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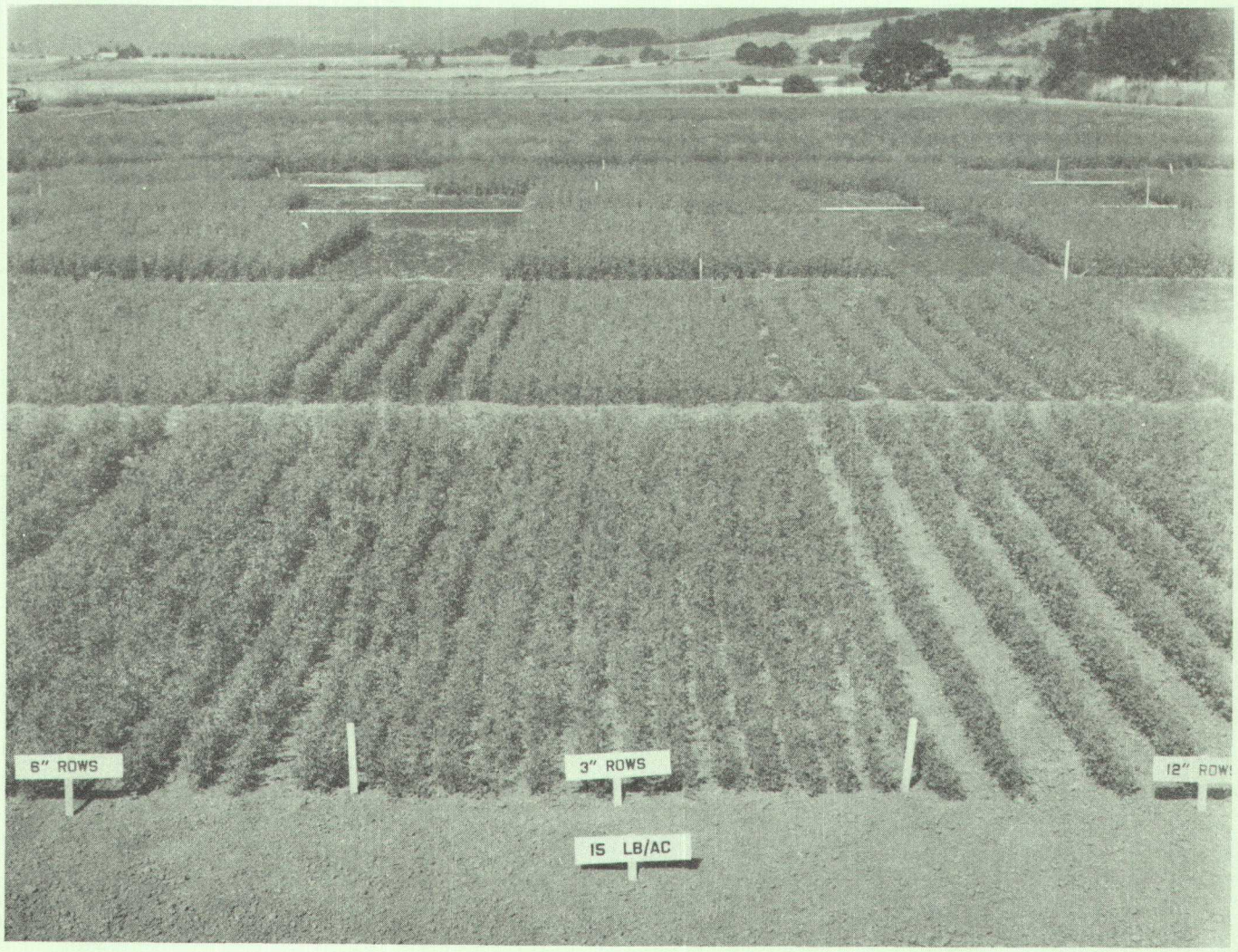
The Influence of Seeding Rates on Yield and Stand of Alfalfa in Oregon's Willamette Valley



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ABSTRACT

Increased seeding rates (7.5, 10, 15.20 pounds per acre) and closer row spacing (12, 6 and 3 inches between rows) resulted in an increased stand of alfalfa during the early years of production. Yield of DuPuits alfalfa was not increased with the additional plants in stand. Vernal alfalfa showed a small increase in yield with the additional plants but only in the first cutting of the first year. Yields declined in the seventh production year when the stand was reduced to 5 or 6 plants per square foot.

