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8-1-1988

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Recommended Citation

Gutormson, Tim J.; Gellner, Jeff L.; Stymiest, Clair E.; and Hall, Robert, "Winter Wheat Seed Size and Plantic Depth" (1988).
Extension Extra. Paper 252.
http://openprairie.sdstate.edu/extension_extra/252

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Extension Extra

ExEx 8032
August 1988
Plant Science

COLLEGE OF AGRICULTURE & BIOLOGICAL SCIENCES / SOUTH DAKOTA STATE UNIVERSITY / USDA

Winter Wheat Seed Size and Planting Depth

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Because of the drought, winter wheat growers need to be especially watchful of the seed they plant this fall.

Seed size influences seedling emergence, vigor, and ultimately yield potential. Varieties differ in average seed size. Within a variety, planting larger sized seed usually results in higher yields. But most seed wheat kernels are small this year.

Quality Measures

There are several measures of winter wheat seed quality used to determine fitness for planting. The most common are test weight per bushel, grams per 1000 seeds, seeds per pound, general appearance, color, and freedom from disease.

The most consistent measure of seed quality is seed size, usually expressed as grams per 1000 seeds or seeds per pound.

Test weight per bushel affects seed quality, but is not an accurate measure of seed size. Table 1, for example, shows a comparison of test weights and seed size for Siouxland harvested at different locations in 1987 and 1988.

Winter wheat growers should use caution when discussing test weight versus seed weight. They are not the same.

Test weight is a measure of weight per bushel or weight per volume. Seed weight is the weight per thousand seeds (usually expressed in grams); therefore, it is strictly a weight measure. There is only one weight per 1000 seeds. However, the number of seeds per pound can vary at a given test weight (Table 1).

Seed Size

Within a variety, large seed--30 grams/1000 kernels (15,000 seeds/lb) or more--usually results in higher yields than small seed. A yield increase of 0.1 to 0.3 bu/A can be obtained from each 1-gram increase in 1000-kernel weight.

For example, if you plant two seed lots of the same variety having 20 and 30 grams per 1000 kernel weights, you'll harvest 1 to 3 bushels more per acre from the 30 grams/1000-kernel seed lot. Above 30 grams/1000-kernel weight, yield increases tend to be closer to 0.1 to 0.15 bu/A for each 1-gram increase in 1000-kernel weight.

Seed with 13,000 to 15,000 seeds per pound would be considered good quality for the popular winter wheat varieties grown in South Dakota. Large seeds outyield small seeds due to increased seedling vigor and number of productive tillers per plant.

Planting Population

The SDSU recommended plant population for optimum winter wheat yield is 20-24 pure live seeds per square foot or 871,000 to 1,045,500 pure live seeds per acre.

Table 1 illustrates the variability in pounds of seed needed for a population of 1,000,000 seeds per acre. Note the difference in pounds of seed needed to plant an acre from seed lots with similar test weights. Differences can be 10 to 12 pounds of additional seed an acre when using the higher test weight seed. To benefit from large sized seed, the pounds of seed planted must be increased to obtain the desired population of 1,000,000 seeds per acre.

Drill Calibration

To plant the optimum number of seeds per acre, you must know the number of seeds your drill delivers per foot of row. The calibration settings on drills are usually based on pounds per acre and not seeds per foot of row.

Calibrate the drill by running it over a road or other hard surface and counting the number of seeds delivered per linear foot of row. Then determine the setting delivering 20-24 seeds per square foot (Table 2).

Check drill calibration when changing seed lots.

Planting Date

Later planting dates are one of the best biological control methods to avoid disease and insect pressures. The recommended planting dates for winter wheat are September 5-10 for the northern, Sept 15 for the central, and Sept 20-25 for the southern portions of South Dakota.

Planting Depth

The recommended depth to plant winter wheat is 1 to 2 inches below the packed soil surface. With dry conditions this fall, you might be tempted to plant deeper, "closer to moisture." This, however, can reduce emergence.

To evaluate the effect of seed size and planting depth on emergence, seed of Brule, Rose, Sage, and Siouxland were taken from the Winter Wheat Breeding Program at Presho and Brookings.

These two locations differed drastically in yield and test weight due to this summer's drought. Test weights varied from 46 lb/bu for Brule at Presho to 62 lb/bu for Siouxland at Brookings.

The eight sources of seed (4 varieties x 2 locations) were screened to produce three sizes for each source. These 24 seed lots were planted at depths of 1, 2, 3, and 4 inches in the greenhouse in early August to test for differences in emergence.

