BRIEFS

Short reports on current agricultural research

Soil moisture and Phytophthora

ROOT-ROT OF TOMATOES

Field studies of a root-rot of tomatoes caused by the soil-borne fungus Phytophthora show that the disease is most severe under water-logged soil conditions. Water-logging may occur because of tight subsoils or a high water table, since both these conditions slow down the drainage of excess water out of the upper root zone.

Cooperative field investigations indicate that careful control of irrigation water will minimize water-logging of the soil and markedly reduce loss of plants by the disease on a soil which can be water-logged rather easily. At the same time, the carefully irrigated treatment supplied adequate moisture for good yields of fruit.

Phytophthora root-rot does not always occur on water-logged soils, even where the disease has been present in previous seasons. Marked reduction of disease where tomatoes follow barley as compared to tomatoes following tomatoes has been observed. Because the surface soil frequently becomes very dry under barley, and the fungus is severely affected by extremely dry soils, the influence of soil moisture on survival of the fungus is being investigated in the greenhouse.

Data on duration of water-logging in field soils are being collected as a means of predicting where special water management practices are necessary in preventing severe Phytophthora infection. *—D. W. Henderson, Dept. of Irrigation, Davis.*

Control of fruiting by

PLANT REGULATORS

Long-term studies are being made concerning the role of growth regulators—hormones—in fruit setting, fruit growth and maturation. Recent results of gibberellin application to almonds, apricots and peaches have led to the challenging of the widely accepted hypothesis that auxins are the only limiting factors in the setting and growth of fruits. Although auxins have been shown to be effective in setting multi-seeded fruits such as the fig, grape and pear, they have been ineffective in this respect on single-seeded fruits like the almond, apricot, cherry and peach.

One application of gibberellin to emasculated peach blossoms at the time of full bloom brought about a 22% increase in fruit set over that obtained by pollination. The fruits produced with gibberellin contained normal pits but no seeds. Average size of these fruits was not greatly different from pollinated fruits even though they matured about 10 days earlier. Similar results were obtained with the almond and apricot.

This evidence suggests modification of the original hypothesis to include gibberellin or gibberellin-like substances as also being essential for stimulating fruit growth.—*Julian C. Crane, Dept. of Pomology, Davis.*

Strong winds, dry air and

WATER USE BY CROPS

Results obtained during the first year's operation of a 20′ diameter lysimeter show that strong north winds at Davis have an even more drastic effect on water use by crops than was previously suspected. These winds in the Sacramento Valley are always very dry, with relative humidity averaging 10%–30% day and night. Under such conditions, water use by grass at Davis on October 12, 1959 was 0.28″, almost three times the normal use for clear and calmer days in October and almost equal to the average daily use for July. On February 23, 1960, water use for the same crop was 0.17″, or about double the normal.—*W. O. Pruitt, Dept. of Irrigation, Davis.*

Double cross hybrid varieties in

LADINO CLOVER

The development of an experimental double cross hybrid variety of ladino clover which would be comparable to double cross hybrid corn is underway. Heretofore a barrier to development of hybrids in such crops as clover has been the inability to control crossing between plants. If two randomly selected plants are crossed, there will be crossing between sister plants of their offspring which results in reduced vigor. This difficulty can be circumvented by use of the built-in incompatibility system of clover, a system of genes determining which plants will or will not cross. Using enforced self-pollination it is possible to secure plants homozygous for different incompatibility genes. When these plants are crossed, there is no crossing between sister plants of their offspring. By utilizing these plants it is possible to produce a true double cross hybrid.

To produce double cross hybrid seed, four plants homozygous for different incompatibility genes are selected. Cuttings from two of the selected plants are planted alternately in one isolation field, and cuttings from the other two plants established alternately in another isolation field. The seed harvested from the two isolation fields are mixed and planted in a third isolation field for the production of commercial double cross seed comparable to double cross hybrid corn seed. Whether or not such seed has the same advantage as commercial hybrid corn has not yet been established.—*W. E. Nyquist and E. H. Stanford, Dept. of Agronomy, Davis.*

Chemotherapy of

BEE DISEASES

During the past three years, approximately 200 colonies of bees have been treated successfully for the eradication of American foulbrood in a research apiary established in Imperial County. The infected colonies were treated with either terramycin or sodium sulfathiazole, or both, after all poor combs were eliminated and the colonies strengthened by the addition of brood, more bees and young queens. Each colony was reduced to a one-story hive and treated with medicated honey or sugar syrup, or with powdered sugar and antibiotics, to stimulate brood rearing and to enable the bees to eliminate all evidence of the disease. Combs were rotated in the brood chambers to cause brood to be reared in all combs.

The colonies were fed only sufficient medicated syrup to stimulate brood rearing or to carry the bees over the winter period, or during the spring buildup. The colonies used up the feed before they began storing surplus honey and were not treated during the honeyflow if they

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.*