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THE INFLUENCE OF SEEDING RATES ON YIELD AND STAND OF ALFALFA IN OREGON'S WILLAMETTE VALLEY

W. S. McGuire

INTRODUCTION

Alfalfa is an important crop in the Willamette Valley with a productive life of five to seven years. Several factors affect the length of life and productivity of the stand, such as soil fertility, disease, rodents, weed infestation, and cutting management. The first limiting factor, however, is the establishment of a stand with sufficient plants to fully utilize the available resources of moisture, nutrients, and light.

Optimum rate of seeding alfalfa in pure stand depends on seedbed preparation, method and depth of seeding, amount and distribution of rainfall or irrigation, soil type, and tilth. An adjustment or range in seeding rate recommendation is made in accordance with the variables.

In humid areas, only 60 to 70 percent emergence is expected, even under good conditions (13). Survival of 40 to 50 percent of seedling plants by the second year is usual, with losses attributed to disease, insects, winter injury, and other causes. Thus, a seeding rate of 10 pounds per acre, or 50 seeds per square foot, would result in 30 to 35 emerging seedlings with only 20 to 25 plants surviving the first winter. The questions remain, in any production area, how many plants per square foot are required for suitable production, and what seeding rate is best or more economical to achieve that desired population?

In the Valley, most alfalfa is planted in drilled six-inch rows, although some machines are designed for closer drilling or broadcasting. Presumably, with the same seeding rate, plants would be spaced more

uniformly, aiding weed control and possibly reducing intra-specific competition by allowing more alfalfa seedlings to establish. On the other hand, wider row spacing may be satisfactory if weeds are not a problem, and if plants are able to fully utilize available nutrients, moisture, and sunlight.

LITERATURE REVIEW

Many studies have been made to determine the optimum rate for yield by using a range of seeding rates. The optimum, or adequate minimum, rate varies with enviornmental factors, primarily soil moisture, being lower in drier areas or when alfalfa is grown with grass mixture. The literature reviewed here deals only with alfalfa in humid areas or alfalfa grown under irrigation.

Several studies have shown increased yield with higher seeding rates during the first year of production. Carmer and Jackobs (4) observed an increase in yield of alfalfa in Illinois for the first and second cuttings in the season after fall seeding, with the 8-pound rate more than the 4-pound and equal to the 12-pound per acre rate. There was no yield increase from seeding rate after the first two harvests. In a similar test the next year, under more favorable moisture conditions, no yield increases from higher seeding rates were found during the first harvest year. They did suggest that a loss of leaves in the more dense stands at first harvest and a moisture deficit before second harvest could have caused the lack of agreement with results of the earlier test. Graffis and Pardee (7), also with results from Illinois, obtained yield increases in the first harvest of the seeding year (spring planting) with increased

seeding rates, but no increases in the second and third harvests of that year. Yields tended to decrease with increased seeding rates during the year after establishment.

Belzile and Rioux (2), working in Quebec, obtained increased yields with higher seeding rates with early planting (late April to early May), but with later planting dates, increased seeding rates did not increase yields. Other results from Quebec by Genst (6) showed a yield increase when two cultivars were increased in seeding rate from 5 to 10 pounds per acre. There was no further increase in yield of Alfa but Vernal alfalfa yield decreased at the 15-pound rate and increased again at the 20-pound rate. Moline and Robison (10), using rates of 2.7, 8.9, 15.2, and 21.4 pounds per acre with weed control treatments, in Nebraska, showed that rates above 8.9 increased yields the first year, particularly with weed control. They concluded that the highest seeding rate gave the potential for productive stands during the seeding year, but was less productive in following years. Brown and Stafford (3), using seeding rates of 2, 4, 8, and 16 pounds, showed a yield increase with increasing seeding rate for Saranac and Narragansett alfalfa. They suggested thirty plants per square foot in the first year for top yield.

In a recent study in Wisconsin, using Vernal and Saranac alfalfa, Sund and Barrington (12) showed that for the first harvest of the seeding year yields were increased with increased seeding rates, from 4 to 32 pounds per acre. The yields, however, were not significantly different beyond the 12-pound rate. In the second harvest of the seeding year and in subsequent years, there was no significant yield advantage beyond the 6-pound rate, but they did recommend that the 10 to 12 pound seeding rate be retained to assure a good stand.

