

Chemically Speaking

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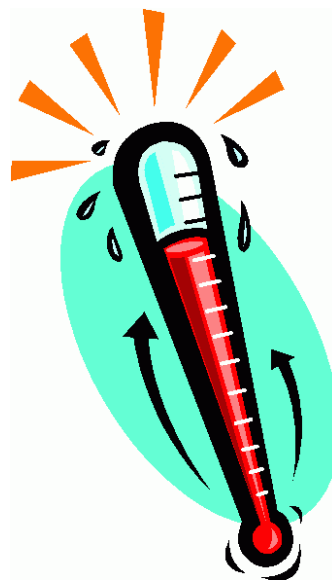
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Climate Change May Affect Exotic Species Spread

Plants that range northward because of climate change may be better at defending themselves against local enemies than native plants concludes a team of scientists that included a University of Florida geneticist. The team's findings suggest that certain plants could become invasive if they spread to places that were previously too cold for them. "This paper is the first to suggest that the mechanisms that aid invasive species when they move from one continent to the next may actually work within continents when climate change gradually extends the distributional range of a species," said Koen J.F. Verhoeven, an evolutionary biologist at The Netherlands Institute of Ecology. "Plants may be able to outrun, so to speak, their enemies from the southern range."



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Often, exotic plants and animals are introduced to new continents or geographic regions by travelers and commerce. Separation from their natural enemies can drive their invasive success in the new range. But, increasingly, the distribution of many species is shifting because of climate change and changes in land use. The team compared exotic plant species that had recently established in Millingerwaard, a nature preserve in The Netherlands, with related native plant species from the same area. “We set out to see whether the native and exotics responded differently to natural enemies such as herbivores or microorganisms in the soil,” said Lauren McIntyre, an associate professor of molecular genetics and microbiology in UF’s College of Medicine and a member of the UF Genetics Institute. “UF helped develop a statistical model that took into account the experimental design and had good power to detect the effects of herbivory.”

Scientists grew six exotic and nine native plant species in pots with field-collected soil from the Millingerwaard area, allowing natural soil pathogenic microbes to accumulate in the pots. Then they removed the plants and replanted the soils with the same plant species. The growth of native plants was reduced far more than the growth of exotic species, indicating natives were more vulnerable to natural soil-borne microbes. In addition, all plant species were exposed to North African locusts and a widespread species of aphid. These herbivores were not expected to show a preference for either the native or the exotic species, but they preferred the native plants and left the exotic ones relatively alone. The success of exotic plants expanding their range in response to warmer climates may be comparable to invasive exotic plant species that arrive from other continents, representing an additional threat to biodiversity. (UF Release, 11/19/08).

Bodyguard Bees

Honeybees are important to plants for reasons that go beyond pollination, according to a new study published in December. The insects’ buzz also

defends plants against the caterpillars that would otherwise munch on them undisturbed. The German researchers, led by Jüürgen Tautz of Biozentrum Universität Wüürzburg, earlier found that many caterpillars possess fine sensory hairs on the front portions of their bodies that enable them to detect air vibrations, such as the sound of an approaching predatory wasp or honeybee. “These sensory hairs are not fine-tuned,” Tautz said. “Therefore, caterpillars cannot distinguish between hunting wasps and harmless bees.” If an ‘unidentified flying object’ approaches, generating air vibrations in the proper range, caterpillars stop moving or drop from the plant. If caterpillars are constantly stressed by buzzing bees, as they likely are in fruiting trees heavily laden with blossoms, they will feed a lot less, he said.



In the study, the researchers found that bell pepper plants without fruit suffered 60 to almost 70 percent less damage to their leaves when confined in a tent with bees and caterpillars in comparison to those in a tent with caterpillars alone. The amount of leaf damage was less on fruit-bearing plants as the beet armyworm caterpillars moved into the maturing peppers. “Our findings indicate for the first time that visiting honeybees provide plants with a totally unexpected advantage,” the researchers said. “They not only transport pollen from flower to flower, but in addition also reduce plant destruction by herbivores.”



The findings highlight the importance of indirect effects between apparently unrelated members of food webs in nature, Tautz said. They might also have some practical application for sustainable agriculture. If crops are combined with attractive flowers in such a way that honeybees from nearby beehives constantly buzz around them, it may lead to significantly higher yields in areas with lots of leaf-eating pests. "Our finding may be the start of a totally new biological control method," he said. (*Cell Press*, 12/22/08)

EPA Risk Assessment Process Criticized by NRC

The U.S. Environmental Protection Agency's process of generating risk assessments - which estimate the potential adverse effects posed by harmful chemicals found in the environment in order to protect public health - is bogged down by unprecedented challenges, and as a decision-making tool it is often hindered by a disconnect between available scientific data and the information needs of officials, says a new report from the National Research Council.

