Seeding Rate Effects On Winter and Spring Wheat Yields in Southeast Idaho

Emily Tolley[1], Greg Blaser[1], Juliet Marshall[2], Chad Jackson[2], Tod Shelman[2], Cathy Wilson[3]

Department of Applied Plant Science, Brigham Young University-Idaho[1]; University of Idaho[2]; Idaho Wheat Commission[3]

Introduction

Economic sustainability for producers requires effective management of all input costs. Recently, seeding rate recommendations have inflated. Producers are pressured into planting over the recommended rate, (mostly based on their neighbors' practices and sales recommendations) without appropriate experimental evidence.

Most wheat producers outside of the Pacific Northwest plant according to seeds/acre rather than lbs./acre to account for every seed and lower input costs. Wheat cultivars differ by seed size, weight, and germination rates; these factors depend on seed source, location grown, and fertility practices. Calibration of each seed lot was conducted to ensure consistency in seeding rates. Trials were conducted in order to determine what planting rates would produce optimum yield and become most cost efficient for the nine winter and nine spring wheat varieties grown in southeast Idaho.

Materials and Methods

Trial locations were on BYU-Idaho campus in Rexburg, Idaho. Eighteen varieties were tested.

The winter cultivars are: *Idaho AES, USDA-ARS* lines: Brundage (SWW) and Bruneau (SWW), *Syngenta Cereal* lines: SY Ovation (SWW), Whetstone (HRW), *WestBred* (a unit of *Monsanto*) lines: WB 1529 (SWW), WB 456 (SWW), Keldin (HRW), *Oregon State University* released line Norwest 553 (HRW), and *Montana Agricultural Experiment Station's* Yellowstone (HRW).

The spring cultivars included: *Syngenta Cereal* lines: Bullseye (HRS) and Cabernet (HRS), *WestBred* lines: WB936 (HRS), Paloma (HWS), Snowcrest (HWS) and BZ 608125 (an advanced, numbered SWS from *WestBred*), Klasic (HWS), and *University of Idaho's lines:* UI Pettit (SWS) and Alturas (SWS). Abbreviations: SWW = Soft White Winter, HRW = Hard Red Winter, SWS = Soft White Spring, HWS = Hard White Spring, and HRS = Hard Red Spring.

Five different seeding rates were used for each of the varieties: 2,000,000 seeds/acre, 1,750,000 seeds/acre, 1,500,000 seeds/acre, 1,250,000 seeds/acre, and the Univ. of Idaho research standard of 1,000,000 seeds/acre. The plots (winter trials planted October 10th, 2013 and spring trials planted April 11th, 2014) were seeded using a Hege 500 plot planter (**Fig. 1**). Plot layout was a split-split plot RCB design. Main plots were varieties, sub plots were seeding rates, and sub-sub plots were seed treatment vs. non-treated. Seed was treated with Cruiser Maxx fungicide (Syngenta Crop Protection) at labeled rate of 3 fl. ounces per 100 lbs. of seed. Plot dimensions consisted of 5X16 ft. plots.

As an AGRON 445 (Cereal Crops) class project, plant stands (**Fig. 2**) were counted for each plot on May 20th, 2014. Harvest occurred on August 27 (winter trials) and August 28 (spring trials) with a Wintersteiger plot combine equipped with a Harvestmaster® 400 (**Fig. 3**) weigh system that recorded test weight, yield, and seed moisture. Statistical data was analyzed using SAS 9.2 (Cary, NC) with α=0.05. Grain protein was evaluated with NIR after harvest.

Results and Discussion

Yield vs. Seeding Rate

The coefficient of variation for yield was 8.8% for winter trials and 6.23% for spring trials. The lowest rate, 1 million seeds/ acre, had the highest yield in the winter trials (**Fig. 4**). Data shows that the varieties responded the same to different seeding rates among the reps. In the spring trials (**Fig. 5**), the yield wasn't significantly affected by planting rates.

Plant Stand/ Lodging vs. Seeding Rate

Plant stand varied by seeding rate and fungicide treatment. In winter wheat trials, treated plots showed a slight increase in stand density. Both the winter and spring trials had an increased plant stand in the higher seeding rate. This does not indicate that yield is higher, due to potential tiller competition among higher seeding rates. Further data showed increase lodging among higher seeding rate test plots.

Yield/ Test Weight/ Protein vs. Varieties

There were significant differences in yield, test weight, and protein between varieties in both the winter and spring trials. This is to be expected, as the varieties represent different market classes and genetic backgrounds. The hard wheats (Hard Red Winter, Hard White Spring, and Hard Red Spring) are for higher protein yielding kernels for bread end product use. Soft wheat classes (Soft White Winter and Soft White Spring) are for lower protein yielding kernels for pastry and cracker end product use.

Yield vs. Seed Treatment

A drop in yield (2 bushels/ acre) occurred in the treated plots of the spring trials, due to phytotoxicity. The BZ 608125 variety is the only line that responded positively to seed treatment in the spring trials. This significance did not occur in the winter wheat trials.

