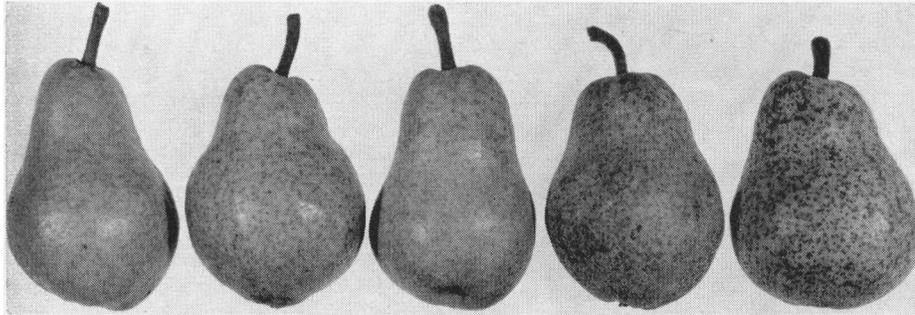


# Russet on Bartletts

pears from trees treated with copper or streptomycin equally free from russet

Richard W. Harris and William H. Griggs



Bartlett pear on the left has little lenticel russet; rating 10%. The four pears to the right have varying amounts of russet up to 90%.

**Bartlett pears** from trees in two Mendocino County orchards and one Sacramento Valley orchard that were sprayed or dusted with copper—for blight control—during 1955 were as free from russet as fruit from trees treated with streptomycin.

Studies in a Sacramento Valley orchard during 1953 and extended in 1954 to include a Placer County orchard showed that pears were equally russeted whether they developed on trees dusted with copper, sprayed with streptomycin, or given no blight control treatment.

In 1955, test plots were established in two orchards in Mendocino County and the trials in the Sacramento Valley were continued. In addition to the copper and streptomycin sprays and dusts, nine insecticides were tested singly and in various combinations to determine whether or not they may cause russet.

During the experiments, blight control treatments were applied by the operators of the test plot orchards who used their own spraying or dusting equipment. Each treated plot consisted of between 60 and 300 trees. The times of application were those established by

The Effect of Various Insecticides on the Amount of Lenticel Russet—Sacramento Valley, 1955

Treatment <sup>1</sup>	Russet %	
	With parathion	Without parathion
Check	37	36
Aramite	33	36
Sulphenone	34	36
Chlorobenzilate	40	38
Ovotran	32	44
Average	35	38

<sup>1</sup> Sprays were applied at the rate of 8–10 gallons per tree. In addition to the miticides, the trees received the first and second applications of DDT.

each grower for his particular orchard, except the streptomycin treatments in the Sacramento Valley orchard which were applied at more frequent intervals.

In each test plot, tree branches—with 30 to 60 blossom clusters—were covered with large muslin or nylon bags for various intervals during the blossoming period. A few days before harvest, samples of fruit subjected to each of the experimental treatments were collected and taken to the laboratory to be rated according to the percentage of lenticels russeted. The photograph shows the extremes of lenticel russetting.

One of the Mendocino County orchards is normally sprayed for blight control and the other is usually dusted. Three different copper treatments and four of streptomycin were applied in the two orchards. Each treatment was ap-

The Effect of Various Blight Control Treatments on the Amount of Lenticel Russet—Sacramento Valley, 1955

Treatment	Concentration	Number of applications	Russet %
Check			36
Dusts			
Copper-lime	10–90	8	46
Streptomycin (pyrophyllite carrier)	500 ppm	14	42
Streptomycin (pyrophyllite carrier)	1000 ppm	14	48
Sprays			
Streptomycin nitrate	100 ppm	13	63
Streptomycin sulfate	100 ppm	13	72
Least significant difference (5% level)			9
(1% level)			12

<sup>1</sup> Copper dust applied, 30 lbs/acre (1.0 lb. metallic copper/acre)

Antibiotic dusts applied, 50 lbs/acre  
Sprays applied, 8–9 gals/tree

plied to at least 60 trees. The table in column 3 combines the results from these two orchards.

The pears were equally russeted—regardless of treatment or whether protected by bags—corroborating the results of previous years and indicating that the blight control treatments were not responsible for the fruit russet present in the test orchards.

The Sacramento Valley russet evaluations of the 1955 treatments are summarized in the table in column 2. At least 80 trees were treated in each plot. Fruit from all of the treated trees, except those dusted with 500 ppm—parts per million—streptomycin, had more russet than that from the check trees receiving no blight control treatment. There were no significant differences in the amount of russet occurring on fruit dusted with 500 streptomycin, however, than on fruit dusted with 10-90 copper-lime or 1,000 ppm streptomycin. Both the streptomycin sulfate and the streptomycin nitrate sprayed fruit were more russeted than fruit from either the copper-lime or the streptomycin dust treatments.

