natural sciences

AGRICULTURE

Asphalt helps sandy soil

Vegetable crop yields are increased dramatically, and some are even doubled, in sandy soils when asphalt is laid underground to create an artificial barrier to retain moisture.

Researchers at the University of Florida agricultural station near Live Oak installed the barrier two feet below the soil surface in a successful effort to increase water storage capacity in sandy soils and prevent vital plant foods from seeping down into the ground away from plant roots.

Dr. L. C. Hammond, soils physicist with the university's Institute of Food and Agricultural Science, says that the underground paving involves the combination of some principles of farm plowing and highway building. A powerful tractor is used to draw a hollow, wedge-shaped plow and a tank from which hot asphalt is pumped into the plow. When the plow is lowered into position two feet below the ground, hot asphalt is sprayed on the soil from holes on the bottom of the plow.

"The plow cuts through the soil like a knife," says Dr. Hammond, "without disturbing or removing the soil above it."

BOTANY

Fluid transport cells

The role of a plant hormone in the transformation of a simple plant cell to a highly specialized structure that conducts fluids has been determined by a team of Princeton University biologists.

Dr. William P. Jacobs and his colleagues have linked indoleacetic acid (IAA) with the wall-building process of an undifferentiated plant cell whereby it develops the strength and tube shape required to serve in the xylem system of fluid transport. Xylem elements differ from other plant cells by their thick inner walls of lignin and cellulose which give wood its characteristic toughness.

The experimenters tagged IAA with radioactive hydrogen and by means of photomicroscopy traced the hormone to the newly forming wall, where it appears to participate directly in the process. This finding is the first indication that IAA works directly to form the specialized system. Earlier, it was thought the hormone acted only as a catalyst.

AGRICULTURE

Quackgrass nuisance

Corn planted in fields infested with quackgrass doesn't grow very well, even when all the necessary nutrients are present in the soil. Adding nutrients doesn't help.

University of Wisconsin agronomists have found that the grass exerts its inhibiting effect by producing a toxic material in its roots and rhisomes. The poison becomes trapped in compacted soil, interfering with corn root absorption of nitrogen, phosphorus and potassium.

Even when quackgrass is destroyed by chemicals before a crop is planted, its inhibitory effects persist for several months. Tilling to expose the soil to air helps shorten the action of the toxic substances.

The agronomists, N. L. Hartwig and K. P. Buchholtz find that when just one corn shoot is isolated and immersed in a container of mineral nutrients it is able to supply enough sustenance for the entire plant, even though the plant itself is planted in soil with quackgrass.

SILVICULTURE

Test tube tree

Success has been achieved in creating a tree from a tissue culture.

Dr. Lawson Winton of the Genetics and Physiology Group at the Institute of Paper Chemistry directed the six-year research which culminated in producing a completely new tissue culture individual, genetically identical to the parent tree.

The tree is an aspen possessing a triploid set of chromosomes, a peculiarity originally identified by geneticists at the institute where they have been working toward mass production of the tree because of its desirable characteristics as a pulp and paper species. The new process could allow trees to be developed in the greenhouse, where they can be protected until large enough to fend for themselves.

The tissue culture process is a nonsexual, vegetative means of reproduction which has been used successfully to reproduce non-woody plants such as tobacco, carrots, endive and parsley as well as animal tissues.

From a parent plant, a small piece of the cambium is removed and incubated in a medium containing nutrients and growth regulators. Cells multiply, forming a mass of cells (callus), then subcultured in a second medium containing cytokinin which directs the differentiation of cells into the roots and shoots of the young tree.

The new tree at the institute has been transplanted into soil, where it has grown to a height of several inches.

GENETICS

Fly chromosomes and cancer

A South American fly with large chromosomes, *Rhynchosciara angelae,* is being used in cancer experiments by Dr. Crodowaldo Pavan at the University of Texas. The tests should show effects of viruses that are not visible in other organisms.

The cells of *Rhynchosciara* are susceptible to infection by several kinds of microorganisms which cause chromosomal enlargement and an overall increase in cell size. The behavior of these infected cells resembles that of mammalian tumor cells, the difference being that infected fly cells increase in size rather than number.

Dr. Pavan says the cells enlarge enormously, as do the chromosomes which may reach proportions visible to the unaided eye. Even in the normal state, these chromosomes are among the largest found in animals, which makes them particularly suitable for genetic studies.

Dr. Pavan regards the *Rhynchosciara* as a significant step up the evolutionary ladder from simpler plant and animal forms upon which most work in this area has been based. A single gene of the fly chromosome is larger than many of the microorganisms traditionally used in genetic research.