Counts on the number of seedlings emerged were conducted 5 to 11 days after planting. Before planting, seed dormancy was broken by a cold treatment. All varieties and seed sizes produced a laboratory germination of 95-97%. Soil temperatures ranged from 65 to 90 F during the study. Soil moisture conditions were optimum.

In general, the major factor affecting seedling emergence was planting depth (Fig 1).

All varieties had at least 80% emergence at the 1- and 2-inch planting depths. At the 3-inch planting depth, emergence averaged 70%. A large reduction in emergence occurred at the 4- inch planting depth across varieties.

Seeding depths of 1 and 2 inches did not affect emergence regardless of seed size (Fig 2). At the 3-inch seeding depth, large seed tended to have greater emergence. Seeds of all sizes at the 4-inch seeding depth exhibited a unsatisfactory level of emergence.

Table 1. Comparison of test weight, grams/1000 seeds, seeds/pound and pounds needed to seed an acre of Siouxland winter wheat seed lots harvested in 1987 and 1988.

YEAR OF HARVEST	TEST WT. IN LBS	SEED SIZE		POUNDS NEEDED FOR 1,000,000 SEEDS/ACRE
		GRAMS PER 1000 SEEDS	SEEDS PER POUND	
1988	60.9	22.38	20,282	49.3
1987	60.9	27.51	16,502	60.6
1987	60.4	30.89	14,698	68.0
1987	59.5	33.14	13,699	73.0
1987	59.5	27.84	16,309	61.3
1987	58.0	25.33	17,921	55.6
1988	57.8	20.70	21,928	45.6

SDSU Seed Testing Laboratory data.

Table 2. Seeding density needed to deliver a final population of 1,000,000 seeds per acre at four drill row spacings.

Desired Seed Population	Seeds per Sq. Foot	Drill Spacing (Inches)			
		8	10	12	14
		-- Seeds per linear foot --			
871,200	20	13.3*	16.7	20.0	23.3
914,760	21	14.0	17.5	21.0	24.5
958,320	22	14.7	18.3	22.0	25.7
1,001,880	23	15.3	19.2	23.0	26.8
1,045,440	24	16.0	20.0	24.0	28.0

*Rounded to nearest tenth.

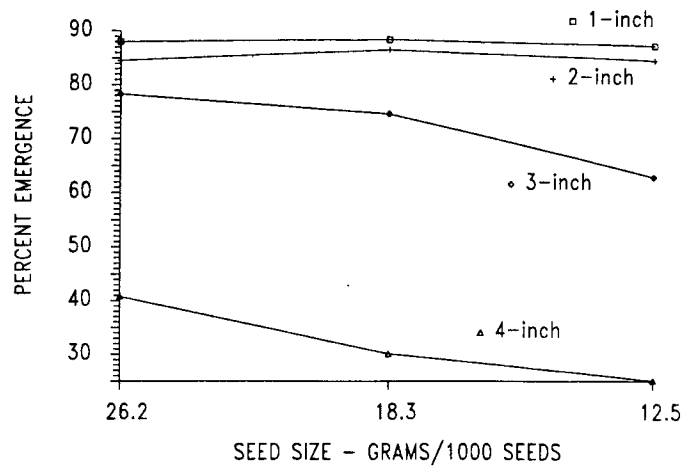


Figure 1. The relationship between greenhouse emergence and four seeding depths of four winter wheat varieties averaged over locations and seed sizes.

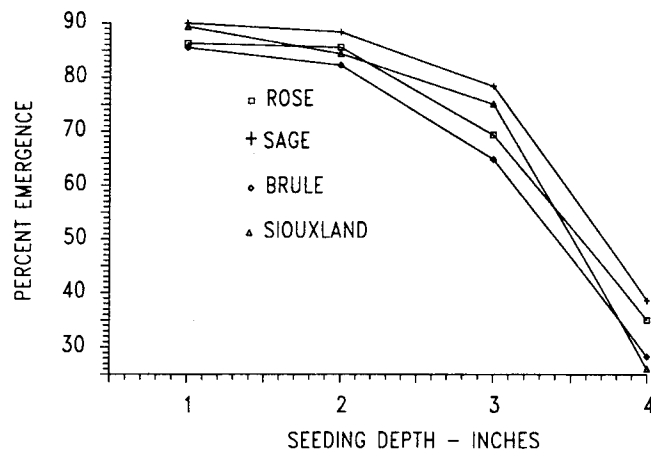


Figure 2. The relationship between greenhouse emergence and seed size of winter wheat averaged over locations and varieties.

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