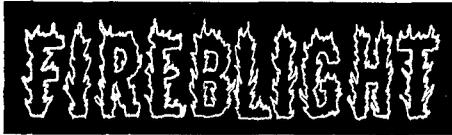


# Bartlett Pear Fireblight Control

- (1) *evaluation of chemicals*
- (2) *streptomycin resistance*
- (3) *spray-caused russetting*
- (4) *coverage evaluation*



## EVALUATION OF CHEMICAL TREATMENTS ON PEAR, '70, '71

J. A. BEUTEL · W. J. MOLLER · W. O. REIL

L. B. FITCH · D. H. CHANEY

**F**IREBLIGHT, caused by the bacterium *Erwinia amylovora*, was more severe in Sacramento Valley pear orchards during 1970 than any time in the previous 20 years. Following the warm winter of 1969-70, the regular pear bloom was prolonged for approximately a month with first bloom March 16 and petal fall ending in mid-April. "Rat-tail" (late season) bloom continued for several weeks during May and June. During much of this period, weather conditions favoring blight were ideal with temperatures over 65° F, and frequent rains. First widespread fire-

blight infections were observed in the Sacramento Valley between April 18-21, continuing through May and June.

To learn more about blight control treatments in 1970, a survey was made of most pear orchards in the Sacramento Valley and River districts. Growers provided information on dates of blight treatments and first infections, materials used, and related details on blight control. Orchards of similar vigor, age and location were then compared to gain more information on efficacy of the various spray programs employed. The conclusions of this survey were:

- (1) Best results were obtained when growers initiated spray treatments before 10% bloom, rather than waiting for 50% bloom.
- (2) Regular applications every five days on an alternate row basis gave excellent results. Intervals of 6, 7, or 10 days gave less effective control.
- (3) Concentrate sprays of 4.8 to 9.6 ounces of 17% streptomycin in 20 to 100 gallons per acre, in regularly timed sprays, gave excellent results.
- (4) Night applications of sprays and dusts were preferred by most growers.
- (5) Copper dust and streptomycin dust formulations performed about equally well in the Sacramento Valley.

U.C. research in 1969 and 1970 to compare the efficacy of streptomycin sprays, copper sprays and dust had shown superior control of blight with streptomycin sprays, at application rates of 8 ounces or 24 ounces/acre. Kocide 101 (copper wettable powder) spray at 8 ounces per acre gave less effective control than streptomycin sprays. The copper-lime dust (20-80) treatment gave the poorest results.

### 1971 Tests

In 1971, a large blight control test was conducted to compare several materials and spray procedures found successful for blight control in the 1970 survey. The test was conducted in a 16-acre block in the C. E. Sullivan orchards near Yuba City. Blight was severe in this block in 1970. Obvious holdover cankers were removed during the fall and winter, 1970-71. The Bartlett pear trees were approximately 12 years old, spaced on 15½-ft squares. The orchard was divided into 60 small plots of 48 trees each (6 rows × 8 trees long) with 15 different treatments replicated 4 times, and applied in a randomized block design. The treatments were designed to (1) test various rates of streptomycin, (2) compare streptomy-

#### CALIFORNIA AGRICULTURE

Progress Reports of Agricultural Research,  
published monthly by the University of California  
Division of Agricultural Sciences.

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cin and copper spray, (3) evaluate day vs night applications, (4) evaluate dilute vs concentrate applications, (5) compare alternate-row applications with every-row applications, and (6) compare travel speeds of 1 and 2 miles per hour.

The sprayer used was a Hart Carter 432G 500-gallon machine calibrated to spray either concentrate at 100 gallons per acre or dilute at 400 gallons per acre (every-row basis).

Rain, relative humidity and temperature were monitored in the orchard during the test to relate them to time of blight infections. Rain occurred March 25, 26, 27, April 6, 9, 13, 17, 20 (including some hail), May 1, 2, 4, 5, 6 and 8. Table 1 shows the hours per week of temperatures over 65° F (critical temperature for blight infection) and hours over 90% relative humidity. Five percent bloom was recorded March 28 and full bloom on April 3. The first blight infections were observed on April 26.

The orchard was first irrigated during early bloom, March 20, which precluded use of ground spray treatments at that time. Due to the earliness of bloom, a streptomycin 3,000 ppm dust application was made by air at the rate of 20 lbs per acre to the entire block on March 24. Following this initial aerial treatment, ground applications began with the treat-

TABLE 1. SULLIVAN RANCH 1971 WEATHER DATA

Week ending	Hours per week over 65° F	Hours per week over 90% RH
March 29	10	42
April 5	50	48
April 12	24	52
April 19	42	43
April 26	21	24
May 3	44	44
May 10	38	66
May 17	72	24
May 24	82	28

