

## Evaluation of Organic HRS Wheat Seeding Rates

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**N**orth Dakota has a history of organic production and is a leader in the nation with USDA certified organic acres ranking fifth overall in 2016. The majority of the organic acres are field crops with spring wheat being the main crop grown in the state.

With the absence of synthetic inputs such as herbicides for weed control organic farming relies on cultural methods to control pests like weeds. Organic agriculture tends to use increased seeding rates as a production practice. An organic field trial was established at the CREC to evaluate seeding rates with spring wheat. The trial was in collaboration with the Northern Plains Sustainable Agriculture Society's (NPSAS) Farm Breeding Club (FBC). The FBC is a non-profit member group that works with farmers to evaluate and develop crop varieties adapted to organic agriculture. The seed source used in the trial was a variety of hard red spring wheat released by the FBC in 2008. Objectives of this trial were twofold: evaluate the effect of seeding rates on agronomic performance and determine the effect seeding rate has on milling and baking qualities of the wheat.

The trial evaluated six seeding rates ranging from 500,000 to 3 million PLS/ac spaced in increments of 0.5 million PLS between each treatment. Seeding rates ranged from 36 to 218 pounds per acre. FBC Dylan wheat was sown on May 3 on ground that was a radish cover crop the previous year. The seed lot used had a germination of 98% and a seed count of 14,012 seeds per pound. The trial was blind harrowed (crop not emerged) with a tine weeder on May 7 for weed control. Stand counts were taken on May 17 to determine the number of plants established with each seeding rate. Stand counts are presented both in plants/ac and plants per square foot. Stand establishment based on percent of plants emerged relative to seeding rate was highest at the lowest seed rate, 85%, while only 60% establishment was achieved at the highest seeding rate (data not presented). Data gathered illustrates a trend often observed where successful plant establishment in relationship to seed rate decreases as seeding rates increase.

Gathered agronomic data demonstrate the effect plant density has on maturity. Lower seeding rates took longer to reach heading as compared to higher rates. Days to 50% heading ranged from 56 days for the 0.5 million rate to 52 days for the 3 million rate. Plant height was also influenced by seeding rates. As rates are increased, plant heights tend to slightly decrease. Spike counts taken at harvest demonstrate the wheat plant's ability to compensate by producing more spikes per plant with lower plant densities. Counts from the lowest rates show that the plants produced 1.9 spikes per plant as compared to 1.1 spikes for the highest rates.

The trial was direct combined on August 18. Grain quality was significantly influenced by seeding rate in this trial. Seed weights or 1000 KWT were higher for the lower rates and decreased as the seeding rate was increased. Test weights were the opposite, as seeding rates increased there was a trend of increased test weight. Grain protein was highest for the 0.5 million seeding rate and decreased as the seeding rate increased. Protein contents significantly decreased approximately 1% from the lowest to the highest rate.

Grain yields were significantly influenced by seeding rates with this trial. As rates were increased there was a trend for increase grain yield. Yields increased from 30 to 39.8 bushels per acre as seeding rates were increased. Data gathered from this trial suggest that a seeding rate of 1.5 million PLS/ac or greater is required for organic management of a spring wheat crop.

Samples from each of the seeding rate treatments will be sent to a miller/baker where they will be stone ground and artesian baked as 100% whole wheat to determine if plant density has an influence on the milling and baking qualities of this wheat variety.

<b>Organic Hard Red Spring Wheat Seeding Rate Trial</b>
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Seeding Rate	Pounds Sown	Seedling Stand	Seedling Stand	Days to Heading	Plant Height	Spikes	Spikes	1000 KWT	Test Weight	Grain Protein	Grain Yield
PLS/ac	lb/ac	plants/acre	sq ft		inch	spikes/acre	sq ft	gram	lb/bu	%	bu/ac
0.5 million	36.4	427,107	9.8	56.0	30.2	802,961	18.4	34.6	59.5	10.5	30.0
1 million	72.8	625,000	14.3	54.8	30.0	1,084,852	24.9	33.9	60.7	10.2	34.4
1.5 million	109.2	895,501	20.5	54.0	29.2	1,181,663	27.1	32.3	60.7	9.9	37.1
2 million	145.6	1,272,779	29.2	52.3	28.9	1,355,353	31.1	31.4	60.5	9.4	36.4
2.5 million	182	1,463,554	33.6	52.0	28.8	1,711,276	39.3	31.0	60.6	9.6	39.8
3 million	218.5	1,816,629	41.7	52.0	27.8	1,950,456	44.7	30.1	60.3	9.6	38.0
Mean		1,083,428	24.9	53.5	29.2	1,347,760	30.9	32.2	60.3	9.9	36.0
C.V. (%)		10.6	10.6	1.3	3.1	10.0	10.0	3.4	0.7	5.6	5.5
LSD 0.05		173,097	4.0	1.0	1.4	203,254	4.7	1.6	0.7	0.8	3.0