

Grass Seed Fertility

A grass seed fertility experiment was established during the fall of 1965 to determine the relative effectiveness of ammonium nitrate, ammonium sulphate and urea as sources of nitrogen fertilizers.

On a number of farms, heavy applications of nitrogen (approx. 300# per acre) as urea have failed to provide sufficient N to carry the grass seed crop the full year. A possible explanation of this failure is the loss of ammonia through volatilization. The fertilizer is surface applied to the soil after the fields are burned and, consequently, is applied on an alkaline ash or unburned duff. Often in October and November and early December the soil surface remains dry and soil temperatures can be relatively high. These conditions would be conducive to volatilization losses. In addition, urea, during the course of breakdown, creates a local alkaline condition which would further enhance losses through volatilization.

The experiment was established on two locations; the Merle Carlson farm at Culver, Oregon, and the Louis Olsen farm at Madras, Oregon.

The Olsen farm received a uniform application of fertilizer during the fall of 1966 and had a source x rate interaction at the higher N levels in 1968. Consequently, most of the following statements will be made in reference to the Carlson location. However, in general, similar trends appear at the Olsen location.

The 1968 results of the Merle Carlson location are shown in Table No. 1 and represent an accumulative effect of three years treatment to the same plot. The results indicate a rather striking effect of both source and rate of nitrogen application. Ammonium nitrate as a source produced approximately 100 pounds of seed per acre more than ammonium sulphate and 50 pounds of seed per acre more than urea. The average effect of nitrogen rate after three years of production is also very marked with the 200 pound per acre rate of nitrogen giving the highest yield at 486 pounds of seed per acre which was 350 pounds of seed more than the 50 pound N rate. Previous experiments have shown zero yield from 0#N.

Table No. 3 presents the average effect of source of nitrogen for each of the three years harvested and in each case indicates that the higher yields came from ammonium nitrate as a source of N rather than urea or ammonium sulphate. However, ammonium sulphate was the poorest source under the conditions encountered and not urea.

Table No. 4 indicates that as the stand grows older more nitrogen is required to produce an optimum yield. The optimum yield increase during the first year of production was obtained from 100 pounds of nitrogen while in 1968 the top yield was obtained from 200 pounds of nitrogen and the yield difference between the 50-pound and 200-pound rate increased from 36 pounds of seed in 1966 to 400 pounds of seed in 1968.

The effect of potassium fertilizer is shown in Table No. 5

and the soil test in Table No. 6. Potassium fertilizer (KCl) reduced seed yield each of the three years applied and the effect became more marked with each year. The soil test indicated a marked increase in the K level of the soil, particularly on the surface. Presumably, at least two possible factors could have influenced the reduction in yield by potassium chloride, 1- the K and or Cl ion could have hampered the uptake of N, 2- the increase of basic salts on the surface could have caused greater volatilization of nitrogen from the soil surface.

The complete soil test for 1968 (Appendix Table No. 4) of the Carlson location indicates that urea fertilizer tended to increase the pH and the calcium, and lower the phosphate level as compared to ammonium sulphate.

Appendix Table No. 1 gives the yields by replication for the Carlson location.

Table No. 2 presents the yield summary for the Olsen location and Appendix Table No. 2, the seed yield by replication. Also, Appendix Table No. 4, the soil test for 1968.

Table No. 1

Summary of the Effects of Rates and Sources of Nitrogen Fertilizer and the Rate of Potassium Fertilizer on the Seed Yield of Windsor Bluegrass
Merle Carlson Farm - Culver, Oregon - 1968

Source and Rate Nitrogen Fertilizer	Average Seed Yield
Am. Sulfate	
50	107.5
100	321.3
150	326.7
200	419.3
Am. Nitrate	
50	166.7
100	349.2
150	472.8
200	565.7
Urea	
50	131.2
100	311.8
150	443.6
200	473.7
	L.S.D. @ 5% 103.3
	@ 1% 138.6
	C.V. 18.6%

Effect of Nitrogen Source

Source	Seed Yield
Am. Sulfate	293.7
Urea	340.1
Am. Nitrate	388.6
	L.S.D. @ 5% 51.7
	@ 1% 69.3