The risk assessment process entails four steps - hazard identification, exposure assessment, dose-response assessment, and risk characterization - which were described in a 1983 National Research Council report known as the Red Book. After a risk assessment is complete, officials and regulators use it to decide how to protect the public from exposure to toxic substances. However, the challenges of risk assessment have become increasingly complex. As knowledge of environmental contaminants and potential health impacts advances, EPA must

address issues of multiple exposure, multiple risks, and susceptibility of different populations. Recognizing this, the agency asked the Research Council to identify improvements it could make to enhance risk assessment. In turn, the committee that wrote the report presented recommendations and a proposed framework for risk-based decision making to provide a template for risk assessment in EPA and strengthen the scientific basis, credibility, and effectiveness of future risk management decisions.

The committee found that EPA is struggling to keep up with demands for hazard and dose-response information and is challenged by a lack of resources. For example, the risk assessment for trichloroethylene, a chemical that is linked to cancer, has been under development since the 1980s and is not expected until 2010. However, state and federal officials often must continue to make risk management decisions in the absence of completed risk assessments. If this practice continues, the value and credibility of risk assessment will erode, the committee stressed. Perfection in scientific knowledge is unattainable; therefore, risk assessment should incorporate the best available scientific information and reasonably capture uncertainties in information so it is still useful for officials.

The report stated that EPA should focus more attention on the formative stages of risk assessment, specifically on planning, scoping, and problem formulation, which have been applied inconsistently, the committee said. This includes defining a clear set of options for consideration and involving decision makers, stakeholders, and risk assessors upfront to evaluate whether the design of the assessment will address the problems. To this end, the committee proposed that EPA adopt an expanded risk assessment framework that has the same core as the Red Book model but differs in its preliminary and final steps.

The three-phase framework begins with enhanced problem formulation and scoping, in which risk management options and the types of technical analyses needed to evaluate and discriminate among the options are identified. The second phase involves planning, hazard

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identification, exposure assessment, risk characterization, and deciding whether the assessment is appropriate and allows discrimination among risk management options. The final phase examines the relative health or environmental benefits of the proposed risk management options for the purpose of reaching a decision.

Under this framework, the questions posed come from early and careful planning and stress the appropriate level of scientific depth that is needed to evaluate the relative options being considered. The goal of the new approach is to assure that risk assessments are focused on the right questions, use the best available science, and address the needs of decision makers. The committee also recommended that EPA adopt a unified approach for the dose-response step of risk assessment, which estimates the amount of a chemical that would lead to an adverse health effect. Currently, dose-response assessments are conducted differently for chemicals that produce cancerous effects and those that produce other health effects. For carcinogens, EPA assumes that even a low exposure may result in cancer, and scientists estimate the probability of cancer developing in a certain population given different levels of exposure. For chemicals that could produce noncancerous effects, such as asthma or birth defects, scientists currently try to determine a threshold - the amount below which effects of the chemical are not expected to occur or are extremely unlikely.

However, the current noncancer assessment process, while valuable in certain public-health situations, does not provide decision makers with information on varying estimates of risk at different exposure levels, nor does it allow for adjustment of background exposures and underlying disease that may lead to increased risk. Rather, it provides a distinct line between possible harm and safety for all populations. The committee suggested unifying the cancer and noncancerous dose-response assessment approaches to include assessments of background disease processes and exposures, possible vulnerable populations, and modes of action that may affect a chemical's dose-response relationship in humans. (*National Academy of Science*, 12/3/08).

Pesticide Registrations and Actions

Food Related Actions

- On November 6, the Florida Department of Agriculture and Consumer Services (FDACS) approved the registration of Natural Forces, LLC's insecticide/miticide sorbitol octanoate (Sorbishield®) to control insect and mite pests on most crops in most settings. The EPA registration number is 70950-3-84710. (FDACS PREC Agenda, 12/4/08).
- On November 6, the FDACS approved the registration of Natural Forces, LLC's insecticide/miticide sucrose octanoate (Sucrashield®) to control insect and mite pests on most crops in most settings. The EPA registration number is 70950-2-84710. (FDACS PREC Agenda, 12/4/08).
- On November 8, the FDACS approved the experimental use permit (EUP) registration of Certis USA LLC's microbial insecticide *Paecilomyces fumosoroseus* (PFR-97) to evaluate toxicity to the Asian citrus psyllid in field citrus. The EPA registration number is 70051-19. (FDACS PREC Agenda, 12/4/08).



