BRIEFS

Short reports on current agricultural research

Perplexing problem of

PEACH TREE REPLANTS

Three facts are perplexing in the peach replant problem: *1*, as a rule, affected replants are symptomless except for their reduced growth rate; *2*, although the effect is highly specific, it does not always occur in a replanting, and when it does, it varies in severity; *3*, the mechanism has not been demonstrated, nor has the effect been modified experimentally.

For over 20 years the peach replant problem has been studied in Sutter County, where it is serious. One finding is that where peaches are replanted in old Armillaria spots that have been treated with carbon bisulfide, they often grow better than surrounding replants.

It was formerly thought that the carbon bisulfide treatment was the beneficial agent for the replant. However, work in the past 10 years indicates it is the Armillaria which modifies the influence of the old planting on the new.

If a similar action can be shown for other, nonpathogenic organisms, the specificity coupled with irregular occurrence and variability may be explained. —*A. E. Gilmore, Dept. of Pomology, Davis.*

The manufacturing of

FATS IN PLANTS

A comprehensive program is being carried out to explore the basic biochemical processes which synthesize or degrade fats in plants. It has been discovered that TPN—a nicotinamide-vitamin derivative—and biotin are intimately connected with the process of fat synthesis in plants. Once the biochemical steps have been developed, research can turn to the explanation of the physiological factors that control the biosynthesis of fats. Problems under exploration in the research program include the questions whether hormones regulate synthesis, why certain plants—such as avocados, peanut seeds, and cotton—have high fat contents while others—such as peas, beans, and lupines—have low fat contents. Also under investigation are the questions what initiates or triggers fat synthesis and breakdown, and how the plant balances these opposing sequences. —*Paul K. Stumpf, Dept. of Biochemistry, Davis.*

Disease resistance in

PEPPERS

Because little is known about the types and distribution of peppers in western South America, a collection has been made of 425 peppers from the north coast of Colombia, along its main highway and through Ecuador, and from Peru and Bolivia.

Considerable information has been gained on kinds of peppers grown, and where each is found. Since the peppers were collected from many different locations, they should prove adaptable to a wide range of climates. Some may have commercial value in their present form.

These peppers are of interest to the plant breeder, particularly as potential sources of disease resistance. They are now being tested for resistance to cucumber mosaic virus. Certain species from northern Colombia that can be hybridized with the common pepper appear to be less susceptible to this disease than do the peppers from Mexico.—*P. G. Smith, Dept. of Vegetable Crops, Davis.*

Effects of sodium in water on

INFILTRATION RATES

Irrigation water containing a high sodium percentage may cause a soil to disperse and markedly reduce infiltration rates so that the subsoil will not be wetted following a normal irrigation.

However, the changing from a high-sodium to a low-sodium water may also reduce infiltration rates. In these cases, the low infiltration from the new water is usually attributed to the sodium in the soil from the previous water. Recent observations and experiments have shown that under some conditions low-salt and low-sodium water from the Sierra Mountains resulted in a marked reduction in infiltration rates when applied to soil previously irrigated with good-quality water of low-sodium percentage. Cotton plots at the U.S.D.A. Cotton Station at Shafter were irrigated with good-quality well water and with water from the Friant-Kern Canal. In July and August, the plots receiving canal water were irrigated seven times, while those receiving well water were irrigated four times. The infiltration rate for the canal water was approximately one-third that of the well water, and the yields were significantly reduced because of drought, even though the water was held in the furrows for 24 hours for each irrigation. Investigation of this problem was started a year ago at the Cotton Station and recently expanded to the West Side Field Station and in the laboratory at Davis.

Application of gypsum to the soil or irrigation water at the Cotton Station increased the total salt concentration of the Friant-Kern Canal water and improved infiltration. The laboratory work indicates that this relationship becomes critical with soils of high volume weight or density. The present studies on this problem are designed to predict when infiltration rates will be impaired and the procedure necessary for their improvement or prevention.—*L. D. Doneen, Dept. of Irrigation, Davis.*

Proper depths for

DRAINAGE TILE

Present drainage theories were developed for homogeneous isotropic soils which are seldom, if ever, encountered in the field. The most general soil is one in which the hydraulic conductivity decreases with depth either due to layering or to natural development.

The drainage of such soils is being investigated by means of the electrical analog. Several typical soil profiles have been analyzed. Flow patterns have been determined and the rate of water table drawdown calculated. The proper depth of tile drains in such soils is clearly shown by the analysis.—*James N. Luthin, Dept. of Irrigation, Davis.*

Water interaction with

PLANT CARBOHYDRATES

Plant carbohydrates—pectic substances—play an important role in ripening of fruits and vegetables and in processing of certain food products—for example, the manufacture of jelly. Their properties and uses depend largely on the way they interact with water.

The interaction of water vapor with various plant carbohydrates has been studied by means of surface chemistry. The thermodynamic properties of the sorption of water vapor by various

chemically treated pectic substances have been determined. Three forms of pectic substance, designated acid, salt, and ester, were used in the study. Although it is well known that pectin swells when water is absorbed, these studies indicate that, in the swelling process, new groups for the sorption of water are made available for the acid and salt forms, but not for the ester form.

