Defoliation for Early Pruning

Bartlett pears defoliated without tree injury by application of caustic dust in tests on most efficient use as defoliant

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The principal ingredient of a lime nitrogen fertilizer—calcium cyanamide—has initial toxic or caustic properties, in the presence of moisture, that cause plant leaves to abscis.

For several years the lime nitrogen fertilizer—containing 21% nitrogen and 70% hydrated lime equivalent made from limestone, coal, and air-nitrogen—has been used to defoliate such field crops as cotton, soybeans, potatoes, tomatoes, and ramie.

Some pear growers—in certain districts of the state—make a practice of applying 5–8 gallons of lime sulfur per 100 gallons of spray in late October for the main purpose of removing the leaves so part of the pruning can be accomplished before the winter rains and fog. No apparent harm has come from this practice.

In cooperation with several Bartlett pear growers defoliation trials with the lime nitrogen fertilizer—the only defoliant applied as a dust—were made during 1957 to determine the most efficient use of the material.

In the manufacturing process, the defoliant—Aero Cyanamid, Special Grade—is ground to a fineness that makes it suitable for application by dusting equipment. The degree of injury to the leaves—which results in abscission—is comparable to the rate of application. The manufacturer recommends rates of application ranging from 30–40 pounds per acre for defoliating cotton, 75–125 pounds per acre for killing potato tops and 100–125 pounds to the acre for the defoliation of apple and pear nursery stock. The manufacturer also suggests applying the dust when the foliage is wet with dew or a short while before a dew is likely to occur.

Studies in Yuba, Mendocino, and Sacramento counties were initiated in four Bartlett pear orchards where the defoliant dust was used during October and November of 1957. The dust was applied with ground-rig dusters under varying conditions. The foliage on the trees ranged from summer green to turning or partly yellow, and from dry to wet with dew, rain, or water spray. The rates of application were 40 pounds and 50 pounds per acre as single applications. One block received two dusts of 40 pounds per acre per application.

Dates of leaf fall were recorded for the different plots. The trees were checked to see if the defoliation stimulated them to produce late bloom or affected the time of bloom the following spring. To determine whether or not the defoliation dusts affected the 1958 fruit set, blossom clusters on two large branches were counted on 10 trees in each of the plots in the Yuba County orchards during April. Later, counts were made of the fruit which had developed on those same branches.

The first dusts were applied in the Yuba County orchard Number *1* on October 22 before the leaves started turning yellow. Because there was no dew that morning, one block of trees was sprayed with approximately three gallons of water per tree with a speed sprayer just before the dust was applied. In an adjoining block the dust was applied to dry foliage. In the block which was sprayed with water before dusting, most of the leaves were down in 14 days—by November 5. This allowed pruning 20 days earlier than following normal leaf fall. The 5-day delay in the defoliation effect which resulted in the plot where the dust was applied to dry foliage emphasizes the importance of applying the dust when the foliage is wet.

Delaying the time of dusting from October 22 until October 26 and 30 in the Yuba County orchards did not shorten the time between application and leaf fall, but simply delayed the time when most of the leaves were down.

In the Mendocino County orchard, where the growing season is shorter than in the Sacramento Valley, the dusts were not applied until after the leaves started turning yellow. Although most of the leaves were down in from 15 to 17 days following dusting, the leaves fell in the dusted blocks only 4–8 days earlier than in the control blocks. The dusts should

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The Effect of Dust Defoliant on Bartlett Pears, 1957[a]

