COMPARATIVE STUDY OF 6 INCH AND 7 INCH SPACINGS FOR GRAIN DRILLS[1]

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Numerous experiments have been conducted to determine the effect of spacing upon plant development and yield of small grains and other crops[5,6,7]. Most of this work has been conducted by varying the rate of seeding in the row or by thinning the plants in the row. These studies have shown that tillering changes are sensitive to variation in spacing, while yields are determined largely by soil fertility, weather conditions, absence or presence of weeds, diseases and pests.

Although evidence shows that spacing of drill rows within reasonable widths of four to eight inches has little or no effect on wheat yields[8], many users of grain drills have a preference for one width or another. Evidence of this is the construction and wide use of both six inch and seven inch grain drills. At one time the power necessary for drilling was a factor, especially on the press type of drill. At that time the seven inch drill came into use because it reduced the required power by one-seventh and by wider spacing eliminated some of the disadvantage of the closer wheels picking up soil when not quite dry. The wide use of tractor power has changed this picture today. Some farm implement manufacturers[1] wish to discontinue the manufacture of one size and concentrate on the other size if either could be shown to be more desirable.

To determine the more desirable width between the six inch and seven inch drills, these grain drill manufacturers asked the North Dakota Agricultural Experiment Station, in cooperation with a number of other stations, to determine the relative merits of these two widths of drills. A special drill equipped with six inch spacing on one side and seven inch spacing on the other side was furnished the station for this work. Object of this study was to determine the effect of sowing small grains in six and seven inch drill spacings on yield of grain and straw, test weight of grain, the number and growth of weeds as reflected in two rates of seeding.

Tests On Standard Varieties

These tests were conducted in 1948 and 1949. A standard variety each of barley, hard red spring wheat, durum wheat and flax was used with four replications of each variety, and for each drill row spacing in the experiment. Table 1 indicates the varieties and rates of seeding.

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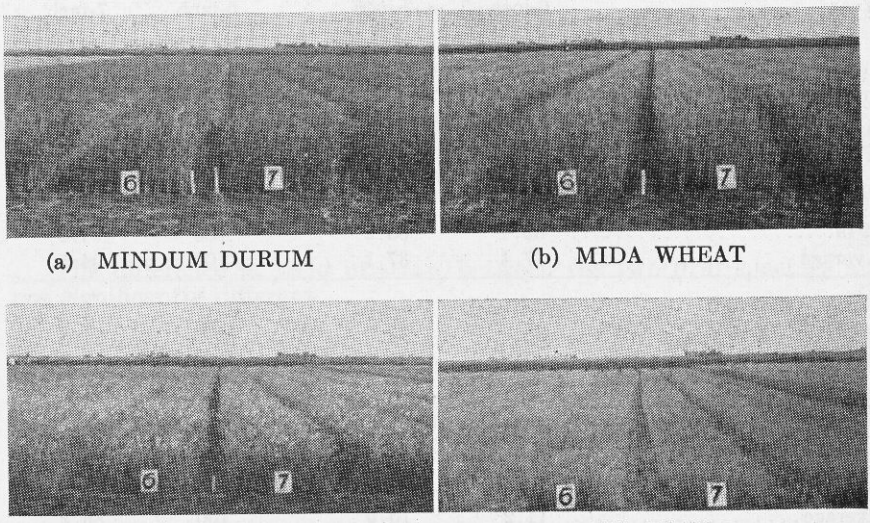
[4]The authors are indebted to Student Assistants, Howard Olson and Harlan Aldrich, who conducted the work in the field.

[5]The Effect of Uniformity of Spacing Seed on Development and Yield of Barley. H. B. Sprague and N. F. Farris. Jr. Am. Soc. Agron. 23:516-533, 1931.
[6]Rates of Seeding Wheat and Other Cereals with Irrigation. Roy E. Hutchison. Jr. Am. Soc. Agron. 28:699-703, 1936.
[7]Seeding Small Grain in Furrows. S. C. Salmon, Kans. Agric. Expt. Sta. Tech. Bul. 13, 1924.
[8]Crop Production. H. D. Hughes and E. R. Hensen. The MacMillan Co., New York, 1930, p. 461.

Table 1. VARIETY AND RATE OF SEEDING.