Although these studies are primarily of theoretical interest at present, they may finally yield information valuable both for the utilization of plant waste material and for the processing of food products.—*D. H. Volman, Dept. of Chemistry, Davis.*

Microscopic

MITES ON BEES

A search for internal and external mites on bees, extending to various parts of the United States and Canada, revealed that external mites have been infesting bees for many years without causing any observable symptoms of the Isle of Wight or acarine disease. They are microscopic in size, never invade the breathing system of the bee, and have no connection with the disease. No internal mites—considered to be the cause of the disease—were discovered during the search. Two species of external mites, their biology, distribution, relationship to the life of the bees and to the economy of the hive are being studied.—*J. E. Eckert, Dept. of Entomology, Davis.*

Sunlight intensity tests on

ORNAMENTALS

To determine the sun and shade requirements of ornamental plants, an experimental shade shelter was constructed with large panels of woven Saran cloth on the top of a large frame. The sides were not covered so sunlight could enter from the sides. Depending on the season of the year and the time of day, 55 different sunlight intensity situations can be tested under this shelter.

Plant material is planted in north-south rows at five different locations across the shelter in an east-west direction. During the first growing season, turfgrass, ground-cover, and certain herbaceous species have been evaluated as to plant size, density of growth, abundance of flowering, and insect and disease tolerance under the various sunlight conditions.—*R. W. Harris, Dept. of Landscape Horticulture, Davis.*

MODIFIED ATMOSPHERES

for vegetables after harvest

Modified atmospheres—the changing of the carbon dioxide and oxygen concentrations in the air—alter the rate of respiration, ripening, and deterioration of fruits and vegetables after harvest and may prolong their storage life. The effect of modified atmospheres is specifically under study on the postharvest behavior of tomatoes, lettuce, and Brussels sprouts. The air conditions of a sealed storage room or a container are simulated, and practical possibilities will be assessed. These could include the use of plastic film liners, dry ice, or direct addition of a gas or gas mixture into containers or load space.

The value of modified atmospheres is under investigation for vine-ripened tomatoes, which reach nearby markets in good condition but may be too ripe and soft on arrival at distant markets. Modification of the atmosphere may be commercially useful for retarding the rate of ripening under certain conditions, but the tomatoes are injured by marked changes in carbon dioxide and oxygen concentrations, especially when prolonged beyond a few days. Although use of modified atmospheres is not likely to replace temperature control, it may have supplementary value for various vegetables.—*L. Rappaport and L. L. Morris, Dept. of Vegetable Crops, Davis.*

Size relations of

CANNING PEACHES

The relationship of canning-peach sizes at various times prior to harvest and those at harvest is under study. In recent years the correlation between fruit size at one specific early-season date—reference date—and at harvest has been the basis of evaluating the thinning problem. Size at reference date has also been used to estimate size at harvest. It is known, however, that reference date size can only be the first approximation of harvest size. Factors affecting fruit growth, particularly those related to environment or cultural practices, may occur in amounts different from those earlier in the season.

From the data of the current studies it is expected that estimates of harvest sizes can be made at various times between reference date and harvest. Such estimates would supply information about growth behavior of the fruit at intervals after the reference date; and furnish a series of estimates of harvest sizes which will verify or modify the reference date projections and thereby provide increased confidence in the estimates of final size.—*Luther D. Davis, Dept. of Pomology, Davis.*

Study on control of

FRUIT RIPENING

The nature of physiological and biochemical changes in the fruit during its development and ripening is being studied in melons, tomatoes, and peppers. Particular attention is being devoted to the stage when the fruit has reached maturity but before final ripening starts. The experiments aim at determining the influence that finally triggers the ripening process—it may be the production of ethylene within the fruit, or a critical change in the concentration of some metabolic regulator. Ethylene, a gas produced by fruits during the final ripening process, is known to affect fruit ripening, but it has not been known when ethylene production starts. Use of sensitive detectors available in gas chromatography may make it possible to determine ethylene concentrations within plant tissues. Determination of the exact beginning of ethylene production in the fruit may help answer questions as to the role of this gas in ripening—whether it controls ripening directly, or whether it is in turn controlled by some other process. The principles of fruit ripening—which may lead to ripening control by man—are similar for most kinds of fruits investigated.—*Harlan K. Pratt, Dept. of Vegetable Crops, Davis.*

Reduction of impurities in

DISTILLATION OF BRANDY

A simple, inexpensive, and efficient process was developed to eliminate the impurities and utilize the alcohol contents of the heads that accumulate at the top of the distilling column during the distillation of wine into brandy. The process uses fermenting yeast to reduce the undesirable substances—mainly acetaldehyde—and has been widely accepted by the California wine industry. Heads are recycled to a tank of new distilling material at a time when it has attained vigorous fermentation.

During distillation these impurities—responsible for hot or burning tastes in alcoholic beverages—accumulate in the heads at the top of the still. Most brandy