Stukenholtz Laboratory, Inc.

ADDISON AVENUE EAST • P.O. BOX 353 • TWIN FALLS, IDAHO 83303-0353
PHONE (208) 734-3050 • 800-759-3050 • FAX (208) 734-3919

December 4, 1998

Ken Steelman
JH BIOTECH
4951 Olivas Park Drive
Ventura, CA 93003

RE: BIOZYME, PHOSGARD & BIOACTIVATE on potatoes in 1998

Dear Ken:

The following is my report from the field research we conducted on potatoes using Biozyme, Bioactivate and Phosgard on potatoes in Idaho in 1998. There were four experimental locations and each one will be discussed separately.

I. Eden-Hazelton Location

1. This field had a silt loam texture and the previous crop was alfalfa. The soil is strongly calcareous and the fertilizer program is as follows:

   Broadcast - 60-220-225 plus 10 lbs zinc, 6 lbs manganese, and 2 lbs boron
   Starter Markout - 25-90-0
   Topdress - 100-0-60 was topdressed prior to cultivation

2. The irrigation system was wheel lines with a rotation time of 7 days. Irrigation was scheduled using tensiometers and the "feel" method.

3. The crop was Russet Burbank with seed pieces averaging 2.25 ounces and the seed spacing was 12 inches.

4. Application and plot size - Each plot was 4 rows wide by 40 feet long and five replications. Foliar applications were made with a hand held pressurized sprayer at the rate of 30 gpa.

5. The treatments were as follows:
   a. Check
   b. Biozyme at 8 ounces per acre applied with the liquid starter just prior to planting in the bed. Eight ounces of Biozyme was applied 6-20-98 when the plants were small and tubers were about ½ inch in diameter.
   c. Bioactivate starter only
      Bioactivate at 16 ounces per acre was applied with the starter fertilizer just prior to planting.
   d. Bioactivate Foliar Only
      Bioactivate at 16 ounces per acre was applied on July 1 when tubers were 1 inch in diameter.
      Bioactivate was also applied again at 16 ounces per acre on July 25th.
   e. Phosgard was applied at 32 ounces per acre on:
      6-20-98
      7-3-98
      7-21-98

7. Disease Assessment
   a. Rhizotonia - slight amount
   b. Blackleg and seedpiece decay - none
   c. Verticillium Wilt - well controlled until the last two weeks
   d. Colletotrichum - small amount but significant
   e. Early blight - present late in the season
   f. Late blight - none
   g. Common and powdery scab - none
   h. Sclerotina (white mold) - small amount late in the season

Results and Discussion

Table 1 shows the soil test values of the experimental area. The soil was depleted of many nutrients but an excellent fertility program was used.

Table 2 shows the nematode assessment of the experimental area.

Table 3 shows the yield and quality components of the various treatments. The addition of BIOZYME-PS resulted in an increase yield of U. S. Number Ones of about 53 cwt/acre. Salable yield of ones and twos were increased by 41 cwt/acre. Total yield including culls and undersized were increased by 25.6 cwt/acre. U.S. Number Ones increased from 60.2% in the check to 69.8% with Biozyme. The yield increase came mostly from the larger Ones and Twos. The specific gravity was slightly lower but not significant in the Biozyme treatment.

The treatment with Phosgard improved percent ones in comparison with the check by 44% and saleable potatoes increased by 16.4 cwt/acre. Large ones and twos were increased by Phosgard but the small ones and twos were lower.

Bioactivate applied in the starter liquid fertilizer increased percent numbers ones a small amount and yield of number ones a small amount but failed to increase saleable and total yields. Specific gravities were quite good for all treatments for the very hot season that was present and it appears treatments had no real effect.

II. Rockland (American Falls)

1. This field has a sandy loam texture as shown in table 7. The previous crop was a wheat with all residue returned to the soil. The fertility program consisted of the following:

   Broadcast - 100-100-10 plus 70 sulfur, 10 lbs zinc, 4 lbs manganese, and 1.5 lbs boron
   Starter - 20-80-0
   Water application - according to tissue tests

2. The irrigation system was a center pivot and irrigation was scheduled using tensiometers and the "feel" method.

3. The crop variety was Shepodie with seed pieces averaging 2.5 ounces and the spacing was 11-12 inches.

4. Application and plot size - Each plot was 4 rows wide by 40 feet long and five replications. Foliar applications were made with a hand held pressurized sprayer at the rate of 30 gpa.

5. The treatments were as follows:
   a. Check
   b. Biozyme at 8 ounces per acre applied with the liquid starter just prior to planting in the bed. Eight ounces of Biozyme was applied 6-24-98 when the plants were small and tubers were about ½ inch in diameter.
   c. Bioactivate starter plus Foliar Bioactivate at 16 ounces per acre was applied with the liquid starter and on July 10 when tubers were 1 inch in diameter. Bioactivate was also applied again at 16 ounces per acre on July 27th.
   d. Phosgard was applied at 32 ounces per acre on:
      6-26-98
      7-9-98
      7-21-98

6. Cultural Practices
   Excellent cultural practices were utilized whereby weed, insects, and fungal leaf diseases were controlled.

Results and Discussion

Table 9 shows the soil test values of the experimental area after fertilization. The soil is a sandy loam, is weakly calcareous, and the is low in salts and sodium.

Table 10 shows the yield and quality components of the four treatments. Biozyme increased the yield of number one potatoes from 349 cwt/acre to 372 cwt/acre. Saleable yield increased from 370 cwt/acre up to 403 cwt/acre. The percent number ones stayed the same while specific gravity was virtually unchanged.

The addition of Phosgard produced a small increase in saleable potatoes (18 cwt/acre) and a larger increase in total yield (27 cwt/acre) largely because of greater culls plus undersized. The percent number ones decreased from 83.8 % for the check down to 77.7 % for Phosgard. Specific gravity was about the same.

The Bioactivate treatment failed to produce quality improvements. The percent ones went down from 83.8 % to 78.0%. Saleable yield increased from 370 cwt/acre to 387.8 cwt/acre.

Tables 11 through 14 present the tissue test values throughout the season. The data shows that phosphorus nutrition was quite adequate throughout the season. None of the treatments appeared to improve phosphorus nutrition. Even though ten pounds of zinc was applied, it seems obvious that an inadequate amount was absorbed by the end of the season. Only about 10-12 ppm zinc was present in the petioles on August 20.

The experiment was harvested on September 29 and the vines were still quite green and healthy. As a result of the early harvest, the petiole nitrates were fairy adequate under the circumstances.

III. American Falls Location (Rangers)

1. This field has a heavy sandy loam texture and the soil analyses are shown in Table 14. The previous crop was wheat with all of the residue returned.

2. The irrigation system was wheel lines and irrigation was scheduled using tensiometers and the "feel" method.

3. The crop variety was Rangers with seed pieces averaging 2.25 ounces and the spacing was 12 inches.

4. Application and plot size - Each plot was 4 rows wide by 40 feet long and five replications. Foliar applications were made with a hand held pressurized sprayer at the rate of 30 gpa.

5. The treatments were as follows:
   a. Check
   b. Biozyme at 8 ounces per acre applied with the liquid starter just prior to planting in the bed. Eight ounces of Biozyme was applied 6-24-98 when the plants were small and tubers were about ½ inch in diameter.
   c. Bioactivate starter plus Foliar Bioactivate at 16 ounces per acre was applied with the liquid starter and on July 10 when tubers were 1

inch in diameter. Bioactivate was also applied again at 16 ounces per acre on July 27th.

d. Phosgard was applied at 32 ounces per acre on:
   6-26-98
   7-9-98
   7-21-98

Results and Discussion

Table 15 shows the soil test values of the experimental area on June 10th. The soil is mildly calcareous but tests very low in soluble salts and sodium.

Table 16 shows the yield and quality components of the five treatments. The data shows that none of the treatments effected an increase in number ones or saleable yield. For some unknown reason, the Phosgard treatment resulted in less yield of U.S. Number Ones and percent number ones. There was an increase in culls and total yield as a result of the Phosgard treatment. However, specific gravity appeared to have been reduced by the Phosgard treatment.

Table 17 shows yield and quality comparisons between the check and Bioactivate applied in the liquid starter fertilizer only. These comparisons were in a different part of the field where the soil was in the lower flat part of the field. The data shows that in this situation Bioactivate applied in the starter reduced the yield of both number ones and twos. There was a much greater amount of culls and undersized in this portion of the field. It would appear heat and moisture stress were definite limiting factors.

Tables 18 through 21 show the plant petiole test results at four time periods throughout the season. The check treatment shows petiole phosphorus testing slightly low to borderline throughout the season. Most of the other elements were fairly adequate except for the iron which was law much of the season. The Biozyme treatment appeared didn't appear to change the tissue levels. The use of Phosgard may have increased the phosphorus nutrition throughout the season. All other values were much the same as the check.

IV. Murtaugh Location - Russet Burbank

The experimental field was in the Murtaugh area on a silt loam soil. This soil is characterized by having too much sodium and excess lime. As a result, it tends to become hard and the water has a tendency to run. The grower used a mechanical dammer/diker and many other production practices in order to obtain high yields.

The season had some serious problems which limited the yield and quality of the potatoes. The season started off by being cooler than normal and much wetter. This field received 11.5 inches of rainfall which tended to cause soil compaction and poor soil aeration. The summer was unseasonable hot and the nighttime temperatures were 10 degrees above average. The farmers in this area generally produced below average potato crops both in yield and in quality. See Table 22 for soil test results of the experimental area. The previous crop was wheat with all residue returned to the soil.

1. The fertilization program consisted of the following:
   a. Broadcast - 80-210-90 plus 4 lbs Zinc and 80 lbs elemental sulfur.
   b. Starter Mark-out - 23-80-0 plus 1 Qt zinc chelate.
   c. Water run - Nitrogen as 32-0-0 plus Thio-Sul were added in the water according to tissue tests. A total of 190 units N was added in the water during the season.
   d. See table 22 for soil test values.

2. The crop was Russet Burbank with seed pieces averaging 2.4 ounces and the seed spacing was 12 inches.

3. The irrigation system was center pivot and the water was scheduled using tensiometers

4. A uniform appearing part of the pivot was selected and each plot was 4 rows wide and 40 feet long with 5 replications.

5. The treatments were as follows:
   a. Check

b. Biozyme at 8 ounces per acre applied with the liquid fertilizer just prior to planting in the bed. Eight ounces of Biozyme was applied 6-22-98 when the plants were small and tubers were about ½ inch in diameter.

c. Bioactivate starter only
Bioactivate at 16 ounces per acre was applied with the starter fertilizer just prior to planting.

d. Bioactivate Foliar Only
Bioactivate at 16 ounces per acre was applied on July 3rd when tubers were 1 inch in diameter.
Bioactivate was also applied again at 16 ounces per acre on July 27th.

e. Phosgard was applied at 32 ounces per acre on:
6-22-98
7-5-98
7-23-98

6. Cultural Practices
Very modern cultural practices were used in regards to weed, insect, and fungal leaf disease control.

7. Disease Assessment
a. Rhizotonia - slight amount
b. Blackleg and seedpiece decay - none
c. Verticillium Wilt - well controlled until the last 2-3 weeks
d. Colletotrichum - small amount but significant
e. Sclerotina (white mold) - large amount late in the season
f. Late blight - none
g. Common and powdery scab - none

8. The plots were hand harvested on 9-15-98 and the results are shown in Table 23

9. Plant tissue analyses were determined at five times during the season and the results are provided in Tables 24 and 28.

Results and Discussion

Table 23 shows results of yield and quality of Russet Burbank potatoes as influenced by treatment with Biozyme, Bioactivate, and Phosgard. The data shows that generally the yields and quality are less than we normally expect. The weather was such that it favored rough and misshapen potatoes. Early in the tuber growth period the soil tended to be wet and cold. Suddenly, the temperatures became hot and stayed hot throughout the season. This change in weather resulted in tubers with pointed ends.

The addition of Biozyme resulted in a U.S. Number One increase of 26 cwt/acre and a saleable yield increase of 40 cwt/acre. The percent number one stayed the about the same at about 50%.

The addition of Phosgard resulted in a U.S. Number One increase of 24 cwt/acre and a saleable yield increase of 35 cwt/acre. The percent number ones showed no increase of 50%.

Bioactivate in the starter didn't appear to produce a noticeable increase in yield or quality. However, Bioactivate applied foliarly produced 9 cwt/acre more U.S. Number Ones and 24 cwt/acre more saleable yield. The difference is probably not very significant.

