Superbugs:

A New Biblical Plague?

By Michael Satchell

The battle erupts in Texas. After years of being under control, a generation of insects begins multiplying in fantastic numbers — suddenly unaffected by the chemical weapons that have kept them in check. Farmers get panicky, some spraying their fields as many as 50 times with powerful insecticides, but it has little effect.

After devouring much of the Texas cotton crop, the insects march into northern Mexico, gobbling up a million more acres of cotton, wiping out an entire industry, and leaving the land wasted and barren.

Newer and more exotic poisons are thrown at them but serve only to slow the insects down. After shaking off the new assault, the voracious hordes regroup and sweep into Louisiana, eating a quarter of that state's cotton crop. Temporarily sated, they head west to California, bringing terror to the lush Imperial Valley, America's vegetable bowl.

Here, the crawling, wriggling juggernaut begins by chomping its way through some 5 billion pounds of lettuce — three quarters of the nation's crop. All seems lost until a last-ditch defense with another new poison thwarts the assault. America's salad bowls are safe this year, but the victory may be only temporary. Where will the monster bugs strike next?

This may sound like the scenario of a Hollywood horror movie, but the saga of the budworm (which is equally happy eating tobacco, cotton, lettuce and tomatoes — plus DDT, toxaphene, methyl parathion and other powerful insecticides) is very real. Last winter's California lettuce crop was saved only after authorities agreed to the emergency use of a highly toxic and largely untested pyrethroid chemical. In time, scientists believe, the budworm will develop immunity to this poison too.

The budworm is just one of 364 so-called "superbugs" worldwide that have developed resistance to the witches' cauldron of poisons used to destroy them or keep them in check. They are the shock troops of a global insect army locked in constant combat wth man, challenging us for our food and fiber supplies and bringing death, disease and discomfort to millions, particularly in Asia, Africa and Latin America.

Viewed in terms of war, it is the insects that are on the offensive. "They are beginning to tip the scales in their favor," warns Dr. Paul Schwartz, a U.S. Department of Agriculture (USDA) entomologist. "The potential for disaster is always present — in agriculture or in disease."

The United Nations Environment Program, in its recent

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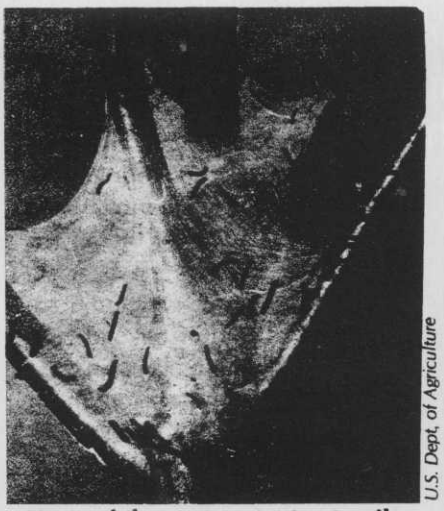
U.S. Dept. of Agriculture

Fire ants eagerly feeding on unopened flower bud of okra.



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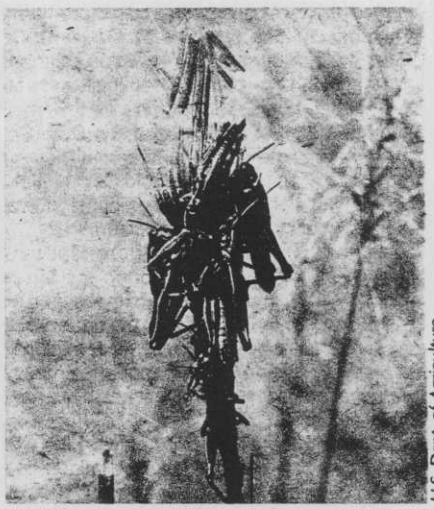
Nests of the eastern tent caterpillar. Note the layers of silk.



U.S. Dept. of Agriculture

Grasshoppers are shown chomping away on a half-devoured stalk.