Grain	Approximate Usual Rate for Red River Valley	1 Peck Below Usual Rate for Red River Valley
Manchuria Barley	72 lbs. per acre	60 lbs. per acre
Mida Wheat	75 lbs. per acre	60 lbs. per acre
Mindum Durum	90 lbs. per acre	75 lbs. per acre
Dakota Flax	42 lbs. per acre	28 lbs. per acre

All plots were on Fargo clay soil. In 1948 the plots were sown on fallow. The wheat and barley plots emerged uniformly with full stands. The flax plots were sown later when surface moisture was less favorable, resulting in emergence that was less uniform. Favorable moisture a short time later, however, resulted in fuller stands. May was dry and warm. June and July were also warm with ample rainfall. August was very dry and relatively cool.



(a) MINDUM DURUM (b) MIDA WHEAT

(c) MANCHURIA BARLEY (d) DAKOTA FLAX

Fig. 1. Plots of wheat, barley and flax planted with a six inch drill row spacing show no visible difference from plots planted with seven inch drill row spacing.

In 1949 the plots were sown on fall-plowed barley ground, one year after fallow. Seeding was early and all crops made good emergence. Rainfall was near normal for May, June and July with August being fairly dry again. Temperatures were good until early July when high temperatures were unfavorable for blossoming. High temperatures again in late July, with drying conditions, caused some premature ripening and shrivelling of the grain.

Yield Data

Data were taken on yield of grain, the number and growth of weeds and the amount of straw. Stand counts were made of the grain. Weeds were weighed in 1949. Ability of the straw to hold up the combine

swath was measured in 1949. The drill was carefully calibrated previous to its use and an attempt was made to seed all replications at the same rate per acre whether six inch or seven inch. The grain was harvested with a binder and shocked. Threshing followed after sufficient drying. In the harvesting and threshing operations each replication was handled separately. Data for comparisons are given in Tables 1 and 2, which are the average of the two rates of seeding.

Table 2. YIELD OF GRAIN IN BUSHELS PER ACRE AND STAND COUNTS IN PER CENT AND AVERAGE OF TWO RATES OF SEEDING.

	YIELD Bushels per Acre		STAND[1] Per Cent	
Year	6-inch	7-inch	6-inch	7-inch
	Manchuria Barley			
1948	59.4	57.5	100	100
1949	38.6	40.7	100	90.2
Average	49.0	49.1	100	95.1
	Mida Wheat			
1948	42.4	41.0	100	94.1
1949	32.4	33.2	100	94.9
Average	37.4	37.1	100	94.5
	Mindum Durum			
1948	38.0	38.0	100	91.8
1949	32.8	32.1	100	93.2
Average	35.4	35.0	100	92.5
	Dakota Flax			
1948	16.4	16.4	100	84.7
1949	5.9	5.3	100	91.7
Average	11.2	10.9	100	88.2

[1]Stand counts were made soon after emergence and do not account for difference in tillering.

Yields in 1948 were higher than those of 1949 because of very few weeds and a fairly good moisture supply of the fallow used, plus a relatively cool August. Yields of grain from these two years show very little difference between the six inch and seven inch spacings. The only spacing to show any difference in 1948 was the barley in the six inch spacing, 59.4 bushels compared to 57.5 for seven inch spacing, which was significant, but not highly significant. The reverse of this was true in 1949 when the seven inch barley yield was 40.7 bushels compared to 38.6 bushels, which was significantly higher. However, the average for the two years is identical. Stand counts were made shortly after emergence and reflect that the seeding rate of the seven inch spacing is slightly below that of the six inch spacing. Test weights were made of the four crops each year and were found to be identical for the two widths of spacing.

Table 3. STRAW IN POUNDS PER ACRE AND GREEN WEIGHT OF WEEDS IN POUNDS PER ACRE, AVERAGE OF TWO RATES OF SEEDING.

Year	STRAW Lbs. per Acre		WEEDS Lbs. per Acre (Green Wt.)[1]	
	6-inch	7-inch	6-inch	7-inch
Manchuria Barley				
1948	3388	3088	...	...
1949	1836	1932	131	163
Average	2612	2510	...	...
Mida Wheat				
1948	4617	4321	...	...
1949	3285	3498	131	115
Average	3951	3900	...	...
Mindum Durum				
1948	3798	3956	...	...
1949	2752	2839	246	240
Average	3275	3398	...	...
Dakota Flax				
1948	3600	3600	...	...
1949	1235	1291	1338	1460
Average	2418	2446	...	...

