Chemical weed control produced slight increases in yield on all treatments. The average increase was approximately 160 lbs. of dry matter per acre. This very sandy soil released not more than 4 lbs. of nitrogen per acre, as indicated by total grass production (269 lbs. dry matter, 1.5 percent nitrogen). The 200 lb. nitrogen rate increased dry matter yields 1,900 lbs. per acre. The increase in protein per acre was slightly more than 400 lbs. per acre. Thirty pounds of nitrogen plus 15 lbs. of P_2O_5 and 15 lbs. K_2O per acre increased dry matter yields 200-300 lbs. per acre. The application of 100 lbs. of nitrogen alone produced more than 600 lbs. more dry matter when chemical weed control was used.

Location - Pennington County - Thief River Falls, Minnesota
Species - Bluegrass, quack, white clover
Soil Type - Garnes sandy loam - surface contains many stones, moderately drained. This site used as a pasture for many years.
Soil Test - pH 6.6; phosphorus 10 lbs/A; potassium 200 lbs/A

Treatment lbs/acre N	P_2O_5	K_2O		Yield (3 cuttings) Dry Matter lbs/acre	Protein lbs/acre
0	0	0		861	
0	0	0	W C	632	90
30	15	15		1127	
30	15	15	W C	1005	153
200	50	50		3206	
200	50	50	W C	3502	693
100	0	0		1461	
100	0	0	W C	1385	

This area which had been mowed 5 times during the previous years showed little or no yield response from chemical weed control. Thirty lbs. of nitrogen in combination with 15 lbs. of P_2O_5 and K_2O per acre increased yield 300-400 lbs. of dry matter per acre and increased the yield of protein per acre by 63 lbs. Yields of dry matter were increased by an average of 1,400 to 1,800 lbs. per acre with an application of 200 lbs. of nitrogen and 50 lbs. of P_2O_5 and 50 lbs. K_2O per acre.

Location - Norman County - Ada, Minnesota
Species - Quack, bluegrass
Soil Type - Borup series - a well drained silt loam. Relatively high in fertility.
Soil Test - pH 7.7; phosphorus 24 lbs/A; potassium 280 lbs/A

Treatment lbs/acre N	P_2O_5	K_2O		Yield (2 cuttings) Dry Matter lbs/acre	Protein lbs/acre
0	0	0		777	
0	0	0	W C	928	117
30	15	15		1026	
30	15	15	W C	1048	123
150	50	50		2631	
150	50	50	W C	2352	336
100	0	0		866	
100	0	0	W C	502	

This area was grazed until late June so that at least one cutting was lost. This, no doubt, reduced considerably the yield increase obtained from the treatment consisting of 30 lbs. of nitrogen plus 15 lbs. of P_2O_5 and 15 lbs. of K_2O per acre. The application of 150 lbs. of nitrogen per acre plus 50 lbs. each of P_2O_5 and K_2O increased dry matter yields as much as 1,800 lbs. per acre. The same treatment resulted in an increased protein content of 213 lbs. per acre. Chemical weed control had little effect on forage yields. This area had been mowed several times during the 1971 and 1972 crop seasons.

SUMMARY

The average dry matter and protein yield of pasture grasses obtained from 39 cuttings on 11 different soil types in the Red River Basin of Minnesota are shown below. These yields represent oven dried forage obtained from areas which had been mowed and fertilized similarly in 1971 and 1972.

Effect of fertilizer and chemical weed control on yield and protein content of grass pastures - Red River Basin, 1973. (11 sites - 39 cuttings)

Treatment lbs/acre N	P_2O_5	K_2O		Yield Dry Matter lbs/acre	Protein lbs/acre
0	0	0		1184	
0	0	0	W C	1117	140
30	15	15		1617	
30	15	15	W C	1559	210
*100	50	50		4023	
*100	50	50	W C	4027	733
100	0	0		1820	
100	0	0	W C	1859	

* received an additional 50 lbs. nitrogen per acre after each cutting, or a total of 200-250 lbs. nitrogen per acre

The population of weeds at the various site locations differed considerably. Chemical weed control produced significant increases in dry matter yields at 5 of the 11 locations. This is quite significant when one considers that all of the sites were mowed several times in 1971 and 1972. A comparison of chemical weed control (1 lb. 2-4-D/acre) with no chemical weed control, on fertilized areas, is shown below.

