# Seeding Rate for Dryland Wheat

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## Summary

Four winter wheat varieties (Plainsgold Byrd, Limagrain T158, Syngenta TAM 111, and WestBred Winterhawk) were planted at five seeding rates (30, 45, 60, 75, and 90 lb/a) in the fall of 2014 at Colby, Garden City, and Tribune, KS. The objective of the study is to identify appropriate seeding rates for dryland winter wheat in western Kansas. Averaged across varieties, a seeding rate of 60 lb/a seemed to be adequate at all locations in 2015. The wheat variety T158 was the highest yielding (or in the highest group) at all locations. Other varieties may have been affected by differential response to stripe rust and winter injury resulting in lower yields. Variety selection appears to have more effect on wheat yields than seeding rate.

## Introduction

The purpose of this project is to determine appropriate seeding rates for dryland winter wheat in western Kansas. In recent years, there appears to be an increase in seeding rate without corresponding increase in grain yields. A preliminary study conducted in 2014 found no yield benefit from increasing seeding rates from 30 to 75 lb seed/a for 4 wheat varieties at Tribune while a similar study at Garden City suffered severe hail damage causing yields to be less than 10 bu/a. The objective is to evaluate seeding rates on grain yield of several popular wheat varieties under dryland conditions at three sites in western Kansas.

## Procedures

Four winter wheat varieties (Byrd, T158, TAM111, and Winterhawk) were planted at five seeding rates (30, 45, 60, 75, and 90 lb/a) in the fall of 2014 at Colby, Garden City, and Tribune, KS. The date of seeding was October 20 at Colby, October 9 at Garden City, and September 26 at Tribune. Seed size was 15,839, 15,479, 17,627, and 12,921 seed/lb for Byrd, T158, TAM 111, and Winterhawk, respectively. All plots were planted on fallow land. Harvest was done on July 4 at Colby, June 29 at Garden City, and June 30 at Tribune. Growing season precipitation (October through June) was 14.03" at Colby, 12.18" at Garden City, and 12.83" at Tribune. Starter fertilizer was applied (5.5-26-0) at Garden City, and (6-20-0) at Tribune. The wheat was topdressed with 90 lb N/a at Colby, 30 lb N/a at Garden City, and 60 lb N/a at Tribune. Herbicides were applied in the spring for weed control: Ally Extra (0.5 oz/a) at Colby; Starane Ultra (0.4 pt/a) + MCPA (0.75 pt/a) + Ally (0.1 oz/a) at Garden City; and dicamba (4 oz/a) + Ally (0.1 oz/a) at Tribune. Plot size was 7.5 by 30 ft at Garden City, and 5 by 40 ft at Colby and Tribune. All treatments were replicated four times. Grain yields were determined by harvesting with a plot combine with moisture corrected to 13%.

## Results and Discussion

Growing season precipitation was near normal for Garden City and Tribune and above normal for Colby in 2015. However, this was created by a wet May (6.38" in Garden City, 6.16" at Tribune, and 6.42" at Colby) making up for a dry winter and early spring. Averaged across seeding rates at Tribune, T158 and Winterhawk produced the greatest yields with TAM 111 producing the lowest yields (Table 1). At both Colby and Garden City, T158 produced significantly higher yields than all other varieties. Stripe rust was prevalent in the 2015 growing season. Resistance ratings from the Kansas State University Department of Plant Pathology (publication MF991, Wheat Variety Disease and Insect Ratings 2016), with a scale of 1 being resistant to 10 being susceptible, were 8, 2, 8, and 6 for Byrd, T158, TAM111, and Winterhawk, respectively. Stripe rust infestation and associated yield reductions at Colby (and other locations) were consistent with these ratings.

At all sites averaged across varieties, there was a positive yield response to increased seeding rates with greatest response when increasing from 30 up to 60 lb/a with minimal response above 60 lb/a.

Based on 2015 results, it appears that a seeding rate of 60 lb/a was adequate for all locations. Variety selection appears to have a greater effect on wheat yield than seeding rate.

**Table 1. Dryland wheat response to variety and seeding rate at three locations in 2015.**

| Variety | Seeding rate | Grain yield | | | |
|---|---|---|---|---|---|
| | | Tribune | Garden City | Colby | Average |
| | lb/a | ---------- bu/a ---------- | | | |
| Byrd | 30 | 47 | 38 | 23 | 36 |
| | 45 | 53 | 42 | 25 | 40 |
| | 60 | 60 | 50 | 27 | 46 |
| | 75 | 54 | 51 | 29 | 45 |
| | 90 | 59 | 53 | 28 | 46 |
| T158 | 30 | 59 | 72 | 45 | 59 |
| | 45 | 60 | 71 | 53 | 61 |
| | 60 | 64 | 79 | 56 | 67 |
| | 75 | 70 | 71 | 53 | 65 |
| | 90 | 71 | 65 | 55 | 64 |
| TAM 111 | 30 | 39 | 34 | 20 | 31 |
| | 45 | 41 | 40 | 25 | 35 |
| | 60 | 43 | 44 | 28 | 39 |
| | 75 | 46 | 50 | 32 | 43 |
| | 90 | 45 | 52 | 34 | 43 |
| Winterhawk | 30 | 60 | 31 | 21 | 37 |
| | 45 | 67 | 41 | 25 | 44 |
| | 60 | 68 | 42 | 29 | 47 |
| | 75 | 64 | 51 | 34 | 50 |
| | 90 | 68 | 50 | 35 | 51 |

*continued*

**Table 1. Dryland wheat response to variety and seeding rate at three locations in 2015.**

| Variety | Seeding rate | Grain yield | | | |
|---|---|---|---|---|---|
| | | Tribune | Garden City | Colby | Average |
| | lb/a | ---------- bu/a ---------- | | | |
| ANOVA (P>F) | | | | | |
| Variety | | 0.001 | 0.001 | 0.001 | 0.001 |
| Seeding Rate | | 0.001 | 0.001 | 0.001 | 0.001 |
| Variety * Seeding Rate | | 0.046 | 0.001 | 0.731 | 0.124 |
| Location | | - - - | - - - | - - - | 0.001 |
| Location*Variety | | - - - | - - - | - - - | 0.001 |
| Location*Seeding Rate | | - - - | - - - | - - - | 0.743 |
| Location*Variety*Seeding Rate | | - - - | - - - | - - - | 0.001 |
| MEANS[1] | | | | | |
| Variety | | | | | |
| Byrd | | 55b | 47b | 26b | 43c |
| T158 | | 65a | 72a | 53a | 63a |
| TAM 111 | | 43c | 44bc | 28b | 38d |
| Winterhawk | | 65a | 43c | 29b | 46b |
| $LSD_{0.05}$ | | 2 | 3 | 3 | 2 |
| Seeding rate (lb/a) | | | | | |
| 30 | | 51c | 44c | 27c | 41c |
| 45 | | 55b | 49b | 32b | 45b |
| 60 | | 59a | 54a | 35ab | 49a |
| 75 | | 59a | 56a | 37a | 50a |
| 90 | | 61a | 55a | 38a | 51a |
| $LSD_{0.05}$ | | 3 | 4 | 4 | 2 |

[1] Means within a column with the same letter are not statistically different at $P = 0.05$.