## WEIGAND LOCATION EXPERIMENTS

The Powell Butte District of Crook County and the irrigated portion of Deschutes County have experienced a decline in alfalfa and potato yields. The reasons for the declining yields are not known but the reduced fields are having a severe affect on the agricultural economy of the area.

The Weigand location is a five acre tract located on the N.L. Weigand farm in Powell Butte and has been established in order to help solve the problems of declining yield in this area.

During 1961, three experiments were established on the Weigand location. Two of the experiments were fertility experiments involving the use of trace elements in conjunction with a base application consisting of the major fertilizer elements used at the recommended rates for potatoes and alfalfa. The third experiment was a soil fumigation experiment involving the use of four soil fumigants for the control of Verticillium Wilt.

The trace element experiment on alfalfa was established in 1961 and no results were available during the year. Difficulty was encountered in obtaining a good stand of alfalfa. The alfalfa seeds germinated and grew, apparently normal, through the catyledonous leaf stage, but shortly after the development of the true leaves the plants turned yellow and died. At that time, the problem was considered to be due to scalding from irrigation water and the high temperatures which prevailed. However, conversations with local farmers at a later date indicated that a similar condition had killed out or seriously reduced the stand of several new seedings in the area and that the several environments were sufficiently different to preclude sun scald as being the cause in each case. The condition didn't appear to be caused by disease, however, this was never positively determined.

The trace element study on potatoes was composed of eighteen treatment combinations. A base treatment (A) composed of nitrogen, phosphate, potash and sulfur at recommended levels of each was supplemented with lime, gypsum, boron, molybdenum, copper and zinc in different combinations. The source and rate of each is shown in Table No. 18 . The base treatment was all applied in bands at planting time. The trace elements, lime and gypsum were surface applied prior to planting and thoroughly disked into the soil prior to planting.

Two replications, I and II, were treated with Vorlex, a soil fumigant, prior to seeding for the control of Verticillium Wilt.

Table 18

Rates and Sources of Fertilizer Treatment Used in Trace Element Study of Potatoes at N. L. Weigand Location - 1961

| Fertilizer | Source | Rate/Acre |
|---|---|---|
| N | Ammonium Sulphate and Ammonium Nitrate | 100 lbs. |
| $P_2O_5$ | Treblesuperphosphate | 75 lbs. |
| $K_2O$ | Sulphate of Potash | 75 lbs. |
| S | (from Ammonium Sulphate and Sulphate of Potash) | 70 lbs. |
| | Gypsum | 1000 lbs. |
| | Lime | 1 ton |
| B | Solubor | 1# B |
| Zn | Sinc Sulphate | 8# Zn. |
| Cu | Copper Sulphate | 8# Cu. |
| Mo | Ammonium Molybdate | ½# $(NH_4)_2 MoO_4$ |

An early phytotoxicity was demonstrated by the potatoes planted in the Vorlex block. The phytotoxicity was overcome later in the season and the yield from these two replications was significantly higher than the non-treated portion.

No consistent vegetative responses could be associated with the trace element applications. Nor were any trace element x Vorlex interactions observed.

Table No. 19 presents the yield by replication. Extremely large yield variations by replication were present. A portion of the differences were due to the Vorlex application and a portion due to the soil variation at the head-end of the field occupied by replications I and III. The soil at the head-end of the field was rockier, heavier and more difficult to prepare for planting. Also, because of ditch seepage it was more moist at planting time. Under these conditions, Vorlex appeared to be the most help in raising yields. The average yield for the Vorlex treated replication was 72 bushels greater than the untreated replication.

Summary Table No. 20 shows the average values for yield, specific gravity, market grade and tuber size of the No. 1 potatoes. The yields were not significantly different for any treatment. The yield trends indicate that in the five treatments exceeding the base yield, molybdenum was the only element to occur in each high yielding treatment. In the highest yielding of these five treatments, molybdenum was in combination with gypsum.

Among the treatments, where specific gravity determinations were made, there appeared to be little difference between the average specific gravity values.

There were no significant differences in No. 1 potatoes as affected by the several treatments. Neither was there any significant difference between the average size of the No. 1 potatoes brought about by the trace element treatments. Higher yielding treatments tended to produce the largest potatoes, which would indicate that yield differences were due to the size of the potatoes and not due to any difference in the set of the potatoes.