Tables 24-28 show the tissue test levels at four different times throughout the season. The treatments including the check were generally well supplied with most nutrients. There were no nutrient deficiencies that limited yield during the season. None of the treatments made a major impact on nutrient composition. However, it appears that Biozyme addition may have improved the nitrogen nutrition late in the season. Phosgard may have increased the phosphorus content in the petioles a small amount. This increase in and by itself probably did not influence yields very much because even the check treatment tested adequate.

If you have any questions about any of this research, do not hesitate to call.

Sincerely,

Dale D. Stukenholtz, Ph.D., CCA
Certified Professional Agronomist

DDS/mm

Table 1

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050
TWIN FALLS, ID 83303-0353 1-800-759-3050

208/734-3050

STUKENHOLTZ, DALE 3001
2924 ADDISON AVENUE EAST
P.O. BOX 353
TWIN FALLS ID 83303-0353

Report No. 84807
Date Received 10/19/97
Date Reported 10/20/97

GROWER: LOCKWOOD

SOIL TEST DATA	Sample 1		Sample 2
pH	8.3	H	
SALTS, mmhos/cm	0.5	VL	
SODIUM, meq/100g	0.3	VL	
CEC, meq/100g	20.1	H	
EXCESS LIME, %	7.5	H	
ORGANIC MATTER, %	1.85	M	
ORGANIC N, lb/Acre	70	M	
NITRATE-N, ppm	9	L	
PHOSPHORUS, ppm	11	M	
POTASSIUM, ppm	135	L	
CALCIUM, meq/100g	16.5	VH	
MAGNESIUM, meq/100g	2.8	H	
SULFATE-S, ppm	8	L	
ZINC, ppm	1.0	L	
IRON, ppm	4.5	M	
MANGANESE, ppm	2.4	L	
COPPER, ppm	1.1	M	
BORON, ppm	0.45	L	
SOIL TEXTURE	SEE TABLE		

	Sample 1	Sample 2
SAMPLE IDENTITY	WA 4	
CROP	POTATOES	
YIELD GOAL	450 CWT	
ACRES		
PAST CROP T/Acre	ALFALFA	
MANURE T/Acre	0	
PREV. APPLIED NUTRIENTS	0	

RECOMMENDATIONS, lbs or Units Actual Nutrients per Acre

NITROGEN	60
P_2O_5 - PHOSPHATE	220
K_2O - POTASH	225
CALCIUM	0
MAGNESIUM	0
SULFATE-SULFUR	0
ZINC	10
IRON	0
MANGANESE	6
COPPER	0
BORON	2
ELEMENTAL SULFUR	0

RATINGS : VL - Very Low L - Low M - Medium H - High VH - Very High

SAMPLE	ACTUAL AND RECOMMENDED PERCENT OF CEC							
	Actual % Potassium	Recommended Potassium	Actual % Calcium	Recommended Calcium	Actual % Magnesium	Recommended Magnesium	Actual % Sodium	Recommended Sodium
1	2.2	3.0-6.0%	82.1	65-80%	13.9	10-20%	1.5	<3.0%
2								

RELATION OF CEC TO SOIL TEXTURE	
0-5	Sand
5-12	Loamy Sand
12-18	Sandy Loam
18-24	Silt Loam
24-36	Clay Loam
36+	Clay

REMARKS

CROP1:ALSO MARK-OUT OR APPLY WITH THE PLANTER, 20 GAL 10-34-0 PLUS 3-4 QTS OF AN EFFECTIVE HUMIC ACID PRODUCT.
CROP1:ALSO TOPDRESS PRIOR TO THE LAST CULTIVATION WITH 100-0-60.
CROP1:ADD EXTRA N IN THE WATER ACCORDING TO PLANT TISSUE TESTS.
CROP1:THIS SOIL SHOULD BENEFIT FROM THE USE OF PENETRON AND HIGH QUALITY HUMIC ACID PRODUCTS.

Supervised by: Dr. Dale Stukenholtz

Table 2

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050
TWIN FALLS, ID 83303-0353 1-800-759-3050

NEMATODE ANALYSIS

208/734-3050
/000-0000

STUKENHOLTZ, DALE
2924 ADDISON AVENUE EAST
P.O. BOX 353
TWIN FALLS ID 83303-0353

Grower: LOCKWOOD

Report No. :84802
Account No. :3001
Date Received :10/20/97
Date Reported :11/22/97

	Sample 1
Report Number	84802
Sample Identity	WA 4
Crop	POTATOES
Previous Crop	ALFALFA
ROOT KNOT (Northern) (Meloidogyne Hapla)	0
ROOT KNOT (Columbia) (Meloidogyne Chitwoodi)	0
ROOT LESION (Pratylenchus)	980
STUBBY ROOT (Trichodorus)	0
STUNT (Tylenchorhynchus)	30
SPIRAL (Heliocotylenchus)	120
PIN (Paratylenchus)	0
DAGGER (Xiphinema)	0
STEM (Ditylenchus spp.)	0
RING (Macroposthonia spp.)	0
SHEATH (Hemicycliphora spp.)	0
OTHER	0
CYST (Heterodera)	
VIABLE	0
EMPTY	0
LARVAE	0
EGGS	0

Comments:
Smpl 1 :There appears to be no significant nematode problem.

Supervised by: Dr. Dale Stukenholtz

Stukenholtz Laboratory, Inc.

ADDISON AVENUE EAST • P.O. BOX 353 • TWIN FALLS, IDAHO 83303-0353
PHONE (208) 734-3050 • 800-759-3050 • FAX (208) 734-3919

Table 3

Results of yield and quality from treatment with Biozyme, Bioactivate, and Phosgard on Russet Burbanks at Hazelton in 1998.

Treatment		Total Yield cwt/Ac	Saleable Yield cwt/Ac	Yield No. Ones cwt/Ac	No. ones % %	U.S. No Ones >10 oz cwt/Ac	U.S. No Ones <10 oz cwt/Ac	U.S. No Twos >10 oz cwt/Ac	U.S. No Twos <10 oz cwt/Ac	Culls cwt/Ac	Specific Gravity
CHECK	1	374.5	336.0	224.7	60.0	105.7	119.0	54.6	56.7	38.5	
	2	336.0	304.5	192.5	57.3	101.5	91.0	56.0	56.0	31.5	
	3	357.0	322.0	231.0	64.7	112.0	119.0	28.0	63.0	35.0	
	4	395.5	353.5	238.0	60.2	98.0	140.0	59.5	56.0	42.0	
	5	374.5	329.0	220.5	58.9	94.5	126.0	56.0	52.5	45.5	
	Ave.	367.5	329.0	221.3	60.2	102.3	119.0	50.8	56.8	38.5	1.0795
PHOSGARD	1	378.0	350.0	203.0	53.7	105.0	98.0	84.0	63.0	28.0	
	2	364.0	329.0	220.0	60.6	133.0	87.5	70.0	38.5	35.0	
	3	365.4	336.0	218.4	59.8	125.3	93.1	72.1	45.5	29.4	
	4	389.9	368.9	214.9	55.1	126.0	88.9	119.0	35.0	21.0	
	5	372.5	343.0	238.0	63.9	133.0	105.0	77.0	28.0	29.5	
	Ave.	374.0	345.4	219.0	64.6	124.5	94.5	84.4	42.0	28.6	1.076
BIOZYME	1	367.5	350.0	252.0	68.6	147.0	105.0	56.0	42.0	17.5	
	2	406.0	392.0	294.0	72.4	182.0	112.0	70.0	28.0	14.0	
	3	420.0	392.0	287.0	68.3	147.0	140.0	63.0	42.0	28.0	
	4	397.7	374.6	280.0	70.4	154.0	126.0	57.5	37.1	23.1	
	5	374.5	343.0	259.0	69.2	126.0	133.0	49.0	35.0	31.5	
	Ave.	393.1	370.3	274.4	69.8	151.2	123.2	59.1	36.8	22.8	1.078
BIOACTIVATE FOLIAR ONLY	1	339.8	311.5	185.5	54.6	63.0	122.5	77.0	49.0	28.0	
	2	377.5	346.0	224.0	59.3	94.5	129.5	42.0	77.0	31.5	
	3	402.5	364.0	168.0	41.7	70.0	98.0	84.0	73.5	38.5	
	4	343.0	308.0	182.0	53.1	77.0	105.0	70.0	56.0	35.0	
	5	386.0	351.0	252.0	65.3	84.0	168.0	49.0	50.0	35.0	
	Ave.	370.0	336.1	202.3	54.8	77.7	124.6	64.4	61.1	33.6	1.078
BIOACTIVATE STARTER ONLY	1	373.0	345.0	240.0	64.3	119.0	121.0	70.0	35.0	28.0	
	2	350.0	329.0	231.0	66.0	84.0	147.0	42.0	56.0	21.0	
	3	359.0	331.0	254.0	70.8	105.0	149.0	49.0	28.0	28.0	
	4	364.0	322.0	224.0	61.5	112.0	112.0	35.0	63.0	42.0	
	5	358.5	318.5	220.5	61.5	63.0	157.5	28.0	70.0	40.0	
	Ave.	360.9	329.1	233.9	64.8	96.6	137.3	44.8	50.4	31.8	1.0805

Table 4

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: LOCKWOOD POTATOES SL No: 361 FIELD: CHECK

DATE SAMPLED [1998]	06/29	07/10	08/05	08/18
Report No.				
Total N, %				
NO_3-N, ppm	21000	18600	18100	17500
Phosphorus, %	0.46	0.36	0.17	0.18
Potassium, %	10.34	11.89	6.26	7.01
Calcium, %	2.04	2.11	2.35	2.10
Magnesium, %	1.01	0.54	1.47	1.35
Sulfur, %	0.20	0.18	0.18	0.17
Zinc, ppm	35	65	14	15
Iron, ppm	108	78	65	68
Manganese, ppm	25	38	24	38
Copper, ppm	8	16	31	25
Boron, ppm	48	30	34	32
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N .....

Units P_2O_5 .....

Units K_2O .....

Units S .....

FOLIAR NUTRIENTS lb/Acre

N .....

P_2O_5 .....

K_2O .....

S .....

Zn .....

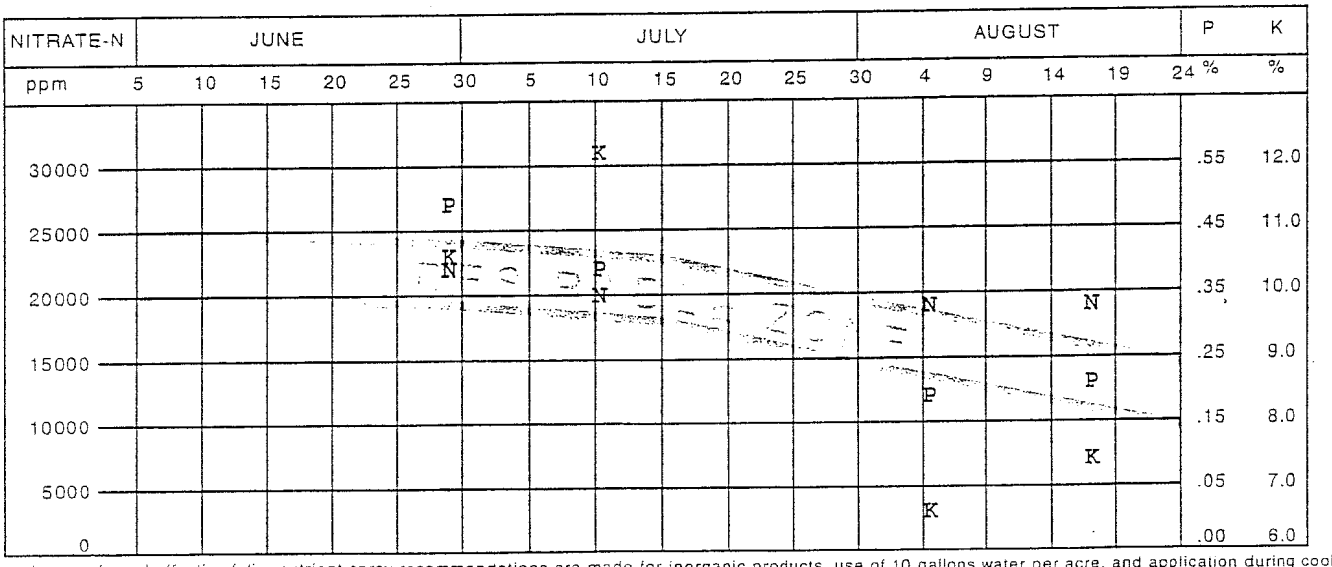
Fe .....

Mn .....

Cu .....

B .....

Formula No. .....



