

# Effects of Seed Size and Fertilizer on Growth and Development of Wheat

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This experiment was conducted to determine the effect of seed size and several fertilizer treatments on the growth and development of INIA 66 and Ramona 50 Wheat. Sandy loam soil was used to fill 96, five gallon containers in which wheat was planted. These containers were then placed in a completely randomized design in an area enclosed by a cement wall eight feet high and covered with wire netting. Weight was used as the measure of seed size. Seeds that weighed .06 g each were classified as large, while those weighing .04 g were classified as small. Six fertilizer treatments equivalent to the following rates per acre were used:

1. 45 lb N
2. 45 lb N, and 35 lb P<sub>2</sub>O<sub>5</sub>
3. 90 lb N, and 35 lb P<sub>2</sub>O<sub>5</sub>
4. 45 lb N, and then 45 lb N applied again at boot stage, and 35 lb P<sub>2</sub>O<sub>5</sub>
5. 35 lb P<sub>2</sub>O<sub>5</sub>
6. No fertilizer

Nitrogen fertilizer was first applied when plants were about 2.5 in high; phosphorous fertilizer was incorporated into the seedbed before planting. The germination irrigation brought soil to field capacity. Thereafter, plants were irrigated when 50% of the available water had been used. The leachate was collected and water use by plants in each plot was determined.

Table 1. Effect of seed size and several fertilizer treatments upon growth and development of two different varieties of wheat.

Treatments <sup>1/</sup> (variety, seed size and fertility)	Plant height (in)	Tillers (number per plant)	Head (number per plant)	Yield (grams of grain per plot)	Seed average weight (g)	Crude protein in seeds (%)	Water consumptive use (qt.)	Water for each gram of grain (qt.)
INIA 66 L 1N	28.7	7.57	6.66	9.11	0.021	15.26	36.2	3.9
INIA 66 L 1N P	27.8	8.67	6.75	9.94	0.019	17.23	34.3	3.6
INIA 66 L 2N P	26.9	7.95	6.94	9.36	0.014	18.02	35.1	3.8
INIA 66 L 2N Spl P	27.1	8.50	7.12	11.69	0.019	16.62	35.0	3.0
INIA 66 L P	25.7	3.00	2.13	2.99	0.016	14.95	33.4	11.2
INIA 66 L Check	25.0	2.50	1.58	2.77	0.018	15.31	33.1	12.0
INIA 66 S 1N	27.3	7.50	6.19	6.99	0.014	16.02	35.4	5.1
INIA 66 S 1N P	27.2	9.38	5.69	13.17	0.018	13.41	36.1	2.7
INIA 66 S 2N P	28.4	8.69	5.67	12.15	0.014	16.59	35.8	2.9
INIA 66 S 2N Spl P	24.9	8.24	6.73	9.48	0.017	17.81	35.8	3.8
INIA 66 S P	24.1	2.68	2.15	2.66	0.013	13.91	34.1	12.8
INIA 66 S Check	24.9	3.06	1.83	2.02	0.010	16.70	33.1	16.4
Ramona L 1N	32.2	9.75	6.56	13.84	0.025	13.59	35.2	2.5
Ramona L 1N P	30.9	10.12	6.25	16.31	0.028	11.69	35.8	2.2
Ramona L 2N P	29.2	10.31	6.05	16.13	0.028	19.82	35.5	2.2
Ramona L 2N Spl P	29.2	10.79	5.78	13.76	0.028	15.35	35.1	2.6
Ramona L P	28.8	3.13	2.25	4.77	0.024	11.17	35.2	7.4
Ramona L Check	28.6	2.94	2.25	3.16	0.019	12.38	33.2	10.5
Ramona S 1N	31.0	9.07	6.31	12.76	0.024	11.75	35.8	2.8
Ramona S 1N P	32.0	9.56	5.88	16.00	0.028	11.75	35.4	2.2
Ramona S 2N P	28.9	9.31	6.00	14.34	0.020	15.07	35.3	2.5
Ramona S 2N Spl P	28.3	10.00	5.31	12.74	0.024	14.79	34.2	2.7
Ramona S P	28.1	3.12	2.06	3.76	0.021	11.59	34.1	9.1
Ramona S Check	31.2	3.56	2.42	3.11	0.018	12.45	33.3	10.7

<sup>1/</sup>Large and small seed of two wheat varieties and six fertility levels. 1N is 45 lb nitrogen, 2N is 90 lb nitrogen, P is 35 lb P<sub>2</sub>O<sub>5</sub> per acre. 2N Spl is 90 lb nitrogen applied half at planting and half at boot stage of growth per acre. The check plots received no fertilizer.

In this experiment seed size did not significantly affect plant height, number of tillers, number of heads, grain yield, water use or water use efficiency. However, the grain produced from plants grown from the larger seed was significantly larger and higher in crude protein.

Plant height, number of heads, crude protein, amount of water used to produce one gram of grain, seed weight, and nitrate in the leachate were significantly higher for plants receiving nitrogen fertilizer than for plants from the unfertilized check or phosphorous only treatment.

### Influence of Planting Method, Seeding Rate, and Row Position on Growth and Yield of Wheat

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Since wheat (*Triticum aestivum* L.) is now grown on beds in the southwestern U.S., experiments were conducted at Yuma, Arizona, to study effects of planting methods, seeding rates, and row positions on beds on the yield and quality of grain from wheat. Two planting methods (on the flat and on beds), three seeding rates (29, 58, and 87 kg/ha), and four row positions on beds (north, south, east, and west) were observed.

Flat and bed methods of planting resulted in similar wheat grain yields and grain volume weights. The low rate of seeding resulted in more wheat seed per head and fewer heads/unit area than did the higher rates of seeding. The net effect of seeding rates on seed weight and grain yield in both flat and bed plantings was not significant.

Wheat grown on beds with an east-west orientation produced more heads per unit area, more seed head, and higher grain yields than did wheat planted on beds with a north-south orientation. The south row position on east-west beds resulted in more heads/unit area, more seed/head, and higher grain yields than did the north row position. Row position on east-west beds had no significant effect on seed weight.

When wheat was grown on north-south beds higher rates of seeding resulted in heavier seeds than did the lower rate; however, heads/unit area, seed/head, and grain yields were not influenced by seeding rates. Although west rows produced more seed/head and heavier seeds than did east rows, row position on north-south beds had no effect on heads per unit area and grain yields.

Table 1. Average number of heads per unit area, number of seeds per head, seed weight, and grain yield for Maricopa wheat grown at three seeding rates and two row positions on east-west beds at Yuma, Arizona in 1968 and 1969 (2-year average).

Seeding rate (kg/ha)	Row position	Heads in 0.37 m <sup>2</sup> (no.)	Seeds per head (no.)	Weight of 1,000 seeds (g)	Grain yield in 0.37 m <sup>2</sup> (g)
29	North	100 a	39 a	37.6 a	150 a
	South	125 b	43 b	36.9 a	197 b
58	North	109 a	37 a	38.5 a	154 a
	South	129 b	41 b	38.1 a	205 b
87	North	113 a	35 a	38.3 a	152 a
	South	141 b	40 b	38.0 a	213 b
C.V. (%)		12	7	3	16
Significance of differences:					
Between seeding rates		*	**	ns	ns
Between row positions		**	**	ns	**

Legend: ns = not significant, \* = significant at 5%, \*\* = significant at 1%.

Means followed by the same letter, within seeding rates and between row positions, are not different at the 5% level of significance (Student-Newman-Keuls' Test).