- The SLN registration for the ovicide/miticide hexythiazox (Savey®) use in strawberry has been amended. The new wording allows fruiting vegetables to have the same plantback as snap bean and cucurbits, which is 30 days when the plastic beds remain undisturbed. (FDACS letter, 12/8/08).

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- Based on a request by Chemtura Corp., the EPA has approved tolerances for the fungicide ipconazole (Vortex®). Tolerances of importance in Florida include cotton, peanut, and soybean. (*Federal Register*, 11/19/08).
- Based on a request by Mitsui Chemical Inc., the EPA has approved a tolerances in rice for the insecticide etofenprox. (*Federal Register*, 12/12/08).
- Based on a request by IR-4, the EPA has approved tolerances for the insecticide novaluron (Rimon®/Diamond®). Tolerances of importance in Florida include sugarcane and tomato. (*Federal Register*, 12/10/08).
- Based on a request by the USDA, the EPA has approved tolerances for the fungicide chlorothalonil (Bravo®). Tolerances of importance in Florida include okra, yam, ginseng, lychee and starfruit. (*Federal Register*, 12/3/08).



Non-food Related Actions

- On November 8, the FDACS approved the EUP registration of Dupont's termiticide chlorantraniliprole (E2Y45) to evaluate the control of termites in post-construction situations. The EUP registration number is 352-EUP-172. (FDACS PREC Agenda, 12/4/08).

Other Actions

- The EPA has announced an extension of the final sale deadline for fenamiphos (Nemacur®) nematicide products (Nemacur® 10% Turf and Ornamental, 432-1291 and Nemacur® 3, 264-731). The final sale date is now March 31, 2009. (*Federal Register*, 12/10/09).
- In November, the EPA Administrator authorized a finding that will allow growers on Tribal lands to use certain pesticide products not currently available for use in Indian country to combat pests in emergency situations. Under federal pesticide law, growers in Indian country do not explicitly have access to the benefits of pesticide emergency exemptions or special local needs registrations. These products are especially useful when growers in a particular region identify a pest problem that available products do not currently alleviate, such as the arrival of a new pest species from abroad. Without the added protection of emergency exempted or special local needs pesticide products, pest infestations could go unchecked in Indian country, with the potential to devastate crops in Indian country and beyond. In the worst-case scenario, untreated fields in Indian country could act as a safe haven for pest species, allowing them to easily re-infest nearby crop-growing areas. With this pilot program in place, a use that would otherwise be considered illegal in Indian country would be lawful, if all conditions of the finding are met. The pilot will expire in three years. The agency will continually assess whether or not this approach should be continued, modified, or expanded. Tribes may decide not to participate in this pilot program at any time. If a tribe does not want to participate, the tribe must notify EPA; otherwise, it will automatically be included. For more information on the tribal pilot, including special conditions that apply and a table of tribes that are not participating in the pilot, please see <http://www.epa.gov/oppfead1/tribes/pilot-project.htm> (EPA OPP Update, 12/5/08).
- The FMC Corporation voluntarily requested cancellation of a number of uses of carbofuran (Furadan®) for both the flowable and granular

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formulations. The EPA intends to grant these requests, but also stated that any uses that remain would be subject to cancellation because the agency has determined that only loss of all uses could reduce the potential risk. (*Federal Register*, 12/19/08).

Pesticide Potpourri

- Early in 2009, Southern Gardens Citrus intends on planting red grapefruit trees developed at Texas A&M that have been shown to resist greening and bacterial canker. (*Palm Beach Post*, 12/4/08).



- While genetically engineered peanut research is unlikely to result in the creation of completely allergen-free peanuts, it could produce a peanut that results in fewer reactions and complications. For years, government scientists have been testing ordinary peanuts in the hope of finding one that cannot cause the deadly allergic reactions which kill more than 50 Americans every year. Horticulture expert Peggy Ozias-Akins at the University of Georgia in Tifton is taking a different tack by using genetic engineering to grow hypoallergenic peanuts. Most allergic reactions to peanuts are triggered by the same eleven molecules. In

theory, peanuts without the genes responsible for those molecules would be far less likely to trigger allergic reactions. “Some proteins cause more severe allergic reactions than others,” said Ozias-Akins. Tackling the worst offenders first, her team has made and tested peanuts that do not produce two proteins that are among the most intense allergens. (*Wired Science*, 11/30/08).