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 5

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: LOCKWOOD POTATOES SL No: 362 FIELD: BIOZYME

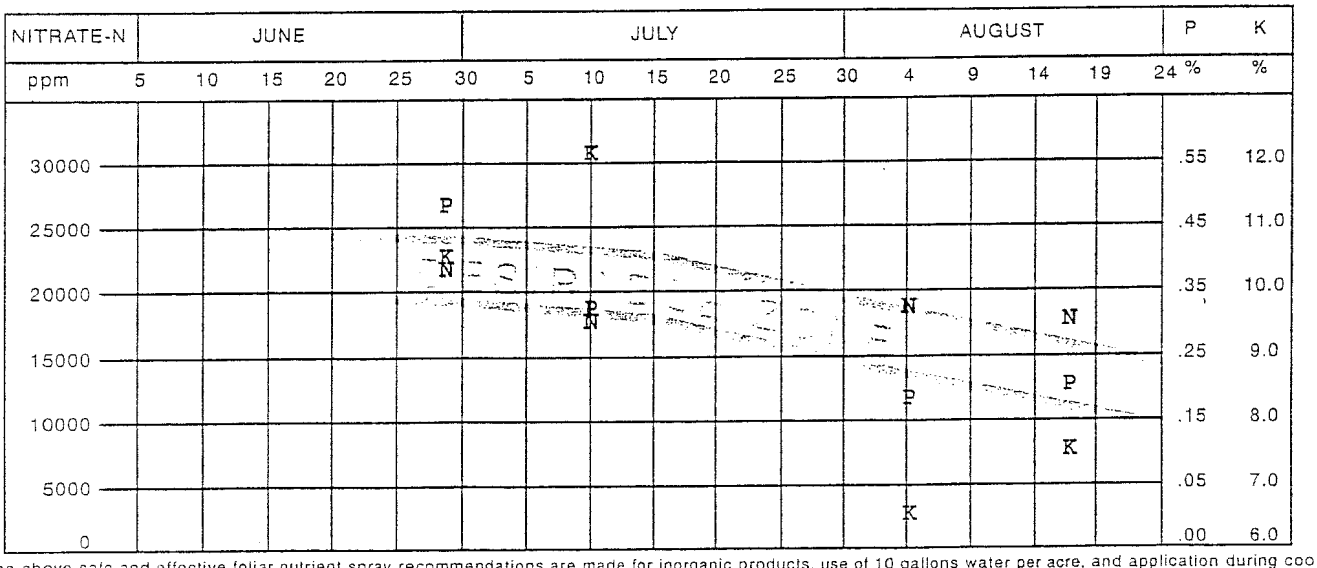
DATE SAMPLED [1998]	06/29	07/10	08/05	08/18
Report No.				
Total N, %				
NO_3-N, ppm	21000	17200	17900	17200
Phosphorus, %	0.46	0.31	0.17	0.19
Potassium, %	10.34	11.90	6.27	7.25
Calcium, %	2.04	2.23	2.32	2.18
Magnesium, %	1.01	0.58	1.49	1.41
Sulfur, %	0.20	0.15	0.20	0.19
Zinc, ppm	35	50	13	14
Iron, ppm	108	96	64	70
Manganese, ppm	25	31	23	40
Copper, ppm	8	11	28	23
Boron, ppm	48	30	35	32
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 6

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: LOCKWOOD POTATOES SL No: 363 FIELD: BIOACT. STARTER

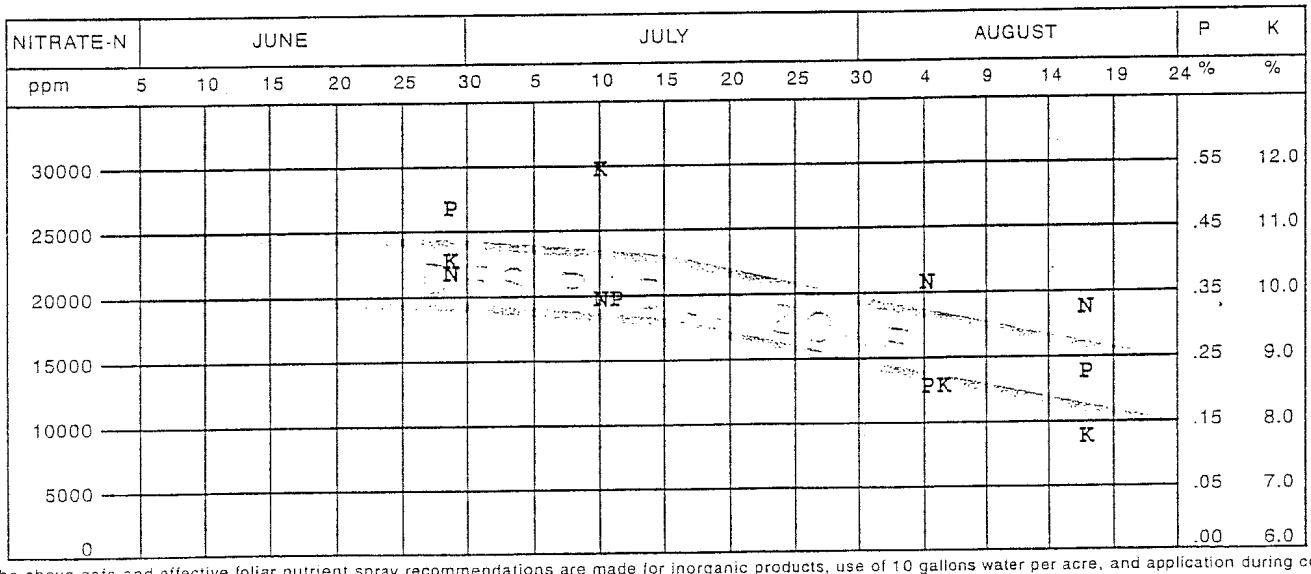
DATE SAMPLED [1998]	06/29	07/10	08/05	08/18
Report No.				
Total N, %				
NO_3-N, ppm	21000	18900	20200	17900
Phosphorus, %	0.46	0.33	0.19	0.20
Potassium, %	10.34	11.73	8.21	7.60
Calcium, %	2.04	2.11	1.91	2.10
Magnesium, %	1.01	0.55	1.09	1.35
Sulfur, %	0.20	0.18	0.22	0.20
Zinc, ppm	35	52	14	13
Iron, ppm	108	79	78	70
Manganese, ppm	25	33	22	35
Copper, ppm	8	12	12	19
Boron, ppm	48	31	31	31
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 7

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: LOCKWOOD POTATOES SL No: 364 FIELD: BIOACT FOLIAR

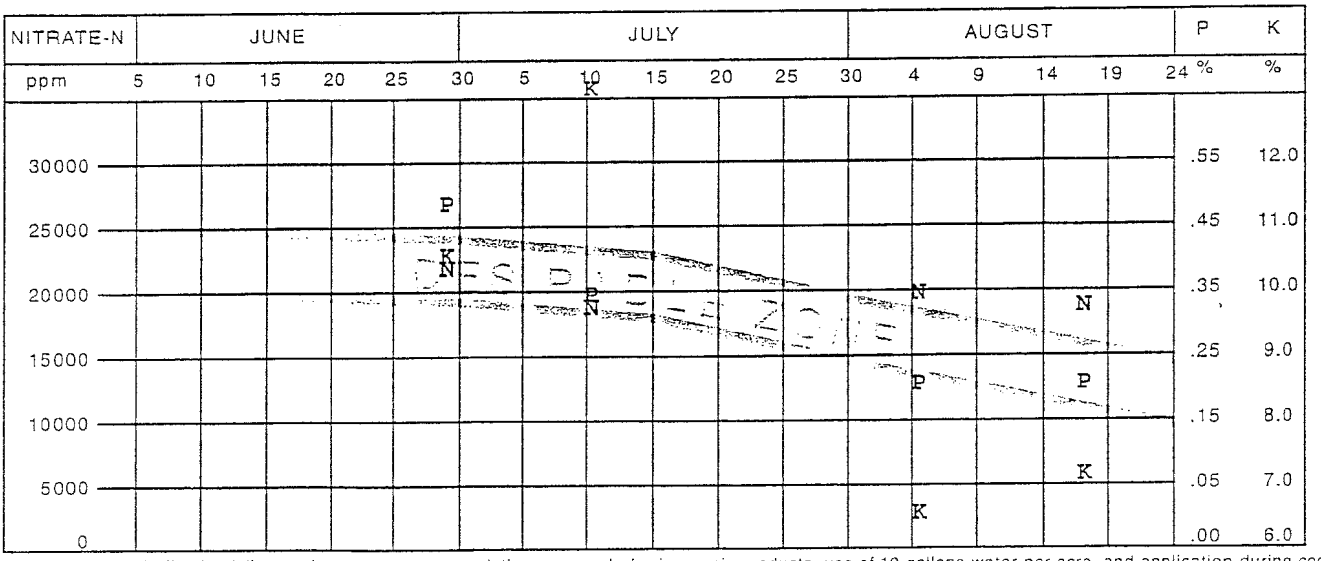
DATE SAMPLED [1998]	06/29	07/10	08/05	08/18
Report No.				
Total N, %				
NO_3-N, ppm	21000	18000	18800	17600
Phosphorus, %	0.46	0.33	0.18	0.18
Potassium, %	10.34	12.88	6.31	6.95
Calcium, %	2.04	2.25	2.22	2.30
Magnesium, %	1.01	0.50	1.34	1.30
Sulfur, %	0.20	0.16	0.19	0.19
Zinc, ppm	35	59	13	12
Iron, ppm	108	64	79	71
Manganese, ppm	25	34	22	37
Copper, ppm	8	13	26	22
Boron, ppm	48	31	31	30
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 8

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: LOCKWOOD POTATOES SL No: 365 FIELD: PHOSGARD

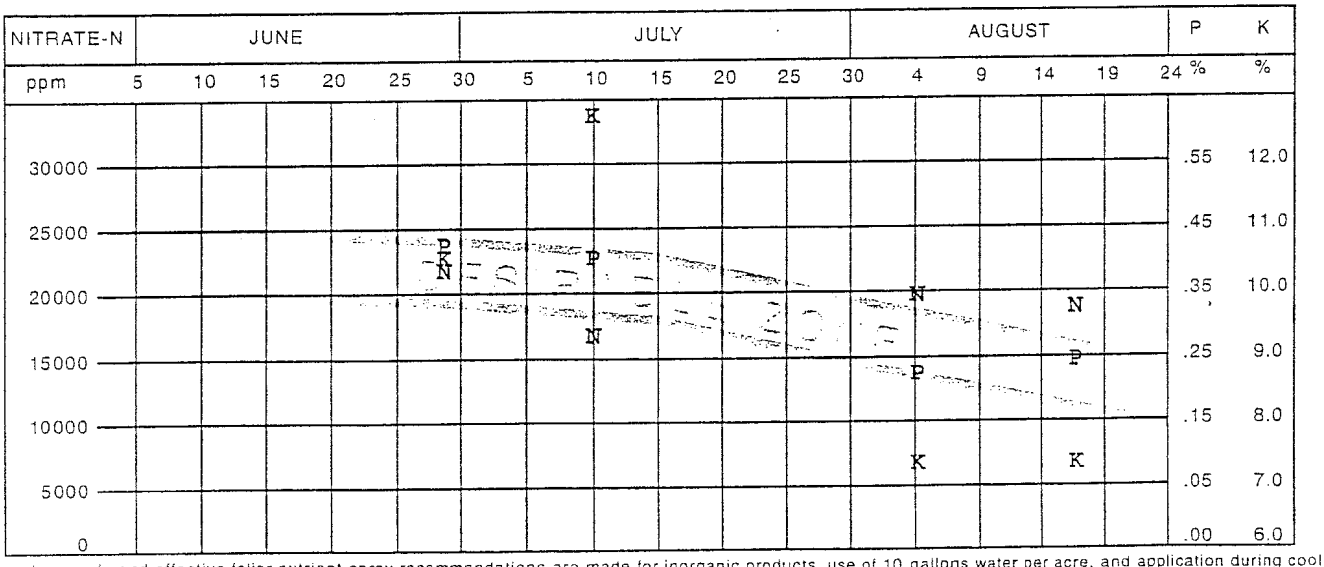
DATE SAMPLED [1998]	06/29	07/10	08/05	08/18
Report No.				
Total N, %				
NO_3-N, ppm	21000	15500	19300	18200
Phosphorus, %	0.41	0.39	0.21	0.22
Potassium, %	10.34	12.51	7.18	7.02
Calcium, %	2.04	2.02	2.34	2.20
Magnesium, %	1.01	0.45	1.48	1.35
Sulfur, %	0.20	0.13	0.20	0.20
Zinc, ppm	35	75	14	13
Iron, ppm	108	86	72	68
Manganese, ppm	25	43	25	34
Copper, ppm	8	14	37	30
Boron, ppm	48	33	36	33
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 9

