

check trees during the three harvests. More important was the increase in yield of the treated trees on the second and third picks.

In general, a higher percentage of larger-sized fruit was obtained from gibberellin-sprayed trees in both groves (table 2). More of the gibberellin-sprayed fruit remained greener longer than the control samples, and these color differences continued during cold storage.

Growers are cautioned that gibberellic acid on limes cannot be recommended at this time because it has not been registered for this use (although federal registration has been obtained for use on lemons).

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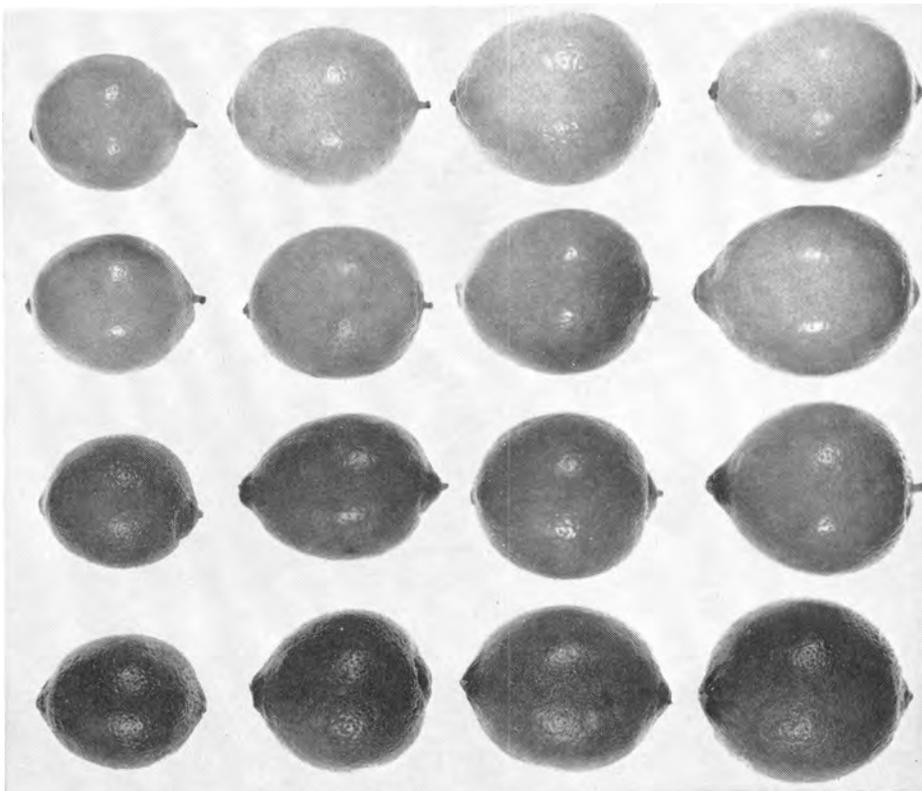


Photo showing lime size and color differences indicates value of maturity delay possibility. Sizes from left to right: 385, 310, 265, and 160. Color range: yellow above to dark green below.

## CLOVER ESTABLISHMENT IN NORTHERN CALIFORNIA

A SURVEY OF 26 northern counties has shown that pastures of rose clover (*Trifolium hirtum*) and subterranean clover (*T. subterraneum*) establish and produce a high quality forage under a wide variety of soil and climatic conditions when they are inoculated with the appropriate root-nodule bacteria and properly fertilized with sulfur or phosphorus where needed. However, there have been a number of failures associated with early nitrogen deficiency in the legume followed by the death of the plants. In certain cases this can be attributed to faulty handling of the cultures of root-nodule bacteria or improper sowing practices. These factors have led to the desiccation and death of the root nodule bacteria on the seed, nodulation failure of the legume and failure of the pasture. Information is being assembled to acquaint ranchers with sound inoculation and sowing techniques in collaboration with J. Street, extension range improvement specialist.

An investigation of the numbers of root-nodule bacteria contained in the

commercial inoculants by means of a legume infection technique has shown low numbers of root-nodule bacteria in a number of inoculants.

When inoculants were fresh they usually contained an adequate number of bacteria to ensure nodulation, but with storage, a decline in bacterial numbers occurred. Nodulation failures in a percentage of the sown legumes pastures may be attributed to this decline in number.

A further complicating factor is the presence of native rhizobia in the soil. These organisms are capable of infecting and producing nodules on the clover plants but fix little nitrogen. These infective bacteria were present in the soil in such high numbers that they were able to infect the plant before the effective root-nodule bacteria contained in the commercial inoculation could multiply sufficiently to cause nodulation. Therefore, these plants although nodulated by native rhizobia were deficient in nitrogen and failed to make good growth. Field experience has shown that if approximately 1,000 effective root-

nodule bacteria per seed were used at the planting time, then these were able to multiply at a sufficiently rapid rate to nodulate the plants before the native bacteria were able to do so. The plants were thus effectively nodulated and good growth was made. However, it is not known whether the beneficial root-nodule bacteria will be able to exist in the soil from year to year in competition with the native organisms.

Research has been initiated to study the behavior of the introduced bacteria and ineffective resident bacteria when in competition. Relative abilities to withstand the adverse soil conditions during the summer dry period are of particular interest. Effective root-nodule bacteria are also being isolated from plants that have survived in the field for a number of years to ascertain whether the soil environment has exerted a selective effect resulting in a more vigorous competitor against the native soil root-nodule bacteria.—A. A. Holland, Department of Agronomy, University of California, Davis.