TABLE 1. MORTALITY OF BEET LEAFHOPPERS CAGED ON PLANTS TREATED WITH THIMET.

Days after applications No. 1	No. 2	% mortality in 24-hours*
7	—	40
16	—	54
27	—	14
41	5	36
49	13	8

* Corrected by Abbott's formula; control mortality less than 5%.

TABLE 2. EFFECT OF THIMET TREATMENTS ON BEET LEAFHOPPER POPULATION DENSITY.

Days after applications		Beet leafhoppers sampled		Leafhopper reduction in treated plots (%)
No. 1	No. 2	Treated plots	Control plots	
7	—	24	71	66
16	—	19	40	53
27	—	59	219	73
41	5	3	46	93
49	13	5	54	91
80	44	17	43	60

TABLE 3. EFFECT OF THIMET TREATMENTS ON CONTROL OF TRANSMISSION OF CURLY TOP VIRUS IN SUGAR BEETS.

Days after applications		Curly top virus incidence (%)		Virus reduction in treated plots (%)
No. 1	No. 2	Treated plots	Control plots	
7	—	1.76	1.57	— —
16	—	3.06	4.63	33.91
27	—	7.13	13.70	47.96
41	5	9.63	28.15	65.79
49	13	9.26	28.43	67.43
80	44	9.72	30.74	68.38

The data on curly top virus incidence shown in table 3 and the graph were obtained by carefully examining a total of 1,080 plants from the treated plots and an equal number from the controls on each sampling date. At the time of the last sampling there was an average of 9.72% infected plants in the treatments as compared with 30.74% in the controls—a reduction of 68.38%.

No further counts were taken due to the reduction of insect activity as a result of the onset of cooler temperatures. In addition, the plants had by then reached the stage when they could suffer only negligible damage as a result of further virus infections.

The above results indicate the possibility of substantial reduction in the spread of curly top virus of sugar beets by the use of a systemic insecticide. Further work is now underway to test the efficacy of the treatments under different environmental conditions and in situations of higher vector density.

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Gibberellin Sprays Delay Lime Maturity

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PRELIMINARY TRIALS indicate that gibberellic acid sprays will delay maturity of limes as well as lemons (*California Agriculture*, January, 1964). In southern California, Bearss lime trees bear some fruit most of the year, but much of the crop colors and ripens in the fall and winter and must be picked. As with lemons, the lime industry would benefit if more fruit matured later in the season when the demand is greater.

Other advantages resulting from a delay in maturity for both limes and lemons include: a larger percentage of fruit with a long storage life and a decrease in small tree-ripe fruit. Gibberellic acid also tends to delay the loss of green pigments from other citrus fruits.

Trials to influence fruit set with other growth regulators were conducted in Santa Barbara County in 1958. Giberellin sprays were tested in 1960 in San Diego County. Both of these early trials were inconclusive.

The recent series of trials reported here began in November, 1963, with spray applications of 10 ppm gibberellic acid to 15 lime trees in each of two groves. One grove in Orange County included mature, relatively nonvigorous trees approximately 30 years old. The other was a grove of vigorous five-year-old trees in northern San Diego County.

There were only two harvests after spraying on the older grove in Orange County—mid-December and early February 1964. In the first pick, the total box counts for the 15 gibberellin-sprayed trees and 15 unsprayed check trees were almost the same. A total of 10½ boxes were picked from the sprayed trees and 11 boxes for the checks. The second pick at the older grove was 16 boxes for the sprayed trees and 13 for the checks. Total for both picks was 26½ for the gibberellin-sprayed trees and 24 for the control trees.

In the younger grove at Valley Center there were three picks after spraying—November 24, December 30, 1963, and February 18, 1964 (table 1). There was a total of four more boxes picked from the 15 gibberellin-sprayed trees than the

TABLE 1. YIELD OF GIBBERELLIN-SPRAYED LIME TREES (SAN DIEGO, 1963–64)

Harvest dates	Control		Gib-sprayed	
	Boxes*	Pounds	Boxes	Pounds
11/24/63	11.0	482	9.0	388
12/30/63	11.0	445	15.0	585
2/18/64	2.5	103	4.5	191
	24.5	1030	28.5	1164

Sprayed November 8, 1963.
* Total field boxes from 15 trees in each treatment.

TABLE 2. PACKINGHOUSE RESULTS OF GIBBERELLIN-SPRAYED LIME TREES (ORANGE COUNTY, 1963–64)

Treatment	Sizes 160	265	310	385	Total pounds packed	By-products Size 500	Off grade	Culls	Total pounds	Total % picked
	*Pounds of Fruit									
Gibberellin	0	5	410	175	590	18	42	15	665	89
Control	0	5	125	170	300	15	95	0	410	73

Sprayed November 11, 1963; picked February 4, 1964; washed February 10, 1964.
* Total of 15 trees in each treatment.

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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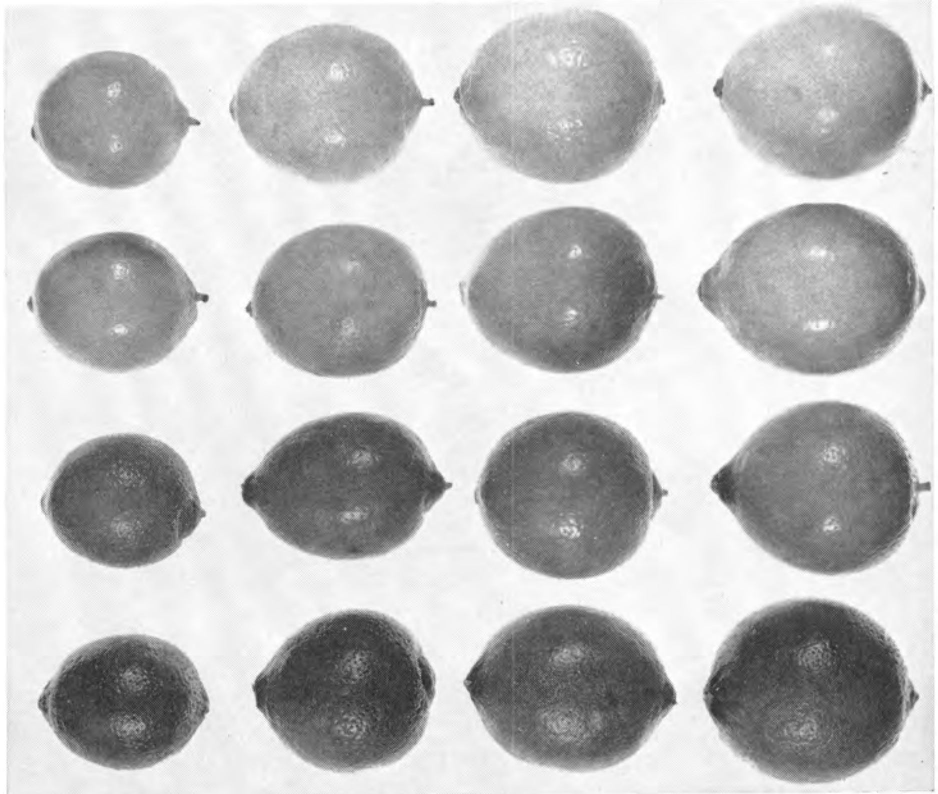

Photo showing lime size and color differences indicates value of maturity delay possibility. Sizes from left to right: 385, 310, 265, and 160. Color range: yellow above to dark green below.

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.*