Dry Matter Production Lbs/Acre
Fertilized Areas

Soil Series	No. Cuttings	30-15-15	30-15-15 (2-4-D)	*100-50-50	100-50-50 (2-4-D)
Cathro	5	2951	3424	5309	6465
Sioux	4	890	1372	3531	3652
Flom	4	2460	2660	5954	6594
Roliss	4	1775	1902	4223	5137
Hamar	3	434	598	3013	3172
Avg.		1702	1991	4406	5040

* 100 lbs. nitrogen applied in early spring with an additional 50 lbs. nitrogen per acre after each cutting

Influence of soil series on dry matter and protein production of grass forage on unfertilized areas - Red River Basin, 1973.

Series*	Cutting	Yield Lbs/Acre (no fertilizer) Dry Matter	Protein
Cathro Muck	5	2223	415
Sioux	4	746	97
Flom	4	1829	226
Flaming	3	299	19
Wheatville	4	1221	210
Percy	4	774	92
Roliss	4	1222	135
Hamar	3	269	22
Garnes	3	632	90

* Kratka and Borup series not included; all cuttings were not available.

Influence of soil series on dry matter and protein production of grass forage on heavily fertilized areas - Red River Basin, 1973.

Series*	Cutting	Nitrogen** lbs/acre	Production Dry Matter lbs/acre	Protein lbs/acre
Cathro	5	300	6465	1475
Sioux	4	250	3652	724
Flom	4	250	6594	1235
Flaming	3	200	2320	390
Wheatville	4	250	5093	1140
Percy	4	250	2669	558
Roliss	4	250	5137	899
Hamar	3	200	3172	427
Garnes	3	200	3502	693

* Kratka and Borup series not included; all cuttings were not available.

** Applied in combination with 50 lbs. of P_2O_5 and 50 lbs. of K_2O per acre.

HIGH PROTEIN FEED FROM PEAT SOILS

Charles A. Simkins and Robert P. Schoper

High protein feeds for animal consumption are in demand throughout the world. In the past, alfalfa and soybeans have furnished a large portion of our needs for plant proteins. In the future, it is unlikely that they will be able to provide all the needed plant protein for successful meat production.

It has been recognized for some time that grass plants properly fertilized and harvested can also furnish feed with high protein content. The Netherlands, Northern Germany, Denmark, as well as several other countries in Europe, are currently using grass plants harvested at an early age as a source of high protein feed for livestock production. The soils and climatic conditions of these areas are unsuitable for the economical production of alfalfa or soybeans.

The State of Minnesota also has certain soils and climatic areas where the production of grass as a crop would appear more feasible than other cultivated crops. One such area is the 7 1/2 million acres of peat soil of the state. Approximately 4 million acres has been, or can be, readily put into agricultural production of grasses.

Grass seed production has already become a rather sizeable industry on the peat soils of Minnesota. Vegetable, wild rice and extensive forage production has also been established on peat soils. These soils, when drained and cultivated, are recognized as good suppliers of nitrogen for plant growth. Recently it has become of interest to determine the quantity and quality of high protein feed which might be produced from these soils through fertilization.

METHODS AND MATERIALS

A pasture near Gully, Minnesota in East Polk County was chosen as an experimental site. The peat soil was 5 to 6 feet in depth, underlain for the most part by heavy clay soil. The pasture had originally been established for production of timothy seed. The subsequent invasion by Agropyron repens (quack grass) had resulted in the field being abandoned for timothy seed production. The field at the time of establishment of the trial contained several grass species of which Agropyron repens made up more than 95 percent.

In April 1973, the existing grass residue was burned off and fertilizer treatments were applied by broadcasting on the surface.

