Botany

RNA's found to induce plant cancer

Crown-gall disease has been called "plant cancer," and is studied because of its similarity to animal cancer. When the bacterium *Agrobacterium tumerifaciens* is introduced into a plant through a wound, some bacterial factor combines with the wound fluid and causes the initiation of unlimited cell growth and insensitivity to growth-regulating hormones. Once a primary tumor is established, the bacterium no longer needs to be present for the "cancer" to continue and spread to other parts of the plant.

Researchers have tried to isolate the "bacterial factor," and now a French team has done so. Six scientists from the Institut Pasteur in Paris, report in the May PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, the isolation of the tumor-inducing factor.

The team found two RNA fractions from both the cancer-causing and noncancer-causing strains of *A. tumerifaciens*, which, when introduced through a wound, will induce tumor formation in the thornapple. One of the RNA's was associated with the bacteria's DNA, and the other was associated with a DNA coupling factor. The two might be the same, small, single-stranded RNA, they state.

Why were the same tumor-inducing RNA's found in both the cancer- and noncancer-causing strains? The team suggests that either the RNA is not in an active form in the latter strain; that it is released but somehow inactivated; or that the cancer-causing strains have a special way of introducing the RNA that is missing in the others.

Although the analogies between plant and animal cancers are far from exact, this work is a step toward understanding abnormal cell growth.

A green signal for bird breeding

Each autumn, the towering piñon pines of the western United States rain a rich harvest of seeds and cones, which provide food for the piñon jay and other western birds and mammals. New evidence on the ecological role of the piñon pine was presented by biologist J. David Ligon of the University of New Mexico in the July 5 NATURE.

Ligon's tests showed that the presence of green (immature) piñon pine cones can serve as a proximate factor in piñon jay reproduction. Proximate factors are those which initiate breeding, such as day length and rainfall. These provide the animal with clues about coming environmental conditions, and have been shown to influence testes growth, and therefore reproductive activity, in birds. Ultimate factors, on the other hand, determine breeding efficiency. The availability of food is one such factor.

One might not normally suspect, therefore, that piñon pine cones would initiate breeding, but rather, have only a secondary effect on it. But they do, Ligon found.

He tested two groups of adult male birds, feeding one a diet that excluded piñon pine seeds or cones, and the other seeds, then green cones when they normally appear, in August. Testes in three birds from the latter group were found to be enlarged—a sign of readiness for mating. Because of erratic food supply, the piñon jay is sometimes found in nature to breed in autumn.

The data suggest, Ligon says, that green piñon pine cones themselves can be proximate factors and provide predictive information for the birds. The clue they give is this: When green cones are abundant in late summer, then enough food (piñon seeds) will be available for the brood during the winter.

Climatology

Irrigation legacy

The area of irrigated land in Texas increased from one million acres in the early 1940's to more than six million by the late 1950's. In Nebraska, where six million acres are under irrigation, the irrigated area is growing by 125,000 acres a year. Question: What is all this "imported" water doing to the climate?

The possibility that widespread irrigation produces lasting effects on regional climate is the subject of a two-year study now getting underway at the University of Illinois at Urbana-Champaign. Data going back as far as half a century will be collected from heavily irrigated parts of Kansas, Nebraska, Oklahoma and Texas, and, for comparison, from upwind parts of Colorado and Nebraska.

The project will be run at the university by the Illinois State Water Survey, with Paul Schickedanz as principal investigator and Stanley Changnon as supervisor. Questions will include the possibility of hailstorm suppression, effects on thunderstorms and chance of misleading rainfall data.

Deep in the heart of lightning

The lightning-fighters are getting to the heart of the matter. After two summers of work reducing the electrical fields beneath thunderstorms, researchers with the National Oceanic and Atmospheric Administration's Atmospheric Physics and Chemistry Laboratory in Boulder, Colo., are trying the technique of chaff seeding to suppress lightning from within the storms themselves.

Two aircraft—a B-26 used in last year's studies and a Convair T-29 borrowed from the Air Force—will fly through developing storm clouds, each armed with a device called a "chopper." The chopper unrolls a continuous strand of fine, aluminum-coated nylon thread, which it cuts into 10-centimeter-long fibers and spews out into the atmosphere at a rate of millions per minute. The 1972 and 1973 studies have shown that a mere two pounds of chaff—about 10 million fibers—can produce a 10-ampere current in an electrical field of 70,000 volts per meter. This should be enough, NOAA meteorologists estimate, to counter the three-ampere current of the average thunderstorm.

The chaff technique evolved from the observation that an elongated-conductive object placed between two centers of opposite charge increases the conductivity of the air between them, thus causing a continuous flow of current to discharge the region. The resulting discharge is weak enough that it cannot force a spark to jump the gap. Theoretically, with enough chaff in the right places at the right time, the result is no lightning.

Because results of such seeding operations are often extremely subtle, the seeding will be randomized "to keep even unconscious selection of data out of the statistical analysis." All missions (some will be for observation only) will be flown as if for seeding, but only the person dispensing the chaff will know if seeding has actually occurred.

Painting the sorghum white

An unusual idea for reducing evaporation from soil is being investigated by G. Stanhill of the Agricultural Research Organization at Bet-Dagan, Israel. In current tests, sorghum is sprayed with white kaolin (clay), which increases reflection of sunlight and reduces evaporation, apparently without adversely affecting photosynthesis. The tests were discussed at a recent seminar at Israel's Weizmann Institute of Science.