Cooking quality studies of several selected treatments were conducted by Dr. Andrea Mackey and Mrs. Sue Joiner of the Oregon State University Home Economics Department. The treatments included in these studies were as follows:

A
A & G
A, G & B
A, G & Mo

Table No. 19

The Effect of Several Fertilizer Treatments and Soil Fumigation
on the Yield of Russet Burbank Potatoes
at the Weigand Location, Powell Butte, Oregon
1961

| Treatment | Yield in Bushels Per Acre By Replicate | | | | Mean |
|---|---|---|---|---|---|
| | I | II | III | IV | |
| 1. A | 336.0 | 350.8 | 190.8 | 268.1 | 286.4 |
| 2. A, and Gypsum | 235.2 | 296.4 | 186.8 | 255.4 | 243.5 |
| 3. A, Gypsum and Boron | 297.0 | 369.6 | 147.8 | 326.6 | 285.3 |
| 4. A, Gypsum and Molybdenum | 368.3 | 389.8 | 236.5 | 362.9 | 339.4 |
| 5. A, Gypsum, Boron and Molybdenum | 190.8 | 336.0 | 177.4 | 248.6 | 238.2 |
| 6. A and Lime | 241.9 | 260.7 | 173.4 | 290.3 | 241.6 |
| 7. A, Lime and Boron | 336.0 | 268.8 | 200.3 | 300.4 | 276.4 |
| 8. A, Lime and Molybdenum | 299.7 | 307.8 | 200.3 | 272.8 | 270.2 |
| 9. A, Lime, Boron and Molybdenum | 336.0 | 338.0 | 143.8 | 258.0 | 269.0 |
| 10. A, Gypsum, Boron, Molybdenum and Copper | 356.2 | 356.2 | 266.1 | 281.6 | 315.0 |
| 11. A, Gypsum, Boron, Molybdenum and Zinc | 286.3 | 197.6 | 198.9 | 277.5 | 240.1 |
| 12. A, Gypsum, Boron, Molybdenum, Copper & Zinc | 337.3 | 301.7 | 257.4 | 276.9 | 293.3 |
| 13. A, Lime, Boron, Molybdenum and Copper | 262.1 | 364.2 | 190.8 | 239.9 | 264.3 |
| 14. A, Lime, Boron, Molybdenum and Zinc | 267.5 | 346.1 | 255.4 | 239.2 | 277.1 |
| 15. A, Lime, Boron, Molybdenum, Copper and Zinc | 246.0 | 345.4 | 315.8 | 229.8 | 284.3 |
| 16. A and Boron | 266.1 | 323.2 | 180.1 | 269.5 | 259.7 |
| 17. A and Molybdenum | 327.9 | 337.3 | 257.4 | 264.8 | 296.9 |
| 18. A, Boron, and Molybdenum | 219.1 | 361.5 | 329.3 | 239.2 | 287.3 |
| Average | 289.4 | 325.1 | 217.1 | 272.3 | |

A = Base Treatment of N, P, K, and S
Replicates I and II treated with Vorlex
Average yield of Vorlex treated plots = 307.2 Bu.
Average yield of untreated plots = 244.7 Bu.
Difference 62.5 Bu.

Table No. 20

Summary of the Effects of Several Fertilizer Treatments
On Yield, Specific Gravity, and Market Grade
at the Weigand Location, Powell Butte, Oregon
1961

