

Fertilizer trials with

Shasta and Lassen

strawberry varieties in three producing areas

Nutritional requirement studies of strawberry varieties Shasta and Lassen suggest that field behavior of strawberries in the major areas of California production is closer to the behavior of deciduous fruit trees than to annuals.

One of three sets of field trials was established on Sorrento soil south of San Jose. Six plots of nine beds 40' long were given differential fertilizer treatments with the fertilizer placed on the beds and the beds retilled. After soil fumigation with chloropicrin, Shasta strawberry plants were set out in the fall.

The six fertilizer treatments were: 10-10-10, complete, at a rate of 1,000 pounds per acre; ammonium sulfate at 500 pounds; potassium sulfate at 185 pounds; ammonium sulfate at 1,000 pounds; treble superphosphate at 230 pounds; and the grower's treatment of 500 pounds of 10-10-10 per acre followed later by 200 pounds of 16-20.

Leaf samples for analysis were taken at approximately monthly intervals through the growing season. Each sample consisted of 100 leaflets from leaves which had recently attained full size. Some petiole samples were also taken for comparison. Total and nitrate nitrogen, phosphorus, potassium, calcium, magnesium

and manganese were determined for all samples.

Yields were recorded for all pickings in the test years of 1958 and 1959.

Analyses of leaflets and petioles illustrated the differences found in the two tissues, the changes due to time of sampling, and the relative utility of total nitrogen compared with nitrate. The petioles were much higher in potassium than the blades. The application of potassium sulfate at the rate of 100 pounds of potassium per acre per year, whether applied as a simple or with 10-10-10, was not reflected in the potassium content of either blades or petioles. Variability in potassium was high.

Calcium content was similar in blades and petioles, and showed little difference among plots. Variability was higher in the samples taken in late summer than in the earlier samples.

Magnesium, also, was much the same in all the determinations.

The phosphorus content seemed to average slightly higher in the blade than in the petiole. There was no apparent uptake of phosphorus from application of 100 pounds of phosphorus per acre per year from treble superphosphate, nor from the same amount of 10-10-10. The

values found in late summer were slightly greater than those in the spring.

Manganese ran substantially higher in the blades than in the petioles, but also was much more variable in the blades. In the absence of deficiency symptoms, the levels found are considered adequate.

Total nitrogen was about three times higher in the blades than in the petioles. The reverse was true with nitrate. Furthermore, the differences between treatments were far larger with the nitrates in the petioles than in the blades. It required more than 100 pounds of nitrogen to maintain the nitrogen level throughout the season. A split application gave higher nitrogen content late in the season than a single application.

The lowest yields produced were in the 1958 plots lacking nitrogen. The highest yields in the 1958 tests were in the plots receiving the highest nitrogen. In 1958 and again in 1959 the grower-treatment fell a little behind the nitrogen alone, but differences were not great.

A second set of plots was established near Santa Maria on Pleasanton soil. The area was unirrigated grain land prior to grading for strawberries.

Lassen plants were set out in December and fertilized the following Febru-

PRESCRIBED BURNS

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burn about 1,000 pounds of dead material per hour.

The technique of prescribed burning is well developed but each process takes time and costs money. To learn how fast wildfire fuel accumulates, dead fuel material—other than pine needles—accumulated over a period of eight years following prescribed burn in 1952—was measured by weight. The measurements were made on nine plots, 60' x 60' square. The trees on five of the plots had been thinned before the burn in 1952. Three of the five plots were thinned to about proper stocking and the other two

plots were overthinned. The remaining four plots were unthinned. The trees on the thinned plots were pruned so that the lowest branches were 22' above the ground cover of pine needles and herbs. Only the trunks of trees connected the ground fuel layer with the green canopy. The pruning further altered the fuel supply and the danger of wildfires was reduced beyond getting rid of dead materials only.

Dead wood was removed from the plots and weighed after six years of accumulation and again after two more years. The dead material consisted entirely of small suppressed pine trees and limbs more than 1" in diameter on the ground.

The new accumulated dead fuel consisted entirely of small suppressed trees. In the properly thinned plots where the suppressed trees were removed, no fuel accumulated in two instances and only 24 pounds per acre in the other. Even in the unthinned plots where the trees were very dense—up to 1,100 per acre—the fuel accumulated slowly.

The beneficial effects of prescribed burning to reduce wildfire dangers can last for many years and when the cost is divided by the years of benefit obtained, the cost per year is relatively low.

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ary. Six fertilizer treatments were made in duplicate; two 390' long beds per plot. The center two rows were used to supply yield data. Treatments were: complete, supplying 100 pounds per acre each of nitrogen, phosphorus pentoxide, and potassium oxide from ammonium sulfate, treble superphosphate and potassium sulfate; nitrogen-phosphorus, the same as the first treatment, eliminating potassium; nitrogen at 50, 100 and 200 pounds per acre. One plot was not treated and used as a check.