TABLE 2. C. E. SULLIVAN BLIGHT EXPERIMENT—CHEMICAL APPLICATIONS, TIMING, INFECTIONS

Treatment	Amount applied/acre	Night or day	Spray per acre (gallons)	Mean infections per plot†
Check	—	—	—	173
Streptomycin	2.4 oz.	N	50	25 b
COCS 50% Cu	16	D	50	24 b
Streptomycin 17%	4.8	D	50	20 bc
Streptomycin 17%	4.8	N	50	19 bc
Streptomycin 17%	9.6	N	50	11.25 cd
Streptomycin 17%	9.6	N	100*	11.25 cd
Streptomycin 17%	9.6	N	50	9.25 cd
+ oil 1%	64 oz.			
Streptomycin 17%	9.6	N	200	8 cd
Streptomycin 17%	9.6	D	200	6.25 d
Streptomycin 17%	9.6	D	50	5.5 d
Streptomycin 17%	9.6	D	50	5.25 d
+ 2 copper sprays				
Streptomycin 17%	9.6	D	100†	4 d
Kocide 53% Cu	16	D	50	3.25 d
Streptomycin 17%	19.2	N	50	1.75 d

\* 1 mph.  
 † every row.  
 ‡ means followed by different letters differ significantly (P = .05).

ments described. A total of 10 applications were made, starting on March 29, and followed on April 2, 7, 12, 16, 21, 26, 30, May 5 and 10.

The number of blight infections was counted on the interior four rows and center six trees within each plot, providing a one-tree-wide buffer around each plot. Despite some missing trees due to blight in 1970, all plots contained 20 to 24 trees. The average number of blight infections per plot is summarized in table 2.

The more streptomycin used, the better the control achieved. Results with 2.4 and 4.8 oz of 17% streptomycin were nearly equal, but significantly better control was obtained with 9.6 oz and 19.2 oz. There was no significant difference between 9.6 and 19.2 oz, but there was a trend favoring 19.2 oz applications.

Copper materials gave different results. Kocide at 1 lb per acre gave statistically better control than COCS at 1 lb per acre. The best copper spray (Kocide) gave control equal to the best (streptomycin, 19.2 oz) and the lower rates of streptomycin sprays gave control similar to COCS. The addition of 1% oil to 9.6 oz of streptomycin had no effect on blight control.

Concentrate (50 gal per acre) and dilute sprays (200 gal per acre) of streptomycin gave equally good control of blight. Spray patterns were checked for uniform distribution with spray target cards at the beginning and midpoint of the test so no real differences in coverage existed.

Slowing travel speed of sprayer from 2 mph to 1 mph gave no improvement in control. Spraying every row each time, compared with alternate-row spraying, resulted in slightly, but not significantly better, blight control with streptomycin.

Alternate-row treatment consisted of spray application from odd-numbered row middles, followed by a subsequent application from even-numbered row middles, then odd-numbered middles the third time, and so on throughout the test. During the first month following bloom, foliage density is low enough to permit good coverage across two rows of trees, hence the alternate-row treatments commonly used by growers are effective.

Based on this test and other observations it appears that streptomycin at 9.6 or 19.2 oz per acre, or Kocide at 1 lb per acre, gives satisfactory control of fireblight in pears if spray applications are made every five days during bloom, and for at least 30 days after bloom.



W. J. MOLLER • J. A. BEUTEL

**A** SEVERE OUTBREAK of fireblight occurred in Bartlett pear orchards in the northern Sacramento Valley during 1971. It developed in orchards where growers had followed a thorough blight control program using streptomycin sprays (12 to 18 applications per season) exclusively during 1970 and 1971. Blight samples from these orchards were collected and checked for streptomycin resistance in May 1971. The pathogen in many of these samples was shown to be highly resistant to streptomycin. This newly developed resistance to streptomycin in the Sacramento Valley apparently accounted for the failure to control blight in 1971 with streptomycin programs that had performed successfully in 1970.

To test which materials might be effective against this streptomycin-resistant strain of fireblight, an experiment was set up in an orchard near Gridley owned by Heringer Enterprises. Spray treatments were applied to the orchard in September 1971 but no fall blight developed. In the spring of 1972, the same 20-acre pear orchard was again used to determine the efficacy of several materials for the control of fireblight.

The orchard had been badly affected by the streptomycin-resistant strain in the spring of 1971. It was 14 years old and planted in hedgerows with 11 by 22 ft spacing. The 20-acre orchard was divided into 78 plots of 40 trees each (4 rows wide by 10 trees long). Each plot was sprayed on an alternate-row basis with a Hart-Carter 432G air-blast sprayer calibrated to apply either concentrate at 100 gallons per acre or dilute material at 400 gallons per acre on an every-row basis. Thirteen treatments with six replications were applied every 5 to 6 days starting March 13 (at 20% bloom) and ending April 28 for a total of ten applications. Materials tested were three copper compounds (Kocide, COCS and tribasic copper) and two antibiotics (terramycin and streptomycin) and combinations of these materials.

Weather during the test was recorded in the orchard with a recording hydrothermograph. Conditions favoring blight (temperature over 65° F or relative hu-