

its 20 years under cultivation. The other soil, an Elfrida clay loam, was in range land the year prior to sampling.

Various rates of nitrogen, phosphorus, and potassium were applied to the soils. Soil applications of 200 pounds of nitrogen plus 400 pounds of  $P_2O_5$  per acre significantly increased growth of lettuce on both soils used. Heavier applications did not further increase yields.

It should be kept in mind that more fertilizer is required for greenhouse production when plants are confined to relatively small pots as compared to field conditions. There was a linear increase of nitrogen uptake following nitrogen applications up to 400 pounds per acre on both soils. Phosphorus and potassium uptake were not significantly affected by soil applications of nitrogen and phosphorus to the Elfrida soil.

The potassium content of the lettuce grown on the McAllister soil treated with 200 pounds per acre of nitrogen increased significantly.

#### Field Experiment

In the field study at the Campbell Avenue Farm, Tucson, nitrogen, potassium, and magnesium applications varied. A standard application of 100 pounds of  $P_2O_5$  was made to all plots.

Due to past fertilizer practices resulting in a high fertility level, no differences in yield or weight of heads were found. However, the application of 100 pounds of nitrogen per acre significantly increased nitrogen uptake at the wrapper leaf stage. Some evidence was found that magnesium with nitrogen hastened maturity. The nitrogen, phosphorus, potassium, and magnesium contents of mature heads did not vary significantly regardless of treatment.

Potassium applications had no consistent effect on the growth or earliness of maturity of head lettuce.

#### Effect of Fertilizers on Yield, Quality and Nutrient Uptake by Lettuce (J. L. Strohlein and T. C. Tucker)

Abstract: A series of studies on lettuce fertilization have been carried out over the past few years. Fertilizer applications increased yield through increased head size and did not affect the number or quality of harvested heads. The lower rates used were as effective as the higher rates. Nitrogen and phosphorus fertilization generally increased the nitrate and phosphorus content of the various plant parts selected for analysis.

#### Introduction

Lettuce is an important crop in Arizona, and considerable interest exists in fertilization practices for this crop. Since tissue analysis has become an

important tool in guiding fertilization practices in cotton and other crops in this state as well as elsewhere, the development of tissue analysis procedures for lettuce is of interest.

Lettuce is a short-term crop, however, and not well adapted for tissue analysis. It is with these factors in mind the following experiments were carried out.

### Methods and Results

A field experiment was established near Picacho in 1962 with spring lettuce to study various rates and sources of nitrogen fertilizer. Ammonium sulfate, calcium nitrate, ammonium nitrate, and urea were equally effective. The 40 pound per acre nitrogen rate was as effective as higher applications. Nitrogen at this rate increased the number of two dozen size, decreased the number of two and one-half dozen size while higher rates did not affect the number of either size heads.

Total number of heads was not influenced by nitrogen rate, so yields were increased as a result of larger head size.

Source of nitrogen did not influence the nitrate content of wrapper leaves at three sampling dates, indicating an adequate rate of nitrification in the soil.

Nitrogen increased the nitrate content of the wrapper leaves for the second and third sampling dates.

A greenhouse experiment indicated that the use of ammonium nitrate and calcium nitrate gave significant increases in yield and plant nitrate content over that obtained with ammonium sulfate. Therefore, it appeared that nitrate was preferentially absorbed by lettuce in the greenhouse.

An experiment was established near Sacaton during 1962 on a fall crop of lettuce to determine the effect of high rates of phosphorus along with magnesium sulfate and manganese sulfate on yield, bolting, and nutrient uptake. Nitrogen at a rate of 110 pounds per acre was applied as ammonium nitrate to all plots. Treble superphosphate was banded to the side and below the row.

Applications varied from 0 to 800 pounds of  $P_2O_5$ . Magnesium and manganese were applied as sulfate with the 400 pound  $P_2O_5$  application.

Yield differences (number and weight of harvested heads) were not found since only one harvest was made. The incidence of bolting was quite high but not related to treatment since the lettuce was planted early and the temperatures were high. Phosphorus content of the tissue was significantly increased by treatment, although position in the field also affected phosphorus uptake because of variation in the fertility of the soil. The manganese content of the tissue was not influenced by manganese sulfate applications.

An experiment was established on a fall crop of lettuce at Marana in 1963 in order to compare the effect of nine fertilizer treatments on yield, quality, and nutrient content of lettuce.

Nitrogen rates varied from 45 to 95 pounds per acre,  $P_2O_5$  from 0 to 100,  $K_2O$  from 0 to 20, and sulfur and micronutrients were included in certain treatments.