Other workers have found no increase in yield from increased seeding rates. Wakefield (15) reported no benefit in Rhode Island, even in the first year, when 10 and 20 pound rates were compared with a 5-pound rate, provided weeds were controlled. Alonso, et al. (1) concluded that the first harvest yield in spring after seeding was not affected by higher rates. They used seeding rates of 11.2 to 27.9 pounds per acre. Van Keuren (14) in Ohio found no increase in yield above a 6-pound rate, even in the first year of production.

It appears, therefore, that increased seeding rate above the usual recommended rate (8 to 12 pounds per acre) may provide for some increase in yield during the first year of production, or at least for the first cutting, but later cuttings and production in succeeding years are not increased. An economic analysis (12) showed that the cost of extra seed was not recovered by the additional yield of the first year, even when based on a high market value of hay.

Seeding rates and density of stand do affect the size of plants and roots during the first year (4, 12, 15) or even through the life of the stand. Root size was greater with lower density of plants. Apparently, yield is not affected as long as a sufficient stand is maintained to fully utilize the moisture, nutrients and sunlight.

Number of plants established varies directly with seeding rates (1, 4, 5, 6, 7, and 15) but the number of plants declines during the life of the stand, particularly during the first year. Van Keuren (14) obtained more plants from higher seeding rates, but by the next spring, there were similar numbers of plants with seeding rates of 12 to 48 pounds per acre. Fribourg (5) showed similar reduction in plant numbers

during the first winter, with continued reduction the second year to a final count of one to five plants per square foot. In Wisconsin, plant mortality was higher with increased seeding rates (12). By the end of the third year, there were nearly equal numbers of plants at all rates.

Apparently, plant numbers decline to some number depending on enviornmental factors. The number of plants required per unit area for maximum production during the life of the stand, assuming no loss from insects, diseases, winterkill, etc., depends on the limitation of moisture or nutrients and possibly on light interception or intraspecific competition for light. The number of plants required for maximum production could vary in different areas. In a stand of alfalfa-bromegrass, Marten et al. (8) found no significant differences in yields of plots containing 2, 4, 6, 8, 10, or 12 plants per square foot. Murphy et al. (11) concluded that 4 to 8 plants per square foot were required for optimum production of irrigated alfalfa in central Oregon. Their stand of 0.67, 1, 2, 4, or 8 plants per square foot was obtained by thinning a source area and did not decrease materially during the subsequent 3 years of harvest.

EXPERIMENTAL PROCEDURE

The experiment was conducted on the Hyslop Agronomy Farm, Corvallis, Oregon. Rainfall is almost 40 inches, mostly in winter with a summer average of 3.38 inches. The alfalfa-growing season is from mid-March to early October.

The deep, well-drained Woodburn silt loam soil was limed to pH 6.5, with 400 pounds per acre of borated single superphosphate applied in the fall each year of the test.

After early June sowing, the test was irrigated once in July, with a hay crop removed in September. An excellent weed-free stand was obtained. There was no irrigation during subsequent years of the test. Orchardgrass at 3.6 pounds seed per acre was oversown in late September on six treatments, as indicated, to measure influence on total yield and alfalfa survival.

The test was a randomized block design with three replications. The plot was 6 x 20 feet. Treatments are shown in Table 1.

Actual seeding rates differed from attempted rates because of limitations of the planting plates in the Planet Jr. drill. Actual weights were determined by weighing seed in the drill box and reweighing seed left over.

Table 1. Row spacing and seeding rates for two alfalfa cultivars

Treatment No.	Row Spacing inches	Attempted seeding rate Pounds/acre	Actual seeding rate Pounds/acre
1	6	10	9.0
2	6	15	13.5
3	6	20	22.5
4	3	15	12.5
5	12	15	12.9
6	12	7.5	6.7 + orchardgrass
7	12	15	12.9 + orchardgrass
8	6	7.5	6.3 + orchardgrass

Two cultivars of alfalfa were used. Vernal has smaller stems than the Flemish types and was included for comparison. DuPuits represented the larger stem size alfalfa cultivars. The orchardgrass was S-143.

