Fertility Experiment on Grass Seed Production

The fertility experiment for grass seed production for the 1960 crop season was designed to further deliniate the requirement for nitrogen fertilizer in the production of grass seed. Both rate of nitrogen application and time of application were studied. Rates from 80 and 120 pounds of N were applied as a single application or as split applications and rates of 160 pounds of N were applied in split applications. The applications were made principally during October and November in the fall and March and May in the spring. Single applications of 120# of N were made from October through March.

Except where noted, all plots received blanket applications of 90 pounds per acre of P_2O_5 as 48% treble super phosphate, 100 pounds per acre of K_2O as 60% muriate of potash and 80 pounds per acre of S as 20% gypsum.

In general the soil moisture conditions were made favorable for the fall and winter applications either by irrigation or winter precipitation.

Late spring frosts in Jefferson County were severe enough that some fields were not harvested as seed, however, the frosts were spotty. The effect on the several experimental locations was not clearly defined but they were possibly hurt to varying degrees by the frost, although there were no visible symptoms.

Merion Bluegrass Section

Three locations of the experiment were established on Merion Bluegrass stands. They were established on the farms of Louis Olson, Agency Plains district; Roy Stevenson, Agency Plains district and Bill Collins, Little Agency Plains district. Summary Table No. 1 indicates the rate of fertilizer application, the month of fertilizer application and the average yields obtained at each location.

There was a considerable infestation of rat tail fescue and cheat (Bromus tectorum) at the Collins location and this undoubtedly tended to reduce yield and add to the variability of the trial.

It was found in the cleaning operation that lots of seed tended to vary in their bushel weight. This variance may have been due to treatment but could also be due to rate of feeding seed into the cleaner. Consequently, in order to place each treatment on a comparable basis, at the Merion Bluegrass locations, the bushel weight of all the heavy or normal seed yields was corrected to a bushel weight of 20#. The light seed bushel weight varied somewhat but approached 9 pounds in each case.

Table No. 1

Summary Table Showing the Effect of Nitrogen Rate and Date of Fertilizer Application, also the omission of P,K,&S on the Seed Yield of Merion Bluegrass at Three Locations and the Average of the Three Locations.

1960

Pounds of Nitrogen Applied Per Acre as Amm. Nitrate By Month of Application							Seed Yield Pounds Per Acre			
							By Location			Ave. of
Oct.	Nov.	Dec.	Jan.	Feb.	March	May	Collins	Olson	Stevenson	3 locations
40-K(2)					80		265.4	309.7	361.9	312.3
40-P					80		207.1	327.9	364.6	299.9
40-S					80		260.8	299.6	343.6	301.3
120							305.9	314.2	391.3	337.1
	120						246.5	262.8	389.8	299.7
		120					291.8	287.3	423.4	334.2
			120				228.6	310.6	362.1	300.4
				120			256.2	373.8	(1)	
					120		230.4	288.4	360.0	292.9
80							284.9	301.3	324.6	303.6
	80						242.3	270.3	322.9	278.5
	40				40		281.7	284.5	294.5	286.9
40					40		294.0	318.8	325.6	312.8
	40					40	264.3	216.3	338.3	288.0
	40				80		208.3	302.6	379.8	296.9
40					80		264.6	289.7	352.5	302.3
	40					80	195.6	255.7	247.0	232.8
40					40	40	267.6	266.2	388.0	307.3
40					120		236.6	307.7	382.7	309.0
80					80		271.5	258.9	410.9	313.8
120					40		270.0	281.3	427.4	326.2
					L.S.D. .05		NS	NS	66.0	45.8

(1) Treatment Omitted at this location

(2) All treatments received a blanket application of 90# / A P_2O_5, 100# / A K_2O & 80# / A S except where noted.

Summary Table No. 1 indicates that of the three locations, only the Stevenson location produced statistically significant differences. Those differences were generally associated with nitrogen level and not time of application. The 160 pound nitrogen rate yielding more that the 80 pound rate. The lowest yielding treatment, however, was a split application of 120 pounds of nitrogen with 40 pounds of N in November and 80 pounds in May.

From the average of the three locations, it appears that the single application of nitrogen in the fall or winter resulted in the most efficient returns from nitrogen applied. It appears from these results that the only time one would be justified in making an application in the spring would be to replace the nitrogen lost by Leaching after a winter of extremely high precipitation.