Each plot was 1/100 acre in size. Each treatment, as shown in the following table, was replicated four times. It was pre-determined that the grass would be harvested when the first growth reached a height of 8-10 inches. Additional harvests would then be made on a monthly basis. The dates of harvesting in 1973 were May 24, June 27, July 31, August 28 and October 2. The entire plots were harvested with a Toro mower. Green weights were taken in the field. Samples of the grass were dried to allow for calculation of dry matter yields and protein content. Fiber and fat content were determined

on certain treatments at the 5 cuttings. Soil chemical analysis of the site showed the following:

pH	NO_3-N-2 ft.	Available phosphorus	Exchangeable potassium
6.4	128 lbs/acre	2 lbs/acre P	70 lbs/acre K

The moisture obtained during most of the growing season was moderately low. From April 1 to September 1, less than 10 inches, during September more than 11 inches were obtained in two days.

RESULTS

The yields of dry matter per acre obtained from the various treatments are shown in Table 1. These weights in lbs/acre are the totals obtained from the 5 cuttings for each fertilizer treatment.

Table 1. Effect of various fertilizer treatments on yield of Agropyron repens (5 cuttings). Gully, Minnesota 1973.

Treatment lbs/acre			Grass Production Dry Matter
N	P_2O_5	K_2O	lbs/acre
0	0	0	2,485
30	15	15	3,797
100	0	0	3,031
*100	50	50	7,023
*100	100	100	7,609
*200	100	100	7,757
*300	100	100	7,590
*400	100	100	8,471

* These plots received an additional 50 pounds of N per acre after each cutting, or an additional 200 pounds of nitrogen per acre for the season.

The total pounds of protein per acre obtained from the various treatments are shown in Table 2.

Table 2. Effect of various fertilizer treatments on protein yield of Agropyron repens. Gully, Minnesota 1973.

Treatment lbs/acre			Protein
N	P_2O_5	K_2O	lbs/acre
0	0	0	461
30	15	15	711
*100	50	50	1,518
*100	100	100	1,819
*200	100	100	1,768
*300	100	100	1,779
*400	100	100	2,008

* An additional 200 pounds N per acre were applied to these areas, i.e., 50 pounds N per acre after each cutting.

Fat and fiber analysis were made on two treatments of each cutting. This data is shown in Table 3.

Table 3. Fat and fiber content of Agropyron repens as influenced by fertilization and date of cutting. Gully, Minnesota 1973.

	May 24		June 27		July 31		August 28		October 2	
Treatment	% Fat	% Fiber	% Fat	% Fiber	% Fat	% Fiber	% Fat	% Fiber	% Fat	% Fiber
0- 0- 0	5.1	20.6	3.3	24.5	3.9	19.2	4.5	19.9	-	-
100-100-100	5.9	19.6	3.6	29.9	4.1	20.3	4.3	20.1	-	-

The analysis for fat and fiber content for the October 2 harvest has not been completed to date.

The amino acid composition of selected treatments was made on the first harvest (May 24, 1973). The content of amino acid for the various treatments is shown in Table 4.

Table 4. Amino acid composition of Agropyron repens (percent) - May 24 harvest date. Gully, Minnesota 1973.

	Treatments N - P_2O_5 - K_2O lbs/acre		
Amino Acid	30-15-15	100-100-100	200-100-100
Lysine	1.39	2.10	1.82
Histidine	0.36	0.53	0.48
Ammonia	0.48	1.11	0.78
Arginine	1.28	1.91	1.68
Aspartic Acid	2.89	5.14	4.17
Threonine	1.08	1.47	1.36
Serine	0.82	1.20	1.06
Glutamic Acid	3.28	4.19	3.86
Proline	1.33	1.60	1.52
Glycine	1.47	1.95	1.80
Alanine	2.12	2.66	2.55
Half Cystine	Trace	Trace	Trace
Valine	1.79	2.36	2.24
Methionine	0.18	0.21	0.21
Isoleucine	1.24	1.63	1.60
Leucine	2.21	2.90	2.70
Tyrosine	0.68	0.89	0.85
Phenylaline	1.40	1.88	1.77
Tryptophan	-	-	-

The percent protein in the harvested grass for selected treatments at various dates of cutting is shown in Table 5.