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050
TWIN FALLS, ID 83303-0353 1-800-759-3050

208/226-7307

KRUCKEBERG, J.P. 3005
3250 HORNBACHER ROAD

AMERICAN FALLS ID 83211

GROWER: KOOMPIN - STEVE

Report No. 99999

Date Received 5/12/98

Date Reported 5/13/98

SOIL TEST DATA	Sample 1		Sample 2
pH	7.8	H	
SALTS, mmhos/cm	0.9	L	
SODIUM, meq/100g	0.1	VL	
CEC, meq/100g	13.8	M	
EXCESS LIME, %	1.3	M	
ORGANIC MATTER, %	1.65	M	
ORGANIC N, lb/Acre	65	M	
NITRATE-N, ppm	15	M	
PHOSPHORUS, ppm	28	H	
POTASSIUM, ppm	350	H	
CALCIUM, meq/100g	10.6	VH	
MAGNESIUM, meq/100g	1.9	H	
SULFATE-S, ppm	12	M	
ZINC, ppm	0.8	L	
IRON, ppm	4.6	M	
MANGANESE, ppm	3.2	M	
COPPER, ppm	1.2	M	
BORON, ppm	0.55	L	
SOIL TEXTURE	SEE TABLE		

	Sample 1	Sample 2
SAMPLE IDENTITY	PVT BIOZYME	
CROP	POTATOES	
YIELD GOAL	NG	
ACRES	NG	
PAST CROP T/Acre	GRAIN 4	
MANURE T/Acre	0	
PREV. APPLIED NUTRIENTS	0	

RECOMMENDATIONS, lbs or Units Actual Nutrients per Acre

NITROGEN	
P_2O_5 - PHOSPHATE	
K_2O - POTASH	
CALCIUM	
MAGNESIUM	
SULFATE-SULFUR	
ZINC	
IRON	
MANGANESE	
COPPER	
BORON	
ELEMENTAL SULFUR	

RATINGS : VL - Very Low L - Low M - Medium H - High VH - Very High

SAMPLE	ACTUAL AND RECOMMENDED PERCENT OF CEC							
	Actual % Potassium	Recommended Potassium	Actual % Calcium	Recommended Calcium	Actual % Magnesium	Recommended Magnesium	Actual % Sodium	Recommended Sodium
1	8.5	3.0-6.0%	76.8	65-80%	13.8	10-20%	0.7	<3.0%
2								

RELATION OF CEC TO SOIL TEXTURE	
0-5	Sand
5-12	Loamy Sand
12-18	Sandy Loam
18-24	Silt Loam
24-36	Clay Loam
36+	Clay

REMARKS

Supervised by: Dr. Dale Stukenholtz

Stukenholtz Laboratory, Inc.

ADDISON AVENUE EAST • P.O. BOX 353 • TWIN FALLS, IDAHO 83303-0353
PHONE (208) 734-3050 • 800-759-3050 • FAX (208) 734-3919

Table 10

Results of yield and quality from treatment with Biozyme, Bioactivate, and Phosgard on Shepodie at Rockland in 1998.

Treatment		Total Yield cwt/Ac	Saleable Yield cwt/Ac	Yield No. Ones cwt/Ac	No. ones % %	U.S. No Ones ≥10 oz cwt/Ac	U.S. No Ones ≤10 oz cwt/Ac	U.S. No Twos ≥10 oz cwt/Ac	U.S. No Twos ≤10 oz cwt/Ac	Culls cwt/Ac	Specific Gravity
CHECK	1	420.8	379.4	372.5	88.5	124.2	248.3	0.0	6.9	41.4	
	2	452.2	421.1	406.9	90.0	151.7	255.2	6.6	7.6	31.1	
	3	401.7	346.5	317.3	79.0	69.0	248.3	5.1	24.1	55.2	
	4	406.9	358.6	334.4	82.2	96.5	237.9	6.9	17.3	48.3	
	5	396.6	344.9	313.7	79.1	99.9	213.8	3.4	27.8	51.7	
	Ave.	415.7	370.2	349.0	83.8	108.3	240.7	4.5	16.7	45.5	1.089
BIOZYME	1	469.4	420.5	393.1	83.7	124.2	268.9	20.7	6.7	48.9	
	2	479.1	417.1	400.0	83.5	117.2	282.8	13.8	3.3	62.0	
	3	427.6	393.1	331.1	77.4	124.2	206.9	37.9	24.1	34.5	
	4	399.5	375.4	365.5	91.5	151.7	213.8	6.6	3.3	24.1	
	5	452.6	411.2	372.3	82.3	124.9	247.4	27.6	11.3	41.4	
	Ave.	445.7	403.6	372.4	83.6	128.4	244.0	21.4	9.8	42.2	1.088
PHOSGARD	1	500.0	438.0	382.8	76.6	124.2	258.6	48.3	6.9	62.0	
	2	426.8	375.8	358.6	73.8	103.4	255.2	13.8	3.4	51.0	
	3	427.6	393.1	344.8	80.6	131.0	213.8	34.5	13.8	34.5	
	4	400.0	344.8	331.1	82.8	110.4	220.7	3.3	10.4	55.2	
	5	458.0	389.0	344.8	75.3	113.8	231.0	31.1	13.1	69.0	
	Ave.	442.5	338.2	352.4	77.7	116.6	235.9	26.2	9.5	54.3	1.0875
BIOACTIVATE STARTER PLUS FOLIAR	1	369.0	313.8	289.8	78.5	148.9	140.9	20.7	3.3	55.2	
	2	486.2	424.2	372.4	76.6	117.2	255.2	27.6	24.2	62.0	
	3	410.6	376.1	358.6	87.3	82.7	275.9	13.8	3.7	34.5	
	4	420.8	365.6	337.9	80.3	96.5	241.4	10.4	17.3	55.2	
	5	507.1	458.8	351.8	69.4	89.7	262.1	86.3	20.7	48.3	
	Ave.	438.8	387.8	342.2	78.0	106.2	236.0	31.7	13.9	51.0	1.092

Table 11

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: STEVE K POTATOES SL No: 324 FIELD: CHECK

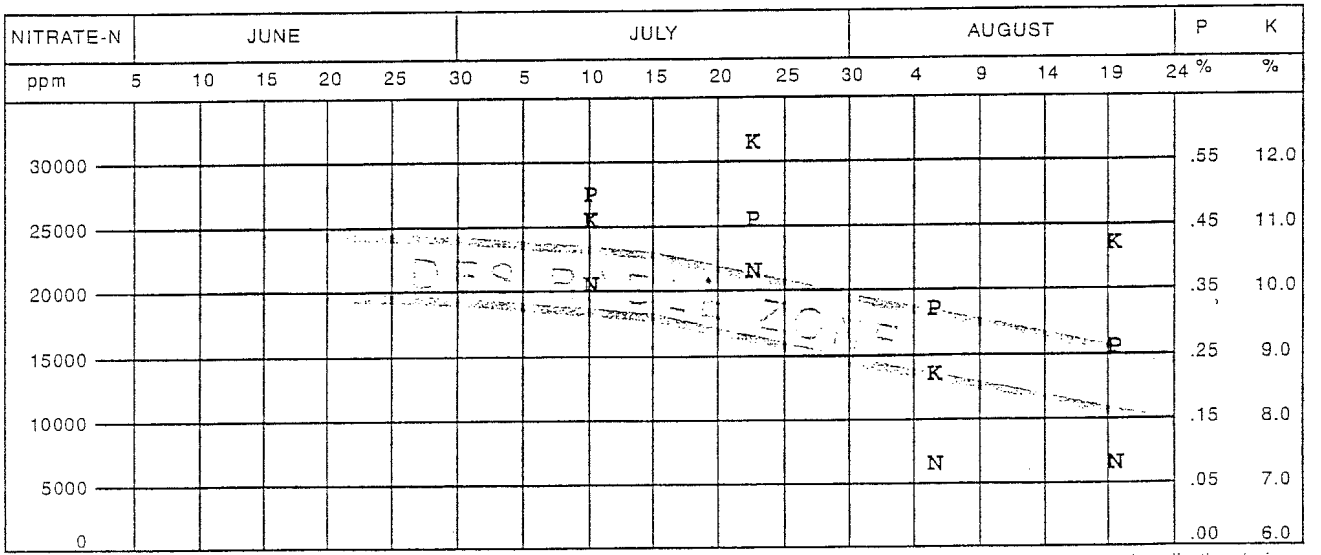
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	20300	20800	6260	5870
Phosphorus, %	0.48	0.45	0.31	0.24
Potassium, %	10.84	12.02	8.55	10.58
Calcium, %	1.82	1.80	2.14	2.58
Magnesium, %	0.50	0.44	0.49	0.43
Sulfur, %	0.22	0.34	0.21	0.16
Zinc, ppm	39	19	18	11
Iron, ppm	165	30	44	43
Manganese, ppm	60	55	81	81
Copper, ppm	12	7	8	4
Boron, ppm	31	35	41	32
Soil NO_3-N,ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 12

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: STEVE K POTATOES SL No: 325 FIELD: BIOZYME

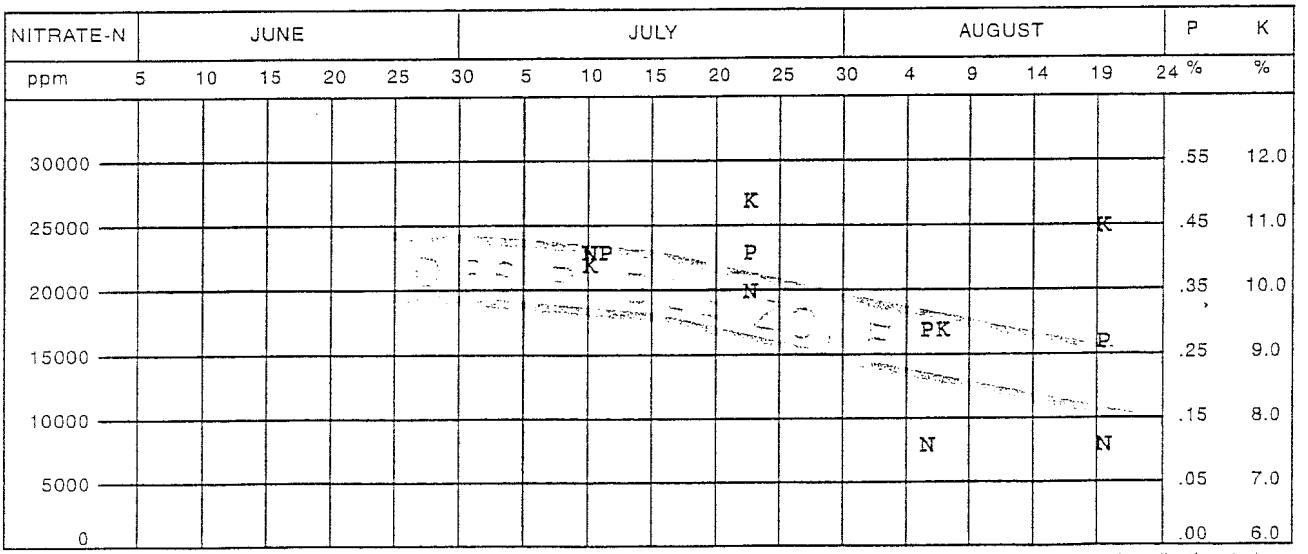
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	21800	19000	6890	7210
Phosphorus, %	0.38	0.38	0.27	0.24
Potassium, %	10.20	11.07	9.07	10.63
Calcium, %	1.70	2.01	2.14	2.80
Magnesium, %	0.49	0.49	0.56	0.44
Sulfur, %	0.28	0.30	0.22	0.13
Zinc, ppm	46	23	18	13
Iron, ppm	105	34	50	48
Manganese, ppm	55	70	75	81
Copper, ppm	10	9	8	5
Boron, ppm	29	37	38	33
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 13

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: STEVE K POTATOES SL No: 326 FIELD: BIO-ACTIVATE

