Wheat Seed Size Influences Yield

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The effect of seed size and plumpness on yield has been of concern to farmers for many years. Several studies have been made on the effect of seed size on yield but the literature does not show that test weight was considered in the studies. In seed size studies, a uniform number of viable seeds were planted per foot of row. Drummond (1), working with Wells durum, reports "Seed sizes and planting rates, of the factors tested, appeared to have greatest influence on yields." Peterson and Foster (2), working with barley, state, "There was little difference in yield among seed sizes at the early seeding date, but as planting was delayed the comparative yields of the medium and thin seed lots were markedly reduced."

Procedure

To study the effect of seed quality of hard red spring wheat on yield, a lot of certified Selkirk seed of variable seed size and containing some shriveled seed was separated into two seed sizes over and through a No. 9 round hole sieve on a sieve cleaner. These lots were then graded over a gravity cleaner to separate the light and heavy weight kernels. Characteristics of the four seed lots used are shown in Table 1. Sufficient seed was prepared to permit using the same seed source during the three years of the experiment. Tests made each year showed no reduction of germination. The seed was treated with mercury fungicide at planting time.

The experiment was seeded in two trials at normal wheat seeding time. In the trial referred to as test number 1, one-fortieth acre plots were seeded in triplicate with a double disc drill with 7 inch row spacing. All plots were seeded with the same setting of the drill feed mechanism. It was assumed that this would plant the same volume of seed per unit area. The plots were fertilized with 23 pounds of phosphate (P_2O_5) per acre in the row with the seed. The number of live plants per foot of row were counted in 3 locations on each plot when the plants were in the five to six leaf stage. The small, 53 pound test weight seed produced the highest number of plants per foot of row and the large, 61.5 pound test weight seed the fewest plants, as shown in table 2.

In 1965 and 1966, a similar trial, referred to as test number 2, was grown in a rod row planting in which an equal number of variable seeds from the same lots used in test number one were planted per unit area for all seed sizes and test weights. The plots were seeded with a belt seeder and no fertilizer was applied. Each seed size was planted in four plots to provide data which could be analyzed statistically. When the plants were in the five to six leaf stage, stand or population counts were made to determine the number of plants per foot of row. Stands were uniform for all seed

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Table 1. Characteristics of seed used in the test at Minot, N. D., 1964-1966.

Test Wt. of seed (lbs.)	Seed size	1000 kernel weight, grams	Purity per cent	Germination per cent	Per cent pure live seed
53 thru No. 9 sieve	small	17.0	81.9*	88	75.1
55 over No. 9 sieve	large	31.7	99.0	95	94.1
57 thru No. 9 sieve	small	28.0	96.8	94	91.0
61.5 over No. 9 sieve	large	39.5	99.9	97	96.9

*This seed contained considerable cracked seed.

Table 2. Plant populations from one drill setting — trial number 1, Minot, 1964-1966.

Test Wt. of Seed	Seed size	Average number of plants per foot of row 1964	1965	1966	1964-66 Av.
53 thru No. 9	small	11.9	10.0	13.3	11.7
55 over No. 9	large	9.3	7.7	10.3	9.1
57 thru No. 9	small	10.0	8.1	11.3	9.8
61.5 over No. 9	large	9.0	7.2	9.9	8.7

sizes at 6.4 plants per foot of row in 1965 and 9.6 plants per foot of row in 1966.

Results and Discussion

In both tests the small 53 pound test weight seed produced noticeably less vigorous seedlings than the larger or heavier seed. This lack of vigor could be observed until after heading. Small differences in seedling vigor also were observed for the other seed sizes and test weights, with the large 61.5 pound test weight seed producing the most vigorous seedlings. After the crop was fully headed no difference in vigor could be observed between the plots seeded with the various seed sizes and test weights.

In test number one, small but no significant yield differences occurred in 1964 and 1966. In both years, the small 53 pound test weight seed produced the lowest yields. In 1965, when plant diseases were more prevalent, the yield from this seed was significantly lower than from seed of all other seed sizes and test weights used. In the 1964-66 three year average yield, the yield for the small 53 pound test weight was significantly lower than the average yield from each of the other seed sizes and test weights used, as shown in table 3.

In test number 2, where the same number of seeds were planted per foot of row for all seed sizes and test weights, the plots seeded with the small 53 pound seed also produced the lowest yields, while plots seeded with the large 61.5 pound seed produced the highest yields. However, greater yield variations ocurred among plots seeded with the other seed size and test weight combinations than in the experiment planted with the same drill setting. The large 61.5 pound

Table 3. Effect of seed size and weight on yield of wheat when seeded at one drill setting, Minot, 1964-66. (Test number one).

Test Wt. of Seed	Seed size	Bushels per acre 1964	1965	1966	1964-66 av.
53.0	small	39.1a*	34.8a	36.5a	36.8a
55.0	large	39.8a	39.5b	37.1a	38.8b
57.0	small	39.3a	38.8b	39.0a	39.0b
61.5	large	40.0a	39.0b	39.0a	39.3b

*The bushels per acre within each column being compared do not differ significantly at the .05 level if they are followed by the same letter.

Table 4. Effect of seed size and weight of yield of wheat when planted to obtain an equal number of plants per unit area, Minot, 1965-66. (Test number two).

Test Wt. of seed	Seed size	Yield in bushels per acre 1965	1966	1965-66 av.
53.0	small	22.2a*	33.5a	27.9a
55.0	large	24.3ab	36.5bc	30.4b
57.0	small	23.8ab	38.5cd	31.2bc
61.5	large	26.6b	38.7d	32.6c

*The bushels per acre within each column being compared do not differ significantly at the .05 level if they are followed by the same letter.

seed produced a significantly higher yield than the large 55 pound seed in 1966. For 1965-66, the 61.5 pound test weight seed produced average yields significantly higher than the plots seeded with the 53 pound small and the 55 pound large seed. The small yield difference between plots seeded with the 57 pound small and the 61.5 pound large seed as shown in table 4 is of interest, though not significant. Since average yield differences of these two seed lots in test number one were only .3 bushel, compared to 1.4 bushels in test number 2, it appears that more plants which resulted from seeding the same volume of small seed compensated for the greater vigor of the smaller number of seedlings produced by the large 61.5 pound seed.

Conclusions:

Small shriveled seeds of hard red spring wheat will produce satisfactory crop yields, but, such yields will be lower than yields from larger plumper seed planted under similar field conditions.

Small seed that is well-formed and plump will produce yields equal to those produced by large plump seeds and slightly higher than yields produced by large shriveled seed when the same drill feed setting is used for all seed sizes. However, when seeding rates are adjusted to get the same number of plants per unit area for all seed sizes, slightly lower yields are produced from the small plump seed than from large plump seed, but higher than from large shriveled (55 pound test weight) seed.

Seed plumpness appears to have greater influence on yield than seed size.

References:

1. Drummond, Wm.; What is Good Seed. Eighth North Dakota Seed Trade Association Short Course, Dec. 18, 1964.
2. Peterson, G. A. and Foster, A. E.; The Effect of Seed Size and Date of Planting on Barley Performance. Eighth North Dakota Seed Trade Association Short Course, Dec. 18, 1964.