FRANCIS L. SMITH and BYRON R. HOUSTON

Root rot resistance in Common Beans sought in plant breeding program

More than 1,200 introductions and commercial bean varieties were tested by inoculation with cultures of the two most prevalent organisms causing root rot in California. Only seven showed some tolerance to the Fusarium fungus, and none to the Rhizoctonia. These seven were crossed with ten commercial bean varieties in most of the 70 possible combinations. Each plant was graded on severity score of 0–4, and the average scores were used for evaluation. None of the first-generation plants showed resistance. Second-generation plants were tested from 60 of the 70 combinations. These tests indicated that hybrids from three of the resistant lines gave very few plants with low disease scores. Second-generation plants of hybrids from the other four accessions had 16%–19% resistant plants, or a ratio of 13 susceptible to three resistant. These results could be explained by assuming that resistance is due to two independent genes, one dominant and the other recessive. To test this hypothesis, four third-generation combinations were tested. To confirm the assumption, only $1/16$ of the third-generation progenies would have disease scores as low as the resistant parent, and $2/16$ would segregate three resistant to one susceptible and would have relatively low average scores.

Third-generation progenies from 102 second-generation plants from each of three crosses gave the following results: Sutter Pink × N203—15.7% resistant; California Red × N203—17.7% resistant and California Red × PI 165,435—14.7% resistant. The resistant plants must carry the recessive gene.

Seed from the lowest scoring second-generation plants in the greenhouse tests were planted in the breeding nursery and backcrossed to the commercial varieties. Cross pollinations were made on as many plants in each cross as was possible. From these hybridizations 38 backcrosses were obtained from Sutter Pink × N203, 35 from California Red × N203 and 24 from California Red × PI 165,435.

The F_3 plants which were used as parents in the backcrosses to the commercial varieties have been tested. Theoretically $1/3$ should be homozygous for resistance and $2/3$ heterozygous. A total of 17 progenies from the resistant F_3 plants were tested and five were found to be as resistant as the resistant parent. These results lend further strength to the validity of the hypothesis that was made to account for the F_2 results that resistance is governed by two independent genes, one a dominant, the other recessive. Backcrosses from these proven resistant plants will be used in the breeding program. These plants will also be used in crosses with other commercial varieties.

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INTEGRATED PROGRAMS

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action on the pest and natural-enemy complex. Nonselective materials, with short residual action, may be used if the beneficial organisms can survive in a resistant stage or in an untreated reservoir area. For some pests, a disease can be used as a selective insecticide.

In addition to selective insecticides, other steps have been developed to utilize integrated control. One successful step has been the development of supervised control programs. In such a program farmers—singly or in groups—contract with a professional entomologist who determines the status of the insect populations in their fields. On the basis of pest population counts, and conditions peculiar to each situation—including the pests and their biological controls—the time and method of control are selected.

Cooperative, statewide, long-range entomological research projects have been undertaken to investigate integrated control methods against field and forage crop pests.

In appropriate situations, integrated programs have been successful in the control of certain pests of agricultural crops and give great promise of further success.

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Rootstock breeding for new

GRAPE VARIETIES

The object of a rootstock breeding program at Davis is to find new grape varieties which meet the special needs of California agriculture. In choosing promising new rootstock varieties, selection from the seedling lots is carried out in three phases: disease and pest resistance tests; nursery performance of the seedlings; and vineyard performance of the scions on the grafted vines. The first two phases are made under controlled conditions in an experimental nursery and greenhouse; the third is studied under long-term field trials carried out under commercial vineyard conditions.

Five years ago, initial selections were made from several large populations of hybrid vines which showed promise in their phylloxera and nematode resistance. After initial resistance studies and some nursery tests, 100 of these seedling vines were retained as the most promising for further trials. Vineyard trials are now under way with these seedling rootstocks in several locations in California. As data from these tests are accumulated, further eliminations will be made and the remaining selections will be released to growers for commercial use.

At this time the most promising seedlings appear to be those which are nematode resistant and high in inherent vigor. A number of these types are being tried in sandy, low-fertility, nematode infested sites in the San Joaquin Valley, where a need exists for a satisfactory new rootstock.—*L. A. Lider, Dept. of Viticulture and Enology, Davis.*