Response of

Bartlett Pear

to nitrogen in California

E. L. PROEBSTING

The response of Bartlett pear trees to fertilizers is of continuing interest to pear growers in California. An extended series of trials to obtain facts with respect to this relationship was conducted in all of the major pear producing areas in the state. Immediate objectives varied among the trials but, in each case, response in yield to the application of nitrogen was determined.

Fifteen orchards were represented, and all trials were continued for a minimum of five years.

Yield response the first year after starting a fertilizer program is unusual, because the buds which produce the flowers for that crop have already been formed. It may take longer than two years for the tree to adjust its bearing surface and the conditions for bud differentiation to produce greater yields.

Leaf samples were collected and analyses were made from each of the trial orchards. The standard sampling procedure was to remove the basal leaf from each of 100 shoots of moderate vigor from each plot. Each sample was a composite of leaves from several trees, the actual number being determined by the size of the plot.

Total nitrogen was used as a measure of nitrogen level in the top, because there is a negligible amount of nitrate in pear leaves. Very low concentrations of nitrate may appear, usually toward the latter part of the season, but are not correlated with tree condition. In most cases, seasonal curves of total nitrogen were obtained by sampling at intervals throughout the season. The seasonal curves were typically at their maximum in the early spring when the cells of the leaf are immature, with thin cell walls and little accumulation of carbohydrates. There was a rapid drop as the leaf matured and

---

numbers of bugs per caged plant portion was evident in reduced seed weight. This decrease in seed weight was significant at a concentration of eight bugs per cage in the first experiment, when the large and small seeds were not segregated. In the second experiment, twice the number of bugs were required per cage in order to produce a significant reduction in the weight of 100 large seeds. The control also produced significantly less seeds of the small size.

Decreases in seed weights by lygus feeding affect the size of seeds, so that the number of seeds required per ounce is increased. This decrease in weight of seeds became economically meaningful when the number of bugs was maintained at eight and 16 per cage, equivalent to 22.8 and 50.7 bugs per plant.

Lygus damage cages on table beet seed plants

Effect on Seed Viability

The table also shows germination tests of the 100-seed samples selected for seed weight determinations. In the first experiment only one level of bug infestation—four bugs per cage—reduced viability significantly below the value for the check plants. The number of viable germs per seed, however, was reduced significantly by both four and eight bugs per cage.

In the second experiment the numbers of viable seeds of the large category were reduced significantly by eight and 16 lygus bugs per cage. Also significantly decreased were the numbers of viable germs per seed. Maximum loss of viable germs—at one to five per seed—was 42% per 100 seeds. At the highest level of infestation the viability of small seeds dropped 82%.

The data indicate that the decrease in viability was of economic significance when the bugs were maintained at infestation levels calculated to be 22.8 to 50.7 per plant. Only four bugs per cage —12.7 bugs per plant—may at times be sufficient to cause an economic reduction in seed viability. The decrease in viability of large and apparently sound seeds is important, because seeds having a germination of only 60% or slightly over are not commercially usable. Furthermore, such seeds can not be cleaned out or separated from good seed, and the accepted minimum viability of beet seed is 85%.

Elmer C. Carlson is Associate Specialist in Entomology, University of California, Davis.

John Campbell, Nurseryman, University of California, Davis, assisted in the experiments reported.

The above progress report is based on Research Project No. 1565.

then a more gradual reduction in nitrogen throughout the summer. In any given orchard there will be variations from year to year, both in per cent nitrogen for the season and in the rate at which it decreases through the summer.

For purposes of comparison the amounts found in midsummer were used, but the values are approximations, depending on sampling date and seasonal factors.

Unfertilized trees gave values ranging from 1.6% to 2.2% as per cent dry weight. The nitrogen content was found to vary from 1.9% to 2.6% in the fertilized trees. On rare occasions, trees have failed to absorb and translocate nitrogen to the leaves. No satisfactory explanation has been found to account for this behavior. Explanations of this condition are hypothetical and unsatisfactory. In such cases, response would not be anticipated, and such is the case whether the initial level has been high or low. Increases in leaf nitrogen varied from 0% to 0.9%.