Effect of Nitrogen Rate

#N/Acre	Seed Yield
50	135.0
100	327.1
150	414.0
200	485.7
	L.S.D. @ 5% 59.6
	@ 1% 80.0

Effect of Potassium Rate

#K/A @ 150# N	Seed Yield
0	487.6
200	326.7
	L.S.D. @ 5% 103.3
	@ 1% 138.6

Table No. 2

Summary of the Effects of Rates and Sources of Nitrogen Fertilizer and the Rate of Potassium Fertilizer on the Seed Yield of Windsor Bluegrass
Louis Olsen Farm - Madras, Oregon - 1968

Source and Rate Nitrogen Fertilizer		Average Seed Yield
Am. Sulfate	50	212.2
	100	266.0
	150	276.0
	200	219.5
Am. Nitrate	50	220.1
	100	261.7
	150	371.0
	200	234.4
Urea	50	260.8
	100	237.4
	150	326.7
	200	382.0
	L.S.D. @ 5%	73.9
	@ 1%	99.1

Effect of Nitrogen Source

Source	Seed Yield
Am. Sulfate	251.0
Urea	274.7
Am. Nitrate	284.0

Because of a significant source x rate interaction,
200 # N rates are not included in main effects.

Effect of Rate of Nitrogen Application

Rate	Seed Yield
50	231.1
100	255.1
150	324.6

Effect of Potassium at 150# N Level

0 K	339.2
200 K	276.0

L.S.D. @ 5% ns

Table No. 3

Summary of the Effect of Nitrogen Source on the
Yield of Windsor Bluegrass Seed for the
Years 1966 - 1968 Inclusive
Merle Carlson Farm - Culver, Oregon

	1966	
Source of N	Average Seed Yield	
Am. Sulfate	332	
Urea	343	
Am. Nitrate	357	+25
	1967	
Am. Sulfate	808	
Urea	812	
Am. Nitrate	822	+14
	1968	
Am. Sulfate	294	
Urea	340	
Am. Nitrate	389	+95**

Table No. 4

Summary of the Effect of Nitrogen Rate
on the Yield of Windsor Bluegrass.
Merle Carlson Farm - Culver, Oregon

Rate of Nitrogen as Am. Nitrate	Average Seed Yield	
	1966	
50	343	
100	353	
150	356	
200	379	+36
	1968	
50	167	
100	349	
150	473	
200	566	+400**

Table No. 5

Summary of the Effect of Potassium Fertilizer
on the Yield of Windsor Bluegrass Seed Yield
Merle Carlson Farm - Culver, Oregon

K #/acre @ 150# N (Am. Sulf.)	Average Seed Yield	
	1966	1967
0	363	987
200	339	913
	L.S.D. @ 5% ns	-74
	1968	
0	488	
200	327	-161**
	L.S.D. @ 5% 103.3	
	@ 1% 138.6	

Table No. 6

Soil Test Values for Carlson Farm Comparing
1965 and 1968 Samplings for pH, Phosphorus and
Potassium at the 200# Nitrogen Application Rate
Madras Loam Soil

Depth	pH		
	1965	1968 (200# N Level) Am. Sulf.	Urea
0-1/2"	5.9	6.3	6.8
0-8"	6.1	6.3	6.6
P (PPM) 80#/Acre P ₂ O ₅ Annual			
0-1/2"	60	60.4	49
0-8"	25	30.9	19
K (me/100 gm.) 200# K Annual			
0-1/2"	1.53	2.14	2.44
0-8"	1.06	1.52	1.23

Appendix Table No. 1

Yield of Windsor Bluegrass Seed from Several Rates of Nitrogen Fertilizer Applied as Ammonium Sulfate, Ammonium Nitrate and Urea. One Treatment Without Potassium was Included. - 1968