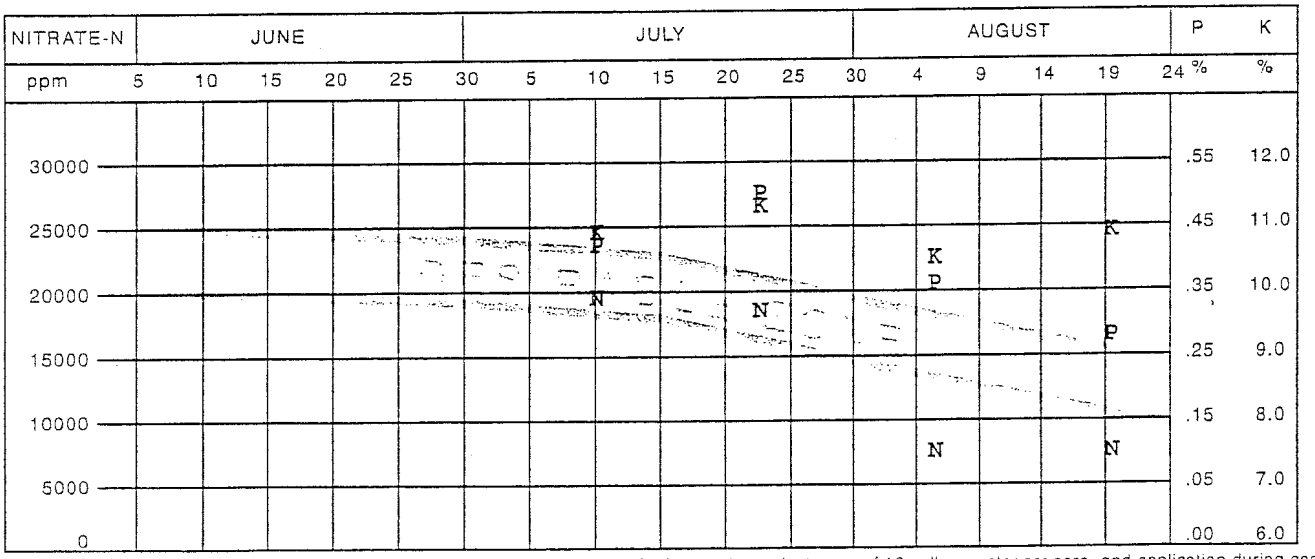
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	18900	17600	6800	6620
Phosphorus, %	0.40	0.49	0.34	0.27
Potassium, %	10.64	11.14	10.36	10.63
Calcium, %	1.69	1.93	2.27	2.51
Magnesium, %	0.44	0.44	0.46	0.42
Sulfur, %	0.21	0.30	0.24	0.15
Zinc, ppm	26	26	20	10
Iron, ppm	99	44	57	41
Manganese, ppm	52	59	80	76
Copper, ppm	10	8	10	4
Boron, ppm	30	40	45	33
Soil NO_3-N,ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 14

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: STEVE K POTATOES SL No: 327 FIELD: PHOSGARD

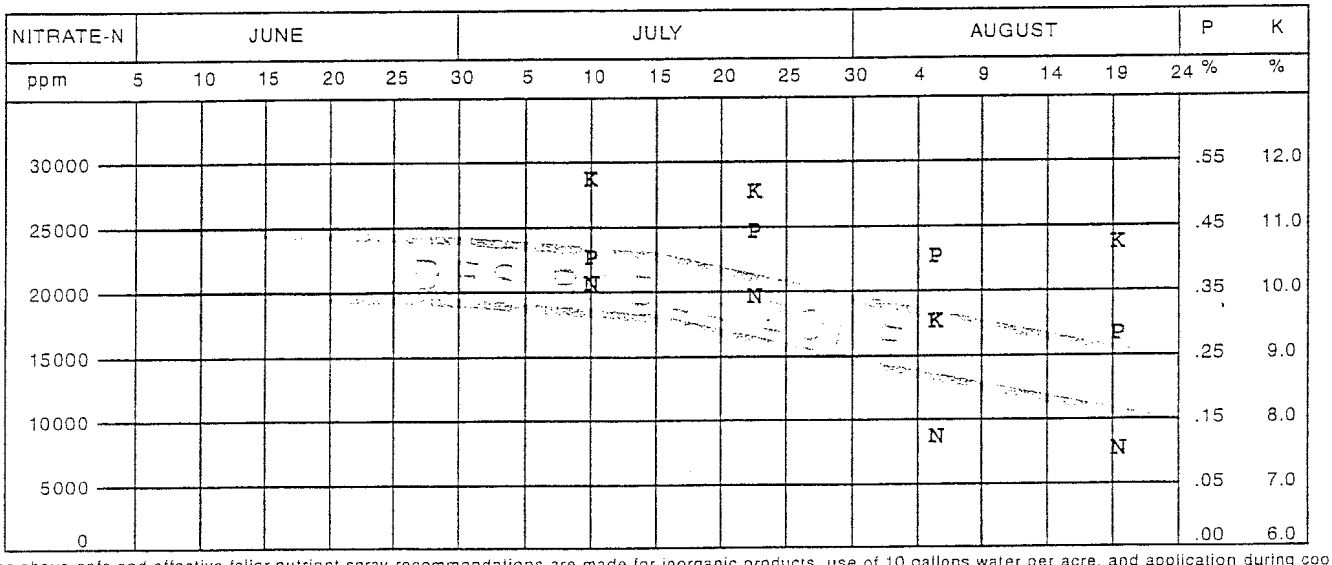
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	20000	19200	8340	6630
Phosphorus, %	0.39	0.43	0.38	0.26
Potassium, %	11.42	11.21	9.30	10.60
Calcium, %	1.86	1.89	2.16	2.67
Magnesium, %	0.45	0.49	0.39	0.42
Sulfur, %	0.23	0.33	0.24	0.14
Zinc, ppm	29	19	19	11
Iron, ppm	111	46	48	43
Manganese, ppm	54	62	85	88
Copper, ppm	11	9	8	4
Boron, ppm	30	36	40	33
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 15

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050
TWIN FALLS, ID 83303-0353 1-800-759-3050

208/226-7307

KRUCKEBERG, J.P. 3005
3250 HORNBACHER ROAD

AMERICAN FALLS ID 83211

GROWER: KOOMPIN - NANCYS

Report No. 99998

Date Received 5/09/98

Date Reported 5/10/98

SOIL TEST DATA	Sample 1	Sample 2		Sample 1	Sample 2
			SAMPLE IDENTITY	BIOZYME 0-12	
pH	8.3 H		CROP	POTATOES	
SALTS, mmhos/cm	0.8 L		YIELD GOAL	450 CWT	
SODIUM, meq/100g	0.3 VL		ACRES	NG	
CEC, meq/100g	15 M		PAST CROP T/Acre	GRAIN 2	
EXCESS LIME, %	2.3 M		MANURE T/Acre	0	
ORGANIC MATTER, %	1.65 M		PREV. APPLIED NUTRIENTS	0	
ORGANIC N, lb/Acre	65 M		**RECOMMENDATIONS, lbs or Units Actual Nutrients per Acre**		
NITRATE-N, ppm	13 M		NITROGEN		
PHOSPHORUS, ppm	25 M		P_2O_5 - PHOSPHATE		
POTASSIUM, ppm	220 M		K_2O - POTASH		
CALCIUM, meq/100g	11.1 H		CALCIUM		
MAGNESIUM, meq/100g	2.9 H		MAGNESIUM		
SULFATE-S, ppm	9 L		SULFATE-SULFUR		
ZINC, ppm	0.9 L		ZINC		
IRON, ppm	4.8 M		IRON		
MANGANESE, ppm	3.0 L		MANGANESE		
COPPER, ppm	0.8 M		COPPER		
BORON, ppm	0.80 M		BORON		
SOIL TEXTURE	SEE TABLE		ELEMENTAL SULFUR		

RATINGS : VL - Very Low L - Low M - Medium H - High VH - Very High

SAMPLE	ACTUAL AND RECOMMENDED PERCENT OF CEC								RELATION OF CEC TO SOIL TEXTURE	
	Actual % Potassium	Recommended Potassium	Actual % Calcium	Recommended Calcium	Actual % Magnesium	Recommended Magnesium	Actual % Sodium	Recommended Sodium		
1	4.9	3.0-6.0%	74.0	65-80%	19.3	10-20%	2.0	<3.0%	0-5	Sand
2									5-12	Loamy Sand
									12-18	Sandy Loam
									18-24	Silt Loam
									24-36	Clay Loam
									36+	Clay

REMARKS

Supervised by: Dr. Dale Stukenholtz

Stukenholtz Laboratory, Inc.
ADDISON AVENUE EAST • P.O. BOX 353 • TWIN FALLS, IDAHO 83303-0353
PHONE (208) 734-3050 • 800-759-3050 • FAX (208) 734-3919

Table 17

Results of yield and quality from treatment with Bioactivate in the starter only on Ranger potatoes grown near American Falls in 1998.

Treatment		Total Yield cwt/Ac	Saleable Yield cwt/Ac	Yield No. Ones cwt/Ac	No. ones % %	U.S. No Ones >10 oz cwt/Ac	U.S. No Ones <10 oz cwt/Ac	U.S. No Twos >10 oz cwt/Ac	U.S. No Twos <10 oz cwt/Ac	Culls cwt/Ac
BIOACTIVATE	1	447.1	354.0	257.3	57.5	60.2	197.1	32.8	63.9	93.1
IN THE	2	483.7	428.9	339.5	70.2	109.5	230.0	38.3	51.1	54.8
STARTER	3	604.1	527.5	412.5	68.3	120.5	292.0	73.0	42.0	76.6
ONLY	4	578.6	450.8	337.6	58.2	116.8	220.8	51.1	62.1	127.8
	Ave.	528.4	440.3	336.7	63.6	101.8	235.0	48.8	54.8	88.1
CHECK	1	571.2	511.0	401.5	70.3	178.9	222.6	49.3	60.2	105.9
	2	523.9	439.9	324.9	62.0	80.3	244.6	73.0	42.0	84.0
	3	540.2	432.5	372.3	68.9	82.1	290.2	60.2	0.0	107.7
	4	598.7	492.8	423.4	70.7	91.3	332.2	43.8	25.6	105.9
	Ave.	558.5	469.1	380.5	68.0	108.1	272.4	56.6	32.0	100.9

Table 18

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: NANCY K - AM. FALLS POTATOES SL No: 320 FIELD: CHECK

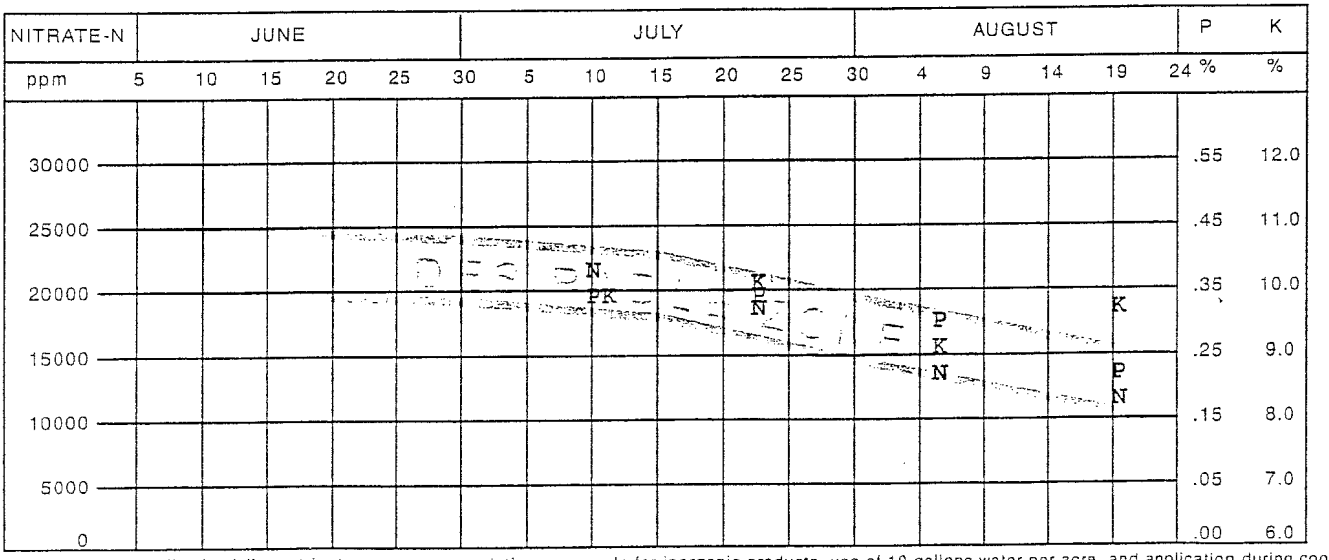
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	21400	17800	13100	10600
Phosphorus, %	0.33	0.33	0.28	0.20
Potassium, %	9.61	9.95	8.81	9.51
Calcium, %	1.86	1.73	1.67	1.63
Magnesium, %	1.11	1.05	1.00	1.00
Sulfur, %	0.24	0.29	0.24	0.22
Zinc, ppm	33	16	30	22
Iron, ppm	74	35	39	59
Manganese, ppm	38	48	33	45
Copper, ppm	16	11	7	4
Boron, ppm	25	31	30	26
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Stukenholtz Laboratory, Inc.
ADDISON AVENUE EAST • P.O. BOX 353 • TWIN FALLS, IDAHO 83303-0353
PHONE (208) 734-3050 • 800-759-3050 • FAX (208) 734-3919

Table 16

Results of yield and quality from treatment with Biozyme, Bioactivate, and Phosgard on Ranger Potatoes grown near American Falls in 1998.