Time of nitrogen application also was studied. The treatments covered the length of the field and were replicated three times. Unfortunately, variable thinning time and harvest schedule made it impossible to accurately determine yields.

Cartons of lettuce were stored at  $44^{\circ}F$  for 8 and 19 days in order to observe any effects of fertilizer treatments on lettuce quality. No significant difference was found on butt discoloration, seed stalk formation, tipburn, rib discoloration, and head weight. Fertilizer applications had no significant effect on nitrate and phosphorus content of midrib tissue of mature leaves.

A lettuce experiment on the Mesa farm during the fall and winter of 1963 involved the effects of nitrogen and phosphorus fertilization on yields and the nitrate and phosphorus content of the tissue.

Nitrogen was applied as ammonium nitrate at rates of 0 to 400 pounds per acre with and without phosphate. Treble superphosphate was used at rates of 0 and 100 pounds of  $P_2O_5$  per acre. Midrib tissue from the wrapper leaves were taken four times during the growing season for nitrate and phosphorus analyses.

Due to the cold season yields were not satisfactory although the check plots were considerably poorer than the fertilized plots. No difference in yields was observed between the various fertilizer treatments.

Results of tissue analysis is shown in Table 1.

Without nitrogen the nitrate content of the lettuce decreased through the first three sampling dates but increased for the fourth date as the soil became warmer. The nitrate content increased as nitrogen rates increased where phosphorus was added. Without phosphorus the same trend was present but not as consistent.

Phosphorus applications did not affect the phosphorus content of the midribs for the first two sampling dates but increased phosphorus for the last two dates. The phosphorus content increased through the season regardless of phosphorus applications.

Table 1. Influence of N and P fertilization on NO<sub>3</sub>-N content of midribs of wrapper leaves during the growing season.

| N<br>Rate | +P                     |         |         |         | -P      |         |         |         |
|-----------|------------------------|---------|---------|---------|---------|---------|---------|---------|
|           | Dec. 17                | Dec. 28 | Jan. 14 | Feb. 26 | Dec. 17 | Dec. 28 | Jan. 14 | Feb. 28 |
|           | ppm NO <sub>3</sub> -N |         |         |         |         |         |         |         |
| 0         | 2,600                  | 1,200   | 160     | 840     | 1,370   | 1,300   | 140     | 1,960   |
| 50        | 3,400                  | 5,100   | 4,150   | 4,300   | 3,600   | 4,700   | 4,470   | 3,300   |
| 100       | 3,900                  | 5,000   | 4,300   | 5,100   | 3,750   | 4,400   | 3,300   | 4,150   |
| 200       | 4,200                  | 5,300   | 4,400   | 5,300   | 3,300   | 4,500   | 3,600   | 4,850   |
| 400       | 5,450                  | 5,500   | 4,700   | 6,400   | 3,200   | 4,200   | 7,800   | 4,200   |
|           | % P                    |         |         |         |         |         |         |         |
| 0         | .129                   | .116    | .135    | .214    | .134    | .111    | .124    | .188    |
| 50        | .134                   | .136    | .170    | .241    | .133    | .127    | .137    | .209    |
| 100       | .136                   | .133    | .161    | .247    | .138    | .127    | .140    | .206    |
| 200       | .132                   | .115    | .151    | .206    | .136    | .126    | .134    | .215    |
| 400       | .136                   | .118    | .141    | .232    | .127    | .124    | .134    | .198    |

Sclerotiniase or Drop of Lettuce  
(William J. H. Stone)

Abstract: Preliminary tests have been initiated in a program for control of Sclerotiniase, or drop of lettuce. Damping-off problems are concurrently being investigated.

Introduction

Lettuce growers in the Aguila area brought our attention to infections by Sclerotinia sclerotiorum during the fall of 1964. They have been having considerable trouble in all fields in the area for the past several crop seasons. The disease has occurred in every crop, but has been the most severe in the spring.

The growers had been using 600-1000 lb. calcium cyanamide per acre but felt that it was doing very little good. Interest in a field testing program with the spring crops was expressed.

Methods

Three chemicals were selected because of their reported effectiveness against Sclerotinia; Dow M-2633 (80% Telone, 15% chloropicrin, and 5% propargyl bromide), Upjohn's Botran (2, 6-dichloro-4-nitroaniline), and Mathieson's Terraclor (Pentachloronitrobenzene). Spencer Chemical Company has tests in the Salt River Valley with plastic mulch for its horticultural values. Since it is generally assumed that Sclerotinia infects lettuce in arid regions primarily by penetration of the lower leaves that are lying on the soil surface, we thought it