The average of the three locations indicates that the best results could be expected by application in September (or Possibly earlier), however, the highest single yield at the Stevenson location for the 120 pound level of N was in December, at the Olson location in February, at the Collins location in September with the December application a close second. It will be indicated later that in Newport Kentucky Bluegrass the highest yield was in January. A check on Primordial development on Merion Bluegrass in the winter of 1960-61 indicated that by the first of February the primordia had not shifted from vegetative to reproductive development. Could these winter applications be providing the plant with a shock at transition stage of primordial development and thus stimulating the plant into seed head formation? This point is worthy of further consideration.

Table No. 2 shows the percentage of light seed by location and in general the table indicates 20% light seed at the Stevenson location, 33% at the Collins location and 40% at the Olson location. Light seed is apparently not associated with the age of the stand in this case, because the Olson location was producing its second seed crop.

An analysis of variance of the light seed of the Olson location indicated a significant difference in light seed due to treatment. The results in Table No. 3, however, indicate that the same treatments that tended to produce the most heavy seed also produced the most light seed. This is born out by the rather consistant amount of light seed in relation to normal seed as indicated by the percentage of light seed.

It is well known that frosts during and close to the period of anthesis causes blank seed. Also it is generally recognized that hot dry weather during the formation of the seed tends to cause light seed. However, in the Central Oregon area there appear to be other factors in operation and causing much of the light seed. Nitrogen, phosphorus, potash and sulfur fertilizers apparently are not associated wth light seed. There is a tendency for light seed to increase with the age of the stand. Also, solid seedings tend to produce light seed earlier in the life of the stand that do row seedings.

Table No. 2

Effect of Nitrogen Rate and Date of Application, also the Omission of P,K,&S on the Percentage of Light Seed in Merion Bluegrass at three locations in Jefferson County.

Pounds of Nitrogen Per Acre as Ammonium Nitrate By Month of Application							Percentage Light Seed By Location		
Oct.	Nov.	Dec.	Jan.	Feb.	March	May	Collins	Olson	Stevenson
40-K					80		33.7	42.7	19.0
40-P					80		34.5	40.0	17.3
40-S					80		31.6	40.3	15.9
120							31.3	41.3	21.4
	120						32.4	43.3	21.1
		120					32.5	44.8	16.8
			120				34.8	42.5	20.9
				120			33.7	38.8	
					120		32.6	41.4	21.9
80							32.2	35.8	22.3
	80						34.3	43.8	17.7
	40				40		32.6	38.7	18.4
40					40		34.5	38.7	23.0
	40					40	31.6	39.4	19.5
	40				80		34.2	40.1	19.7
40					80		30.6	43.6	23.0
	40					80	32.6	41.1	33.0
40					40	40	34.1	40.6	18.0
40					120		32.1	40.9	23.1
80					80		34.0	39.5	19.8
120					40		33.6	42.8	20.6

The fact that other areas apparently do not have the high incidence of light seed in Merion Bluegrass tends to indicate that the phenomena is associated either with a pecularity of our climate, day length or some nutritional disturbance.

It is hoped that as this research program develops it will be possible to study the causes of this light seed problem in the Central Oregon area.

Seed yields by replicate, average seed yield and percentage light seed, for the three Merion Bluegrass location may be found in Appendix Tables 1, 2, &3. Also, the appendix section describes the plot design and experimental methods used in conducting the experiment.

Table No. 3

Effect of Nitrogen Rate and Date of Application, also the Omission of P,K,&S on Seed Yield of Merion Bluegrass. Yields are in Pounds of Seed Per Acre for Heavy Seed, Light Seed and Percentage Light Seed.

Louis Olson Farm - Madras, Oregon - 1960

Pounds of Nitrogen Per Acre aa Ammonium Nitrate By Month of Application							Average Yield (1) Heavy Seed	Average Yield (2) Light Seed	Percent Light Seed
Oct.	Nov.	Dec.	Jan.	Feb.	March	May			
40-K					80		309.7	231.0	42.7
40-P					80		327.9	218.3	40.0
40-S					80		299.6	202.0	40.3
120							314.2	221.1	41.3
	120						262.8	200.5	43.3
		120					287.3	232.8	44.8
			120				310.6	229.4	42.5
				120			373.8	236.8	38.8
					120		288.4	203.5	41.4
80							301.3	167.8	35.8
	80						270.3	210.8	43.8
	40				40		284.5	179.7	38.7
40					40		318.8	201.4	38.7
	40					40	261.3	169.9	39.4
	40				80		302.6	202.6	40.1
40					80		289.7	224.1	43.6
	40					80	255.7	178.1	41.1
40					40	40	266.2	181.6	40.6
40					120		307.7	213.1	40.9
80					80		258.9	169.0	39.5
120					40		281.3	210.9	42.8
					L.S.D. .05		NS	51.5	

Coeffient of Variation = 49.3%

(1) Bushel weight 20#

(2) Bushel weight slightly variable but approximately 9#.