Plant counts were taken in October of the first autumn after production of one hay crop. Additional counts were made in succeeding

years. All counts were made by digging around the crowns sufficiently to ensure counting individual plants along 2 feet of the drill row at 2 random locations within each plot. Counts were calculated for number per square foot.

Dry matter yields were obtained by oven-drying the 3 x 20 foot swaths cut from each plot. The remainder of each 6-foot plot was used for other measurements.

RESULTS AND DISCUSSION

Yields of Dry Matter

Results for the two cultivar are shown separately rather than combined for treatment totals (Vernal plus DuPuits) since the only significant difference during the seven years was in the first cutting of the first production year.

In the first cutting of the first year (Table 2), Treatment 1, with 9-pound rate, yielded 3.66 tons (1.78 plus 1.88) compared with 4.02 tons (2.17 plus 1.85) for Treatment 2 with 10-pound rate. This was the only indication during the entire test period when seeding rate of alfalfa in pure stand showed any significant difference in yield of dry matter. This difference in treatment yield is attributed to lower yield of Vernal in the first cutting of the 10-pound rate.

DuPuits had earlier growth in spring and more rapid recovery after cutting than Vernal. Both cultivars were cut on the same date (May 25) of the first year. In a cutting management test adjacent to the seeding rate test, it was shown that crown bud development during the first crop growth occurs first in DuPuits and 5 to 6 days later for Vernal.

Subsequent cuttings during the test were on this basis. It is suggested that the difference shown in Vernal yields as a result of seeding rates might have been less with further development of the plants. At any rate, the difference is small and it is doubtful that higher seeding rates would have been profitable.

With orchardgrass oversown in alfalfa (Treatments 6, 7, and 8), there was reduced yield for both Vernal and DuPuits in Treatment 7 compared with Treatments 6 and 8. Plant population within the drill row with 15 pounds of seed per acre and 12-inch row spacing is equivalent to 30 pounds of seed per acre in the conventional 6-inch drill rows. The relative decrease in yield in Treatment 7 in the first year was not apparent in subsequent years. It is suggested that the high concentration of plants within the row provided intraspecific competition. This and the interspecific competition of the grass decreased the establishment rate of the alfalfa. Under the dry summer conditions (non-irrigated), less developed plants would be less competitive in obtaining moisture and nutrients at lower depths.

On the basis of these results and under similar conditions, it is evident that the seeding rate of alfalfa, from 10 to 20 pounds per acre, and in row spacings of 3, 6, and 12 inches, has no effect on total yield during the life of the stand, with the exception of some decrease at lower seeding rate in the first cutting of the first year. Drill width beyond 6 to 7 inches is not a usual practice in pure alfalfa production. Wider row spacing could allow for more weed invasion. This test remained free of weeds until the last two years when flat weeds, principally dandelion and plantain, invaded and were visibly more numerous in wide-row spacing.

Alfalfa in the Willamette Valley may be managed on a 3-cut or 4-cut system. A cutting management test (9) has shown that the 3-cut system with first harvest in late May to early June in the flower bud to early bloom stage has a slight advantage in total yield over the 4-cut system. In the 4-cut system, the first cutting is 15-20 May when lower leaves are shaded and turn yellow. The 2 subsequent cuttings are taken at crown bud or early flowering stage. The fourth cutting, usually less than one ton, is taken in late September or grazed. The advantage of the 4-cut system is primarily in better quality of alfalfa at first cutting, provided that weather is suitable for haying or if silage is made.

With the 3-cut system, yields of a developed, fully productive stand are approximately 3 1/2, 3 and 1 1/2 tons per acre per cutting, respectively. With the 4-cut system, yields are approximately 3, 3, 1 1/2, and 1/2 tons per cutting. These yield trends have been established with several alfalfa tests on non-irrigated Woodburn silt loam soil at Hyslop Agronomy Farm, Corvallis.

The seeding rate test described here was cut four times each of the first two years. Table 2 combines the third and fourth cuttings with the fourth cutting on September 24. Table 3 shows yields of each of the cuttings. The trend of yield per cutting during the season in this test is similar to that described above. A 3-cut system was used for the last 5 years of the test (Table 4) reduce time and labor expended.