Table 5. Percent protein in Agropyron repens for various dates of harvest and fertilizer treatments. Gully, Minnesota 1973.

Treatment lbs/acre			% Protein				
N	P_2O_5	K_2O	May 24	June 27	July 31	August 28	October 2
0	0	0	21.2	14.8	22.2	24.3	21.5
*100	50	50	27.8	16.4	25.8	24.3	26.5
*100	100	100	27.3	15.2	23.6	25.9	25.8
*200	100	100	30.4	17.7	25.8	26.3	26.0
*300	100	100	32.6	17.7	26.6	26.0	26.6
*400	100	100	32.4	18.2	25.3	27.0	27.3

* An additional 200 pounds nitrogen per acre was applied during the growing season (50 pounds nitrogen per acre after each cutting).

DISCUSSION

Relatively high yields of high protein feed were produced as a result of fertilization and early cutting of Agropyron repens. It is quite likely that larger yields of dry matter would have been obtained if the grass had been allowed to grow to a greater height. The June 27 (second cutting) attained a height of nearly 24 inches and gave the highest yield of dry matter per acre for all cuttings. All treatments at the second cutting, June 27, which had received applications of phosphorus and potash plus 100 pounds of nitrogen per acre or more produced yields of more than 3,000 pounds of dry matter per acre. The fiber content, however, as shown in Table 3, rose to nearly 30 percent (29.9) on the fertilizer treated areas. The percent protein at the second cutting was also reduced by harvesting at a height of approximately 24 inches. The application of nitrogen fertilizer in combination with phosphorus and potassium resulted in dry matter yields of more than 7,000 pounds per acre for the 5 cuttings. This occurred when 300 pounds of nitrogen or more were applied, Table 1. These yields were nearly 3 times those of the unfertilized areas (2,485 lbs/acre).

Total protein produced per acre was similarly increased by fertilizer applications. Protein yields where 300 pounds of nitrogen per acre or more were applied attained levels of more than 1,800 pounds of protein per acre, Table 2.

An analysis of the amino acid composition of the grass indicated a relatively high level of lysine and other essential amino acids. This analysis confirmed the protein content of the grass as obtained by Kjeldahl method of analysis.

SUMMARY

1. The yields of Agropyron repens were significantly increased by fertilizer applications on peat soils. (Increase of 5,000 pounds of dry matter per acre.)

2. During the 1973 growing season, it was possible to harvest the grass 5 times without damage to stand.

3. The protein content of fertilized grasses harvested at an early stage (8-10 inch height) ranged from 25-32 percent when fertilized.

4. The use of potassium and phosphorus fertilizer proved to be of importance in producing high yields of grass on this peat soil.

5. The highest protein content and lowest fiber content of Agropyron repens was obtained when the grass was harvested at 8-10 inches in height.

6. There may be other cool season grasses which have the capacity to produce under these conditions more total dry matter per acre than Agropyron repens. Reed canary grass has demonstrated good yielding ability under these conditions. There are, however, large areas of peat land where Agropyron repens already exists and with proper fertilization and management, this grass can produce high yields.

INFLUENCE OF VARIOUS NITROGEN FERTILIZER RATES ON YIELD OF SEMI-DWARF WHEAT - ADA, MINNESOTA - 1973

C. Simkins, P. Groneberg, R. Schoper

A nitrogen rate study was conducted on the R. E. Jamison farm near Ada, Minnesota. This trial consisted of 5 rates of nitrogen applied as ammonium nitrate on Red River 68 variety of wheat. Four replications of each treatment were applied on plots 10 x 30'. Phosphorus was applied on all plots at the rate of 40 lbs. of P_2O_5 per acre. Soil analysis indicated the following characteristics:

NO_3-N (2 ft. depth) - 70 lbs/acre

P - 115 lbs/acre

K - 460 lbs/acre

pH - 7.3

The wheat was seeded on April 30 and harvested on July 25, 1973. Nitrogen rates used in the trial were 0, 50, 100, 150 and 200 lbs. of nitrogen per acre.