Conclusion

This study shows that seeding rates (within 1 million to 2 million seeds per acre) will not significantly increase yield or change grain protein. Further data shows that increased lodging occurred with increased seeding rates. Therefore, it would be economically beneficial to plant 1 million seeds per acre, rather than any other higher planting rate.

Figures

Figure 1. Planting

Figure 2. Plant Stands

Figure 3. Harvest

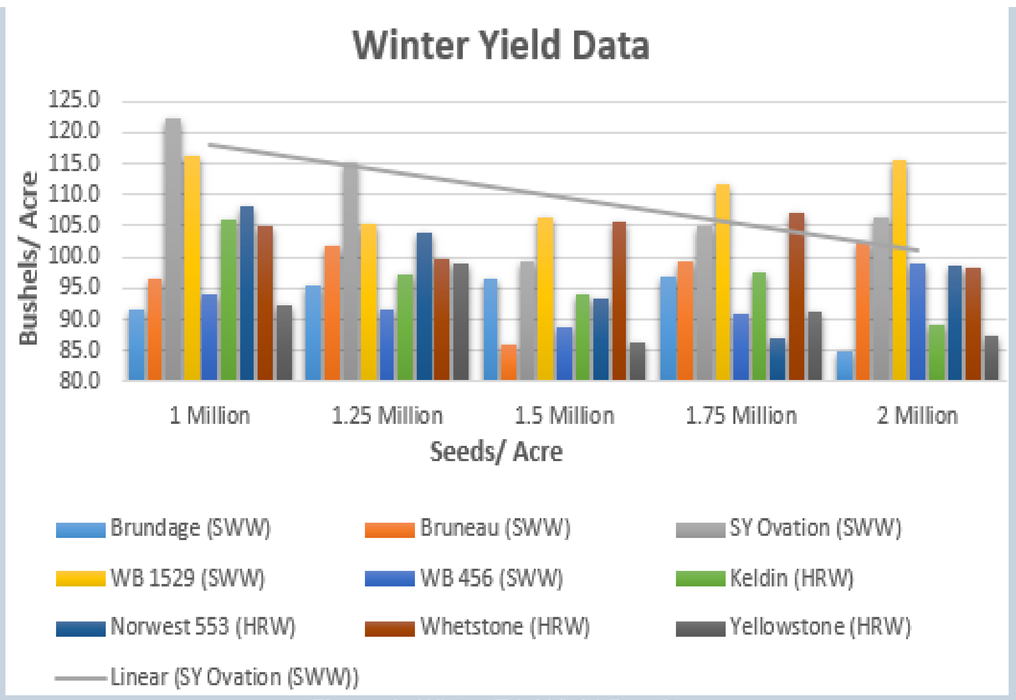

Figure 4. Winter Trial Yield Results

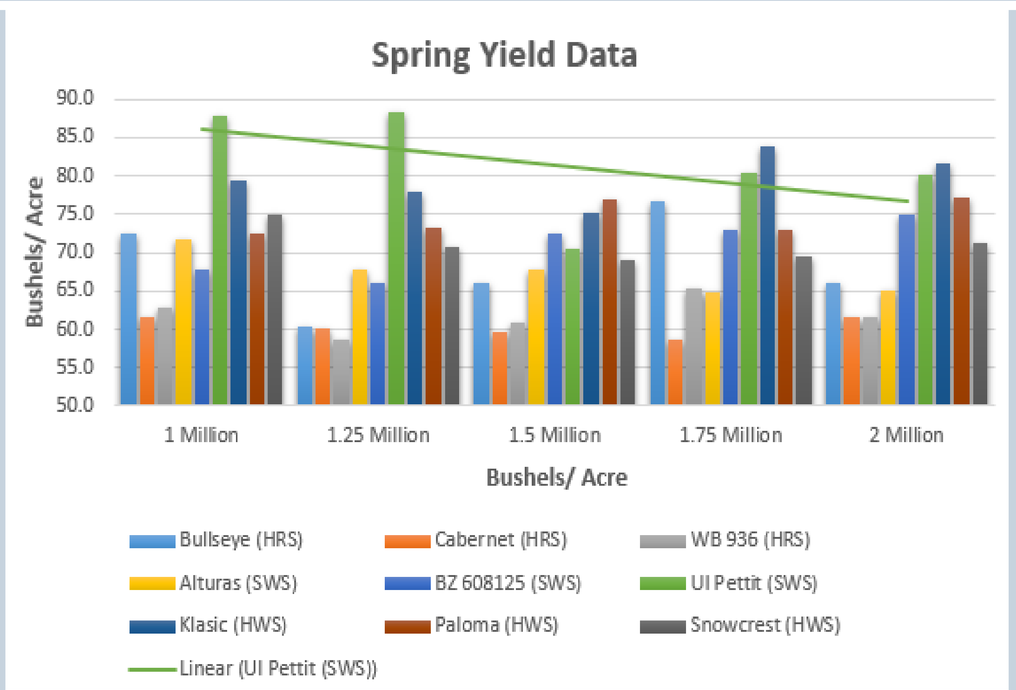

Figure 5. Spring Trial Yield Results

Sponsers