Addition of grass to alfalfa did not increase total yield per acre. Another test using three grass species with alfalfa showed similar results (unpublished data). The mixture with orchardgrass consisted of 30 to 40 percent grass at first cutting, 15 to 20 percent grass at second cutting, and no grass in the third and fourth cuttings. There is some trend with

the grass mixture to increase yields in the first cutting at the expense of subsequent cuttings, with no advantage in total yield.

These results could have application to irrigated alfalfa in the Valley. Increased yield from irrigation would be evident to some extent at second cutting, depending on soil depth, but most response would be in subsequent cuttings. An irrigation test adjacent to the seeding rate test showed no response in yield of alfalfa with application of 18 inches of water (3 applications of 6 inches in July and August). A soil probe showed at least 22 feet of well-drained soil with pH and nutrient content suitable for root production. Although the grass was dormant during the latter half of the season, alfalfa remained green and productive throughout.

The two cultivars of alfalfa used in this test were used also in other management and cultivar tests. DuPuits and other cultivars of Flemish types and origin tend to be more productive than Vernal during early years of the stand, with Vernal often showing to advantage in later years. Average yields during the seven years of the test were 7.25 tons of dry matter per acre for Vernal and 7.48 for DuPuits.

Plant Population

Stand counts during establishment in the first year are shown in Table 5. The number of plants per square foot was directly related to seeding rate; the more seeds that were sown, the more plants that were established. The test was irrigated in July of the establishment year to speed establishment, and a light hay crop was removed in September. Thus, there was sufficient time for loss of some plants from intraspecific competition. Treatment 4, with 15 pound rate drilled in three-inch rows, had more plants per square foot than Treatment 2, drilled at the same rate

per acre but in six-inch rows. There were more plants established with better distribution. The same seeding rate but with 12-inch rows (Treatment 5) showed still fewer plants established per square foot. This trend was clear with Vernal but somewhat erratic with DuPuits.

Plant numbers decreased in all treatments during the winter and to first cutting the following year, but there was a greater loss of plants when higher numbers were present the previous autumn. This might suggest that the loss occurred, probably from competition for light, during growth of the first hay crop rather than from winter loss. If so, all treatments should show a more proportionate loss.

Plant numbers declined throughout the growing season of the first full year of production. It was apparent that many more plants were established in all treatments than were necessary for maximum production. There was a continual loss of plants in 1964, the second year of production. The three-inch row spacing allowed better plant survival than in wider row spacing although no advantage was obtained in yield of alfalfa. Accordingly, plants in 12-inch row spacing declined in number much more rapidly than in closer row spacing, again with no effect on yield.

The counts were calculated on a square foot basis. In 12-inch drill rows, the number of plants per square foot is the same number as plants per linear foot of row. With six-inch spacing, plants per linear foot of row are half the number per square foot, and in three-inch rows one-fourth the number shown per square foot. Therefore, on the basis of number of plants within a linear foot of drill row, plant numbers were similar by the end of the second production year. Examination of the plant counts for Vernal after the last harvest in 1964 shows approximately 9 plants per

foot of row in 12-inch spacing, 8 to 9 per foot of row in six-inch rows (1/2 of 15-19), and 8 per foot for three-inch spacing (1/4 of 27).

Table 6 shows the plant populations for the remaining years of the test. Plant numbers declined continually during the first four years of production to the level shown for 1966, a fairly constant and similar number with the exception of Treatment 4 with three-inch rows. No counts were taken in 1967-68 and the final count was made at the conclusion of the test after last harvest in 1969.

Comparison of the final plant counts in 1969 with final year's yield of alfalfa (Table 4) suggests that a population of 5 to 6 plants per square foot was insufficient for maximum production under conditions of the test. Without a plant count in 1968, the actual minimum population for maximum production cannot be determined.

If competition for moisture was involved, the yield reduction would be reflected in second and third cuttings. Inspection of yield by cutting for the year shows all cuttings reduced from the usual 3 1/2-3-1 1/2 to 2 1/2-2 1/2-1. Yield for each cutting was reduced during the season. The flatweeds would not have been competitive for light. If the tap-rooted weeds were competitive for moisture, the yield reduction of alfalfa would have occurred in the second and third cuttings and not in first cutting when moisture was not limiting. Although superphosphate was applied annually, subsoil nutrients could have become depleted.

