Statistical analysis of the data shows that this treatment and the two-copper-spray treatment are significantly better than the nonsprayed check at the 1 percent level. This means that only one time in 100 trials could such results occur by chance. All the chemical spray treatments were significantly better than the nonsprayed check at the 5 percent level.

In another study, we found a correlation between the chemicals used and the population of fluorescent bacteria on healthy blossoms. All four of the replications of nonsprayed blossoms showed bacterial colonies, whereas the early copper spray followed by a second application of either copper or streptomycin, had, respectively, only one and two culture plates with bacteria. The single early copper spray or the bloom spray with streptomycin had three plates with bacteria. This is an indication that the sprays reduced the bacterial population and hence the number of infections.

It appears that bacterial blossom blast of pears can be effectively controlled with a copper spray applied in the delayed dormant period (green bud) followed by a streptomycin spray at the start of bloom. Two copper sprays are not suggested, because the copper spray applied at 1 percent bloom was somewhat toxic to foliage and flowers. Lower rates of copper and other timings for treatment with both materials need further testing. Control of blossom blast of almond, apple, and stone fruit trees may also be possible with comparable sprays.

Costs must be kept at a minimum if pear growers are to adopt a control program. A promising possibility would be to apply a low rate of copper in the dormant season with the pear psylla control spray. This may reduce early infection sufficiently, because not all flower clusters are needed for a full crop. If freezing temperatures are anticipated just before or during bloom, growers may apply a streptomycin spray at first bloom, just before the freeze, to provide additional protection against blast.

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The growth regulator increased yield by 20 pounds per vine, primarily by improving berry set.

Chlormequat doubles yield of Malvasia bianca grapes

William L. Peacock
Frederik L. Jensen

In the San Joaquin Valley, several grape varieties yield much below the vine capacity because of poor fruit set. Growth retardants and cytokinins have shown potential in improving yield of poor setting varieties in other grape-growing areas but have not been extensively tested in the San Joaquin Valley.

In 1976, trials were conducted with *Malvasia bianca*, a muscat-type wine grape variety, in a vineyard near Tulare that had never fulfilled its yield potential because of poor fruit set. Previous trials with mineral nutrients and fungicides to prevent possible nutrient deficiencies or diseases during bloom had failed to improve fruit set and yields.

The trial was designed as a randomized complete block with five replications and single vine plots. The growth regulators tested were: (1) chlormequat, also known as CCC, Cycocel, (2-chloroethyl) trimethyl-ammonium chloride, formulated as an 11.8 percent solution; (2) daminozide, also known as SADH, Alar, succinic acid-2,2 dimethylhydrazide, formulated as an 85 percent powder; and (3) Cytex, a mixed cytokinin material, mostly zeatin-like, standardized to contain 100 ppm kinetin equivalent.

Chlormequat was used at a concentration of 1 quart per 100 gallons of water and applied on May 10, seven days before the beginning of bloom. Daminozide was applied at a concentration of 1 pound per 100 gallons of water on May 18, at the 90 percent bloom stage. Cytex was also applied at 90 percent bloom using 1 gallon per 100 gallons of water. Application rate was ½ gallon of spray per vine, sufficient to cover the flower clusters and foliage. No adjuvants were employed.

The fruit from each vine was harvested and weighed on September 2. One

Effect of Growth Regulators on Fruit Characteristics of *Malvasia bianca*.

Treatment	Yield*	Lateral length*	Berries per cm of lateral*	Berry weight*	Soluble solids*	Total acidity*
	(lb/vine)	(cm)		(grams)	(°Brix)	
control	16.6 ab	6.5 a	2.5 a	3.2 a	22.2 a	.65 a
chlormequat (Cycocel)	37.3 c	6.8 a	4.7 c	2.8 b	19.8†	.70 a
daminozide (Alar)	21.0 b	6.4 a	3.2 b	3.2 a	21.7 a	.66 a
cytokinin (Cytex)	14.6 a	6.3 a	2.5 a	3.3 a	21.4 a	.66 a

*Means followed by the same letter are not significantly different, 5% level.
†Significantly different at 10% level.

hundred berries were randomly sampled from each plot to determine fruit maturity and berry weight. Twenty-five upper laterals were taken per vine to determine length of the lateral and number of berries.

The results of the trial are shown in the table. Chlormequat greatly increased the yield compared to the control and other materials. Neither daminozide nor Cytex altered yield.

None of the materials affected the lateral length at the proximal end of the cluster. However, both chlormequat and daminozide increased the number of berries per centimeter of lateral, chlormequat being the most effective. Chlormequat may have stimulated even greater set on distal laterals, which would better account for the increase in yield.

The soluble solids were not affected by any treatment except for chlormequat at the 10 percent significance level. This was probably due to the effect of the increased yield. The sugar yield per vine, the product of the yield times the soluble solids percentage, was doubled by chlormequat as compared to the control. Berry weight was reduced by chlormequat. None of the materials affected total acidity.

Immature leaves at the shoot tip compete with the ovaries for organic nutrients. When the growth retardant chlormequat is applied prebloom, shoot growth is temporarily halted. More adequate nourishment for the developing ovaries leads to improved set. Daminozide is also a growth retardant, but weaker in its action than chlormequat.

In conclusion, yield of *Malvasia bianca* was more than doubled by a prebloom spray of the growth regulator chlormequat (Cycocel). The increase of 4.4 tons per acre (20 pounds per vine) was primarily due to improved berry set. Clusters from treated vines were well filled; those from control vines were loose and straggly, with some clusters setting no fruit at all.