Results of the 1955 trial differ from those of the previous two years in the Sacramento Valley orchard and in the Mendocino County orchards, because in 1955 the treatments in the Sacramento Valley orchard produced fruit with more russet than the fruit from the check, or no blight control treatment.

The increased russet associated with the copper-lime dusts was unexpected, especially in view of the previous years' findings when 20-80 dusts were used. One explanation is that the copper-lime dust or the streptomycin dusts or sprays may increase the amount of russet if there are low temperatures during the blight control period. The average temperature

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The Effect of Various Blight Control Treatments on the Amount of Lenticel Russet—Mendocino County, 1955

Treatment	Concentration <sup>1</sup>	Russet %
Orchard No. 1 (4 sprays) <sup>2</sup>		
Check		35
Basic copper-sulfate	2½ lb/100 gal (1.0)	37
Zinc Coposil	1 lb/100 gal (0.6)	35
Streptomycin-Terramycin	50 ppm	29
Orchard No. 2 (6 dusts) <sup>3</sup>		
Check		39
Zinc Coposil	6% (1.2)	44
Streptomycin (pyrophyllite carrier)	1000 ppm	47
Streptomycin (Fuller's earth carrier)	500 ppm	46
Streptomycin nitrate <sup>4</sup>	100 ppm	35

<sup>1</sup> Figures in ( ) are pounds of metallic copper applied per acre per application.

<sup>2</sup> Sprays applied 300 gallons to the acre.

<sup>3</sup> Dusts applied 12–30 pounds to the acre, depending on date of application.

<sup>4</sup> Spray at 1000 gallons to the acre.

## CORN

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Residue analyses were made from samples of approximately 10 pounds taken—from the same location in the silo on each sampling date—about 1' below the surface of the ensilage.

The first sample—from fresh ensilage being put into the silo—analyzed 290 ppm of DDT. The second sample taken after 47 days in the silo analyzed 96 ppm of DDT. In view of the analyses of later samples, it is apparent that this sample was abnormally low. Samples taken 73 days after storage and subsequent samples were divided and analyzed both on the basis of their wet weight and

**DDT Residues on Sweet Corn Ensilage at Various Depths from Approximately One Foot Below the Surface to the Bottom of the Silo, Kern County, 1952.**

Depth below surface of ensilage in feet	DDT residue ppm	
	Wet wt.	Dry wt.
1	125	500
2	68	325
4	98	394
6	70	308
8	88	337
10	83	314

on the basis of air dry weight. The differences in residues point out the importance of moisture content in such analyses. With a given amount of insecticide, the dryer the sample the greater is the rate of DDT to total weight of the sample. The data clearly indicate that DDT residues do not break down rapidly on sweet corn ensilage. In one sample of ensilage, 148 ppm of DDT were present—expressed in terms of wet weight—165 days after preparation. This represents approximately a 50% reduction under the initial residues.

Because first series of samples were taken from approximately 1' below the surface of the ensilage, additional samples were taken at greater depths. On the last sampling date—165 days after initial preparation of the ensilage—samples were taken at approximately 2' intervals from the top to the bottom of the pit. The sample nearest the surface—approximately 1'—contained 125 ppm of DDT on a wet weight basis which was higher than any of the rest. Probably this was because the temperatures near the surface were lower than those at greater depths in the silo. At lower temperatures DDT is broken down more slowly. There was relatively little difference in residues on samples taken below the 1' level, indicating a rather uniform distribution of DDT throughout the ensilage.

Some of the sweet corn analyzed in these experiments was being fed to beef cattle, but none to dairy animals, so no studies were conducted to determine DDT residues in milk resulting from the

feeding of treated sweet corn. However, work by other investigators has shown that even when very low residue is on cattle feed, appreciable DDT will appear in the milk. In one extensive series of experiments, seven cows were fed alfalfa hay with a DDT residue averaging 7 ppm and 8 ppm. After the first few days, the amount of DDT in the milk remained steady at about 2.3 to 3.0 ppm. Butter made from this milk was found to contain 65 ppm of DDT.

In other studies, five cows receiving pea silage containing about 100 ppm DDT for approximately four months had 15.6 ppm DDT in their milk.

Because there is no practical method of eliminating DDT residues from sweet corn once the insecticide has been applied, it is apparent that treated corn forage fed to dairy cattle could result in appreciable quantities of DDT in milk. Consequently, sweet corn fodder that has been treated with DDT should never be fed to dairy animals and it should not be fed to meat animals being fattened for slaughter.