| Fertilizer Application (1) | Average Yield Bu./Acre | Average Specific Gravity | Average Market Grade in Percentage of | | | Average Size #1 Tuber In Pounds |
|---|---|---|---|---|---|---|
| | | | No. 1 | No. 2 | Culls | |
| 1. A. | 286.4 | 1.090 | 39.62 | 18.50 | 41.88 | .294 |
| 2. A and Gypsum | 243.5 | 1.090 | 42.50 | 14.76 | 42.76 | .276 |
| 3. A, Gypsum and Boron | 285.3 | 1.090 | 43.76 | 12.00 | 44.26 | .275 |
| 4. A, Gypsum and Molybdenum | 339.4 | 1.088 | 43.76 | 19.88 | 36.38 | .301 |
| 5. A, Gypsum, Boron and Molybdenum | 238.2 | 1.091 | 30.00 | 18.00 | 52.00 | .269 |
| 6. A and Lime | 241.6 | | 42.12 | 15.50 | 42.38 | .273 |
| 7. A, Lime and Boron | 276.4 | | 30.38 | 26.62 | 43.00 | .272 |
| 8. A, Lime and Molybdenum | 270.2 | | 44.26 | 20.50 | 35.26 | .281 |
| 9. A, Lime, Boron and Molybdenum | 269.0 | | 33.88 | 25.26 | 40.88 | .305 |
| 10. A, Gypsum, Boron, Moly | 315.0 | 1.091 | 44.50 | 22.50 | 33.00 | .302 |
| 11. A, Gypsum, Boron, Molybdenum and Zinc | 240.1 | 1.089 | 36.76 | 18.76 | 44.50 | .291 |
| 12. A,Gypsum, Boron, Molybdenum, Copper & Zinc | 293.3 | 1.088 | 48.00 | 17.12 | 34.88 | .283 |
| 13. A, Lime, Boron, Molybdenum and Copper | 264.3 | | 38.38 | 13.62 | 48.00 | .260 |
| 14. A, Lime, Boron, Molybdenum and Zinc | 277.1 | | 40.76 | 18.76 | 40.50 | .277 |
| 15. A, Lime, Boron, Molybdenum, Copper & Zinc | 284.3 | | 36.12 | 25.38 | 38.50 | .295 |
| 16. A and Boron | 259.7 | | 39.76 | 20.12 | 40.12 | .286 |
| 17. A and Molybdenum | 296.9 | | 38.62 | 20.50 | 40.88 | .288 |
| 18. A, Boron, and Molybdenum | 287.3 | | 38.38 | 19.00 | 42.62 | .289 |
| L.S.D. @ 5% | NS | | NS | | | NS |

(1) Table No. 18 presents the fertilizer application as kind, source and rate in pounds per acre.

A
A & G
A, G & B
A, G & Mo
A, G, B & Mo
A, G, B, Mo & Cu
A, G, B, Mo & Zn
A, G, B, Mo, Cu. & Zn

with A = Base Treatment
B = Boron
Mo = Molybdenum
Cu = Copper
Zn = Zinc

A summary of the results from the cooking quality studies is as follows:

1. Treatments had little or no effect on specific gravity.

2. The treatments had no significant effect on flavor or texture.

3. The addition of trace elements improved the color of the cooked potato when either boiled or baked. When molybdenum or boron or both were added to the base fertilizer, the color was brightened. The color was further enhanced by the addition of Copper and/or Zinc. The overall color changed from a slight yellow-green tinge of medium intensity to a light, bright color with a slight yellow-green tinge. The undesirable gray appearance of the cooked potato was alleviated by the addition of trace elements.

   The baked potatoes followed the same changes in color with the trace element additions except that boron did not appear to contribute to the change.

4. The sloughing experiment indicated that copper might be useful in reducing sloughing. Actually, much more work would be necessary before an application of copper for this purpose is considered.

A brief summary of the procedures used in cooking quality studies are as follows: The potatoes were stored for several weeks in a cool room at a temperature of between 40-45° F. before the studies were commenced. At the end of the storage, the specific gravity of each potato was determined to the nearest .005 in a range of values from 1.065 to 1.100.

The 1.085 class was the model class in the range, therefore, potatoes of this specific gravity class were used in all cooking studies.

Taste and texture studies were conducted on warm baked potatoes. Three replications of each treatment were judged by a panel of four judges. The texture of the potato was placed into four categories which were described as:

4 - Very mealy
3 - Moderately mealy
2 - Slightly mealy
1 - Waxy

with "very mealy" considered most desirable, and "waxy" the least desirable.

Taste was also separated into four categories:

4 - Natural, very pleasing
3 - Fairly desirable
2 - Slightly undesirable
1 - Undesirable

The placings here are obvious. The results of these studies were submitted to statistical analysis.

Color determinations were made on both baked and boiled potatoes. In this phase of the experiment, the color comparisons were made with hot potatoes soon after cooking. The color of the cooked potatoe was matched with a color swatch from a series of swatches representing the range of colors found in cooked potatoes. A gray color in cooked potatoes being considered less desirable than a light, bright slightly yellow hue.

Sloughing in boiled potatoes is described as the tendency for the potato to crumble after a normal cooking period. This characteristic is often found in potatoes grown in the Central Oregon area, and is most common immediately after harvest. In this study, potatoes were placed in boiling water and boiled for 35 minutes. The potatoes were then removed from the water and the sloughing tendency graded from 1 to 6 according to a previously prepared pictorial scale.