Leaf samples were taken as in the San Jose trials at approximately monthly intervals throughout the entire growing season.

Soil samples were taken prior to fertilization in 1' increments to 3'. The samples revealed the usual higher level of potassium in the surface foot where little soil was moved, but little differentiation where there was a fill. Making beds tends to give a greater depth of surface soil under the plants. One area showed some salt accumulation with 16% of the total milli-equivalents—M.E.—replaceable bases being sodium. The remainder of the field varied from 1.5% to 9.5%. Chloride varied from 0.14 to 0.85 M.E. per kilogram in 1:1 water extracts. Bicarbonate lay between 0.039 and 3.52 M.E. per kilogram.

Leaf analyses from the Santa Maria plots showed some variations from those of the San Jose tests. Although total nitrogen was slightly higher in the spring, and showed a greater drop in midsummer, it was less consistently correlated with treatment. Check plots were significantly lower in the first test year than nitrogen fertilized plots, but not in the second year. Nitrate was not in as good agreement with treatment as in the

San Jose tests, and ran much higher in the spring.

The potassium level was well above that at San Jose and there was no evidence of absorption of potassium from the fertilizer.

Phosphorus values were about the same in the Santa Maria and the San Jose plots, and showed no evidence of absorption of added phosphorus.

Calcium and magnesium were of the same order of magnitude in both sets of tests and showed no consistent differences among the treatments. There seemed to be a little higher calcium content toward the end of the season.

Manganese increased with the season at Santa Maria and reached levels in some samples of more than 1,000 ppm—parts per million. Although no symptoms of manganese toxicity were recognized, it seems possible that adverse effects may have occurred from the high levels.

Another factor which may have had serious effects in limiting performance and response was the high chloride content. The level was moderate in the spring, but increased to over 0.7% in some plots the first year and over 1.5% in two plots the second year. There was little evidence of chloride burn in the plots, but normal behavior can not be expected when chloride reaches such levels.

There was no yield response to fertilizer in either test year.

A third set of trials established at Salinas was on Antioch fine sandy loam, a slightly alkaline soil with a pH—relative alkalinity-acidity—of about 7.7. In such soil, sodium is generally less than 3% of the replaceable bases, and chloride in the 1:1 extract is in the 10 to 50 ppm range for the most part. Chloride accumulation

in the leaf was less at Salinas than at Santa Maria, never exceeding 0.5%.

Nine plots of approximately one acre each of Shasta variety strawberries were selected with rate of nitrogen application the only treatment differential. Fertilizer rates were: 0, 10, 20, 30, and 40 pounds of nitrogen per acre per month for 10 months. All plots were duplicated except the 40 pound treatment.

Total nitrogen reflected the presence or lack of nitrogen but did not differentiate clearly between rates. Nitrate followed the treatment pattern much better, although there were some reversals. Total nitrogen levels were similar to those at San Jose, but nitrates at Salinas did not reach the levels found at San Jose.

Calcium was slightly higher and magnesium slightly less at Salinas than at San Jose. Phosphorus was about the same. Manganese was lower at Salinas than in Santa Maria or in San Jose, ranging from about 50 to 100 ppm, but not low enough to produce deficiency symptoms.

These trials indicate that neither the blade nor the petiole can be considered the better tissue for testing all nutrients. The sampling error probably is somewhat higher for strawberries than for deciduous trees because it is more difficult to sample accurately with respect to age of strawberry leaf. Consequently, frequent sampling of strawberry plants is essential for a clear reflection of nutritional responses.

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Stabilizing yields of

SELF-POLLINATED CROPS

Studies with mixed populations of self-pollinated crops are being conducted to explore the potential of mixtures of varieties in improving and stabilizing productivity.

In the past half-century much of the improvement in yielding ability of crops such as barley, wheat and beans has resulted from selecting pure-line varieties—consisting of a single genetic type—which are highly uniform for such features as size, maturity, disease resistance, and quality factors that improve their marketability. Valuable as these pure-line varieties have been, there are theoretical

reasons for believing that certain types of mixed populations may be still more useful in agriculture.

Investigations have therefore been conducted to test the theory that mixtures which provide a controlled measure of genetic diversity may not only yield more than a single pure line but also perform more steadily year after year. Under test is the idea that individual plants may encounter different environments not only within fields but also in different locations and years, and that different plant types may be able to exploit particular sites to their own particular advantage and hence to the advantage of the entire population.

One experiment with lima beans con-

ducted at four locations over four years indicated that mixtures of pure lines were less likely to produce as high yields in any one year as the best pure line included in the mixtures. But neither were the mixtures likely to make the lowest yields. The important point is that certain of the mixtures yielded more, when averaged over several years, than the best constituent pure line included in the mixture.

These results offer encouragement that rational blends of pure lines chosen for their compatibility may, apart from their value in stabilizing production, also raise the yield of blends beyond that of the single best adapted pure line.—*R. W. Al-lard, Dept. of Agronomy, Davis.*