Treatment		Total Yield	Saleable Yield	Yield No. Ones	No. ones %	U.S. No Ones >10 oz	U.S. No Ones <10 oz	U.S. No Twos >10 oz	U.S. No Twos <10 oz	Culls	Specific Gravity
		cwt/Ac	cwt/Ac	cwt/Ac	%	cwt/Ac	cwt/Ac	cwt/Ac	cwt/Ac	cwt/Ac	
CHECK	1	444.0	385.9	306.0	68.9	110.0	196.0	43.6	36.3	58.1	
	2	465.5	400.2	316.7	68.0	113.4	203.3	39.9	43.6	65.3	
	3	446.5	410.2	301.3	67.5	112.5	188.8	47.2	61.7	36.3	
	4	417.5	373.9	268.6	64.4	87.1	181.5	36.3	69.0	43.6	
	5	463.8	413.0	315.0	67.9	115.4	199.6	47.2	50.8	50.8	
	Ave.	447.5	396.6	301.5	61.3	107.7	193.8	42.8	52.3	50.8	1.0885
BIOZYME	1	410.1	366.5	312.1	76.1	101.6	210.5	29.0	25.4	43.6	
	2	388.4	359.4	265.0	68.2	98.0	167.0	43.6	50.8	29.0	
	3	408.2	357.4	239.6	58.7	83.5	156.1	47.2	70.6	50.8	
	4	450.8	403.6	265.7	58.9	108.9	156.8	65.3	72.6	47.2	
	5	482.7	417.4	304.7	63.1	83.5	221.4	43.6	68.9	65.3	
	Ave.	428.0	380.9	277.4	65.0	95.1	182.4	45.7	57.7	47.2	1.086
BIOACTIVATE AS FOLIAR SPRAYS	1	475.5	417.4	319.4	67.2	87.1	232.3	39.9	58.1	58.1	
	2	508.2	435.6	297.7	58.6	94.4	203.3	65.3	72.6	72.6	
	3	417.4	381.1	239.6	57.4	79.9	159.7	101.6	39.9	36.3	
	4	428.3	377.5	268.6	62.7	72.6	196.0	58.1	50.8	50.8	
	5	399.3	355.7	243.1	60.9	83.4	159.7	69.0	43.6	43.6	
	Ave.	445.7	393.5	273.7	61.4	83.5	190.2	66.8	53.0	52.3	1.0885
PHOSGARD	1	488.2	408.3	254.1	52.0	85.3	168.8	65.3	88.9	79.9	
	2	488.4	419.4	250.6	51.3	89.0	161.6	72.6	96.2	69.0	
	3	480.9	415.6	272.3	56.6	78.1	194.2	61.7	81.6	65.3	
	4	444.7	372.1	246.9	55.5	74.4	172.5	39.9	85.3	72.6	
	5	458.3	403.9	269.6	58.9	89.9	179.7	65.3	69.0	54.4	
	Ave.	472.1	403.9	258.7	54.9	83.3	175.4	61.0	84.2	68.2	1.085

Table 19

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: NANCY K - AM. FALLS POTATOES SL No: 321 FIELD: BIOZYME

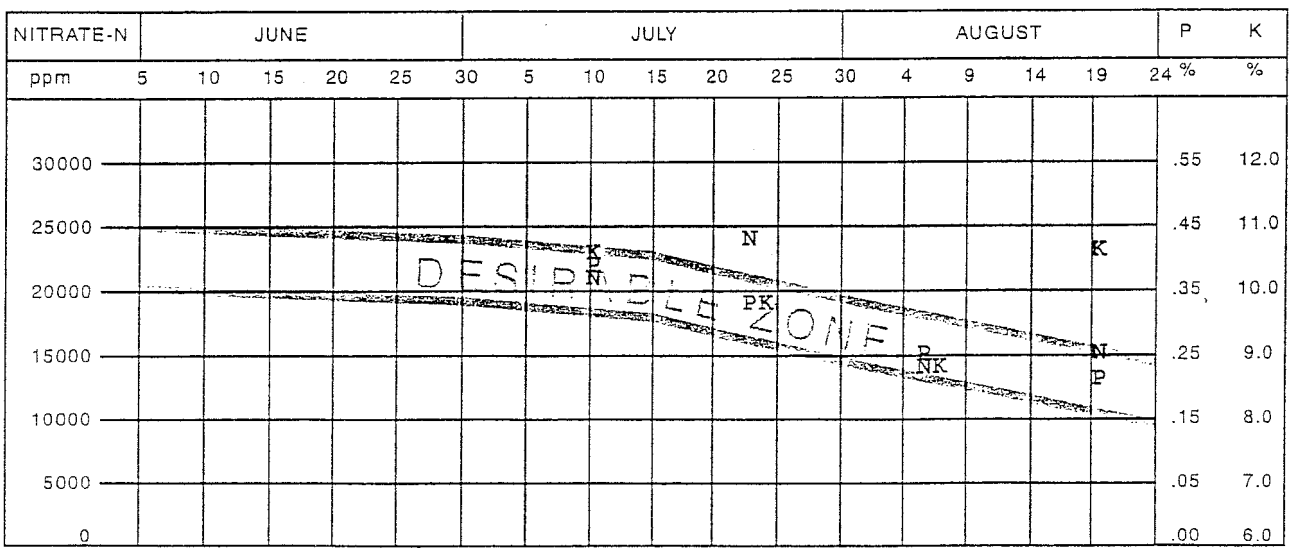
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	19700	22600	13200	13500
Phosphorus, %	0.37	0.31	0.23	0.19
Potassium, %	10.28	9.56	8.44	10.27
Calcium, %	1.74	1.80	1.75	1.63
Magnesium, %	1.01	1.16	1.04	0.88
Sulfur, %	0.23	0.32	0.27	0.27
Zinc, ppm	25	13	54	31
Iron, ppm	103	59	44	52
Manganese, ppm	41	44	38	49
Copper, ppm	16	9	9	4
Boron, ppm	26	28	28	25
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N .....
Units P_2O_5 .....
Units K_2O .....
Units S .....

FOLIAR NUTRIENTS lb/Acre

N .....
P_2O_5 .....
K_2O .....
S .....
Zn .....
Fe .....
Mn .....
Cu .....
B .....
Formula No. .....



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 20

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: NANCY K - AM. FALLS POTATOES SL No: 322 FIELD: BIO-ACTIVATE

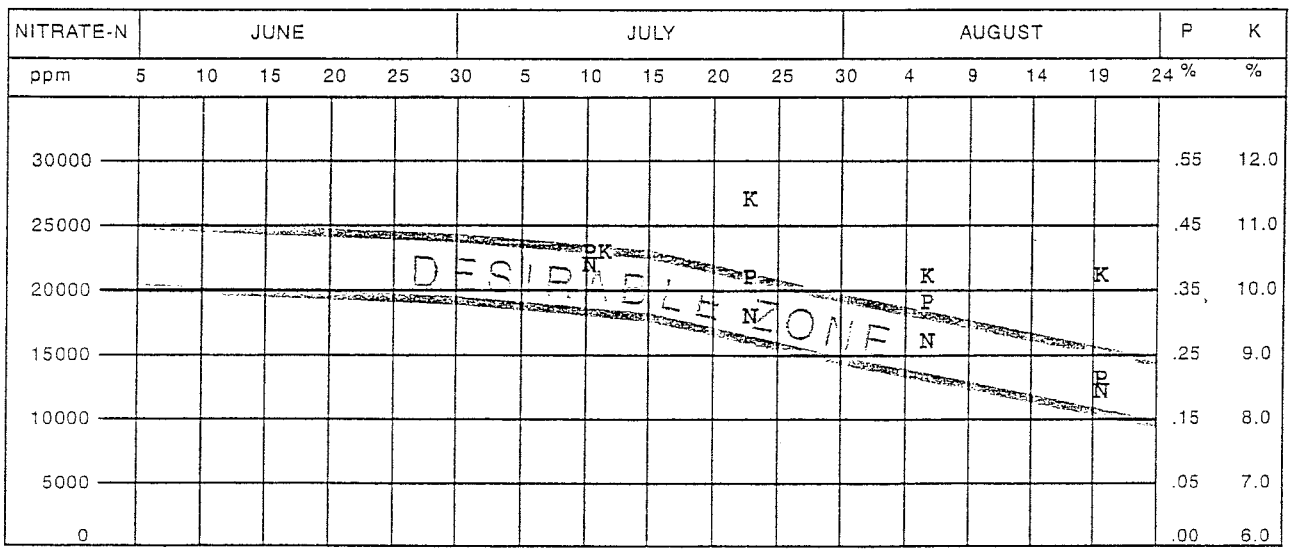
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	20800	17000	14500	11100
Phosphorus, %	0.39	0.34	0.30	0.19
Potassium, %	10.37	11.16	9.83	9.88
Calcium, %	1.83	1.79	1.79	1.49
Magnesium, %	1.15	1.13	1.09	0.89
Sulfur, %	0.25	0.28	0.27	0.23
Zinc, ppm	21	17	33	22
Iron, ppm	83	34	46	128
Manganese, ppm	38	41	40	45
Copper, ppm	16	6	8	4
Boron, ppm	26	31	30	25
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N .....
Units P_2O_5 .....
Units K_2O .....
Units S .....

FOLIAR NUTRIENTS lb/Acre

N .....
P_2O_5 .....
K_2O .....
S .....
Zn .....
Fe .....
Mn .....
Cu .....
B .....
Formula No. .....



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 21

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: NANCY K - AM FALLS POTATOES SL No: 323 FIELD: PHOSGARD

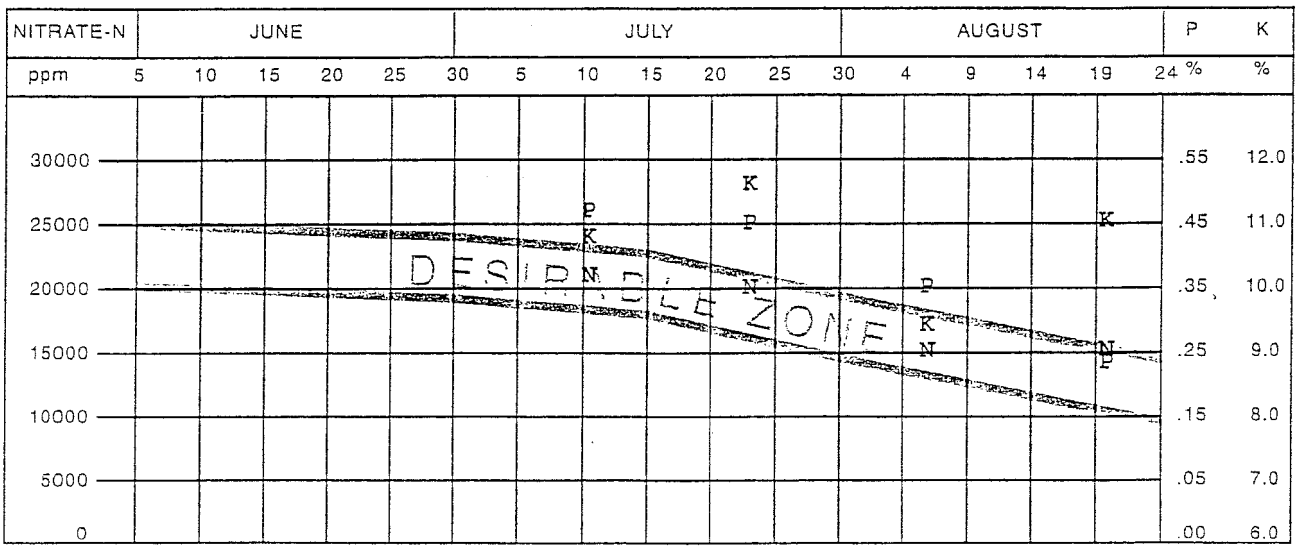
DATE SAMPLED [1998]	07/10	07/23	08/06	08/20
Report No.				
Total N, %				
NO_3-N, ppm	19500	19000	13500	13500
Phosphorus, %	0.45	0.42	0.32	0.20
Potassium, %	10.45	11.28	9.09	10.69
Calcium, %	2.07	1.79	1.67	1.67
Magnesium, %	1.01	0.88	0.80	0.79
Sulfur, %	0.23	0.28	0.26	0.21
Zinc, ppm	25	15	23	19
Iron, ppm	109	30	38	51
Manganese, ppm	47	40	34	47
Copper, ppm	17	5	6	4
Boron, ppm	29	30	27	24
Soil NO_3-N,ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 22