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Grass Seed Fertility

T he grass seed fertility experiment consisted of four locations, three on Merion Bluegrass and one on Newport Kentucky Bluegrass.

The Merion locations were all on Madras loam as near as could be determined by the soils map. The Newport location in the Culver area was on Madras sandy loam.

Each location received the same treatments with the exception that treatment 10 (120# N in Feb.) was omitted at the Stevenson location, and as nearly as possible similiar treatments were applied on the same day. The treatments and yields by replicate are presented in Appendix Tables 1, 2, 3 and 4.

Each location was laid out in a randomized block design with four replications. The fertilizers were surface applied by hand with the fertilizer thoroughly mixed with moistened vermiculite. (Zonolite-plaster aggragate) to add bulk to the application and prevent fertilizer drift by wind.

Each plot was 9 x 50 feet with 10 feet trimmed from the end of each plot at harvest. The plots were harvested with a forage harvester, the materials placed in mattress covers and left in the field until dry. After drying, the material was hauled to the headquarters in Redmond and stored under shelter until threshed in a plot thresher.

The dates of harvest of the four locations are as follows:

Leland King - Newport Ky. Bluegrass - August 7, 1960
Louis Olson - Merion Bluegrass - August 13, 1960
Roy Stevenson - Merion Bluegrass - August 12, 1960
Bill Collins - Merion Bluegrass - August 16, 1960

The seed was cleaned on a Model B clipper cleaner. It was necessary to run the seed through the cleaner four times to obtain clean seed.

In order to place each treatment on a comparable basis the bushel weight of the heavy or normal seed was adjusted to 20# for the Merion Bluegrass experiment. When this was done, the bushel weight of the light seed averaged about 9#.

To adjust the bushel weight when the bushel weight was under 20 pounds, the seed was poured through a Vogel recleaner with the air full open and the seed blown out on a large table. The light end of the seed was removed until the bushel weight was brought up to 20#. To lower the bushel weight the light seed was similarly treated as the above seed but the heavy end of the light seed was added to the normal or heavy seed until the bushel weight was brought down to 20#.

Appendix Table No. 1

Effect of Nitrog en Rate and Date of Application; also the Omission of P,K, S on the Seed Yield of Merion Bluegrass. Yields are Presented by Replicate and Average of Replicates.

Bill Collins Farm - Little Agency Plains - 1960

Pounds of Nitrogen Applied Per Acre as Amm. Nitrate By Month of Application							Seed Y ield - Pounds Per Acre with Bu. Wt. 20# by Replicate				Ave. Seed Yield	% Light Seed
Oct.	Nov.	Dec.	Jan.	Feb.	March	May	I	II	III	IV		
40-K					80		229.4	259.1	326.2	247.0	265.4	33.7
40-P					80		177.7	199.4	239.4	211.9	207.1	34.5
40-S					80		248.2	223.6	304.5	267.0	260.8	31.6
120							273.7	387.9	255.3	306.6	305.9	31.3
	120						120.1	330.4	276.2	259.1	246.5	32.4
		120					407.1	252.0	257.8	250.3	291.8	32.5
			120				197.3	236.9	259.5	220.7	228.6	34.8
				120			214.8	236.5	281.6	292.0	256.2	33.7
					120		181.5	262.0	232.8	245.3	230.4	32.6
80							370.0	258.2	232.8	278.7	284.9	32.2
	80						320.0	216.1	188.6	244.4	242.3	34.3
	40				40		322.9	267.8	271.6	264.5	281.7	32.6
40					40		331.6	250.3	334.6	259.5	294.0	34.5
	40					40	263.6	247.4	284.5	261.6	264.3	31.6
	40				80		161.9	208.2	207.7	255.3	208.3	34.2
40					80		257.8	258.6	288.3	253.6	264.6	30.6
	40					80	147.3	222.8	247.4	164.8	195.6	32.6
40					40	40	256.1	307.9	251.1	255.3	267.6	34.1
40					120		156.8	238.2	268.6	282.8	236.6	32.1
80					80		192.7	285.7	243.2	364.2	271.5	34.0
120					40		271.1	212.7	298.3	297.8	270.0	33.6
										L.S.D. @ .05 N.S.		

(1) Approximate Bushels Weight 9 Pounds

Appendix Table No. 2

Effect of Nitrogen Rate and Date of Application; also the Omission of P,K, and S on the Seed Y ield of Merion Bluegrass. Yields are in Pounds of Seed Per Acre with a Bushel Weight of 20 Pounds. Yields are presented by Replicates and average Y ield and show the Percentage of Light Seed.

