

Use of

Cyclotron at Davis

for tracer studies in agriculture

Construction, at Davis, of a 22" cyclotron capable of producing 12-Mev protons and 6-Mev deuterons will permit the beam from the instrument to be sent into the beta-ray spectrometer for the study of short-lived radioisotopes. The cyclotron also will produce some short-lived or neutron-deficient isotopes for tracer studies in some agricultural fields.—*C. G. Patten, Dept. of Physics, Davis.*

Control of

Red Spider Mites

resistant to standard miticides

During 1959 the Pacific mite on grapes showed increasing resistance to standard miticides. Research in progress is designed to determine whether the Pacific mite can be controlled by so-called silica aerogels. The silica aerogels are marketed as very small particles of silicon dioxide, chemically the same as common sand. The particles are very absorptive and absorb the fatty—lipoid—covering of insects, so affected insects lose water by evaporation and die of desiccation. Because of the way in which the aerogels kill insects, previously acquired resistance to DDT, parathion, and other insecticides will offer no protection from the effects of aerogels. Similarly, it appears that insects will not be able to develop resistance to aerogels because the action of the aerogels is mechanical. Whether the silica aerogels will act on the Pacific mite, and if so, what is the proper method of treating a vineyard, are under investigation.—*Leslie M. Smith, Dept. of Entomology and Parasitology, Davis.*

Root-knot nematode resistant

Alfalfa Varieties

The development of alfalfa varieties resistant to three distinct species of root-knot nematode is the objective of research currently underway at Davis. In many cases poor stands and poor growth, especially on sandy soils, can be traced to nematode infestation. Any one of three distinct species: the northern root-knot nematode, the Javanese root-knot nema-

tode or the cotton root-knot nematode may cause the damage.

The first step in the research program was to find sources of resistance to all three species of nematodes. A survey of 280 different lots of alfalfa from many parts of the world revealed that only in the variety Vernal was there resistance to all three nematode species. The second step was to determine if this resistance would be effective against nematodes in all parts of California. Plants were tested against 24 collections of nematodes from various parts of the state. One plant was found that was resistant to all collections. The third step of the program was to determine how resistance was transmitted to the offspring of the resistant plant. The inheritance of resistance was found to be quite simple. The fourth and final step of the program is to transfer this resistance to adapted California varieties. The variety Vernal is not suited to hay production in California, so the resistant plant is being crossed and backcrossed to California varieties to transfer the nematode resistance.—*E. H. Stanford, Dept. of Agronomy, Davis.*

Skin pigments of

Red Grape Varieties

The visual appeal of many table and of many wine grape varieties depends on the attractive red color of the anthocyan pigments present. Among the factors influencing the shade and intensity of the red color are the number and composition of the pigments in the grape and in the wine. The pigment patterns for approximately 170 vinifera grape varieties were determined. The number of pigment bands varies from two or three for several of the lightly pigmented table grape varieties to a normal maximum of eight bands for a large number of the vinifera varieties. The Pinot noir types have a standard four band pigment pattern. Major qualitative and quantitative differences in the observed pigment compositions within the general eight band pattern were observed for the many varieties investigated.

Hydrolysis of the pigments present in five of the bands resulted in the identification of the anthocyanidin portion of the pigments. Glucose is the only sugar cleaved from the anthocyanidins by the hydrolysis. The complete identification of the pigments present in all eight bands is under investigation. A thorough understanding of the chemical nature of the

anthocyan pigments in vinifera varieties will greatly facilitate investigations into the biosynthetic pathways by which pigments are formed in vinifera grapes. Complete knowledge of the nature of the pigments and the factors that control the development of the skin pigments in grapes are of extreme importance to geneticists in the development of new grape varieties with more desirable color characteristics. — *Richard E. Kepner, Dept. of Chemistry, and A. Dinsmoor Webb, Dept. of Viticulture and Enology, Davis.*

Decline and collapse of

Lemon Trees

Intensive investigations of declining and collapsing lemon trees indicate that the disorder called lemon sieve-tube necrosis is a structural disorder. When certain lemon clones reach an age of three or four years, a deterioration of the sieve tubes begins. Only slight amounts of this deterioration are present at first. Eventually the deterioration becomes extensive and the tree declines as a result of girdling caused by the disease.

About the same time that work on lemon sieve-tube necrosis was in progress nucellar Eureka lemon trees were widely planted. In 1952, a reported evaluation for lemon sieve-tube necrosis of the lemon clones most commonly planted revealed that all of the clones of nucellar Eureka examined had early stages of the disorder.

In 1959 reports from growers that nucellar Eureka trees were declining severely led to a survey of lemon clone

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W. G. Wilde..... Editor

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plots and of commercial orchards in Ventura and in Santa Barbara counties. One hundred and seventy bark samples were taken for microscopic examinations and analysis of the findings.—*Henry Schneider, Dept. of Plant Pathology, Riverside.*

Studies of nutrition of

The Corn Earworm

for development of resistant plants

The corn earworm, which attacks tomatoes, cotton, tobacco, corn, sorghum, and other crops, was rated the number one insect pest in the United States during 1958. Because of the difficulties encountered in efficient insecticidal control, a search is underway for plants that inherently resist the earworm. At the present, this search is being conducted among sweet corn varieties, both commercial and experimental ones, as well as several inbreds.

