

hydrophilic [water-loving] and hydrophobic [water-hating] areas," he says. "So they're apparently susceptible to both [the hydrophobic] vitamin E and [hydrophilic] vitamin C."

However, preliminary data hint that "it's a little easier to get longer-term effects from vitamin E" — perhaps lasting up to three weeks. "I don't want to put vitamin C in a bad light, but right now it looks like 10 days is perhaps its maximum," Norris says.

Genetics also affect the therapy's efficacy, he notes. "When people treat their plants, they'll find some are going to respond better than others. And that's not because our work isn't sound or reproducible. It's because [even within a species] some varieties are more responsive." Norris says he'd like to help breeders identify which plants exhibit the greatest sensitivity.

Spin-off research may provide plant breeders — who sometimes spend up to half of their time in the field screening plants for their susceptibility to stress — with another benefit as well. Norris says he hopes to patent a chemical assay that will allow growers to distinguish innately vulnerable seedlings from stress-tolerant plants within two weeks.

Though he has focused on soybeans, Norris says these are not the only plants that benefit from

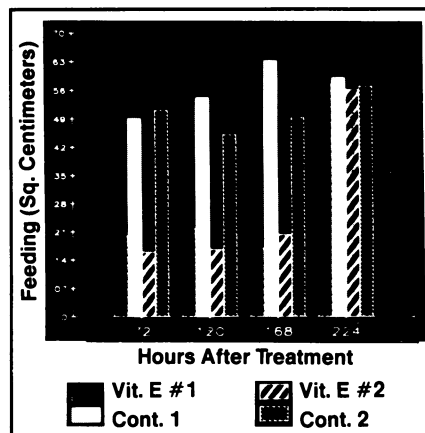
First and third bars for each time period represent coleus plants treated with vitamin E. Over first seven days, cabbage loopers preferred leaves harvested from untreated plants (controls 1 and 2).

antioxidant-vitamin therapy. His team has boosted the stress tolerance of snap beans, sweet corn, field corn, broccoli, coleus, ash trees and elms, often in multiple varieties of a species, he says.

Similar investigations have been conducted elsewhere, especially in Europe, notes Stuart F. Laermer of Nutley, N.J., director of industrial and agricultural products for Hoffmann-La Roche Inc., the world's largest producer of vitamins. In the late 1980s, he says, Hoffmann-La Roche funded a literature search on the topic of vitamins in horticulture and plant science, turning up 155 citations. The company is now actively financing research in this area.

While Laermer questions whether the Wisconsin team's treatment is novel enough to warrant a patent, he says he fully supports the group's scientific conclusions. A wealth of studies show that "vitamin applications enhance stress protection and the stimulation of growth in plants — results that could potentially corroborate Dr. Norris," he says.

"In contrast to animal husbandry, where exogenous application of vitamins has often become routine practice, vita-



Norris

mins are hardly ever used in plant production," observes J.J. Oertli of the Institute for Plant Science of the Federal Technical University-Zurich in Lindau-Eschikon, Switzerland.

Laermer agrees, noting that vitamin therapy for plants "has met with some skepticism in the past, if only because much of the work . . . was done poorly." Well-designed experiments have indicated, he says, that antioxidants are "clearly beneficial for plant growth."

Nor are antioxidants the only vitamins showing promise for crops. "There are [other] vitamins that are really magic bullets," Laermer told SCIENCE NEWS. Because of patent interests, however, he said he would not yet unmask their identity. □

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