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Research in progress

Drip irrigation

Drip irrigation can be more efficient than other irrigation methods and thus result in water savings. But, as with other methods, efficiency requires an accurate determination of when and how much to irrigate.

University of California soil scientists at Riverside have found that a sizable correction factor must be included when using calculations based on weather measurements to determine water requirements of a developing avocado orchard. These calculations relate water use to potential evapotranspiration.

In an experiment with young avocados, the scientists compared water requirements determined by careful monitoring of soil moisture with those determined by calculations from weather measurements. Without the correction factor, the calculations might have resulted in application of too much water, erasing the potential savings offered by drip irrigation. The correction is related to the tree canopy and its constantly changing size. It was found that the vertical rather than the horizontal projection of tree canopy provided a better correction factor for young trees.

Mechanisms regulating enzymes

An analytic procedure developed by University of California biochemistry researchers allows scientists to gain additional insight into the mechanisms by which nutritional and hormonal factors regulate the synthesis of lipogenic enzymes in rat liver. It has been shown that

animals on a high carbohydrate diet have increased levels of several enzymes that convert excess carbohydrate to fat. This increase in the level of fat-synthesizing enzymes presumably permits a more rapid conversion of the excess carbohydrate to fat, which is stored as a source of energy. The increased capacity for fat synthesis may be one of the reasons that certain carbohydrates, such as sucrose, may contribute to arteriosclerosis (fatty deposits in blood vessels).

Salt-tolerant crops

Increased need for food production requires the use of both marginal land, such as salt-affected soils, and more saline irrigation water. Both situations put a premium on development of crops that can tolerate high salt.

Standard screening procedures for selecting such plants entail prolonged, expensive operations in the growth chamber, greenhouse, and field. To alleviate these research problems, plant scientists are making use of somatic cell culture techniques, a radical new approach with which they can evaluate huge numbers of cells—each a potential complete reproduction unit—at minuscule cost and in a fraction of the time required to evaluate full plants. The goal is to select genetically desirable cells from a large population.

Using this technique, D. W. Rains, Department of Agronomy and Range Science, established callus and cell suspension cultures of soybeans, alfalfa, and Atriplex (salt bush, a true salt-loving plant from the outback of Australia), and have isolated a line of soybean cells which

grows at levels of salt lethal to other soybean cells from the same population. This line has been subcultured and re-exposed to varying salt concentrations, and, although there has been some regression to original intolerant characteristics, researchers continue to come up with a salt-tolerant line. The objective now is to stabilize these strains and to generate them into a salt-tolerant line of complete soybean plants. This desirable genetic characteristic could conceivably be transferred to other, less salt-tolerant crops, including alfalfa, a crop frequently grown in areas of increasingly high salinity in California.

Trace elements in oral contraceptives

Preliminary results of studies by nutritional scientists at the University of California show that the hormones in oral contraceptive agents significantly alter the levels of trace minerals in the blood. In general, the effect is to increase amounts of copper and iron and decrease amounts of zinc in the blood serum. Similarly, hormonal levels are markedly elevated in pregnancy, thereby leading to significant changes in serum levels of various transport proteins and trace minerals themselves. The requirements for rapid mobilization and transport of such materials in the developing fetus clearly demonstrate that important physiological mechanisms are involved. Further studies are being undertaken to refine analytical techniques and explain the complex metabolic mechanisms included in the taking of oral contraceptive agents.