

were used in pollination or for surplus honey production. This treatment keeps colonies in production, avoids the expensive destruction of good equipment and safeguards the purity of honey produced for home consumption.

Results of the studies demonstrated that the methods of eradicating American foulbrood by means of chemotherapy were feasible under the conditions of the experiment. The experimental work is being continued at Davis.—*J. E. Eckert, Dept. of Entomology, Davis.*

#### Research on

### SAFFLOWER

With the expansion of safflower acreage in California from about 150 acres in 1949 to well over 100,000 in 1960, there has been an increasing need for more information on its culture. While large amounts of the seed are marketed abroad, the domestic demand for the oil is increasing steadily.

As a step in the improvement of varieties a large number of safflower introductions from many countries are under test at Davis for their resistance to *Phytophthora* root rot and rust, two of the most serious diseases of safflower in the United States. These introductions may also provide improvements in yield and quality of oil. One introduction has proved to be resistant to *Botrytis* blight, a disease that prohibits safflower production in coastal areas. Too low in oil content for commercial use, this introduction has been crossed to commercial varieties.

Weedy species of safflower are being crossed to commercial types, with the hope that the weedy species may be a source of disease resistance, drought tolerance, frost tolerance or earliness. The chromosome number of safflower has been doubled through the use of colchicine to produce a tetraploid. While this tetraploid is not immediately promising, it warrants further study.

Safflower has not been too successful under conditions of surface irrigation because of its susceptibility to *Phytophthora* root rot. Its success in this regard has been improved by the use of tolerant varieties, by planting on beds, and by irrigation practices that keep the plant well supplied with water but, at the same time, keep standing water away from the base of the plant.—*P. F. Knowles, Dept. of Agronomy, Davis, and R. T. Edwards, Agricultural Extension Service.*

#### Resistance to clubroot disease of

### BRUSSELS SPROUTS

The serious threat to the Brussels sprouts industry of California being posed by the clubroot disease is being tackled by the application of chemical treatments to the transplanted seedlings and by the breeding of resistant strains of the host. Successful development of chemical treatments has provided an immediate, though not likely permanent, solution of the problem; for a long-range solution, a plant breeding program is more apt to succeed.

After crosses were made between standard Brussels sprouts and a resistant strain of cabbage, the hybrids and other generations were tested for resistance and horticultural quality in San Mateo County. Selected plants were forced into early bloom to permit the breeding of one generation per year. The first-generation hybrids, showing resistance, were backcrossed to the sprouts parent and the process was repeated in consecutive generations. It has been possible to maintain a satisfactory level of resistance in certain plants through five backcross generations. By inbreeding resistant segregants it has been possible to derive progenies that are pure-breeding for resistance, although still not of acceptable quality. The information obtained reveals that the nature of inheritance of resistance, as well as of horticultural quality, is complex and that genes conditioning the two characters may be linked in a manner unfavorable for the breeding objectives.

Current progress reveals that it should be feasible to breed the combination of satisfactory field resistance and acceptable sprouts characters.—*Charles M. Rick, Dept. of Vegetable Crops, Davis, and R. H. Sciaroni, Farm Advisor, University of California, San Mateo County.*

#### Hybrid vigor in

### SWEET POTATOES

Flower induction in the sweet potato at Davis in the greenhouse during the winter months can usually be facilitated by grafting sweet potato scions on morning glory stocks. One desirable strain—779—responds poorly even to this treatment. Material for grafting was sent to the sweet potato experiment station at Chiayi on Formosa. There it bloomed very freely and set seed abundantly without grafting on morning glory. This

enabled the workers there to use it as a parent in a number of crosses. Seeds from these crosses made on Formosa were returned for planting in the experimental plots at Davis.

A substantial increase in vigor was obtained in sweet potato seedlings from crosses of 779 with five native varieties in Formosa. This vigor was not apparent when 779 was crossed with domestic United States varieties. Not only were greater yields obtained, but the progeny of these crosses proved quite resistant to sunburn, bruising and decay organisms. In a high percentage of the seedlings from Formosa, weight loss in storage was greatly reduced.

Apparently the increase in hybrid vigor is due to the wide divergence between the gene composition of the Formosan varieties and that of the domestic types. Unfortunately, most of the seedlings obtained from these crosses have white-fleshed roots. A few seedlings did appear that had orange-fleshed roots and are now being evaluated.—*G. C. Hanna, Dept. of Vegetable Crops, Davis.*

#### Non-flowering strains of

### HERBAGE GRASSES

Strains of herbage grasses which would remain permanently vegetative within their region of agronomic adaptation are being investigated at Davis. The objective of this research is to utilize the highly sensitive responses of certain grasses to length of daily light period to control the flowering response. In theory at least, permanently vegetative grasses should possess quality advantages over flowering strains because of difference between the two types in amount of protein and crude fiber. Leafy tissue is known to be more palatable to livestock, higher in protein and lower in fiber content than the flowering stems. Temperate-climate grasses such as ryegrass, which may not flower in a southern latitude, may flower when grown farther north where spring daylengths are greater. Thus the region of seed production and forage production would be separated sufficiently to permit flowering in one instance and prevent it in the other. The research is still in its early stages, and it is not possible to predict whether or not successful commercial strains of non-flowering grass can be produced.—*Maurice L. Peterson, Dept. of Agronomy, Davis.*