SEYMOUR D. VAN GUNDV
Interim Dean
College of Natural and Agricultural Sciences
University of California, Riverside

Biological control:
Major emphasis in UC research
Public concern about pesticide residues in foods and degradation of the environment has stimulated increased interest in biological controls. A perception of pesticides as a threat to human health and the environment is leading to increasingly stringent laws limiting their use. It is likely that the number of chemicals available, and the number of uses allowable, will decline to the point where chemical control will not be available for some pest situations, particularly in California.
In addition to increased food safety and reduced pesticide load in the environment, biological controls have the advantage of reduc-ing farm-worker exposure to pesticides. They also help avoid damage to nontarget crops and beneficial insect species, and they lessen the problem of pest resistance to chemicals. Once estab-lished, some biological control strategies can be relatively low in
cost.

Thus the stage is set for increased research and extension pro-grams in biological control. The University of California has a rich tradition in this area. California’s interest in biological control began in 1888-89, when a few hundred vedalia beetles, Rodolia car-dinalis, were imported from Australia and New Zealand to control cottony cushion scale, Icerya purchasi, which was decimating the state’s citrus crops. Within two years, the pest was no longer an economic threat. To mark the centennial of this first successful biocontrol effort and to analyze its future, UC Riverside recently hosted “The International Vedalia Symposium on Biological Con-trol: A Century of Success.”
The University’s first formal research unit in biological control was established in 1923 at what is now the UC Citrus Research Center and Agricultural Experiment Station in Riverside. A second unit was established in Berkeley in 1944. From an initial focus on in-sect natural enemies, biological control has expanded to encompass organisms such as pathogens, microbes, nematodes, and other an-tagonists or competitors of pests.
Today, more than 300 agricultural and urban insect pests world-wide are managed by biological control agents. UC scientists have developed many of them, pioneering biological control since its first scientific use with the vedalia beetle. Today the University of Cali-fornia spends more than $8 million a year on biological control research in eight departments on three campuses. More than 50 UC scientists work primarily in biological control. Within the Division of Agriculture and Natural Resources, a task force is examining the status of biological control and will recommend methods to help bring it into wider use.
In the real world of production agriculture today, biological con-trol often provides a foundation for pest management, but fre-quently must be supplemented by the judicious use of cultural management practices and selective pesticides. Thus, biological control is a critical component of many integrated pest manage-ment programs. One example is the use of parasitic wasps to con-trol red scale in citrus. This natural enemy is highly effective in southern California. But in the San Joaquin Valley, the cold winters limit its use. Although it must be supplemented with chemical control in the valley, use of the wasp has reduced the frequency of pesticide applications.

2 CALIFORNIA AGRICULTURE, VOLUME43, NUMBER5

The goal is not to eradicate pests, but rather to keep pest popula-tions below the threshold of economic injury. As biocontrol meth-ods become more prevalent, reduced use of chemical pesticides will cause more pest damage to appear in foodstuffs. The public will need to learn to recognize that there are reasonable trade-offs be-tween food appearance and increased environmental and human health safety.
Many exciting new frontiers exist for biological control. Genetics play a role in the choice of candidate target species, in the choice of a natural enemy for importation, in strategies for selection, collec-tion, and handling of natural enemies before release, and in delib-erate laboratory or field manipulation to improve the performance of natural enemies. Genetic engineering also has potential for development of more effective viral insecticides. Methods being considered include modification of natural virus functions to in-crease virulence or to alter host range!
The most widely used group of microbial insecticides is associated with the bacterium Bacillus thuringiensis (Bt). UC Riverside re-searchers already have isolated and cloned two genes for mosquito toxins from Bacillus thuringiensis var. isruelensis (Bti). The impact has been sigruficant. In 1983, the World Health Organizationused more than 500,000 pounds of Bti to control disease-carrying blackflies in West Africa. Bt is effective against three major orders of insects, Coleoptera (beetles), Lepidoptera (moths), and Diptera (mosqui-toes and blackflies). UC teams are investigating the molecular mode of action of each protein involved in