ASM MEETING

PLANT BIOTECHNOLOGY—YET MORE NOVELTIES

ARLINGTON, Virginia—Specialized plant structures with odd biochemistry may bring long-term payoffs if persevering researchers prove successful. Investigators are finding that structures as diverse as plant roots and microscopic "cones" found on some leaf surfaces can produce potentially useful secondary metabolic products.

For instance, the biochemical virtues of plant roots have remained largely unsung. Recently, however, Hector Flores and his collaborators at Pennsylvania State University (University Park) have begun to uncover some potentially valuable biochemical mysteries by growing plant roots in culture.

Speaking at the third annual American Society for Microbiology Conference on Biotechnology in June, Flores outlined the root-culture procedure. When seedlings are infected with *Agrobacterium rhizogenes*, critical changes result—changes that enable plants to organize into root cultures that grow efficiently on defined media. Cultured in such a fashion, root structures produce greater-than-usual amounts of specialized biochemicals (including alkaloids and sweeteners). Hence, such culture systems could become a source for otherwise rare and potentially highly valuable plant secondary metabolites. Flores and his collaborators are developing techniques to grow the fragile root cultures in large-scale bioreactors. "It may not be too long before this relatively unappreciated plant organ becomes a commercial source of specialty chemicals," he says.

If roots have been overlooked, then trichomes—the spiked, conelike structures along leaf surfaces of some plant species—have been downright neglected in biotechnologists' search for novel compounds. Nonetheless, several wild varieties of commercially important plant species, including tomatoes and potatoes, appear to contain valuable anti-pest concoctions within their trichomes—a finding that may eventually prove valuable for farmers, according to John Steffens (Cornell University, Ithaca, NY). Steffens and his collaborators Ward Tingey and Robert Plaisted (also at Cornell) have found that these specialized biochemicals seem to confer protection against preying insects. For instance, the trichomes on wild potatoes produce an exudate that helps protect the plants against aphids. The exuded material, when exposed to air, changes from a clear liquid to a viscous brown syrup, acting as a natural glue trap for insects. It is so "cumbersome" that they "walk as if they had cinder blocks" on their feet, Steffens says. The material also plugs insects' mouths. Plant breeders are trying to incorporate the polyphenol oxidase-catalyzed reaction that produces the "glue" into domesticated potatoes.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

PHOTO COURTESY J. STEFFENS

Wild potato plants have a novel means to protect themselves against aphids. The leaves exude a "glue trap;" the insects walk as if they had on "cement shoes."

The leaves of wild tomato plants also contain trichomes producing anti-pest substances, Steffens continues. The protective mechanism, however, is very different from that observed in wild potatoes. The trichomes on wild tomatoes produce various fatty acid-containing glucose esters, which act as aphid repellants. The hybrid progeny of wild and domesticated tomato plants—somewhat surprisingly—produce both glucose and sucrose fatty acid esters, Steffens notes. He hopes such breeding efforts eventually will lead to production of insect-resistant crop plants.

—**Jeffrey L. Fox**

GAO REPORT

FIELD-TEST RULES NEED TUNING

WASHINGTON, D.C.—Because of "gaps in regulatory coverage," the U.S. General Accounting Office (GAO) recommends that two federal agencies modify current policies for the field-testing of genetically engineered organisms. Meanwhile, by continuing to follow a "prudent" case-by-case approach, agencies can "accumulate experience in evaluating organisms and eventually develop generic regulation," the GAO says in a recently issued report, "Biotechnology: Managing the Risks of Field Testing Genetically Engineered Organisms." The report provides a concise snapshot of deliberate release regulatory dispositions within several key federal agencies.

The GAO report was requested by Representative John D. Dingell (D—MI), Chairman of the House of Representatives Subcommittee on Oversight and Investigations of the Committee on Energy and Commerce. In summarizing risk management policies and procedures for several key federal agencies, it complements a recent Congressional Office of Technology Assessment (OTA) report, "Field Testing Engineered Organisms: Genetic and Ecological Issues" (see *Bio/Technology* **6**:753, July '88).

The GAO report focuses on policies of the U.S. Department of Agriculture (USDA), Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA). In general, the three agencies are "using a preventive approach" to risk management, requiring that permission be sought before field tests are conducted instead of simply allowing tests and then coping with any problems that arise. Although "policies are generally appropriate," it notes, there are "gaps in authority and product coverage." Moreover, agencies have emphasized "risks" but given "limited attention to potential benefits at the field-testing stage."

The GAO report contends that, because of "significant scientific disagreements," the exemption from re-