Yields and protein content of Red River 68 wheat - Ada, Minnesota - 1973

Nitrogen lbs/acre	Yield bu/acre	Protein %
0	28.2 a	11.1 a
50	50.6 b	11.9 b
100	56.9 b	12.5 c
150	57.6 b	13.3 d
200	60.2 b	13.2 d

Yields of wheat were increased with increasing nitrogen applications. Fifty lbs. of nitrogen per acre produced the greatest increase per pound of nitrogen applied, approximately 1 bushel wheat for each 2.5 lbs. of nitrogen applied. The application of an additional 50 lbs. of N (100 lbs. N per acre) resulted in a 6.3 bushel per acre increase over the 50 lbs. per acre rate. One hundred-fifty lbs. of nitrogen per acre produced the highest increase in protein content.

INFLUENCE OF ANHYDROUS AMMONIA APPLICATIONS ON YIELD OF ESTABLISHED WHEAT

ADA, MINNESOTA - 1973

C. Simkins, P. Groneberg, R. Schoper

Normally anhydrous ammonia applied as a nitrogen fertilizer for wheat is applied before planting of the wheat crop. An application at this time is less likely to injure germinating wheat or destroy wheat plants if the material is injected at seeding time or after a stand has been established.

In order to determine the influence of anhydrous ammonia applied on a stand of wheat, a trial was established near Ada, Minnesota. Nitrogen was applied at the rates of 0, 50 and 100 lbs. of nitrogen per acre on a wheat stand that was 6 to 8 inches in height. The soil at this location indicated the following characteristics: NO_3-N 70 lbs. per acre, P 115 lbs. per acre, K 460 lbs. per acre, pH 7.3. Nitrogen injectors were spaced 12 inches apart. Although considerable damage was done to the growing wheat, the nitrogen applications resulted in significant increases in yield and protein content of wheat.

Effect of anhydrous ammonia applications on established wheat stand (6-8 in. height) - Ada, Minnesota - 1973

Nitrogen lbs/acre	Yield bu/acre	Protein %
0	31.3	11.7
50	39.3	12.7
100	45.0	13.4

The increases in yield from 50 and 100 lbs. of nitrogen per acre were less than one might expect from this quantity of nitrogen, yields were nevertheless significantly increased. The 50 lb. N rate increased yields approximately 1 bushel for each 6 lbs. of nitrogen used. The 100 lb. N rate increased yields approximately 1 bushel for each 7 lbs. of nitrogen used. It is certain that the anhydrous ammonia application reduced the stand of wheat considerably. Under normal circumstances, nitrogen fertilizer (anhydrous ammonia) should be applied before planting. However, in case of emergence, nitrogen may be knifed into an established stand.

SOYBEAN-NITROGEN FERTILIZER SOURCE AND RATE STUDY

G.E. Ham and S.D. Evans

Ammonium nitrate, urea and soybean meal sources of nitrogen at the rate of 100 and 200 pounds of nitrogen per acre were compared at Morris and Rosemount. All fertilizers were applied to the surface and disked in before planting. Nonnodulating and nodulating isolines of Chippewa maturity and Swift soybeans were grown on the plots. The yields for 1973 are shown in Tables 1. Nitrogen fertilizer significantly increased seed yields at Morris but not at Rosemount. The nodulating plants were well-nodulated at both locations. Nodule number, nodule weight and N_2 (C_2H_2) fixation were reduced by all sources of nitrogen although the effects of soybean meal were less than ammonium nitrate and urea.

Table 1. Effect of nitrogen sources and rates and genotype on soybean seed yield at Morris and Rosemount (1973).