[1]Correction made so that weight for 6 and 7-inch spacings are comparable.

The difference in yield in straw between the two drill spacings are not significantly different.

The number of weeds in 1948 on the fallow were no problem, being so few that they were less than 10 pounds of green weeds to the acre. Weeds were not a problem in the barley or wheat in 1949. The differences in weight of weeds in 1949 between the two spacings showed no significance.

Ability of Stubble to Hold Swath

Ability of the stubble to hold up the swath in combining was studied in 1949. Two areas of Mida large enough for the study were planted, one to six inch spacing and the other to seven inch spacing. The two areas were swathed with a 12-foot swather, with the stubble at about 10 to 11 inches. The distance that the swath was held off the ground was measured. The readings of 20 measurements at intervals of 10 feet of each spacing averaged 3.9 inches when cut against the wind, and 4.3 inches when cut with the wind for the seven inch spacing; and 5.8 inches and 5.9 inches respectively for the six inch spacing. When these measurements were repeated 16 days after the swathing was done, it was found that each swath had settled practically the same amount, which was about 1.5 inches. Rainfall during this period was .93 inches compared to a normal of 1.59 inches. This meant that the swath on the seven inch spacing was just a little more than two inches from the ground while that on the six inch spacing stubble was a little more than four inches from the ground at this time. This difference would be important in the event combining was delayed for some reason.

Summary

Data here presented tend to support previous observations that changing the spacing of drilled rows of grain from six to seven inches may be done without altering the yields of grain and straw.

Number and weight of weeds as recorded under conditions of this trial apparently were not altered by the difference in spacing.

Ability of the stubble to hold up the combine swath was reduced and the swath settled through the stubble somewhat faster in the wider spacing under the one year's conditions encountered in 1949.

THE USE OF ANTIBIOTICS IN FOOD PRESERVATION[1]

By Rae H. Harris[2]

A study of the use of very small amounts of antibiotics in sterilizing food in cans is in progress at the Western Regional Laboratory of the U.S.D.A. Several years' research will be needed before the suitability of the method for commercial canning can be ascertained. Successful preliminary results have been reported for peas, asparagus, corn, green beans, peeled potatoes, tomato juice and milk. Taste is not affected, while the mild heat treatment required yields products with a better flavor than is found in conventionally canned vegetables.

The chief antibiotic used to date is subtilin, which was produced by the Western Laboratory from one strain of a bacterium, *Bacillus subtilis*. This organism occurs widely in nature and in many food products. Other antibiotics which showed promising results were aureomycin, chloromycetin, and lupulon. The latter was recently obtained from hops.

When these antibiotics are employed, only brief heating at 212° F. or lower for five to ten minutes is required in vegetable canning to inactivate enzymes that ordinarily cause food spoilage. Yeasts, fungi, and non-spore forming bacteria are also destroyed. The spore-forming type of food-spoilage organisms are resistant to mild heat but may be controlled with antibiotics with a milder form of heat treatment (240° F. or higher in pressure cookers) than is now necessary.

Further information is required on such points as whether antibiotics only inhibit or actually destroy the harmful organisms, on the length of preservation period, and if possibly a breakdown of the antibiotics themselves may occur with time to form poisonous substances or to allow toxic organisms to arise.

[1]Condensed from Food Industries 22(2): 327. February, 1950.

[2]Cereal Technologist.

BARLEY-OAT YIELD COMPARISONS

The 10 year average yield of barley harvested in North Dakota, 1938 to 1947 inclusive, was 21 bushels per acre; in 1948, 21 bushels per acre and in 1949, 16 bushels per acre.

The 10 year average yield of oats in North Dakota, 1938 to 1947 inclusive, was 28.6 bushels per acre; in 1948, 28 bushels per acre and in 1949, 21.5 bushels per acre.

Comparisons of barley and oats yields on a bushel basis are misleading—expressing the 10 year average yields as pounds per acre the 10 year average yield of barley was 1,008 pounds and the 10 year average yield of oats was only 915 pounds.

In 1949 when both barley and oats yields were low, barley averaged 768 pounds per acre and oats 708 pounds per acre of grain. Yield data from U.S.D.A. (H.L.W.)