State of the World report, noted with alarm the rapid gains made by insects, mites, ticks, rodents, weeds and fungi in becoming increasingly resistant to pesticides. This poses a grave threat to world health and food production.

Of the 364 superbugs, 223 are agricultural pests that attack crops in the fields or after the harvest. The remaining 141 spread disease to livestock or humans — flies, ticks, cockroaches, lice and mosquitoes.

In the last two years, the U.S. has been invaded by exploding populations of pests. Plagues of grasshoppers almost Biblical in size have blanketed and denuded millions of acres of crop and range lands in 14 states west of the Missouri River.

In Maine, millions — perhaps billions — of tent caterpillars have been defoliating trees and invading homes. Gypsy moths have stripped half a million acres of Pennsylvania forest and are spreading south into the Blue Ridge Mountains. Colorado is losing 2 million Ponderosa pines each year on the eastern slopes of the Rockies due to pine beetle infestation. Elsewhere, record numbers of borers, rootworms, bollworms, cutworms, webworms, hoppers, miners, loopers, beetles and weevils are decimating crops, making life miserable for farmers and homeowners, and causing millions of dollars in losses.

Overseas, the effects on food supplies and public health are even more drastic as the insect hordes gather momentum. Locusts — bigger and more voracious cousins of the grasshopper — have swarmed across Africa and parts of Asia, eating everything from crops to wooden fence posts. Increasing resistance to insecticides is being shown by major pests that attack crops on which entire agricultural economies are based — rice in Japan, coconuts in tropical Africa, cattle in Australia, cereals everywhere.

The World Health Organization (WHO) has charted an alarming rise in malaria after seeing the disease dramatically reduced in recent years by effective new insecticides. But the mosquitoes have been highly successful in blunting these attacks by developing immunity. So far, 43 species that carry malaria — plus 41 species that transmit dengue, yellow fever and a host of dread tropical diseases — have developed resistance.

This country also faces a constant threat from mosquito-borne disease. Without expensive, continuing control programs, coastal areas of Florida and some Southern states would be uninhabitable. Dr. Donald Weidhaas, director of a USDA research laboratory in Gainesville, Fla., worries about the increasing resistance trend.

"We're lucky we can afford these expensive methods to combat the problem. The developing countries cannot," he says. "The potential is here for malaria and encephalitis; already we're seeing dengue and yellow fever turn up in Caribbean countries."

Changes in climate, different methods of agriculture and the banning of certain insecticides for environmental reasons are all contributing to the burgeoning insect populations. But resistance to chemicals — our first line of attack and defense — is the major and most worrisome reason.

Compared to millions of years of gradual evolution and adaptability, the changes insects have undergone in becoming resistant to man's chemical poisons have taken place with fearful speed.

The first case of resistance was noted in 1908 when fruit farmers in Washington State found that a tiny pest called the San Jose scale could no longer be controlled by lime sulfur. For the next 30 years, a dozen more insects developed resistance to various pesticides produced from naturally occurring organic substances.

After World War II, the chemical industry began manufacturing synthetic pesticides, and they brought amazing changes in the fields. Farmers applying these new "miracle" chemicals sometimes harvested twice as many crops as before and exulted in the "green revolution." It appeared that man had at last found the answer to controlling his insect foes, and for a while we had the upper hand over the pests.

But it wasn't to last. Many of the most effective pesticides were found to cause serious environmental problems. Rachel Carson's book *Silent Spring*, detailing the disasterous effects of DDT, sounded the first major warning note. Eventually, such compounds as DDT, Chlordane, Aldrin, Dieldrin and Heptachlor were banned or their use severely restricted.

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The chemical onslaught also threw the biological balance out of kilter. The pesticides killed both the target bugs and the beneficial parasites and predators that helped keep them in check.