*Oscar G. Bacon is Assistant Professor of Entomology, University of California, Davis.*

*Wallace R. Erwin is Principal Laboratory Technician, University of California, Berkeley.*

*The above progress report is based on Research Project No. 1275-F.*

*Determinations of DDT residue on corn were made at Riverside by L. D. Anderson, Entomologist, and F. A. Gunther, Associate Insect Toxicologist, University of California.*

*The investigations with DDT on alfalfa hay were conducted by Ray F. Smith, Associate Professor of Entomology, and W. M. Hoskins, Professor of Entomology, University of California, Berkeley; and O. H. Fullmer, formerly Research Assistant, University of California, Berkeley.*

*The studies with pea vine silage were made by H. F. Wilson, Professor of Economic Entomology; N. N. Allen, Professor of Dairy Husbandry; G. Bohstedt, Professor of Animal Husbandry; J. Bethel, Graduate Assistant in Biochemistry; and H. A. Lardy, Assistant Professor in Bacteriology, University of Wisconsin.*

## MITES

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was actually killed. The plot sprayed with dormant oil alone also required retreatment in June. This seems to be typical of the results obtained in past seasons with dormant oil. Even with a carefully hand sprayed plot, the mites build up to damaging populations by early June, and when air carrier equipment is used, the results have been even less satisfactory.

Genite-923 and Mitox held the mites in check until July, and if two-spotted mite had not become a problem in the orchard at that time—necessitating treatment with an acaricide to prevent foliage damage—seasonal control might have

been obtained. There was little difference between the plot sprayed with Genite-923 alone and the plot which received dormant oil followed by Genite-923, although some differences might have been observed if it had been possible to continue the experiment for a longer period of time.

Compound 1303 also showed considerable promise. The mites did not build up to significant numbers until July, at which time the plot required retreatment. This has been the first phosphate compound—in tests made over the past several years—which has shown an ability to kill the overwintering eggs of European red mite.

Of the materials which were effective in the experiment, only Genite-923 is available for use by growers at the present time. The other materials are, as yet, experimental and will be further tested in the coming season.

*Harold F. Madsen is Assistant Entomologist, University of California, Berkeley.*

*The above progress report is based on Research Project No. 806.*

## RUSSET

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during April 1955 was 6F below normal and the temperature in a shelter near the orchard dipped to 28F on the morning of April 2. Frost injury was evident by blackened centers in 80% to 95% of the flowers and small fruits. It is also possible under these low temperature conditions that a spray may cause more russet than a dust.

Bentonite dust, used as the carrier for streptomycin in the 1953 and 1954 trials, appeared to have some russet-reducing properties again in 1955. In the earlier experiments, fruit from trees dusted with streptomycin-bentonite had less russet than that from trees given no blight control treatment.

In the 1955 studies, three applications of a 200-mesh bentonite dust were superimposed on a portion of the check, the copper, and certain of the streptomycin plots in the three test orchards. The bentonite was applied at 10- to 12-day intervals during the blight control period.

In the Sacramento Valley orchard, fruit from trees in the copper-lime plot which were dusted three times with bentonite had less russet than fruit dusted only with copper-lime. This was the orchard where fruit subjected to either the copper-lime or streptomycin applications developed more russet than that from the check trees receiving no blight control treatment. However, the bentonite did not reduce the amount of fruit russet in the check plot. Out of seven other comparisons with and without ben-

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clover was very competitive in Field No. 5 where it amounted to 69% of the forage in the check and 71% in the fertilized treatments.

## Forage Quality

The feed composition of the 1953 samples was analyzed. In every field, crude protein was increased. The phosphorus-fertilized areas averaged 13.1% protein compared to 9.0% for the check treatment. Total protein per acre was increased from two times in Field No. 3 to nine times in Field No. 4.

The quality of the feed prior to the introduction of the clovers and use of fertilizer—at the stage of maturity when sampled—was at a nutritional level that would require feeding a protein supplement.

The values for crude fiber, fat, ash, and calcium were not consistently affected by fertilization.

The phosphorus level of feed grown on this range soil—when unfertilized—is inadequate for livestock well-being. The range improvement operations of seeding legumes and phosphorus fertilization increased the phosphorus in the feed significantly. This was in large part the result of the response of the clovers, since their phosphorus content was increased more than the resident annuals.

## Effect of Livestock Use

The relative difficulty of establishing seeded forage species encountered in areas with an herbaceous cover is primarily due to that cover. Resident annuals are present in most seedings, and these annuals develop faster than most seeded species. A heavy concentration of stock in early spring not only reduces this competition by weedy annuals but converts them into meat or wool when palatable and nutritious.

Field No. 1 was very weedy in the seeding year, so two enclosures—12' square—were placed in the field. The clovers in the enclosures suffered from the severe competition of the resident annual grasses, but in the open field a good stand of seeded clovers developed the first year.