Merle Carlson Farm - Culver, Oregon

Source and Rate of Fertilizer Pounds Per Acre (1)	Seed Yield in Pounds Per Acre				Average
	Rep. I	Rep. II	Rep. III	Rep. IV	
Ammonium Sulfate					
50	104.45	128.74	110.52	86.23	107.49
100	286.65	239.26	336.42	422.65	321.25
150	272.05	246.54	425.08	363.14	326.70
200	208.89	606.04	501.59	360.71	419.31
150 - K	459.08	451.79	599.96	439.65	487.62
Ammonium Nitrate					
50	162.74	173.67	183.39	146.95	166.69
100	404.43	327.92	340.06	324.27	349.17
150	433.58	443.29	522.24	491.87	472.75
200	576.89	625.48	484.59	575.67	565.66
Urea					
50	106.88	149.38	167.60	100.80	131.17
100	252.62	222.25	427.50	344.92	311.82
150	353.42	443.29	500.37	477.30	443.60
200	540.45	484.59	474.87	394.71	473.66
C. V. %					18.6

(1) Sulfur application adjusted to 80# of S per Acre with gypsum
P₂O₅ 80# per Acre uniform application
K 200# per Acre uniform application except where noted
Fertilizer applied November 3, 1967

Appendix Table No. 2

Yield of Windsor Bluegrass Seed from Several Rates of Nitrogen Fertilizer Applied as Ammonium Sulfate, Ammonium Nitrate and Urea. One Treatment Without Potassium was Included. - 1968

Louis Olsen Farm - Madras, Oregon

Source and Rate of Fertilizer Pounds Per Acre (1)	Seed Yield in Pounds Per Acre				Average
	Rep. I	Rep. II	Rep. III	Rep. IV	
Ammonium Sulfate					
50	179.75	202.82	304.84	161.53	212.24
100	273.26	278.12	287.84	224.68	265.98
150	263.55	329.13	256.26	255.05	276.00
200	221.04	180.96	256.26	219.82	219.52
150 - K	312.13	214.97	457.87	371.64	339.15
Ammonium Nitrate					
50	236.83	292.69	162.74	188.25	220.13
100	267.19	167.60	308.48	303.63	261.73
150	422.65	352.21	371.64	337.63	371.03
200	284.19	197.96	238.04	217.40	234.40
Urea					
50	340.06	174.89	262.33	265.98	260.82
100	211.32	273.26	230.76	234.40	237.44
150	302.41	286.62	353.42	364.35	326.70
200	347.35	378.92	455.44	346.13	381.96
C. V. %					20.5

(1) Uniform application of the following fertilizers was made.
 80# P₂O₅/Acre as Triple phosphate
 80# S/Acre as Gypsum or Ammonium Sulfate

Appendix Table No. 3

Soil Test Values from the Olsen Farm Taken
in the Fall of 1968. Experimental Treatments
Applied During 1966 and 1968 Crop Years
Madras Loam Soil
200# N/Acre

Depth	pH		P (PPM)	
	Am. Sulf.	Urea	Am. Sulf.	Urea
0- $\frac{1}{2}$ "	6.0	6.6	98.2	87.0
0-8	5.9	6.3	30.9	19.7

me/100 gm.

Depth	K		Ca		Mg	
	Am. Sulf.	Urea	Am. Sulf.	Urea	Am. Sulf.	Urea
0- $\frac{1}{2}$ "	2.48	2.44	6.6	9.1	3.5	4.3
0-8	1.41	1.03	7.5	9.4	4.8	5.3

Appendix Table No. 4

Soil Test Values from the Carlson Farm Taken
in the Fall of 1968 After 3 Years of Experiment
Madras Loam Soil
200# N/Acre

Depth	pH		P (PPM)	
	Am. Sulf.	Urea	Am. Sulf.	Urea
0- $\frac{1}{2}$ "	6.3	6.8	60.4	49.1
0-8	6.3	6.6	30.9	19.0

me/100 gm.

Depth	K		Ca		Mg	
	Am. Sulf.	Urea	Am. Sulf.	Urea	Am. Sulf.	Urea
0- $\frac{1}{2}$ "	2.14	2.44	7.5	10.4	3.8	4.6
0-8	1.52	1.28	7.8	9.4	4.9	5.3