CFAES

HORTICULTURE AND CROP SCIENCE

Winter Malting Barley Seeding Rate Trials- Year 1

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In fall 2017, a seeding rate trial was established at three locations in Ohio- Northwest Agricultural Research Station (NWARS) in Wood Co., Ohio Agricultural Research and Development Center (OARDC) in Wayne Co., and Western Agricultural Research Station (WARS) in Clark Co. Treatments included five seeding rates of: 0.75, 1.0, 1.5, 2.0, and 2.5 million seeds/acre. The barley cultivar 'Puffin' was planted at all locations.

Table 1. Cultural practices by test site.

	NWARS	OARDC	WARS
Previous crop	Soybean	Soybean	Soybean
Soil type	Hoytville	Canfield	Strawn-Crosby
Tillage	Disc; field cultivator	In-line ripper; vertical	Disc; culti-mulcher
Fly-free date	Sept. 23	Sept. 26	Sept. 29
Plant date	Sept. 29	Oct. 7	Oct. 19
Soil pH	6.7	6.4	6.2
Soil test P (ppm)	66	47	39
Soil test K (ppm)	226	164	144
CEC	21.6	8.8	14.5
OM (%)	4.0	2.4	2.6
N application (fall + spring)	110 lb N/acre	101 lb N/acre	103 lb N/acre
Herbicides	Stinger	Harmony Extra SG, Broclean, Compadre	Harmony Extra SG, Maestro 2EC
Fungicides	Prosaro on May 16	Prosaro on May 16	Prosaro on May 15
Insecticides	None	None	None
Harvest Date	June 21	June 29	June 25

Effect of Seeding Rate on Grain Yield

Overall, there was a poor relationship between seeding rate and grain yield. The number of stems (main shoot + tillers) at Feekes 5 growth stage (leaf sheaths strongly erect) was more closely related to grain yield than seeding rate. **The agronomic optimum seeding rate (seeding rate where grain yield was greatest) was 1.6-1.8 million seeds/acre (Figure 1).**

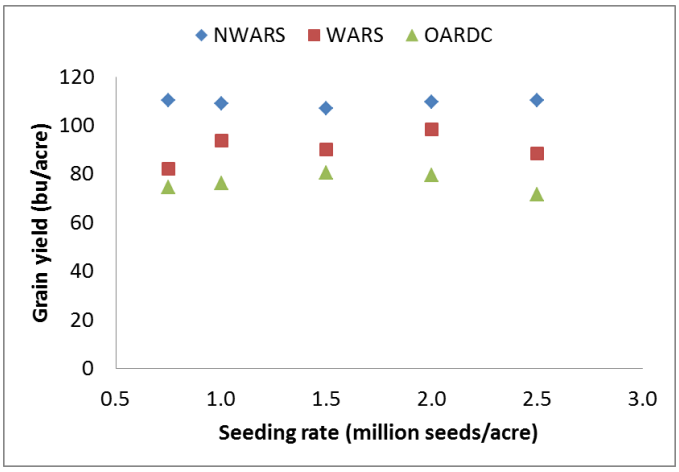

Figure 1. The agronomic optimum seeding rate was 1.6-1.8 million seeds/acre.

Barley should be planted based on the number of seeds/acre. Planting by pounds/acre or bushels/acre is inaccurate due to variability in seed size. **Keep in mind, barley seed is often larger (fewer seeds per pound) than winter wheat seed.** In our trials, 'Puffin' had ~10,000 seeds/pound.

Evaluating Barley Stand in the Spring

Between planting in the fall and resuming growth in the spring, fall planted crops are vulnerable to environmental stress such as freezing temperatures with limited snow cover, saturated soils, and freeze-thaw cycles that cause the soil to heave, which may cause substantial stand reduction. However, a stand that *looks* thin in the spring does not always correspond to low grain yield. Figure 2 shows pictures from our trials planted at WARS.