Remarkably little is known concerning the nutrition of the corn earworm. Its amino acid, fat, vitamin and carbohydrate requirements are not known. Insect nutrition studies frequently augment plant resistance studies; thus, a knowledge of the corn earworm's necessary diet may yield some valuable leads in the search for resistant plants. The feasibility of this approach has been amply demonstrated in the case of the European corn borer and the pink boll worm, which attacks cotton.

An initial phase of the study will be an attempt to develop an artificial diet on which the earworm can be reared readily because, at the present, mass rearing of the corn earworms is difficult, as fresh plant material must be used.—*Frank E. Strong, Dept. of Entomology and Parasitology, Davis.*

Aphid pests of field and orchard crops

Biological Control

A reduction of about \$11 million a year in spotted alfalfa aphid damage to California's alfalfa crop has been achieved. Importation and colonization of three species of wasp parasites, conservation of native natural enemies of the aphid, and use of effective insecticides reduced the \$13 million problem of 1955 to about \$2 million in 1958.

Recent colonization of an imported European parasite of the walnut aphid may aid in the biological control of the walnut aphid because the only parasite occurring naturally in California has never appeared common enough to be of much value.

At least one species among several parasites of the pea aphid, imported from Europe and India, has been established in California and evaluation studies are continuing.

Recent studies of parasitism of the green citrus aphid have shown that no native parasite is capable of complete development in this host.—*E. I. Schlinger, Dept. of Biological Control, Riverside.*

Studies on

Rooting of Grape

cuttings

Whether, when grown under irrigation, the top bud of cuttings of grape rootstocks and fruiting varieties planted in the nursery row should be exposed to the air or covered with a mound of loose soil has been under investigation at Davis. In the San Joaquin Valley such cuttings are commonly left uncovered; in the central part of the valley and in the coast counties they are commonly covered by 2"-3" of loose soil. Three years of experiments indicate that fruiting varieties root better when the top bud is left exposed, but the common rootstocks varied with the year: covered buds rooted best in 1957, and exposed buds in 1956 and in 1958.

Two years of research at Davis indicated that rootstock cuttings with only a top bud rooted as well as or slightly better than rootstock cuttings with a top and bottom bud.

One year's experiments show that the rootstock St. George and the table varieties Thompson Seedless and Tokay are severely injured when cuttings are allowed to dry out eight hours on the open ground. Injury through drying is greatest during the daylight hours. French Colombard and Petite Sirah are not injured in this way until after 24 hours, and can still be rooted after 72 hours. Tests are now underway to determine the minimum time of desiccation which will injure grape cuttings.—*C. J. Alley, Dept. of Viticulture, Davis.*

Bacterial disease of the

Cabbage Looper

may aid natural control of pest

The cabbage looper—*Trichoplusia ni* (Hbn.)—is a serious pest of many vegetable crops in California. High populations of this insect occur on celery in late summer and fall, and heavy insecticide applications are necessary to control it. Most of the effective chemicals for the control of loopers are long lasting,

which often results in serious residue problems at the time of harvest.

The use of *Bacillus thuringiensis* Berliner for control of the cabbage looper on celery is currently being investigated. Trials with this bacterial disease during 1958 yielded promising results when it was applied as a dust.

To determine whether economic control is possible and practical, future work is planned to establish dosage levels, best methods, and proper timing of applications.

Since aphids also can be serious pests of celery, and since the bacillus is not effective against aphids, it may be necessary to investigate bacillus-aphicide combination treatments to adequately protect the crop. However, natural enemies of the celery pests may build up in the bacillus-treated fields so that chemical insecticides may not be needed.—*Albert A. Grigarick and Y. Tanada, Dept. of Entomology and Parasitology, Davis.*

Rootstocks

for peaches, plums, prunes, apricots and almonds

The development of fruit and nut tree rootstocks that will resist certain diseases and pests and will tolerate adverse soil conditions is the main concern of trials at Davis.

There is a need for a rootstock that may be used to adapt the peach to wet areas in orchards. Preliminary trials indicate that certain plum stocks may be suitable for this purpose, so a considerable number of trees are now being tested in commercial orchards. If these trees prove satisfactory in large plantings, they can also be used in home orchards in areas where the soil is too wet and heavy for peach roots.

Several kinds of peach rootstocks that may be used as stocks for peaches and almonds have been found to be resistant to one species of root-knot nematode. The object of the present tests is to determine which one of the various rootstocks under trial has the most resistance to the other root-knot nematode species found in California orchards. The ultimate goal is to find a peach rootstock that is completely resistant to both species of root-knot nematodes. Most apricots, plums, and prunes may be grown on the resistant apricot and Marianna 2624 rootstocks.

Marianna 2624 plum rootstock has shown considerable resistance to oak root fungus, but a number of trees have been killed. Other possible rootstocks are now being tested in oak root fungus infected soil to see if they are better than Marianna 2624.—*Carl J. Hansen, Dept. of Pomology, Davis.*