Botany

An immune system in plants

Some bacteria and viruses cause diseases in humans but not in animals. Others affect animals but not humans. This knowledge led researchers to discover the antibody-antigen recognition systems that help to protect animals against diseases. Plant pathologists are just beginning to understand plant defense systems, and a University of Missouri plant pathologist has described a new one that involves foreign-factor recognition.

Robert Goodman reported the system at a symposium on plant diseases of the International Association of Microbiological Societies in Osaka, Japan. He and his colleagues have discovered that protein factors exist in apple and tobacco plants which can "recognize" nonvirulent strains of certain bacteria as they invade the plant. The protein factors cause invading bacteria to agglutinate at the point of entry into the plant's vascular system. This clump is then digested by the plant's enzymes.

So far, Goodman has found the system working only against nonvirulent strains of bacteria—those that probably wouldn't cause disease anyway. The virulent strains may have polysaccharide envelopes surrounding them, Goodman says, and these interfere with the plant's recognition. He suspects that both virulent and nonvirulent strains give off chemical signals (the equivalent of antigens) and that the envelope prevents the signal from being received and triggering the clumping response against virulent strains. Thus, they can penetrate the plant successfully and cause disease.

Goodman hopes to learn more about the agglutinating proteins and the chemical signals given off by invaders so that eventually, plants can be "taught" to recognize and agglutinate all dangerous foreign invaders.

An artificial diet for mycoplasmas

More than 50 plant diseases, many involving yellowing and stunting, have been traced to mycoplasmas. These invading organisms are not bacteria or viruses, but specialized bodies possessing some cell components and lacking others. It has been somewhat difficult to study mycoplasmas because, until now, no one could get them to grow on sterile, artifically produced media.

Rutgers University plant pathologist Tseh An Chen reported to the International Congress of Mycoplasmology meeting in Bordeaux, France, the successful culturing of a mycoplasma on artificial media. The organisms always have been grown on living plant tissues before, but one could not be sure that the disease-causing agent was not something else in the tissue, Chen says. With the artificial medium, he says, external factors can be eliminated and pathologists can begin to learn much more about how mycoplasmas cause disease.

A draught from the poison pitcher

Botanists always have suspected that fly-eating plants use some secret chemical weapon to ensnare their dinners. Now, two Mississippi State University chemists have isolated two such chemicals from the pitcher plant. D. Howard Miles and Naresh V. Mody reported to the American Chemical Society's meeting in Norfolk, Va., that two amines are responsible for paralyzing flies. One of them, coniine, is also one of the major volatile alkaloids found in the poisonous hemlock plant. After more is known about how the pitcher plant uses these two chemicals, new pesticides or anesthetics perhaps could be formulated, Miles says.

Chemistry

Fluorine propellants: No substitute

Scientific concern has been expressed in recent weeks over the environmental effects of chlorinated fluorocarbons on the earth's protective ozone layer (SN: 9/21/74, p. 180; 10/5/74, p. 212).

So there is increasing scientific interest in finding alternatives to chlorinated fluorocarbons for use in aerosol propellants and refrigerants. Attention has been given nonchlorinated fluorocarbon propellants since chlorine is the portion of the molecule suspected of removing ozone in the stratosphere. But alas a new report concludes that fluorine propellants may have negative environmental effects, too.

Chemists Edgar Heckel and Chao K. Chu of East Carolina University at Greenville, N.C., reported their research on fluorine containing ethanes and ethene at the American Chemical Society's southeast regional meeting in Norfolk, Va. They exposed several fluorine propellants, some now used commercially, to energetic radiation (gamma rays). In the presence of this radiation, fluorine is released and combines with hydrogen to form dangerous hydrofluoric acid. This compound is so reactive that it can dissolve sand, etch glass and cause ulceration of lung tissue if inhaled even in small amounts.

Switching to the large-scale use of fluorine propellants would not be a good idea, Heckel says, because several energy sources exist in the normal environment that can cause the propellants to dissociate: lightning, torches, sparks, hot surfaces, combustion units such as gasoline engines and power plants, radioactive materials and X-rays.

Pesticides and the rural poor

The pesticide DDT has been banned for more than a year, but evidences of its persistence continue to surface. Three chemists reported at the ACS meeting in Norfolk high levels of DDT in milk samples obtained from black women in Mississippi. Bennie T. Woodward of Meharry Medical College at Nashville and Bruce B. Ferguson and David J. Wilson of Vanderbilt University at Nashville compared milk samples from black women living near Mound Bayou, Miss., a cotton-growing area, with samples from white women in suburban Nashville. In the black women's milk, they found a range of from 0.59 parts per million DDT to 1.9 parts per million with an average of .447 parts. The average for the white women was .075 parts per million.

The implication of the study is that many poor, rural people suffer extreme environmental exposure to pesticides, Woodward says. Pesticides applied with aerial sprays enter many of their houses through cracks and holes, he says.

The group plans to test urban blacks and rural whites to finish the comparison study, and wants to do a clinical study on the effects of DDT on breast-fed infants.

Sprinkle on the 'skinny powder'

Biochemist John J. Marshall from the University of Miami has found a protein in the uncooked kidney bean that can inhibit the body's full utilization of glucose. The substance, phaseolamin, inhibits the action of the enzyme alpha-amylase, which helps to convert starch to glucose. In tests on mice, phaseolamin sprinkled on food successfully reduces the number of calories absorbed from the food. Marshall foresees a day when a phaseolamin shaker will share the table with the salt and pepper. He warns in the meantime, though, that kidney beans themselves contain toxins and should not be eaten raw.