of the parasites in finding their host on cotton.

A particular effort will also be made to seek the egg-larval parasites which are not impeded by the protected location of the pink bollworm larvae deep in a cotton boll. Another strongly sought feature will be to obtain a parasite with a diapause synchronized to that of the host. A polyphagous parasite (i.e. one attacking many host species) without diapause itself might, of course, find other suitable carry-over host species during the period of diapause of the pink bollworm so we cannot eliminate these types without field trials.

Search analysis

This search analysis and projection, as presented, offers guidelines for emphasis of effort with individual species of parasites of pink bollworm. The projected program also includes a concentrated search for general predators. It is only in the past one or two decades that the enormous potential of general predators for controlling certain pests like that of the ordinary cotton bollworm (*Heliothia zea*) has been clearly recognized. This is particularly true in southern California desert areas where the general predators alone frequently show a capacity to handle this potentially serious pest. Some very circumstantial evidence at present indicates that the influence of general predators upon the pink bollworm may also be underestimated, and many researchers believe that this is an area of search that deserves considerable attention. The goal of importation and establishment of outstanding general predators from foreign countries is one believed likely to be rewarding against the pink bollworm and simultaneously against many other important California pests.

The importation of pink bollworm disease organisms has never been explored, but also offers considerable promise, and this prospect will be actively pursued in the future.

B. R. Bartlett and D. Gonzalez are Entomologist and Assistant Entomologist, respectively, Division of Biological Control, University of California, Riverside. *Some of the preliminary phases of this study were supported in part by funds provided by Cotton Producers Institute. General support for the program described was assured by the funding in the late summer of 1969 of a budget of $43,-000 drawn from the California growers' bale tax monies administered by the California Department of Agriculture.*

Effects of . . . delayed

KAY RYUGO · D. E. KESTER

One of the more serious cultural problems in the growing of almonds in California is the poor set caused by the lack of cross-pollination during certain climatic conditions. This is especially true in some years when bloom periods do not overlap much. Since almonds bloom early, spring frosts (to which open flowers are susceptible) may also reduce fruit set. To explore the possibility of controlling the time of flower opening, preliminary trials where made in 1966 with the synthetic growth retardant, Alar. (Alar is not registered for commercial use on almonds.) These trials indicated that this compound not only reduces shoot elongation, but also extends the winter dormancy in almonds, thus delaying the opening of the blossoms.

In 1967, more extensive trials on several almond varieties growing in Davis and in the Manteca-Ripon area confirmed earlier findings that Alar reduces shoot length in young trees as shown in photo 1. On large, mature trees sprayed with Alar at 2,000 and 4,000 ppm in June, the average nut and kernel weights were reduced (table 1) causing a reduction in total yields (table 2). It is not known whether this reduction was a direct effect of the

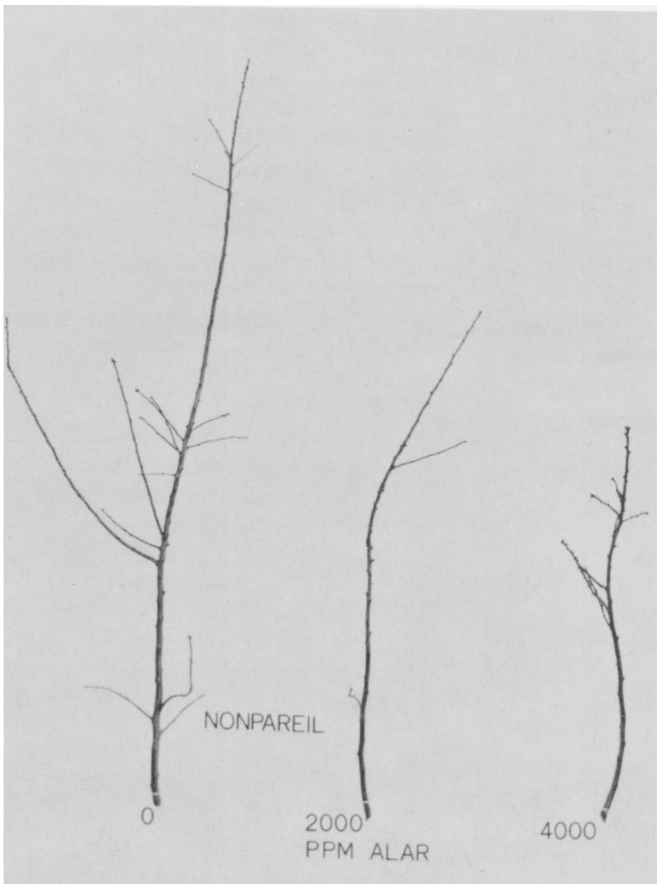

Photo 1. Shoot from control Nonpareil tree (left) and two that were sprayed in June with Alar (right). Photographed January, 1968.

ALAR *on almonds*

flowering . . . shorter shoots

DON ROUGH • FELIX MIKUCKIS

growth retardant on the developing fruit or whether it was due to the diminished leaf area of the treated trees. Small but detectable amounts of Alar residue were found in the hull, shell and the kernel thus indicating that the compound is readily translocated in mature trees.

Applications

Applications of Alar in June, September or October were effective in delaying the opening of the blossoms the following spring (photo 2). The effectiveness seemed to be in proportion to the rest requirement of each variety. For example, the full bloom date of the early blooming variety, Jordanolo, was just slightly affected by the treatment, while flowers of the mid-season bloomer Nonpareil were delayed about two to four days, and the blossoming of the late blooming varieties was delayed by about a week. Thus, Alar-treated Ne Plus Ultra trees bloomed simultaneously with non-sprayed Nonpareil trees. Usually the Ne Plus Ultra trees bloom a few days earlier than the Nonpareil. While the petal size of the flowers from Alar-treated trees was slightly smaller than those from the check trees, the pollen germinated normally and equally as well as that gathered from the controls. Kernels from fall sprayed trees (in contrast to the June treatment) were not noticeably smaller than those from the check trees.

Kay Ryugo and D. E. Kester are Pomologists, Department of Pomology, University of California, Davis; Don Rough is Farm Advisor, San Joaquin County; and Felix Mikuckis is Laboratory Technician II, Department of Pomology, U.C., Davis. *The plot of trees used in these trials was made available through the cooperation of Mr. Ioppini of Manteca and the Manteca High School District.*

TABLE 1. NUT (IN-SHELL) AND KERNEL WEIGHTS IN GRAMS FROM 50 FRUITS SPRAYED IN JUNE WITH ALAR. VALUES REPRESENT AVERAGE OF THREE TO NINE REPLICATE SAMPLES

Variety	Control		2000 ppm		4000 ppm	
	Nut	Kernel	Nut	Kernel	Nut	Kernel
	gms	gms	gms	gms	gms	gms
Nonpareil	83.3	53.9	79.0	52.0	78.3	49.1
Davey	89.7	52.3	84.3	50.1	79.3	43.7

TABLE 2. IN-SHELL YIELD (AVERAGE OF THREE TREES PER TREATMENT) ON MATURE ALMOND TREES IN RIPON AFTER JUNE ALAR SPRAY

	Control	2000 ppm	4000 ppm
	lbs	lbs	lbs
Jordanolo	84.25	76.50	61.75
Ne Plus Ultra	94.00	89.25	70.35
Nonpareil	98.00	81.00	66.00

Photo 2. Effect of Alar on the opening of Nonpareil flowers. Branch on right was sprayed in September and photographed in the following spring.