DDT alternative shows promise

Ever since the publication of Rachel Carson's now famous book, "Silent Spring," and the subsequent government ban on DDT, scientists have been looking for a substitute for the insecticide which would satisfy both agriculturists and environmentalists, i.e. one which would effectively control pests but have minimal side effects on the environment.

Brigham Young University Professor Gary Booth thinks he's as close as anybody to helping find the substitute. For the past seven years, Dr. Booth has experimented with the insectidice known as Dimilin and he says it could replace significant uses of the now outlawed DDT with little environmental effect.

According to Dr. Booth, the chemical appears to give excellent control on at least 30 species of insects, including several species of mosquitoes, cotton boll weevil, cabbage butterfly, Colorado potato beetle, tussock moth, cabbage loopers, stable fly, horn fly, house fly, hemlock looper and several soybean insects.

The Environmental Protection Agency has already granted registration of Dimilin for use on the gypsy moth, one of the serious defoliators of America's northeastern forests. Petitions to use Dimilin on soybeans, cotton and mosquitoes are now pending before the EPA. Dr. Booth is hoping for approval sometime this year.

Dimilin is a relatively simple compound as far as insecticides go. It was discovered by scientists in the Phillips-Duphar labs in Holland who were trying to put two very effective herbicides together to make a topnotch weed killer. The results wouldn't kill a single weed, but proved to be very effective on insects.

Dimilin acts by interfering with the synthesis and desposition of chitin, a structural substance that is one of the main components of insect exoskeletons. As a chitin inhibitor, Dimilin interferes with the formation of the larva's cuticle. At the time of molt, the treated insect's cuticle is improperly formed, which results in death from rupture of the new malformed cuticle. The insect simply starves to death.

In the United States, Dimilin is being developed by the Thompson-Hayward Chemical Company. Dr. Booth has been responsible for about 85 percent of the environmental research on Dimilin.

He was able to speed up the research required by the EPA on new insecticides by testing Dimilin in miniature ecosystems, a revolutionary procedure he helped develop during his post-doctoral work at the University of Illinois under the direction of Dr. Robert L. Metcalf, who conceived the model ecosystem concept.

The miniature nature systems with land and water surfaces, were set up in small aquariums. Then plants and animals were treated with Dimilin and introduced to start a miniature, seven-step food chain similar to what is found in the environment. After 30 days, measurement were taken to determine how much of the insecticide was dissolved and excreted, which organisms were likely to be affected by Dimilin and how degradable the new material was.

"It takes only 30 days in the laboratory to find out what a new insecticide will do to the environment," Dr. Booth explained. In contrast, DDT was used 20 years before mankind began to realize it was doing more to the environment than killing pests.

After Dimilin passed the safety tests in the model ecosystems, Dr. Booth began field tests. During his seven years of research with Dimilin, he has conducted numerous studies on the environmental effects of the insecticide and he says it is the safest compound he has ever studied.

Many water animals were tested, including the blue claw and fiddler crab and grass shrimp, with no bad effects. Extensive tests were also

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DDT substitute being studied

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conducted on quail, frogs and snails and no negative results were found.

Dimilin was also tested on forests around Le Grande, Ore. to determine its effect on the tussock moth, which is deadly to douglas fir trees, and on Utah Lake to observe its effects on nesting birds. Again, the results were negative.

Dr. Booth explained that Dimilin has minimal environmental effect because it breaks down very rapidly in soil and water, unlike DDT which was banned because it remains virulent for years and can be passed up the food chain from plant to animal to man and even from mother to child. He found that half of the Dimilin which was placed in the soil and water was gone in less than two weeks.

Chemically speaking, Dimilin, known also as diflubenzuron, breaks down into difluoro benzoic acid, plus p-chlorophenyl urea, plus p-chloroaniline, none of which are persistent nor are there any known problems with any of them. On the other hand, DDT breaks down in the environment into DDE which causes egg shell thinning in some raptor birds. DDE is also very stable.

Environmentalists have been concerned about the effects Dimilin will have on non-target organisms. At normal use levels, between .1 and 1.0 parts per million, Dimilin results have been favorable.

Dr. Booth says Dimilin is safe on humans. Since he could not test the insecticide on humans, he ran tests on pregnant mice, which are warm-blooded like man, and he found no transfer of Dimilin through the mother to the babies.

Dimilin has not affected the yield of any crops that have been studied except to increase the yields because the insects were controlled. Crops currently being investigated extensively are cotton, soybeans, corn, cabbage and apples.

Dr. Booth admits that there are some disadvantages to Dimilin. One is that it doesn't act the same on all insects. For example, it is effective on tussock moth but ineffective on spruce bud worm. However, he noted that there is no compound made that is effective on all pests.

Also, Dimilin is not as persistent as he would like. For example, it is gone in water in a couple of days. Therefore, more sprayings are necessary.

However, Dimilin does appear to have long-lasting effect on insect control because it prevents the deposition of egg masses which are the source of the following year's infestation. □