particular threats from fuel spills.

One factor that would reduce the price is an increase in supply spurred by changing patterns of consumption, Norland suggests. Soybean products, for example, are gaining recognition for their heart-healthy qualities (SN: 5/30/98, p. 348). "As soybean flour is used more and more, oil becomes a by-product," he notes.

Legislative activity may drive the acceptance of vegetable oil–based fuels and lubricants, whatever their price. The omnibus spending bill recently passed by Congress recognizes B20 as an alternative fuel. The Clean Air Act of 1990 and the Energy Policy Act of 1992 also create markets for these products.

In Germany's Black Forest region, environmental protection laws require farm machinery to use only biodegradable fuels and lubricants, thereby instituting "almost a requirement to use veggie oil," says Boehman. Several products based on canola oil are used in Europe.

At the University of Northern Iowa, Lou Honary and his colleagues developed a vegetable oil replacement for hydraulic fluid used in heavy machinery such as forklifts and garbage trucks. An Iowa bill passed this year requires all state agencies to purchase as much of this fluid, called BioSOY, as allowed by their budgets and manufacturer warranties on equipment.

Iowa Soybean Association

Biodiesel fuel made from processed soybean oil emits fewer pollutants when burned and is less harmful to the environment if accidentally spilled.

Oil companies themselves don't see vegetable-based products as a threat, according to Honary. Instead, they have already jumped on the bandwagon. "I don't know of any petroleum company that doesn't have a green program running," he says. "They are all trying to find some way to promote the use of vegetable oils. They'd like to have this alternative for certain applications."

In the end, researchers hope that vegetable oils will perform well enough to convince people to use them. Honary looks to the example of Sandia National Laboratories in Albuquerque, N.M. The facility tested BioSOY in 20 of its own vehicles from 1996 to 1997. This hydraulic fluid worked so well that Sandia decided to use it in all of its vehicles.

Biology

Geraniums intoxicate Japanese beetles

Several bites of a garden-variety geranium, and a Japanese beetle falls to the ground in a stupor that lasts some 8 hours. It's hardly a great way to avoid predators or get on with beetle business, like reproduction. Yet researchers now find that the beetles never learn. They choose geraniums over perfectly good linden leaves and get paralyzed day after day.

Researchers described the knockout effect on Japanese beetles in 1929, notes Daniel A. Potter. He and David W. Held, both of the University of Kentucky in Lexington, have studied beetle learning and the sad effects of geranium intoxication on family life. Their results will appear in an upcoming issue of the journal ENTOMOLOGIA EXPERIMENTALIS ET APPLICATA.

In theory, insects with wide-ranging tastes are the most likely to learn to avoid noxious foods, according to the few studies that have tested this idea, Potter says. However, Japanese beetles eat nearly 300 U.S. plant species but don't avoid geraniums.

The flower petals, especially from plants in full sunlight, seem the most narcotic, Potter reports. His most extensive tests were of red geraniums, but flowers of white, coral, and other colors also slammed the beetles. So did a water-soluble leaf extract.

A geranium "is like candy to them," Potter says. Beetle pairs offered a choice picked geranium flowers so often that they laid just half as many eggs as pairs provided only with linden leaves. Intoxication is dangerous for the beetle, but is it fun? Potter won't speculate. —*S.M.*

Ravens' memories can lead to thievery

Ravens not only remember where they hid their own food; there's evidence they remember—and steal—caches of other ravens.

As far as Bernd Heinrich is aware, his raven studies at the University of Vermont in Burlington are the first to show that a bird's memory for caches extends to somebody else's hoard.

Ravens don't just sniff out hidden meat, report Heinrich and John W. Pepper of the University of Michigan in Ann Arbor. When Heinrich, unseen by the birds, hid 40 caches in snow in a large, outdoor aviary, the ravens failed to find even one.

Yet when nine ravens hid food at the same time and looked for it the next day, they found 58 out of 85 caches. Fifteen of these were thefts. The ravens appeared to search deliberately in specific spots, Heinrich says. He has also observed that a raven changes its hiding strategies, going farther to stash booty, if others are watching. Results appear in the November ANIMAL BEHAVIOUR. —*S.M.*

Diverse fungi underlie plant success

There's a hidden side to plant diversity that people had better start paying attention to, warn two research teams.

Their experiments demonstrate the major importance of soil fungi in shaping plant communities, say Marcel G.A. van der Heijden of the University of Basel in Switzerland, John N. Klironomos of the University of Guelph in Ontario, and their colleagues. Yet the possible loss of diversity in soil fungi has hardly been studied, they lament in the Nov. 5 NATURE.

Most soils have so-called arbuscular mycorrhizal fungi, which grip roots and boost nutrients for an estimated 80 percent of land plant species. A forest might have 30 of these fungal species, but crop fields typically have few, Klironomos says.

The Swiss researchers grew greenhouse pots of 11 plants with different soil fungi. Plant growth varied depending on the fungus. "This was a surprise," Klironomos notes. Researchers had assumed that any of the fungi could partner with any plant.

Outdoors, Klironomos' group seeded each of 70 tubs with the same combination of 15 plants but different fungi, from a lone species to a mix of 14. All the plants sprouted, but in some tubs, a few species took over. Plant communities were most diverse in tubs with eight or more fungal species. —*S.M.*