BRIEFS

short reports on current agricultural research

Green Bunching Onions

The Beltsville Bunching onion is a superior variety of onion for the fresh or greenbunch onion market but produces such a low yield of seed that demand for seed in commercial quantities exceeds the supply. Cooperative work with the U.S.D.A. is in progress, to isolate a variety which will produce an acceptable yield of seed. Because amounts of seed vary greatly between different plants, approximately 12,000 plants in 100 different Beltsville Bunching and similar lines are included in the study. Beltsville Bunching can be propagated easily, so plants producing the highest seed yield will be selected and isolated for further testing. Progeny from the seed of those high-yielding plants will be tested for their ability to produce an acceptable yield of seed—*G. N. Davis, Dept. of Vegetable Crops, Davis.*

Amino Acid

The bacillus of gangrene catalyzes formation of the amino acid β-methyl aspartic acid from mesaconic acid. The reaction requires addition of ammonia across a double bond. Comparable reactions observed in the laboratory are a Michael reaction, which forms amino compounds from olefins and ammonia, and the reverse of the Michael reaction, called the Hoffman degradation. The addition of ammonia across the double bond may take place by one of the known mechanisms or by a completely novel mechanism.

The enzyme catalyst β-methyl aspartase, responsible for the formation of β-methyl aspartic acid, has been isolated in crystalline form from the bacillus of gangrene. To study the mechanism of the reaction, one of the first steps is to determine whether the components of the ammonia molecule, NH_2 and H, are added on the same side or on opposite sides of the double bond.

It is now possible to determine the relative positions of the groups in a molecule by nuclear magnetic resonance spectrometry. In mesaconic acid, the carboxyl groups are on opposite sides of the double bond. After reaction with ammonia, catalyzed by β-methyl aspartase, N-acetyl anhydride is formed from β-methyl aspartic acid. In the anhydride, the carboxyl groups are tied together so that there is no rotation about the single bond.—*Harold J. Bright and Lloyd L. Ingraham, Dept. of Biochemistry and Biophysics, Davis.*

Cantaloupes

Fertilizer studies indicate cantaloupes mature earlier and yield more when treated with phosphate fertilizer by band application. Some treatments indicated that the location of the fertilizer band was critical. Broadcast applications were ineffective.

Studies are under way to determine the most economical rate of phosphate application, especially in relation to market activity conditions during the year. Phosphate may be uneconomical to apply if weather is extremely favorable for cantaloupe growth or if the accelerated maturity causes ripening when markets are well stocked.

The current studies include phosphate placement or the location of the fertilizer band in relation to the cantaloupe seed as well as determination of the percentage of the total phosphorus in the plants that was derived from the various fertilization treatments.—*John C. Lingle, Dept. of Vegetable Crops, Davis.*

Chemical Reactions

The role of free radicals—uncharged molecular fragments—in chemical reactions has been clarified by the study of relatively simple systems which react by radical mechanisms.

A current investigation of the high temperature photochemical decomposition of acetone illustrates the use of recent research. When irradiated with ultraviolet light, acetone splits into two fragments, an acetyl radical—CH_3CO—and a methyl radical—CH_3. If the temperature is high enough, the acetyl radical becomes unstable and decomposes into carbon monoxide and a second methyl radical. The reaction of the very active methyl radicals, both among themselves and with the undecomposed acetone, furnishes a system wherein several of the individual elementary radical reactions can be studied.

The products of the interactions—methyl ethyl ketone, ketene, ethane, methane, and acetylacetone—have been studied in relation to temperature, light intensity, and the pressure of acetone in the gaseous system. Out of these data can be obtained the individual reaction rate constants, activation energies, and steric factors for at least five elementary radical processes.—*R. K. Brinton, Dept. of Chemistry, Davis.*

Ion Absorption

Cells of plant roots absorb nutrient and other ions in a selective manner. For example, they absorb greater quantities of potassium than of sodium ions, in spite of the fact that sodium is much more abundant in western soils than potassium. This selectivity is important since potassium, in contrast to sodium, is required by plants in large amounts.

The ability of plant cells to accumulate potassium selectively depends on the existence of separate potassium and sodium absorption mechanisms. The presence of calcium in the root environment is essential for maintenance of the integrity of the separate absorption mechanisms. Without calcium the potassium absorbing system becomes progressively deranged. Studies are under way to determine in what way calcium maintains selectivity.—*E. Epstein, Dept. of Soils and Plant Nutrition, Davis.*

Barley Breeding Program

Composite hybrid barley populations —under study in a plant breeding program at Davis for 25 years—have been managed to give high and continuously improved production.

The ranges and shifts of inherited characters—resulting from the evolutionary breeding methods used—show that the best barley varieties of the future will have more genetic diversity, to buffer against diseases and insects. Plants will be shorter, will tiller less, have larger heads and grains and stiffer straw. The heads will be less easily shattered. Time of maturity will not change much. However, development of satisfactory 2-row, black, naked seeded or hooded varieties will be difficult.

The indicated limit on yield increases is about 40% with present crossing, introgressing, and stabilizing methods used in the plant breeding program.—*Coit A. Suneson, Dept. of Agronomy, Davis.*