AGRICULTURE

Sick Plants Get Pills

➤ DRUGS for a wilted cabbage or a rusted wheat may hold the answer to diseases that cost the American farmer billions of dollars in lost crops.

The wilted cabbage and the rusted wheat did not get that way because of hot weather or by being left out in the rain. Fungi cause the wilt and rust diseases which, along with the root rots and blights, are among the most important diseases affecting crops.

Today, however, Dr. A. E. Dimond of Connecticut Agricultural Experiment Station, New Haven, said, with basic research underway in the field of chemotherapy (the use of chemical compounds to fight disease in plants) there is promise that plants, like animals, may be given a "pill" that can cure disease.

Antibiotics, fungicides, growth hormones such as 2,4-D, and anti-growth compounds such as maleic hydrazide are being studied as chemotherapeutic agents for sick plants, Dr. Dimond told the American Phytopathological Society meeting in Bloomington, Ind.

By discovering the biochemical pathways unique to fungi, scientists may be able to introduce substances into the plant that will cure diseases already infecting a plant, he pointed out. This would be an improvement over disease prevention methods that rely on sprays and other substances that must be used before the disease takes hold.

Some compounds, streptomycin is one, are useful against both plant and animal diseases caused by bacteria. Use of these drugs on food crops is, of course, Dr. Dimond said, strictly regulated to prevent humans receiving a harmful quantity of the antibiotic.

Chemotherapeutic substances fight plant diseases in three ways: they may kill or inactivate the disease organism inside the plant; they may neutralize toxins produced by the organism; and they may increase the plant's resistance to disease Scientists are trying to find compounds that can be tailor-made to harm the disease organism but not the plant.

"Tomorrow," Dr. Dimond said, "we may treat plants with a compound that lets them resist infection so effectively that the pathogen may no longer be able to maintain itself." Already, purine compounds are being successfully used in the laboratory to combat virus diseases in plants. These are still too expensive to be used in the field, however.

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CHEMISTRY

Irradiation for Rubber

➤ ATOMIC radiation may soon replace heat and chemicals in vulcanizing some rubber compounds.

Irradiation vulcanization will not ordinarily be as cheap as conventional vulcanization. In fact, the actual radiation vulcanization step in rubber processing will probably be more expensive for the next ten years, Dale J. Harmon, B. F. Goodrich Research Center, Brecksville, Ohio, told the chemists at the American Chemical Society meeting in Chicago.

However, irradiation will eliminate many compounding ingredients, and "appreciable saving may be introduced by the elimination of such items as curing pits, molds and curing ovens," he said.

Vulcanization, whether with heat and chemical accelerators or with atomic radiation, is the process of curing sticky raw rubber to form tough, bouncy, useful products.

Until someone discovers a method of reducing the radiation dose necessary for vulcanization, and thus reduce its cost, irradiation vulcanization's chief advantages will be:

1. Curing rubber goods that are difficult or impossible to cure by chemical means.
2. Curing thick goods uniformly all the way through.
3. Curing extruded goods, such as tubing, without heat.

"Engineers will be free to revise their production lines to capitalize on the high-speed, continuous-flow advantages of radiation cures," Mr. Harmon added.

Another advantage, although indirect, mentioned by the rubber chemist is irradiation vulcanization's aid in solving the problem of what to do with waste products of the increasing number of atomic reactors.

"If large scale industrial uses (such as vulcanization) for these materials can be developed," he said, "they will aid in relieving the waste disposal problem to some extent and will also assist in reducing the cost of operation of nuclear power plants."

Convert Oil Shale to Gas

➤ COLORADO OIL shale can be converted directly to heating and fuel gas by a highly efficient new process.

The process produces gas that is about as efficient and economical as natural gas, and more so than most manufactured gases, Eugene B. Schultz Jr., Institute of Gas Technology, Chicago, reported to the chemists.

An important advantage to the process, besides by-passing the liquid oil stage, is that it converts between 90% and 100% of the active matter in oil shale to fuel. Existing oil extraction processes utilize only about 80% of the active organic matter in the shale, Mr. Schultz pointed out.

He cautioned that the figures are only preliminary calculations based on laboratory experiments performed in cooperation with his co-author on the report, Dr. Henry R. Linden, the Institute's research director.

Hydrogasification, as the process is called, was described as a one-step process during which crushed oil shale is treated wtih hydrogen at high temperature and pressure.

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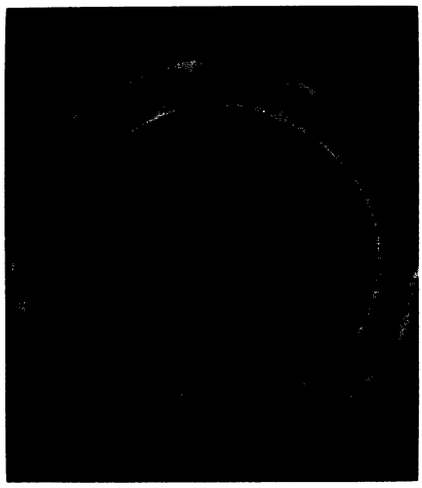

"HOT" TREE—Carbon-14 can be seen distributed in both the cellulose and bark, with sharpest activity near the cambium in the third-year growth ring.

FORESTRY

First Radioactive Injected Pine Trees Examined

➤ "HOT" TREES may help the tire and cellophane industries toward greater production efficiency and lowered costs.

Using ordinary hypodermic cartridges, scientists have injected radioactive carbon, C-14, into two-year-old pine trees for one of the first controlled experiments in the study of cellulose growth in living trees.

First results indicate that there is a strong possibility for higher future yields of cellulose per tree plus improved quality for the large cellulose consumers. Dr. R. L. Mitchell, manager of Rayonier's Eastern Research Division, Whippany, N. J., said. Rayonier scientists have completed the dissection of one of the "hot" trees and have studies underway using the tagged components from bark, lignin, cellulose and the hemicelluloses.

Cellulose in quality suitable for high tenacity rayon has been isolated from the radioactive portion of the tree for further laboratory investigation, particularly in connection with rayon process mechanisms.

The work is still in the preliminary stages and significant conclusions cannot be firmly drawn, he said. But, this first work in the feasibility of tagging cellulose as it grows in the tree has been positive, showing a substantial lay-down in growth processes with only minor diffusion.

Continuing studies should "throw new light upon several unknowns" in both cellulose chemistry and silvichemistry, and eventually results in new technical and product advances, Dr. Mitchell noted.

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