Some point in declining population is reached that is below optimum for full production, and 5 to 6 plants per square foot is within the range of minimum plant stands reported for humid, irrigated areas. Seven productive years is considered sufficient for any rotation in the

Willamette Valley, and usual productive life is less than seven years.

SUMMARY AND CONCLUSIONS

Seeding rate and row spacing variables were imposed on Vernal and DuPuits alfalfa cultivars in pure stand and with orchardgrass on a well-drained Woodburn silt loam soil near Corvallis, Oregon. During the seven production years of the test, DuPuits' yields were not influenced by seeding rates of 10-20 pounds per acre. Vernal showed reduced yield at the 10 pound rate only during the cutting of the first production year.

Yields were not affected by row spacings of 3, 6, or 12 inches, but closer rows did allow for higher plant population during the first four years. Plant populations were similar for all treatments before or by the seventh year.

DuPuits alfalfa was slightly more productive than Vernal for the average seven year production. Addition of orchardgrass to the alfalfa cultivars did not increase total yield.

The production level decreased in the seventh year, suggesting that 5 to 6 plants per square foot were below the minimum number for maximum production.

On the basis of these results, representative of Valley alfalfa production, the following production practices should be considered:

1. The usual seeding rate of 10 to 12 pounds per acre is sufficient for maximum production if a suitable seedbed and establishment conditions are provided.
2. Row spacing of 3, 6, or 12 inches are suitable for production although closer row spacing allows for better distribution and

survival of plants and may be of benefit in reducing weed invasion.

3. Inclusion of orchardgrass in the mixture in non-irrigated production likely would not increase total yield, and would be of value primarily for silage production, grazing, or soil protection.

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Table 2. Yield of dry matter in tons per acre 1963

	Treatment		Cutting			
	Spacing (in)	Rate (lbs)	25 May	18 July	3 Sept.	Total yield
Vernal						
1	6	10.0	1.78	1.99	1.70	5.47
2	6	15.0	2.17	1.89	1.63	5.69
3	6	20.0	1.81	2.00	1.73	5.54
4	3	15.0	1.95	1.80	1.79	5.54
5	12	15.0	1.55	1.80	2.08	5.43
6	12	7.5 + O.G.	2.02	1.57	1.39	4.98
7	12	15.0 + O.G.	1.86	1.61	1.47	4.94
8	6	7.5 + O.G.	1.97	1.84	1.81	5.62
AV			1.89	1.81	1.70	5.40
DuPuits						
1	6	10.0	1.88	1.49	2.11	5.48
2	6	15.0	1.85	1.59	2.05	5.49
3	6	20.0	2.10	1.35	1.72	5.17
4	3	15.0	1.94	1.77	2.02	5.73
5	12	15.0	2.10	1.56	2.05	5.71
6	12	7.5 + O.G.	2.08	1.40	2.05	5.53
7	12	15.0 + O.G.	1.83	1.24	1.88	4.95
8	6	7.5 + O.G.	2.12	1.65	2.02	5.79
AV			1.99	1.51	1.99	5.47
LSD (.05) - Treatments			0.34	N.S.	N.S.	N.S.
(.05) - Cultivars			N.S.	0.26	0.21	N.S.

Table 3. Yield of dry matter in tons per acre 1964

Treatment			Cutting				
	Spacing (in)	Rate (lbs)	22 May	9 July	31 Aug	21 Oct.	Total Yield
Vernal							
1	6	10.0	2.23	2.98	1.87	.35	7.43
2	6	15.0	2.13	2.97	1.83	.36	7.29
3	6	20.0	2.26	2.81	1.86	.34	7.27
4	3	15.0	2.48	2.98	1.78	.42	7.66
5	12	15.0	2.33	3.08	1.95	.50	7.86
6	12	7.5+OG	2.70	2.81	1.82	.29	7.62
7	12	15.0+OG	2.70	2.72	1.64	.34	7.40
8	6	7.5+OG	2.61	2.49	1.76	.33	7.19
AV			2.43	2.86	1.81	.37	7.47
DuPuits							
1	6	10.0	2.47	2.92	2.08	.79	8.26
2	6	15.0	2.60	3.07	2.38	.82	8.87
3	6	20.0	2.77	2.96	2.53	1.01	9.27
4	3	15.0	2.59	2.89	2.13	.73	8.34
5	12	15.0	2.30	2.86	2.14	.75	8.05
6	12	7.5+OG	2.48	2.88	2.02	.72	8.10
7	12	15.0+OG	2.73	3.30	2.11	.88	9.02
8	6	7.5+OG	2.50	2.80	2.11	.82	8.23
AV			2.56	2.96	2.19	.82	8.52
LSD (.05) Treatments			N.S.	N.S.	N.S.	N.S.	N.S.
Cultivars			N.S.	N.S.	0.36	0.56	0.88