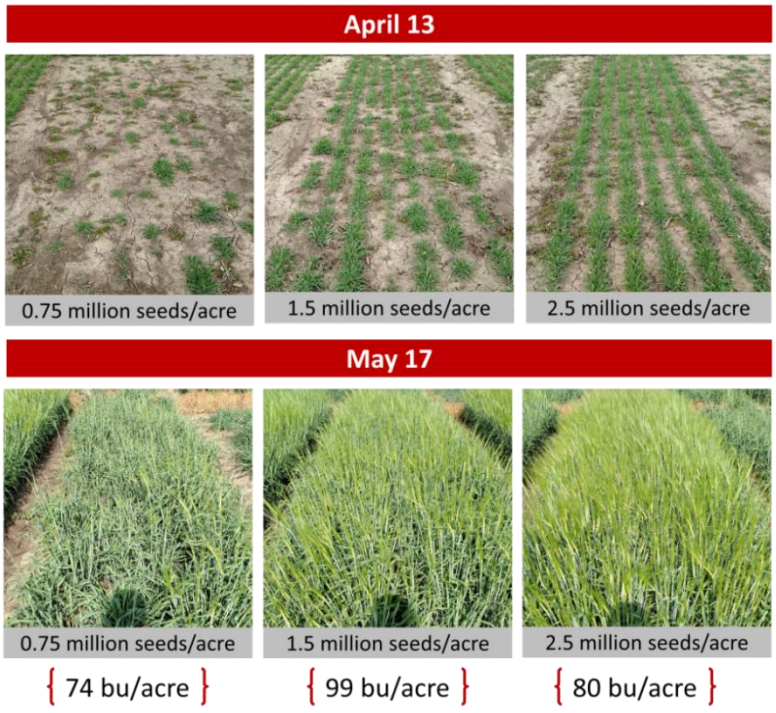

Figure 2. Winter malting barley planted at 0.75, 1.5, and 2.5 million seeds/acre yielded 74, 99, and 80 bu/acre, respectively.

Rather than solely relying on visual stand assessment, farmers should estimate the yield potential of their fall planted small grain crop by counting the number of stems. However, stem counts by hand are time-consuming and labor-intensive. In this research, we evaluated alternative techniques, including fractional green canopy cover (FGCC) and normalized difference vegetation index (NDVI), to estimate yield potential of winter malting barley at Feekes 5 growth stage.

Methods Used to Evaluate Barley Stand

In our trials, we used three methods to evaluate barley stand in the spring at Feekes 5 growth stage:

1) Stem counts- Counting all stems (main stem + tillers) in one foot of row (Figure 3).
2) NDVI- Using a handheld GreenSeeker sensor (Trimble, Inc.)
3) FGCC- Using the free mobile phone application Canopeo (available at: http://canopeoapp.com) (Figure 4)

Figure 3. Measurement tool used to consistently count the number of stems in one foot of row.

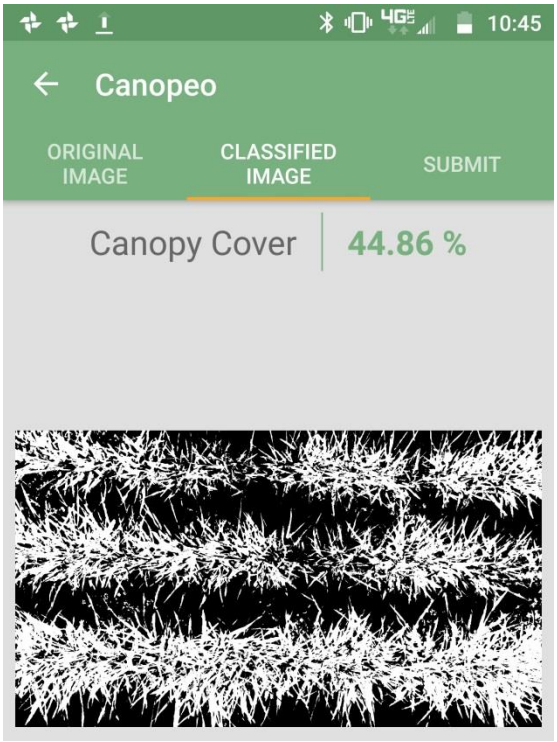

Figure 4. Winter malting barley image analyzed for FGCC with the Canopeo mobile device application.

Stand Evaluation Results

Stem counts, NDVI, and FGCC explained 78%, 67%, and 63% of the variability in grain yield, respectively. The relationship between each measurement and grain yield is shown in Table 2. For example, if you count 23 barley stems in one foot of row, the estimated yield would be 50 bu/acre. Similarly, if you use the Canopeo phone application to measure FGCC from three rows of barley and get a FGCC value of 10%, the estimated grain yield would be 50 bu/acre.

Table 2. Estimated grain yield based on number of stems, NDVI, and FGCC.

Grain yield (bu/acre)	Stem count (number/ft row)	NDVI (unitless)	FGCC (%)
50	23	0.23	10
60	28	0.26	12
70	34	0.29	15
80	40	0.33	18
90	46	0.40	22
100	53	0.45	28
110	62	0.45	34

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