Location	Nitrogen Source	Nitrogen rate	Soybean genotype		
			Nonnod	Nod	Swift
		lb/acre	---------bu/acre-------		
Morris	Check		20.5a	34.2a	40.5a
	Ammonium nitrate	100	39.7bc	40.7bc	41.2ab
	Urea	100	39.4bc	43.1bc	41.5ab
	Soybean meal	100	37.8b	39.4b	45.0b
	Ammonium nitrate	200	44.5d	43.4bc	42.4ab
	Urea	200	43.7cd	42.5bc	44.4ab
	Soybean meal	200	41.8bcd	44.0c	45.5b
	Ammonium nitrate	300	40.1bcd	43.4bc	40.9a
Rosemount	Check		31.9a	43.9c	47.6
	Ammonium nitrate	100	37.5bc	39.8ab	45.6
	Urea	100	35.1ab	39.3ab	47.6
	Soybean meal	100	37.7bc	42.1bc	47.8
	Ammonium nitrate	200	40.1c	37.7a	49.0
	Urea	200	39.4c	42.1bc	47.6
	Soybean meal	200	40.0c	38.8ab	45.3
	Ammonium nitrate	300	39.1c	42.1bc	45.4

Yields at one location under a variety followed by the same letter are not significantly different from each other at the .05 level.

Effect of Phosphorus and Potassium Fertilizer Rates and Placement on Soybean Seed Yields

G.E. Ham, S.D. Evans and G.W. Randall

The effect of P and K fertilizer rates and placement on soybean seed yield was studied at Morris and Waseca during 1973.

Phosphorus fertilizer rates of 15, 30 and 45 kg P/ha (13.4, 26.7 and 40.0 pounds P/acre) were applied as broadcast treatments. Row fertilizer rates were 10, 20 and 30 kg P/ha (9, 17.8 and 26.7 pounds P/acre).

In a separate experiment potassium fertilizer rates were 15, 30 and 45 kg K/ha (13.3, 26.7 and 40 pounds K/acre) for row treatments and 30, 60 and 90 kg K/ha (26.7 53.4 and 80.1 pounds K/acre) for broadcast treatments.

Broadcast treatments were plowed down the previous fall and row fertilizer was applied at planting time two inches to the side and two inches below the seed. The experimental design was a factorial with all rates of broadcast (4) in combination with all rates of row fertilizer (4). Planting dates were May 23 and May 18 at Morris and Waseca, respectively; harvest dates were September 28 and October 15, respectively. Row spacing was 30 inches and plots were six rows wide and 25 feet long.

Soil information from the two locations are shown in Table 1.

Table 1. Characteristics of field sites used for 1973 P and K fertilizer experiments.

Location	Soil Classification	pH	Extractable P	Exchangeable K
Morris	McIntosh (Aeric Calciaquoll)	8.2	6	246
Waseca	Nicollet (Aquic Hapudoll)	6.8	14	250

Morris experiments:

Phosphorus experiment. Seed yields were not increased with either broadcast or banded P since a yield increase of 5.6 bushels per acre was required for significance at the .05 level. Leaf P percentage was not increased significantly by P additions while leaf K percentage was decreased significantly in several cases.

Potassium experiment. Seed yields were not increased significantly by K fertilizer (no yield was greater than the control). K fertilizer decreased leaf P percentage and increased leaf K percentage significantly.

Waseca experiments:

Phosphorus experiment. Seed yield was not increased with P fertilizer. Leaf P percentage was increased significantly in two cases while leaf K percentage was not changed significantly.

Potassium experiment. Seed yield was increased significantly (5.1 bu/acre) by the addition of 90 kg K/ha broadcast and 30 kg K/ha banded. Leaf P percentage and K percentage were increased in some cases.

Table 2. Effect of broadcast and row fertilizer (P and K) on soybean seed yield and leaf P and K percentage on II-61-96 genotype at Morris and Wells variety at Waseca (1973).