Louis Olson Farm – Madras – 1960

Pounds of Nitrogen Per Acre as Amm. Nitrate By Month of Application							Pounds Per Acre of Seed with Bu. Wt. of 20# by Replicate				Ave. Seed Yield	% (1) Light Seed
Oct.	Nov.	Dec.	Jan.	Feb.	March	May	I	II	III	IV		
40-K (2)					80		319.5	377.1	233.2	309.1	309.7	42.7
40-P					80		364.6	300.3	304.5	342.1	327.9	40.0
40-S					80		270.3	324.1	226.1	377.9	299.6	40.3
120							244.0	336.2	356.2	320.4	314.2	41.3
	120						296.2	239.4	252.0	263.6	262.8	43.3
		120					254.9	346.2	299.5	248.6	287.3	44.8
			120				432.2	308.7	277.8	223.6	310.6	42.5
				120			373.8	418.4	371.7	331.2	373.8	38.8
					120		290.8	350.4	287.0	225.3	288.4	41.4
80							239.4	371.7	336.2	257.8	301.3	35.8
	80						279.1	262.8	307.0	232.4	270.3	43.8
	40				40		246.1	351.2	290.3	250.3	284.5	38.7
40					40		313.3	322.0	300.3	339.6	318.8	38.7
	40					40	222.3	277.8	275.7	269.5	261.3	39.4
	40				80		346.2	302.9	327.9	233.2	302.6	40.1
40					80		307.9	275.3	315.4	260.3	289.7	43.6
	40					80	290.8	310.4	204.4	217.3	255.7	41.1
40					40	40	259.5	318.7	267.0	219.4	266.2	40.6
40					120		368.8	352.9	264.5	244.4	307.7	40.9
80					80		289.1	262.4	307.9	176.0	258.9	39.5
120					40		360.4	257.8	231.5	275.3	281.3	42.8
											L.S.D. 105 NS	

(1) Approximate Bushel Weight 9 Pounds

(2) All treatments received in application of 90#/A. P_2O_5, 100#/A. K_2O and 80#/A.S except where noted.

Appendix Table No. 8

Effect of Nitrogen Rate and Date of Application; also the Omission of P,K, and s, on the Seed Yield of Merion Bluegrass. Y ields are in Pounds of Seed Per Acre with a Bushel Weight of 20 Pounds. Yields are Presented by Replicate and Average Y ield with Percentage of Light Seed also Indicated.

Roy Stevenson Farm - Madras - 1960

Pounds of Nitrogen Per Acre as Amm. Nitrate By Month of Application							Pounds Per Acre of Seed With Wt. 20# by Replicate				Ave. Seed Yield	% Light Seed
Oct.	Nov.	Dec.	Jan.	Feb.	March	May	I	II	III	IV		
40-K (1)					80		375.4	371.3	377.9	322.9	361.9	19.0
40-P					80		302.9	388.8	391.3	375.4	364.6	17.3
40-S					80		400.5	327.9	330.4	315.4	343.6	15.9
120					80		427.2	419.7	384.6	333.7	391.3	21.4
	120						459.7	401.3	384.6	313.7	389.8	21.1
		120					455.5	398.0	486.4	353.7	423.4	16.8
			120				327.0	425.5	391.3	304.5	362.1	20.9
				120			(2)					
					120		332.1	345.4	413.0	349.6	360.0	21.9
80	80						398.8	344.6	269.5	285.3	324.6	22.3
	40						334.6	299.5	327.0	330.4	322.9	17.7
					40		391.3	340.4	245.3	301.1	294.5	18.4
40					40		327.9	295.3	317.0	362.1	325.6	23.0
	40					40	264.5	382.9	359.6	346.2	338.3	19.5
	40				80		345.4	407.1	382.1	384.6	379.8	19.7
40					80		341.2	383.8	327.9	357.1	352.5	23.0
	40						223.6	213.6	247.0	303.7	247.0	33.0
40					40		408.8	333.7	458.9	350.4	388.0	18.0
40					120		319.5	393.0	438.0	380.4	382.7	23.1
80					80		436.3	463.0	352.9	391.3	410.9	19.9
120					40		379.6	427.2	500.6	402.1	427.4	20.6
										L.S.D. @ .05	66.0	

(1) All treatments received an application of 90#/A. P_2O_5, 100#/A. K_2O and 80#/A. S except where Noted.
(2) Treatment 10 omitted at this location.