- White corn, the variety that’s milled into chips, taco shells and tortillas, has for years been free of genetic engineering. Millers and companies such as snack-food giant Frito-Lay bought only conventional, biotech-free varieties of the specialty corn from farmers. But that's changing. Farmers in Iowa, Nebraska and other states started growing a small amount of genetically modified white corn in 2008 after word came down from processors they would start accepting it. “Our domestic millers have always been in favor of it,” said Todd Gerdes, specialty grains manager for Aurora Cooperative, which buys white corn at three of its locations in Nebraska. The corn is sold to domestic mills and for export. “What they've always wanted to do is to make sure that they didn't accept (biotech versions) and drive away their customers. They've come to a comfort level where they can convince their customers it's OK.” That change of heart has opened a new business for Pioneer Hi-Bred, which offered three white varieties of its Herculex corn for the first time this year and plans to bring out three more in 2009. About 2 percent of Pioneer's white corn seed this year was genetically modified. Virtually all of the corn grown in Iowa and nationwide is of yellow varieties and used for livestock feed, ethanol and for sweeteners and other food uses. Some 80 percent of the yellow corn seed planted in 2008 was genetically engineered to make the plants toxic to insect pests or immune to a popular weed killer, or both. Biotech varieties have been in the market for more than a decade, and there were even some versions in white corn in the 1990s. But industry officials said millers got spooked by the controversies that initially surrounded biotech crops, including the StarLink® episode in 2000. Foreign corn

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buyers also are playing a role in the acceptance of biotech corn, Gerdes said. They already pay farmers a premium for white corn and feared that would go up unless they allowed farmers to grow genetically engineered versions, he said. (*Des Moines Register*, 11/30/08).



- Cuba could soon authorize the planting of 124 acres of genetically-modified corn for the first time to help reduce its dependence on costly food imports. Regulators are expected to approve this initial crop of biotech corn, which would provide enough seed to expand to 14,830 acres next year, said Carlos Borroto, deputy director of state-run Institute for Genetic Engineering and Biotechnology. “We expect over the next few days to get the license for those 50 hectares. This is very important, because the alternative is to keep relying on imports.” Cuba imports around 60 percent of its food, including large amounts of soy, wheat and corn. The United States is the Communist-ruled island's largest food supplier under an amendment to its trade embargo on Cuba. Cuban President Raul Castro recently called increased agricultural output a matter of ‘national security’ as soaring international food prices are expected to drain more than \$2 billion from the government's coffers this year. (*Reuters*, 12/2/08).
- The European Union’s highest court fined France 10 million euros (\$12.9 million) for failing to update the country’s laws on genetically modified (GM) crops and foods. In a statement, the European Court of Justice said the “unlawful conduct repeatedly engaged in by France in the GMOs sector is of such a nature as to require the adoption of a dissuasive measure, such as a lump sum payment. Due to the circumstances of this case, the lump sum to be paid is set at 10 million euros,” the Luxembourg-based court said. In June, one of the court's advocates-general said in an opinion on the case that Paris had failed to comply with a 2004 ruling that its statute book did not properly integrate an EU directive on releasing GM organisms into the environment. The date for assessing whether France had complied with the 2004 ruling was February 2006, the ECJ said, adding: “It is obvious that, by that date, with the exception of a decree, France had not taken any steps to comply with the initial 2004 judgment establishing its failure to fulfill obligations.” The court had a responsibility to ensure that its initial judgment, a ruling that France had broken EU law, was complied with as swiftly as possible and also to prevent similar infringements from recurring, it said. (*Reuters*, 12/9/08).
- A new type of rice that can survive total submersion for more than two weeks has passed its field tests with “flying colors” say researchers, and is now close to official release. Scientists hope that the rice can make a major difference in Bangladesh and India where up to four million tons of rice per year - enough to feed 30 million people - are lost because of flooding. ‘Sub1’ rice is identical to the high-yielding varieties popular with both farmers and consumers across Asia, except that it contains a single gene that gives it ‘waterproof’ qualities. The enabling gene, ‘sub1A’, was discovered 13 years ago in a traditional Indian rice variety by David Mackill and Xu Kenong. Scientists inserted the gene into other rice varieties and found that it became switched on when a plant was submerged. It acts to make the plant dormant, allowing it to conserve energy until the floodwaters recede. It also countermands

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the rice plant's normal strategy of extending its stem and leaves in an attempt to escape the water. "The potential for impact is huge. Submergence-tolerant varieties could make major inroads into Bangladesh's annual rice shortfall and substantially reduce its import needs." (SciDev.Net, 12/5/08).

- Research at Michigan State University demonstrated that increasing the corn acreage can reduce the abundance of insect predators that control aphids, the most significant soybean pest in the United States. An earlier study of fields in Iowa, Michigan, Minnesota and Wisconsin showed that landscape diversity around a soybean field had a great impact on the abundance of beetles and other insects that help to control aphids. With more nearby fields

being turned over to corn, that diversity decreases. (*NY Times*, 12/23/08).

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