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050
TWIN FALLS, ID 83303-0353 1-800-759-3050

208/734-3050

STUKENHOLTZ, DALE 3001
2924 ADDISON AVENUE EAST
P.O. BOX 353
TWIN FALLS ID 83303-0353

Report No. 80388
Date Received 9/14/97
Date Reported 9/15/97

GROWER: J.H. BIOTECH

SOIL TEST DATA	Sample 1	Sample 2
pH	8.2	H
SALTS, mmhos/cm	1.2	L
SODIUM, meq/100g	0.7	L
CEC, meq/100g	21.6	H
EXCESS LIME, %	9.5	VH
ORGANIC MATTER, %	2.25	M
ORGANIC N, lb/Acre	85	M
NITRATE-N, ppm	14	M
PHOSPHORUS, ppm	18	M
POTASSIUM, ppm	270	H
CALCIUM, meq/100g	17.8	VH
MAGNESIUM, meq/100g	2.2	M
SULFATE-S, ppm	12	M
ZINC, ppm	2.2	H
IRON, ppm	5.0	M
MANGANESE, ppm	7.5	H
COPPER, ppm	1.1	M
BORON, ppm	0.90	M
SOIL TEXTURE	SEE TABLE	

	Sample 1	Sample 2
SAMPLE IDENTITY	DEGNER NW S1/2	
CROP	POTATOES	
YIELD GOAL	450 CWT	
ACRES	130	
PAST CROP T/Acre	GRAIN 3	
MANURE T/Acre	0	
PREV. APPLIED NUTRIENTS	0	

RECOMMENDATIONS, lbs or Units Actual Nutrients per Acre

NITROGEN	80
P_2O_5 - PHOSPHATE	210
K_2O - POTASH	90
CALCIUM	0
MAGNESIUM	0
SULFATE-SULFUR	0
ZINC	04
IRON	0
MANGANESE	0
COPPER	0
BORON	0
ELEMENTAL SULFUR	80

RATINGS : VL - Very Low L - Low M - Medium H - High VH - Very High

SAMPLE	ACTUAL AND RECOMMENDED PERCENT OF CEC							
	Actual % Potassium	Recommended Potassium	Actual % Calcium	Recommended Calcium	Actual % Magnesium	Recommended Magnesium	Actual % Sodium	Recommended Sodium
1	4.2	3.0-6.0%	82.4	65-80%	10.2	10-20%	3.2	<3.0%
2								

RELATION OF CEC TO SOIL TEXTURE	
0-5	Sand
5-12	Loamy Sand
12-18	Sandy Loam
18-24	Silt Loam
24-36	Clay Loam
36+	Clay

REMARKS

CROP1:SOIL NITRATES ARE UNUSUALLY HIGH. TISSUE TEST AND BE PREPARED TO ADD ADDITIONAL N AS NECESSARY.
CROP1:ALSO TOPDRESS PRIOR TO THE LAST CULTIVATION WITH 100-0-60.
CROP1:THIS SOIL SHOULD BENEFIT FROM THE USE OF PENETRON AND HIGH QUALITY HUMIC ACID PRODUCTS.
CROP1:ADD EXTRA N IN THE WATER ACCORDING TO PLANT TISSUE TESTS.
CROP1:SODIUM IS TOO HIGH & ELEMENTAL SULFUR PRODUCTS OR GYPSUM WILL HELP REDUCE THE HARMFUL EFFECTS.

Supervised by: Dr. Dale Stukenholtz

Stukenholtz Laboratory, Inc.

ADDISON AVENUE EAST • P.O. BOX 353 • TWIN FALLS, IDAHO 83303-0353
PHONE (208) 734-3050 • 800-759-3050 • FAX (208) 734-3919

Table 23

Results of yield and quality from treatment with Biozyme, Phosgard, and Bioactivate on Russet Burbanks at the Murtaugh location in 1998.

Treatment		Total Yield cwt/Ac	Saleable Yield cwt/Ac	Yield No. Ones cwt/Ac	No. ones % %	U.S. No Ones >10 oz cwt/Ac	U.S. No Ones <10 oz cwt/Ac	U.S. No Twos >10 oz cwt/Ac	U.S. No Twos <10 oz cwt/Ac	Culls cwt/Ac	
CHECK	1	441.0	338.0	185.0	42.0	44.0	141.0	50.0	103.0	40.0	
	2	442.0	390.0	230.0	52.0	62.0	168.0	44.0	116.0	52.0	
	3	365.0	309.0	187.0	51.2	56.0	131.0	45.0	77.0	56.0	
	4	380.0	320.0	171.0	45.0	51.0	120.0	49.0	100.0	60.0	
	5	397.0	345.0	195.0	49.1	37.0	158.0	52.0	98.0	52.0	
	Ave.	391.8	339.8	193.6	49.4	50.0	143.6	48.0	98.2	52.0	1.0765
BIOZYME	1	424.0	375.0	218.0	51.4	69.0	149.0	63.0	94.0	49.0	
	2	401.0	354.0	210.0	52.4	57.0	153.0	65.0	79.0	47.0	
	3	482.0	425.0	258.0	53.5	73.0	185.0	57.0	110.0	57.0	
	4	395.0	348.0	185.0	46.8	64.0	121.0	63.0	100.0	47.0	
	5	434.0	394.0	226.0	52.1	61.0	165.0	61.0	107.0	40.0	
	Ave.	427.2	379.2	219.4	51.2	64.8	154.6	61.8	98.0	48.0	1.076
PHOSGARD	1	407.0	362.0	209.0	51.4	64.0	145.0	68.0	85.0	45.0	
	2	403.0	360.0	201.0	49.9	53.0	148.0	59.0	100.0	43.0	
	3	460.0	408.0	242.0	52.6	66.0	176.0	60.0	106.0	52.0	
	4	398.0	354.0	183.0	46.0	59.0	124.0	66.0	105.0	44.0	
	5	433.0	392.0	212.0	49.0	57.0	155.0	77.0	103.0	41.0	
	Ave.	420.2	375.2	209.4	50.0	59.8	149.6	66.0	99.8	45.0	1.077
BIOACTIVATE IN STARTER ONLY	1	402.0	349.0	205.0	51.0	56.0	149.0	58.0	86.0	53.0	
	2	358.0	325.0	177.0	49.4	44.0	133.0	66.0	82.0	33.0	
	3	424.0	373.0	221.0	52.1	64.0	157.0	62.0	90.0	51.0	
	4	398.0	349.0	193.0	48.5	52.0	141.0	50.0	106.0	49.0	
	5	426.0	369.0	201.0	47.2	48.0	153.0	74.0	94.0	57.0	
	Ave.	401.6	353.0	199.4	49.6	52.8	146.6	62.0	91.6	48.6	1.075
BIOACTIVATE AS A FOLIAR ONLY	1	413.0	364.0	213.0	51.6	66.0	147.0	56.0	95.0	49.0	
	2	391.0	345.0	205.0	52.4	54.0	151.0	59.0	81.0	46.0	
	3	462.0	404.0	249.0	53.9	70.0	179.0	50.0	105.0	58.0	
	4	382.0	332.0	179.0	46.9	62.0	117.0	56.0	97.0	50.0	
	5	420.0	377.0	218.0	51.9	58.0	160.0	55.0	104.0	43.0	
	Ave.	413.6	364.4	212.8	51.3	62.0	150.8	55.2	96.4	49.2	1.076

Table 24

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: J.H. BIOTECH POTATOES SL No: 301 FIELD: CHECK

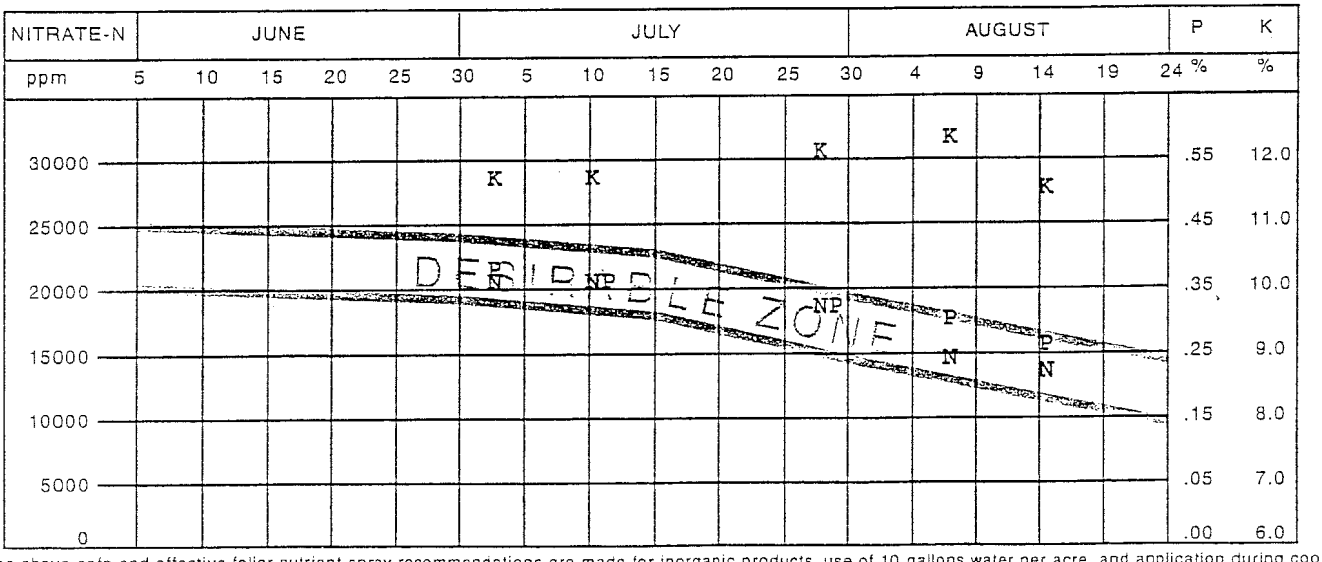
DATE SAMPLED [1998]	07/02	07/10	07/27	08/08	08/15
Report No.					
Total N, %					
NO_3-N, ppm	20100	19700	18400	13800	12500
Phosphorus, %	0.36	0.35	0.31	0.29	0.24
Potassium, %	11.55	11.44	11.95	12.08	11.35
Calcium, %	2.25	2.39	1.92	1.81	1.55
Magnesium, %	0.53	0.47	0.51	0.51	0.44
Sulfur, %	0.23	0.22	0.27	0.21	0.20
Zinc, ppm	47	44	39	26	40
Iron, ppm	175	160	90	79	90
Manganese, ppm	41	38	31	38	40
Copper, ppm	18	10	9	8	10
Boron, ppm	37	39	32	32	33
Soil NO_3-N, ppm					
Salts, mmhos/cm					
Sample Date					

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 25

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: J.H. BIOTECH POTATOES SL No: 302 FIELD: BIOZYME