There was no correlation between region and the nitrogen level of unfertilized trees, although trials on a larger number of orchards might show such differences.

Six of the 15 orchards showed increased yields in the nitrogen fertilized plots. The others did not. In all the orchards showing response, the leaf nitrogen was raised to 2.1% or above. In those failing to show yield increases, the values ranged from 1.9% to 2.4%. Increases in leaf nitrogen in orchards where crops increased varied from 0.2% to 0.9%.

The results of the trials suggest that leaf analyses have a limited utility in predicting response of pear trees to fertilization. Probably response could be expected with leaf nitrogen below 1.7%. Between 1.7% and 2.2%, local influences would determine whether or not a response would be obtained, and the rate of application necessary to secure such a response would be uncertain. Above 2.2% response would be unlikely.

The zone of uncertainty is so wide that good practice would require that field plots be carried on for several years, to determine the best program for a particular situation. A greater response might be expected in the warmer districts, but no single criterion seems adequate as a guide to fertilization. Vigor, leaf color, and production, combined with leaf analyses, should give substantial indications of the likelihood of response, but field trials would still be necessary for a final answer as to whether or not to apply nitrogen, and the rate if applied.

E. L. Proebsting is Professor of Pomology, University of California, Davis.

The above progress report is based on Research Project No. 768.

BRIEFS

short reports on current agricultural research

Growth factor for

Influenza Bacteria

Bacteria of the influenza group produce diseases—in chickens, sheep, pigs, and man—which vary from a nasal discharge in chickens to acute septicemia in sheep. Laboratory cultivation of these parasitic organisms requires an enriched agar culture medium supplemented by whole fresh blood and streaked with a feeder culture. If the feeder culture elaborates an additional growth factor, the nearest influenza colonies are larger than those without the additional factor.

A new growth factor has been found among the products given off by a pseudomonad bacillus—originally isolated from an Emperor penguin. Large numbers of the pseudomonad were grown in a relatively simple medium and—after the whole organisms were filtered out—appropriate chemical analysis was applied to the remaining culture fluid. The new growth factor was not the so-called X factor nor V factor, DPN—diphosphopyridine nucleotide—provided by whole fresh blood, yet it supplied the accessory nutrient requirements of all strains of influenza bacteria so-far tested—four strains of human origin and three of animal origin.

Studies are in progress to determine the chemical nature of the new growth factor, which appears to be a derivative of niacinamide.—*M. Shifrine and E. L. Biberstein, Veterinary Medicine, Davis.*

Effect of aphid wing movement on

Virus Transmission

The relationship between duration of wing movement of the green peach aphid and transmission efficiency of a nonpersistent virus—lettuce mosaic—and a persistent virus—sugar beet yellow net—is the subject of the current tests.

After a 15-second feeding on a plant infected with lettuce mosaic virus, the aphids were attached with watercolor paint to the heads of pins, so that controlled timing of wing movement could be observed, then placed on lettuce test plants for one hour.

Results indicate no significant variation in transmission efficiency, in the tested time periods, between those aphids allowed and those not allowed wing movement. The ability to transmit the virus was retained up to 45 minutes.

Work is continuing to ascertain if similar results exist with the persistent virus of sugar beet yellow net.—*D. L. McLean, Dept. of Entomology, Davis.*

Hard seed in

Range Legumes

Impermeability of the seed coat to moisture is a valuable characteristic in range forage legumes under California range land conditions of climatic variability and adversity. Such seeds, usually called hard seeds, are under study in the winter annual legume species used for range improvement where a continuing stand of legumes is desired. Results show that the hard seed percentage for crimson clover declines to a low level during the summer months after seed maturity. Subterranean clover follows a similar though slightly delayed pattern of decline. Both species have very little hard seed persisting after the first germinating rain in autumn. However, rose clover maintains a high percentage of hard seed throughout the year after seed maturity, and some hard seed persists into succeeding years. With rose clover seed, high summer temperatures cause moderate breakdown of seed coat impermeability whereas a mild winter environment is relatively ineffective. The persistence of rose clover under adverse range conditions is largely due to its prolific production of hard seed.—*W. A. Williams, Dept. of Agronomy, Davis.*