

(continued from page 26)

gants which also combat fungi and several other enemies at the same time.

Pests also contributed to cost we all pay with our money and our concern: \$3.1 million already appropriated by Florida legislators to clean up wells known to be contaminated by EDB, which had been the main nematicide.

Some costs of pest control are hidden. For example, while our soil fumigation has been killing off the root-knot and sting and other enemy nematodes, we have also been killing off their enemies: fungi, other nematodes and bacteria. Likewise the use of pesticides in our citrus groves and tomato fields and landscapes. Possibly even in our homes. While fighting pests, we have sometimes made our pest problems worse.

However, with the addition of biological pest control to our pest control tool kit, we can seize the opportunity to rebuild the invisible ecology of living soil according to our desires, to structure the ecology of our landscape, to re-engineer the setting of our lives and of our food production — so long as we play by nature's rules. ■

NEMATODE NEMESIS

The nematode may be brought to heel by an extract of crab shells.

Nematodes are tiny parasitic worms that dwell in the soil and cause an estimated \$3 billion of damage a year to

crops and gardens. Unlike other soil microbes, the nematode larvae contain a complex sugar called chiten, explains Robert Milch, the president of Igene Biotechnology Inc. in Columbia, Md. If extraneous chiten is mixed in the soil, it will trigger other soil microbes to produce an enzyme that destroys it. Thus, mixing chiten with soil sets off a kind of chemical warfare that destroys nematode larvae.

THE PROTEIN SPURS THE GROWTH OF FUNGI AND OTHER MICROBES THOUGHT TO ATTACK ADULT NEMATODES.

Crab, oyster and clam shells are rich in chiten and Igene has found an inexpensive way to extract it, Dr. Milch says. After extracting residual meat from crab-shell wastes to produce a flavoring compound, Igene dissolves away the calcium with an acid. This leaves a chiten-and-protein mix that Igene has turned into a product it calls ClandoSan. The protein spurs the growth of fungi and other microbes thought to attack adult nematodes.

Igene plans to market ClandoSan later this year, after tests of its effectiveness are completed at Auburn University in Alabama and Hebrew University in Israel. Since chiten is a natural pesticide, formal federal approval may not be needed for ClandoSan, Mr. Milch says. Igene notes that most synthetic chemicals formerly used against nematodes have been banned because of environmental problems. ■



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