		Row Fertilizer (kg/ha)											
		0 P			10 P			20 P			30 P		
Broadcast fertilizer		Yield bu/acre	P %	K %	Yield bu/acre	P %	K %	Yield bu/acre	P %	K %	Yield bu/acre	P %	K %
	kg/ha												
Morris	0 P	51.7	.444	2.74	50.5	.417	3.00	52.7	.417	2.77	53.7	.438	2.74
	15 P	50.9	.427	2.74	49.5	.500	2.80	51.5	.443	2.77	51.7	.458	2.63
	30 P	50.5	.456	2.66	53.2	.459	2.74	49.4	.435	2.82	51.0	.444	2.71
	45 P	47.1	.471	2.73	50.5	.418	2.80	50.1	.425	2.78	50.8	.449	2.52*
Coefficient of variation (%)		7.8	1.4	5.1									
LSD .05		5.6	0.070	0.20									

	0 K			15 K			30 K			45 K		
0 K	48.4	.533	2.29	47.9	.477	2.27	45.2	.428	2.35	46.1	.468	2.29
30 K	48.9	.494	2.37	46.4	.467	2.52*	47.0	.479	2.29	46.2	.447*	2.37
60 K	47.7	.481	2.38	45.9	.443*	2.35	47.8	.457	2.41	45.2	.451*	2.43
90 K	47.2	.473	2.34	44.2	.473	2.39	47.1	.446*	2.47*	48.4	.468	2.38
Coefficient of variation (%)	8.0	10.1	5.4									
LSD .05	5.2	.073	0.18									

(Table 2 continued)

Table 2 (continued). Effect of broadcast and row fertilizer (P and K) on soybean seed yield and leaf P and K percentage on II-61-96 genotype at Morris and Wells variety at Waseca (1973).

	Row Fertilizer (kg/ha)											
	0 P			10 P			20 P			30 P		
	Yield bu/acre	P %	K %	Yield bu/acre	P %	K %	Yield bu/acre	P %	K %	Yield bu/acre	P %	K %
Waseca 0 P	42.8	.349	2.21	42.8	.367	2.35	43.9	.348	2.02	44.4	.368	2.21
15 P	46.7	.354	2.29	45.2	.375	2.10	45.2	.371	2.22	43.7	.363	2.18
30 P	47.6	.364	2.17	45.3	.389*	2.17	44.1	.382	2.26	45.0	.375	2.25
45 P	45.7	.379	2.09	45.1	.380	2.17	45.9	.384	2.23	42.4	.393*	2.26
Coefficient of variation (%)	9.1	7.1	8.0									
LSD .05	5.7	0.037	0.25									

	0 K			15 K			30 K			45 K		
0 K	42.3	.351	1.87	42.2	.376*	2.10	41.4	.375*	2.11	45.7	.357	2.00
30 K	45.9	.357	2.17*	42.7	.375*	2.16*	42.7	.365	2.14*	45.0	.366	2.36*
60 K	44.3	.352	2.15*	43.2	.364	2.14*	41.8	.366	2.25*	42.3	.349	2.41*
90 K	45.5	.355	2.20	44.3	.356	2.09	47.4	.352	2.12	44.4	.365	2.09
Coefficient of variation (%)	8.3	4.1	8.6									
LSD .05	5.1	0.021	0.26									

SOIL TESTING

John Grava

Currently the University of Minnesota Soil Testing Laboratory processes over twenty five thousand samples annually. The following data show the number of various types of samples analyzed in 1973.

Regular farm garden and lawn samples		16,966
Florist (greenhouse) samples		2,131
Specials:	Nitrate	1,164
	Sulfur	802
	Zinc	703
	Soluble salts	665
	pH	87
Departmental research samples		3,033
	Total	25,551

Monthly distribution of regular soil samples received by the laboratory is shown in Table 1.

Table 1. Monthly distribution of soil samples received by the University of Minnesota Soil Testing Laboratory during 1973.

Month	Number of Samples
January	585
February	554
March	1,786
April	2,497
May	949
June	497
July	513
August	1,355
September	1,862
October	2,797
November	2,354
December	1,216

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