Table 4. Yield of dry matter in tons per acre 1965-1969

Treatment			Year				
No.	Spacing (in)	Rate (lbs)	1965	1966	1967	1968	1969
	Vernal						
1	6	10.0	7.45	7.00	8.56	8.28	6.50
2	6	15.0	7.75	6.82	8.45	8.29	6.03
3	6	20.0	7.61	7.01	8.61	8.48	6.19
4	3	15.0	8.04	6.87	8.29	8.19	6.25
5	12	15.0	7.55	6.81	8.32	8.14	6.03
6	12	7.5 +O.G.	7.55	6.09	8.09	8.89	6.31
7	12	15.0 +O.G.	7.41	6.30	8.44	8.53	6.36
8	6	7.5 +O.G.	7.43	6.52	8.32	7.88	6.45
	AV		7.60	6.68	8.38	8.33	6.26
	DuPuits						
1	6	10.0	7.72	7.85	8.89	7.99	5.91
2	6	15.0	7.51	7.83	9.43	8.18	6.15
3	6	20.0	7.53	7.86	8.59	8.19	6.03
4	3	15.0	7.61	7.56	9.05	7.76	6.23
5	12	15.0	7.92	6.94	8.71	7.82	5.86
6	12	7.5 +O.G.	7.57	7.39	8.56	8.57	6.16
7	12	15.0 +O.G.	7.97	7.37	9.23	8.86	5.96
8	6	7.5 +O.G.	8.27	7.31	8.28	8.40	6.01
	AV		7.76	7.51	8.84	8.22	6.04
	LSD (.05)	Treatments	N.S.	N.S.	N.S.	N.S.	N.S.
		Cultivars	N.S.	0.30	0.84	N.S.	0.37

Table 5. Number of plants per square foot (stand counts) after establishment and during the first two years of production

No.	Treatments Spacing	Treatments Rates	1962 Oct. 10	1963 Harvests 1	1963 Harvests 2	1963 Harvests 3	1964 Harvests 1	1964 Harvests 2	1964 Harvests 3
	Vernal								
1	6	10	32	26	19	17	14	13	15
2	6	15	50	28	23	18	16	17	17
3	6	20	66	42	29	21	16	15	19
4	3	15	61	59	37	27	27	25	27
5	12	15	43	19	14	10	12	11	9
6	12	7.5	24	18	15	9	10	7	10
7	12	15	40	24	14	12	11	8	9
8	6	7.5	22	23	21	11	12	9	14
	DuPuits								
1	6	10	21	17	11	10	10	10	8
2	6	15	37	23	15	14	11	11	9
3	6	20	65	25	20	19	13	12	15
4	3	15	43	36	34	24	19	17	22
5	12	15	40	16	9	9	7	6	7
6	12	7.5	24	10	8	7	6	6	5
7	12	15	39	16	11	8	7	5	8
8	6	7.5	21	18	15	11	12	11	9

Table 6. The influence of row spacing and seeding rate on number of plants per square foot (stand count) for the final production years

No.	Treatment		Plants per square foot (Oct.)		
	Spacing	Rates	1965	1966	1969
	Vernal				
1	6	10.0	9.7	9	7
2	6	15.0	8.0	10	6
3	6	20.0	10.3	9	6
4	3	15.0	16.0	12	7
5	12	15.0	7.3	9	6
6	12	7.5	6.2	6	5
7	12	15.0	6.2	7	5
8	6	7.5	9.3	10	6
	DuPuits				
1	6	10.0	7.5	7	5
2	6	15.0	8.8	7	6
3	6	20.0	7.5	7	5
4	3	15.0	16.1	12	6
5	12	15.0	6.3	5	4
6	12	7.5	5.3	5	5
7	12	15.0	5.1	7	5
8	6	7.5	6.3	6	6