This is a report of work in progress. Until the products and uses discussed in this report appear on a registered pesticide label or other legal supplementary directions for use, it is illegal to use the chemicals as described.

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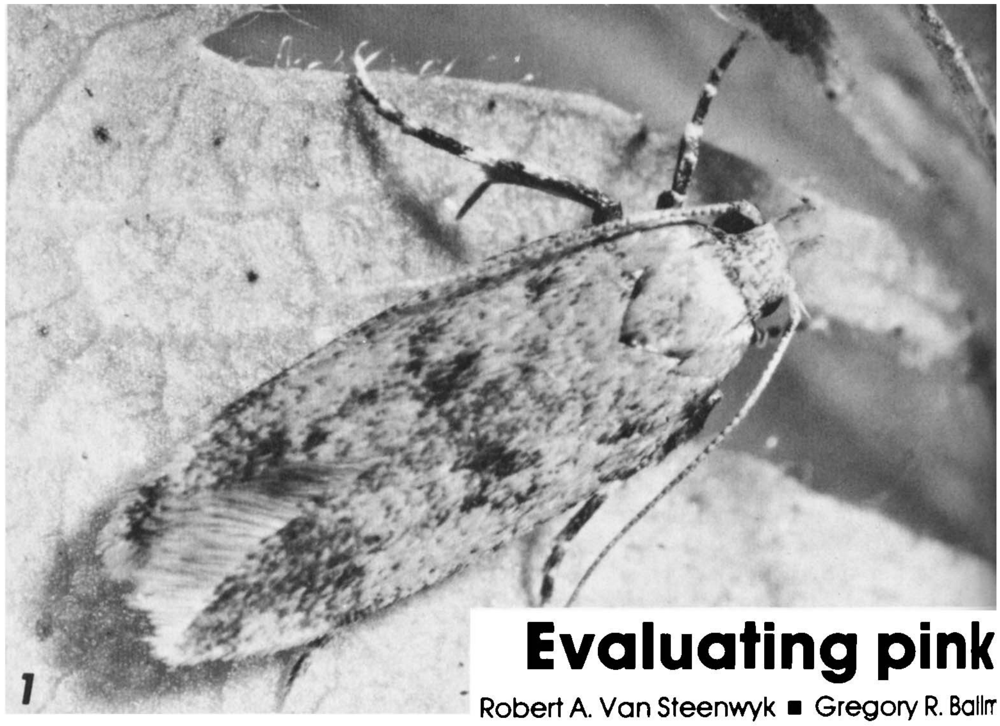

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Evaluating pink

Robert A. Van Steenwyk ■ Gregory R. Ballm

The decision to begin insecticide treatment to control pink bollworm, *Pectinophora gossypiella* (Saunders) (fig. 1 and 2), in cotton is usually based on a Hexalure trap catch or on the percentage of boll infestation. With the trapping method, insecticide application is initiated when a mean of 3.5 or more moths per night are captured in a baited cone trap. Using the percentage-boll-infestation method, an automatic 5- to 7-day treatment schedule is begun when the mean boll infestation reaches 10 to 20 percent.

Whichever method is used in initiating treatment, the percentage of boll infestation must be estimated to evaluate the effectiveness of the control measures. However, there has been some question as to the age or size of bolls to examine. Thus, a study was conducted to learn how age, size, and moisture percentage of cotton bolls are related to susceptibility to pink bollworm attack.

Bolls inspected

In an untreated field at Meloland, California, 100 white flowers (Delta Pine 16 cotton variety) were marked at weekly intervals from June 15 through July 26, 1974. On July 19, ten bolls of age 7, 14, 21, and 28 days were removed from the plants. Thereafter, ten bolls from all age categories were removed weekly until only open bolls remained. The sampled bolls were measured, weighed, and inspected for pink bollworm larvae. Then the bolls were dried and reweighed.

Also, in another untreated cotton field, 100 white flowers (Delta Pine 61 cotton variety) were marked every 2 days from July 14 through August 11, 1975. On August 14, all marked bolls were measured, weighed, and inspected for pink bollworm larvae and exit holes and then dried and reweighed.

In the 1974 preliminary study, first to third instars (white larvae) were found in bolls of all age categories but were most abundant in bolls 14 to 21 days old (fig. 3). The fourth and fifth instars (red larvae) were found only in bolls 21 or more days old and were most abundant in those 28 days old. Boll growth was nearly complete after 14 days, but moisture content continued to decrease with increasing boll age.

In 1975, a more extensive study produced results similar to the 1974 study. Bolls 15, 17, and 21 days old contained the greatest number of first to third instars; bolls 25 and 27 days old contained the greatest number of older larvae (fig. 4). Exit holes first appeared in bolls 23 days old, and the number in-

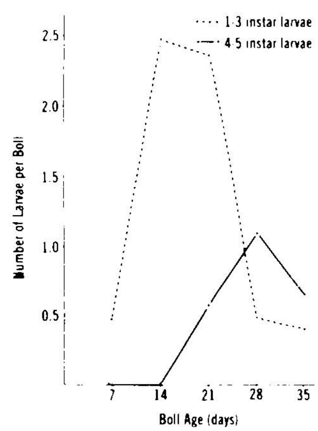

Fig. 3. Mean number of pink bollworm larvae per cotton boll at different boll ages, Meloland, California, 1974.