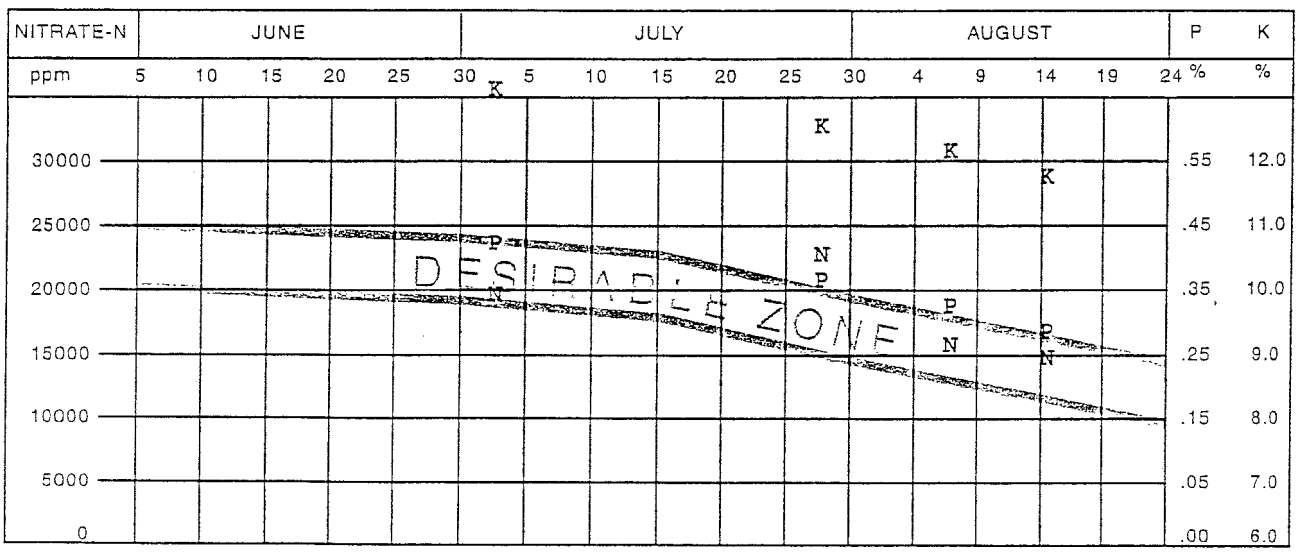
DATE SAMPLED [1998]	07/02	07/27	08/08	08/15
Report No.				
Total N, %				
NO_3-N, ppm	18500	22000	14900	13700
Phosphorus, %	0.41	0.35	0.30	0.26
Potassium, %	12.90	12.27	12.0	11.59
Calcium, %	2.47	1.48	1.75	1.60
Magnesium, %	0.52	0.41	0.46	0.43
Sulfur, %	0.22	0.27	0.23	0.21
Zinc, ppm	48	33	27	41
Iron, ppm	170	87	84	91
Manganese, ppm	41	23	35	37
Copper, ppm	11	9	8	10
Boron, ppm	31	28	31	32
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 26

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: J.H. BIOTECH POTATOES SL No: 304 FIELD: BIOACT. FOLIAR

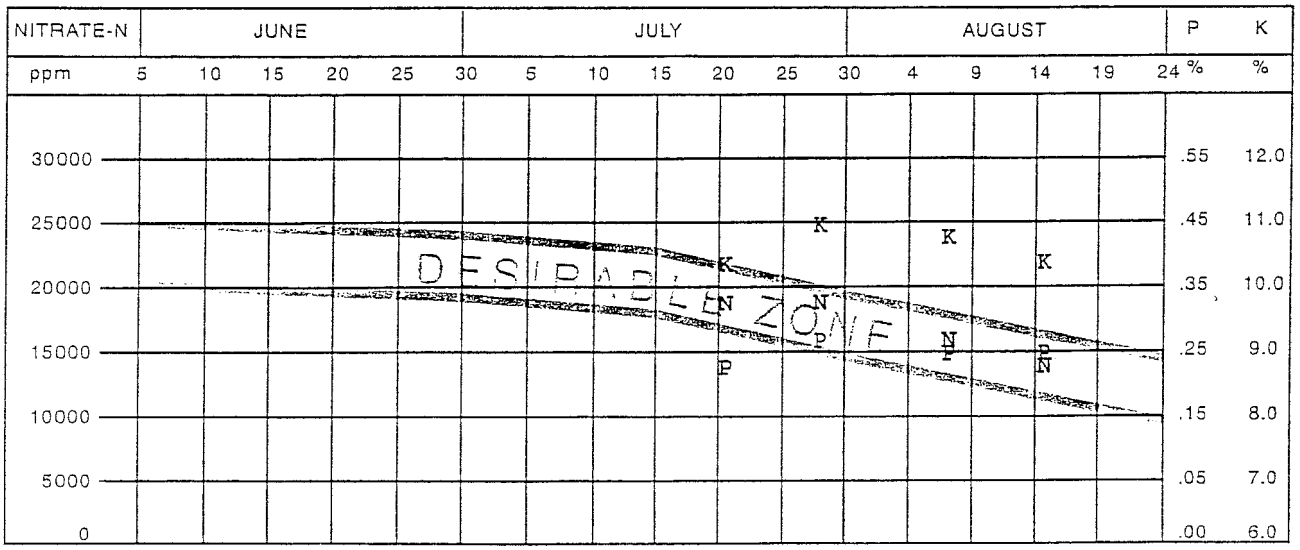
DATE SAMPLED [1998]	07/20	07/27	08/08	08/15
Report No.				
Total N, %				
NO_3-N, ppm	18100	18300	15100	13100
Phosphorus, %	0.21	0.25	0.23	0.22
Potassium, %	10.16	10.77	10.51	10.15
Calcium, %	2.44	1.69	1.60	1.49
Magnesium, %	1.28	0.46	0.41	0.37
Sulfur, %	0.17	0.27	0.24	0.22
Zinc, ppm	19	25	16	36
Iron, ppm	81	90	81	88
Manganese, ppm	30	29	31	36
Copper, ppm	7	9	8	7
Boron, ppm	29	28	31	30
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 27

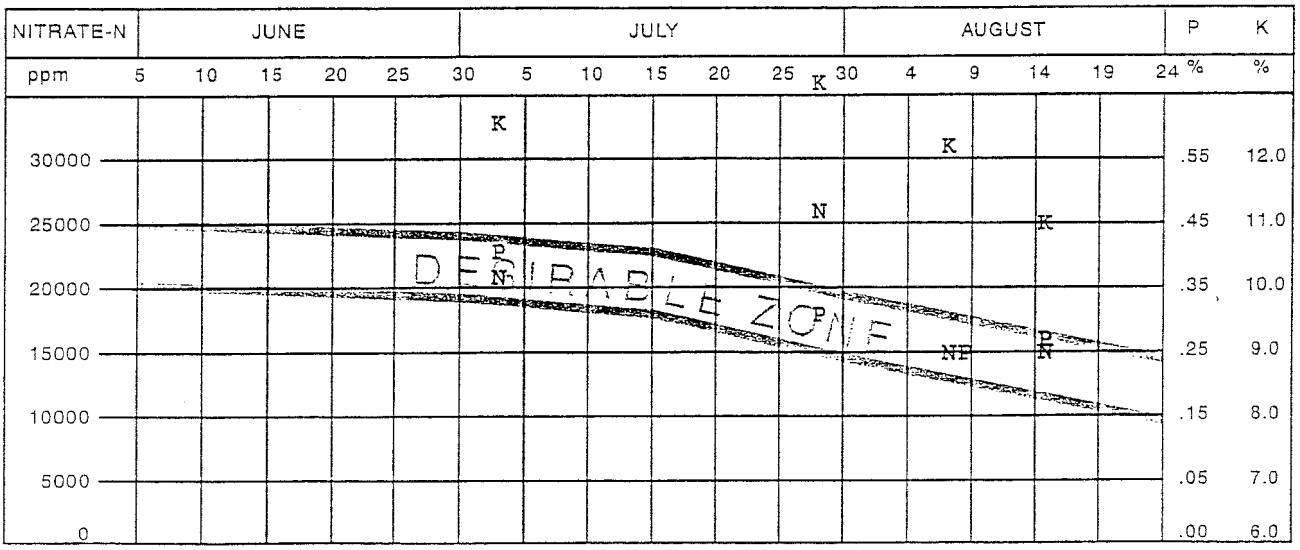
STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: J.H. BIOTECH POTATOES SL No: 303 FIELD: BIOACT. STARTER

DATE SAMPLED [1998]	07/02	07/27	08/08	08/15
Report No.				
Total N, %				
NO_3-N, ppm	19700	24500	14000	13600
Phosphorus, %	0.39	0.29	0.23	0.24
Potassium, %	12.40	12.93	11.97	10.67
Calcium, %	2.60	1.74	1.62	1.51
Magnesium, %	0.51	0.49	0.34	0.38
Sulfur, %	0.20	0.35	0.20	0.20
Zinc, ppm	47	26	15	38
Iron, ppm	162	78	66	90
Manganese, ppm	46	24	28	35
Copper, ppm	10	9	7	8
Boron, ppm	31	31	32	30
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				
RECOMMENDATIONS In-the-water-or Broadcast				
Units N	25	0	15	15
Units P_2O_5	0	10	0	0
Units K_2O	0	0	0	0
Units S	0	0	0	0
FOLIAR NUTRIENTS lb/Acre				
N	2	2	2	2
P_2O_5	1	3	2	0
K_2O	0	0	0	0
S	0	0	0	0
Zn	0	0.20	0.30	0
Fe	0.10	0.20	0.20	0.10
Mn	0.20	0.30	0.20	0
Cu	0	0	0	0
B	0.15	0	0	0
Formula No.				



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.

Table 28

STUKENHOLTZ LABORATORY, INC.

P.O. BOX 353 ADDISON AVENUE EAST 208-734-3050 TWIN FALLS, ID 83303-0353 1-800-759-3050

DEALER: DDS

GROWER: J.H. BIOTECH POTATOES SL No: 306 FIELD: PHOSGARD

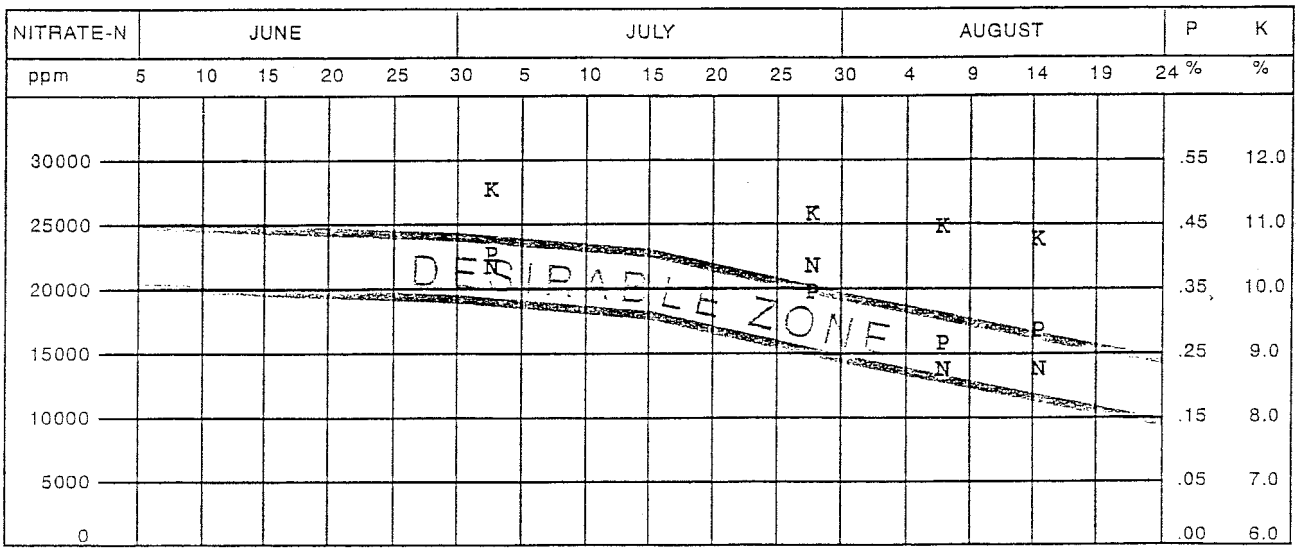
DATE SAMPLED [1998]	07/02	07/27	08/08	08/15
Report No.				
Total N, %				
NO_3-N, ppm	20900	20700	12500	12900
Phosphorus, %	0.38	0.33	0.24	0.27
Potassium, %	11.25	10.83	10.70	10.60
Calcium, %	2.20	1.73	1.74	1.65
Magnesium, %	0.55	0.46	0.53	0.42
Sulfur, %	0.30	0.32	0.17	0.19
Zinc, ppm	49	32	15	38
Iron, ppm	170	86	79	95
Manganese, ppm	42	29	33	42
Copper, ppm	20	10	6	9
Boron, ppm	36	29	33	32
Soil NO_3-N, ppm				
Salts, mmhos/cm				
Sample Date				

RECOMMENDATIONS In-the-water-or Broadcast

Units N	
Units P_2O_5	
Units K_2O	
Units S	

FOLIAR NUTRIENTS lb/Acre

N	
P_2O_5	
K_2O	
S	
Zn	
Fe	
Mn	
Cu	
B	
Formula No.	



The above safe and effective foliar nutrient spray recommendations are made for inorganic products, use of 10 gallons water per acre, and application during cool parts of the day. Substitutions with organic products and less water/acre may alter the above safe and effective application rates. Plants should not be under stress when foliar nutrients are applied. Do not exceed label rates of any product used to supply above recommendations.