The grazing load of better than three animal-unit-months per acre in early spring favored the legumes. The continuation of this practice for three seasons resulted in the dominance of sub-clover over rose and crimson clover. In the phosphated strips in Fields Nos. 2, 3, and 4, which were relatively clean, deferring the grazing had no unfavorable effect on the clovers.

In the unfertilized strips in Fields Nos. 2 and 4, and in both the fertilized and unfertilized strips in Field No. 5,

an early grazing during the seeding year would have been helpful to the clovers.

Since it is almost impossible to have range land in a Mediterranean-type climate completely free of weeds before seeding, a concentrated grazing by livestock or a mowing is usually imperative the first spring.

The use of a mixture of annual clovers of varying growth habit allows much greater latitude of adjustment of livestock use than is otherwise possible.

*William A. Williams is Assistant Professor of Agronomy, University of California, Davis.*

*R. Merton Love is Professor of Agronomy, University of California, Davis.*

*John P. Conrad is Professor of Agronomy, University of California, Davis.*

*The above progress report is based on Research Project Nos. 1526, 1194, and 1317.*

*The range improvement studies reported in this article were conducted with the assistance of the Franceschi Ranch and the Chamberlain Ranch near Lincoln, Placer County.*

## WALNUTS

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at a rate to exceed four pounds of actual material per acre. This dosage is sufficiently high to give adequate control of the codling moth.

Where air carrier sprayers are employed—at a maximum ground speed of 1½ miles an hour—the following mixture in combination with a suitable aphicide and applied at the rate of 200 gallons per acre has been effective:

DDT, 50% wettable powder.....	20 lbs.
DDT depositor .....	2 lbs.
Light summer oil emulsion containing 80% oil	3 gals.
Water .....	500 gals.

Experiments conducted with a dry depositor substituted for the light summer oil emulsion gave inconclusive results.

Where treatments are applied with a conventional sprayer, the following spray mixtures in combination with a suitable aphicide are effective:

1. Standard lead arsenate.....	2 lbs.
DDT, 50% wettable powder.....	½ lb.
Safener-commercial basic zinc sulfate product containing 50% zinc expressed as metallic .....	½ lb.
Light summer oil emulsion containing 80% oil .....	¼ to ⅓ gal.
Water .....	100 gals.
2. DDT, 50% wettable powder.....	¾ lb.
Light summer oil emulsion, containing 80% oil .....	¼ to ⅓ gal.
Water .....	100 gals.

Regardless of the formula used, it was necessary to slurry the dry ingredients and add them to the spray tank with agitator going and the tank one-third to one-half filled with water. The oil was added when the tank was three-fourth or more full.

The finished spray mixture must be applied as a thorough coverage spray. For large trees, upward to 1,000 gallons or more of spray are needed per acre.

*A. E. Michelbacher is Associate Professor of Entomology, University of California, Berkeley.*

*Earl Oatman is Research Assistant in Entomology, University of California, Berkeley.*

## RUSSET

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tonite, five showed less russet on the bentonite-dusted fruit, but the differences were not significant.

Further tests using more and varied applications will be needed to determine more accurately the effect bentonite may have on russetting.

Insecticides have come under suspicion as possible russet-causing agents. Therefore, in 1955 a number of commonly used insecticides were tested in the Sacramento Valley orchard. A block of about 100 mature trees was given the standard lime sulfur, wettable sulfur cluster-bud spray and the 10-90 copper-lime dusts for blight control. Single applications and various combinations of nine insecticides were applied at the recommended time and concentration for each. Each treatment was applied to a set of four trees.

As seen in the table in column 1 on page 9, none of the four miticides applied either alone or in combination with parathion had any effect on russetting. DDT, lime sulfur, wettable sulfur, and TEPP also were shown to have no influence on the amount of russetting.

*Richard W. Harris is Assistant Professor of Pomology, University of California, Davis.*

*William H. Griggs is Associate Professor of Pomology, University of California, Davis.*

*The studies concerning streptomycin treatments and fruit russetting in the Sacramento Valley orchard were made in Professor Peter Ark's plots.*

*The above progress report is based on Research Project No. 1450.*

## ALFALFA

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of the available control measures. Best results can be obtained if all alfalfa growers in an area cooperate in combating the pest so that heavy infestations are not left untreated to serve as a reservoir for reinfestation. Poor timing, inadequate applications, and negligence in watching the development of the pest will reduce the effectiveness of the control measures and in some instances may even aggravate the problem by disturbing natural control factors.

*Ray F. Smith is Associate Professor of Entomology, University of California, Berkeley.*

*John E. Swift is Extension Entomologist, University of California, Berkeley.*

*Jack Dibble is Extension Field Technologist, University of California, Berkeley.*

*The spread of the aphid reported above has been followed by co-operative surveys conducted by the University of California, the State Department of Agriculture, and the County Farm Advisors and Agricultural Commissioners.*