But most important of all was the growing trend to immunity. In 1957, researchers counted 76 species of bugs resistant to the new poisons. Ten years later, the number rose to 228 species. Today, the 364 resistant insects are immune to the effects of some 60 different poisons, and some insects have multiple resistance — born with the ability to withstand attack from as many as a dozen different chemicals.

As insects became more difficult to control, farmers began pouring more and more insecticides into their fields, killing increasing numbers of beneficial insects — along with birds, fish and small mammals — and pushing the poisons higher up the food chain.

When one insecticide became useless, the industry simply created a new one; and when insects developed immunity to that, still another one was introduced. This expensive and rather insidious trend has reached the point where American farmers now spread 1 billion pounds of pesticide on their crops each year at a cost of $2 a pound. And in these times of oil shortage, costs will certainly leap, because 80 percent of synthetic pesticides are made from a petroleum base.

The heavy dependence on pesticides has locked us on a chemical treadmill, and the strategy has been a "debacle" in the view of the late Dr. Robert van den Bosch, University of California entomologist. "It is questionable," he said, "whether we have made gains against the pests since the mid-1940s. And, in fact, with insects there is evidence we have lost ground."

Agriculture, realizing the biological errors of its old ways, today is moving to switch strategy to control pests by combining methods as old as farming itself with exotic new technology and the limited, careful use of pesticides.

These include crop rotation — growing different things each year instead of the same food or fiber that allows insects to become established generation after generation by feeding on a favored crop.

There is the biological warfare approach — breeding and introducing predator insects into the fields to feed on these agricultural pests/parasites.

The most fascinating development, however, is still in the highly experimental state: the use of pheromones — chemicals produced in the laboratory that duplicate the sexual lure substances of the insects.

These sex excitants can be used to entice insects into traps or to disrupt their mating habits. In some tests, scientists have flooded fields or orchards with a pheromone, making it impossible for males to locate the females.

In others, tiny amounts of the sex lure are spread in thin plastic tubes. "The males are attracted to the tubes and spent their time trying to mate with the plastic instead of the female," chuckled one government scientist. "It must get pretty frustrating."

Similar methods are being tested for pests that bother humans, though introducing predator insects into an apartment building plagued with cockroaches is hardly feasible. Entomologists advise that the best method of combating insects and rodents around the house remains a simple one: don't leave garbage about.

Despite all the modern weapons at our disposal in the continuing conflict with insects, this country still loses 30 to 40 percent of its food and fiber supplies to pests. On a global scale, almost half of the world's crops are eaten or destroyed by rodents, bugs and weeds. Since insects outnumber use and are far more adaptable and theoretically able to breed resistance to any kind of poison that we can invent, the end result of our age-old battle with them is inevitable.

Superbugs and superpests will eventually take over the earth, just like in some Hollywood movie. A disturbing thought, but hardly something to worry about in our lifetime — unless, perhaps, the budworm eats its way out of America's farmlands and starts showing up alongside the cockroach in our cupboards and kitchens.

USGA Regional Meeting

The United States Golf Association, Green Section, Southeastern Region will hold their next regional meeting Monday, February 23, 1981 at the Holiday Inn-Lakeside, Boca Raton. The motel is immediately west of the Boca Raton exit from the Florida Turnpike. Plan to attend this all day session. South Florida Chapter and Palm Beach Chapter will not hold February meetings because of this event. Registration fee is $15 which includes lunch.

A wide range of subjects will interest golf management people of all levels. To be discussed in the morning session are the USGA and its role in the game of golf. Other subjects are golf etiquette, trends in golf facilities, integrated pest management — weed control, performance — evaluation of Bermauda species, the manager's role with the golf course. The afternoon session subjects are: importance of course housekeeping, coping with traffic, vandalism, bermuda green mutation in the superintendent management program and conditioning the course for play. The afternoon session highlight will be a rare appearance by cytogeneticist Dr. Wayne Hanna of the Tifton Georgia Coastal Plain Experiment Station. His topic will be contamination in greens — the Pee Dee Syndrome.