient crop. To maximize yield and quality, potential field selection must be evaluated. Some factors to evaluate include:

- Fields should be relatively free of wild oats and have minimal to no herbicide residue carryover.
- It is best practice to NOT rotate cereals back to back with oats.
- More desirable rotational crops include canola, corn, hay fields, soybeans, and/or other legumes.
- Oats can tolerate cooler and wetter soils than many other crops and can germinate at soil temps as low as 45°F or 7°C.[1] Early planting will typically help promote a higher quality food ingredient.

1. Peterson, David. "Chapter 4." Oat Science and Technology. 1st ed. N.p.: ASA/CSSA, 1992. 81. Print

SEEDING

It is recommended to use certified seed to ensure purity, germination and overall quality. Oats need to be in the ground early to provide defense against weeds and weather. Usually oats are seeded starting in early or mid-March in parts of Iowa and through mid-June in the northern growing regions of Alberta. As mentioned previously, oats are a hardy crop, and can germinate in soil temps as low as 45°F or 7°C.

The recommended seeding rate for oats usually varies between 80 and 130 pounds per acre, depending upon the amount of seeds per pound. The goal of this seeding rate is to have a final stand of 18-25 plants per square foot. Although it is somewhat complex, it is important to calculate seeding rate in the method described below, because individual kernel size can vary greatly among varieties and crop years. Calculating seeding rate in this fashion can ensure you achieve optimal plant populations, which reduces tillering and improves both yield and quality. To accurately calculate seeding rate, use seeds per pound and the following formula:

$$\text{Seeding rate (lbs/acre)} = \frac{\text{(desired stand} \div \text{(1-expected stand loss*))}}{\text{(seeds per lb.)} \times \text{(\% seed germination))}}$$

*Expected stand loss is used in a decimal form (10 percent = 0.1)
"Desired Stand" is defined as plants per acre

FERTILITY & WEED CONTROL

Oats require fewer nutrients than many other crops. To produce 100 bushel (bu.) of oats the minimum plant needs are as follows: N = 73 lbs/A, P2O5= 27lbs/A, K2O= 18 lbs/A, Mg= 4lbs/A, and S=7 lbs/A. These levels are the bare minimum that the crop will remove. To promote higher yields, be sure to increase nutrient levels within the soil in a balanced formulation.

Soil tests are recommended to determine nutrient levels within the soil and accurately determine additional nutrient needs. For a healthy oat crop with yields over 100 bu. it is recommended that the soil nitrate test have at least 120lbs/A in the top 2 feet. Applying too much nitrogen may cause lodging and test weight issues later in the season.

Organic and conventional systems share common weed control tactics. The first of these is early planting. Early establishment of oats allows the crop to canopy and compete better with weeds. Oats are also known to provide an allelopathic (the chemical inhibition of one plant acting as a germination or growth inhibitor) residue that hinders germination of many weeds."[2] In addition, the seeding rate plays a factor in overall weed control. An adequate stand will help shade and create stronger competition against weeds.

Conventional systems also allow for use of herbicides to help promote weed control. South Dakota State University and the Government of Saskatchewan provide valuable information for approved herbicides. The resources are as follows:

- South Dakota Pest Management Guide for Small Grains
- Government of Saskatchewan 2021 Guide to Crop Protection: weeds, plant disease, insects (pg. 62)

Be sure to only use approved herbicides and to always follow label directions for application.

2. Managing Cover Crops Profitably, 3rd Ed. 3rd ed. Sustainable Agriculture Network, 2007. 93-97 Print.

INSECTS & DISEASES

Monitoring disease pressure is just as important in oats as any other crop. A handful of diseases bring about the largest area for concern. Crown and Stem Rust, Septoria, and Fusarium Head Blight are the most prominent fungal diseases. These can all be treated with timely applications of fungicides in a conventional system. When in an organic system, control comes from genetic resistance increasing the importance of variety selection. Barley Yellow Dwarf (BYDV), or Red Leaf, is a prominent virus that can affect oats. The best management plan for this disease is genetic resistance and/or chemical control of the Cherry Oat Aphid, which is a vector for the disease.

Crown Rust: Symptoms of this fungal disease consist of red/orange-colored pustules forming on the leaves of the oat plant. Fields should be scouted during the late 4 leaf stage and into flag leaf. Fungicide control for crown rust is most effective when applied during flag leaf.

Crown Rust in Oats (Swedish U of Ag. Sciences, Dept of Forest Mycology and Plant Pathology)

INSECTS & DISEASES
(continued)

Septoria: A fungal disease that exhibits symptoms first as small spots on the lower leaves of seedlings. Spots grow into larger, lens-shaped lesions which are initially yellow and later turn reddish brown.[3] Lesions are first found on lower leaves within the plant canopy. Wet, warm, and humid conditions promote growth. Fungicide applications have been known to help control spread and damage of the disease.

Oats infected with Septoria (Dept. of Ag. New Brunswick,Canada)

Fusarium Head Blight: Fusarium Head Blight: Common symptoms are pink and tan shading at the base of an infected glume. This fungal disease is known to produce the mycotoxin deoxynivalenol (DON), more commonly known as vomitoxin. It is hard to scout for and detect within an oat crop. Fungicide application during flag leaf has been known to help reduce effects of FHB.

3. "Septoria Leaf and Glume Blotch in Wheat, Barley, and Oats. "Agriculture, Food, and Rural Development. Government of Manitoba, Web.

INSECTS & DISEASES
(continued)

BYDV: Also known as Red leaf, it is a virus that turns an infected leaf red or yellow and causes it to curl toward the midrib. The most common vector for BYDV is the Cherry Oat Aphid. BYDV is best controlled with genetic resistance variety selection. The newer varieties typically show resistance.

Oat plant infected with BYDV (From Oklahoma State University)

MATURITY & HARVESTING

Oats, unlike many other grains, mature from the top of the panicle downward. Since 90% of grain is in the bottom two-thirds of the head, it is important to ensure proper maturity before harvest.

- Swathing: Ideal grain moisture range is between 20-25%. The greenest kernels should have just changed to a cream color. Swathing the oats too early will have a negative effect on test weight and milling quality. The oats should then dry to approximately 14% in the windrow before combining.
- Straight Cutting: This should be done once the oats have reached full maturity and the grain has dried to a moisture of approximately 14-15%. Straight cutting may be done providing that adequate air drying is available prior to long term storage.

It is important to note that the desired moisture specification for delivery to Grain Millers' facilities is 13.5%. If there is no on-farm capacity for bringing moisture down (aeration storage, grain dryer, etc.) then target harvest moisture should be 13.5% or less.

It is important to avoid dehulled kernels when harvesting. If conditions are dry, widen concave and slow cylinder speeds to prevent de-hulling and kernel breakage; perform reverse procedure if threshing quality is poor. Increasing fan speed will provide heavier test weights and higher quality milling oats.

STORAGE

Proper grain storage is imperative to maintain quality milling oats. Storage for oats should be clean and dry; aeration is best if available. The target moisture should be between 11-13% when entering the bin for long-term storage.

If the oats are harvested above 14%, the proper use of a grain dryer is recommended to bring down the moisture to an appropriate level. When drying oats, the dryer should remain at a temperature of less than 160°F (70°C). Grain temperature should not exceed 120°F (50°C) during the drying process. After drying, the oats should be aerated in order to reduce the temperature for greater quality preservation.

When moisture is below 14% at harvest, simple aeration will be able to bring down the moisture to storage levels. Be sure to only run fans on cool and dry days. As with all grain, oats should be closely monitored for hot spots or quality deterioration.

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