Orchard county and size	Condition of trees	Date of application	Lbs/acre	Weather and foliage conditions	Date leaves started falling	Date most leaves down	Date all leaves down	Date full bloom 1958	Frt set /100 fl clust. 1958
Yuba									
1 (5 a)	Vigorous, green leaves	Oct 22	50	Low humid. no dew, water spray 3 gal/tree	Oct 27	Nov 5	Nov 12	Mar 26	24.3
1 (2.5 a)	"	Oct 22	50	Low humid. no dew, leaves dry	Oct 31	Nov 10	Nov 17	Mar 25	28.4
1 (7 a)	"	Oct 30	50	High humid. heavy dew	Nov 12	Nov 17	Nov 22	Mar 25	26.2
1 (10 a)	"	Check			Nov 13	Nov 25	Dec 2	Mar 25	35.7
2 (18 a)	"	Oct 26	50	Fog, heavy dew	Nov 3	Nov 10	Dec 18	Mar 24	40.2
2 (10 a)	"	Check			Nov 14	Nov 26	Dec 4	Mar 24	17.8
Mendocino									
1 (12 a)	Mod. vigor, some	Oct 25	40	Wet, misting	Nov 4	Nov 9	Nov 12		
1 (8 a)	leaves turning	Oct 25	50	Leaves drying	Nov 4	Nov 9	Nov 12		
1 (20 a)	yellow	Oct 26	50	Heavy dew	Nov 4	Nov 10	Nov 13		
1 (6 a)	"	Oct 26	50	Nearly dry	Nov 6	Nov 13	Nov 16		
1 (4 a)	"	Oct 25 and Oct 26	40 40 80	Wet, misting Dry	Nov 4	Nov 9	Nov 12		
1 (10 a)	"	Check			Nov 12	Nov 17	Nov 22		
Sacramento									
1 (20 a)	Vigorous, leaves	Nov 6	50	Heavy dew, light frost	Nov 17	Nov 21	Nov 26		
1 (10 a)	turning yellow	Check			Nov 26[b]	Nov 30	Dec 2		

[a] Applied with ground-rig dusters.

[b] A killing frost occurred on the morning of November 25.

when the wet plots *B*, *D*, and *F*, and the intermediate plots *C* and *E* were pooled and the treatment value was calculated, the difference was highly significant.

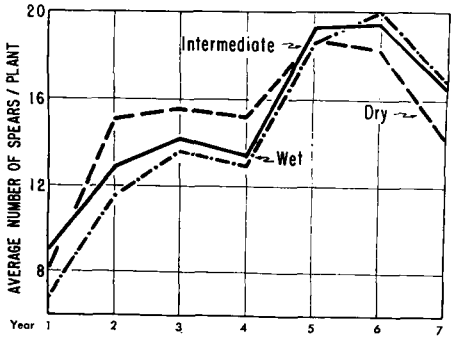
The mean number of spears per crown over the 7-year period—as given in the graph—indicated no significant difference occurred for the irrigation treatment. However, in the first four years, more spears were produced on the dry plots than on the irrigated treatments. Likewise, more spears were produced on the intermediate than on the wet treatment. In the fifth and sixth years the reverse became apparent. In contrast, the size of spear was definitely related to irrigation.

In this experiment, only the spears above 3/16" in diameter were measured. Due to the gradual decline in spear size with the advance in age of the plants, a larger proportion of spears were below the minimum size from the dry plots.

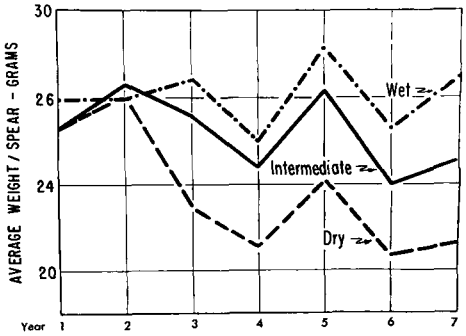
Just why more spears are produced on the dryer plots is not known.

On the basis of the results obtained in this long-term experiment it appears that asparagus can utilize about 20" of irrigation during the growing season in addition to the normal 16" rainfall.

Effect of irrigation treatments on average number of spears per plant.



Effect of irrigation treatments on the average weight per spear.



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DEFOLIATION

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have been applied earlier for practical results. The trees in the block receiving the double application of dust did not drop their leaves more quickly or thoroughly than those receiving only a single one.

The dust was also applied relatively late—November 6—in the Sacramento County orchard. Most of the leaves were down in 15 days following dusting, and this allowed the pruning operation to start nine days earlier than in the control plots. A killing frost occurred the morning of November 25 which speeded up leaf drop in the control plots. Leaf fall sufficient to allow pruning often occurs as late as mid-December in that particular orchard.

There was no stimulation of fall bloom in any of the four orchards where the dust was applied, indicating that the dust could have been applied at least a few days earlier without harmful effects.

The dust applications had no effect on the blooming dates in 1958. However, there was some variation in the fruit set and crop in the different plots. The differences seemed to be associated with the presence of pollinizing varieties rather than to dusting treatment.

The defoliating dust should be applied only to that portion of an orchard to be pruned before the time of normal leaf fall. Application of 40–50 pounds of the dust to the acre should be made when the leaves are wet with dew, rain, or water spray. Most of the leaves should be down in approximately two weeks.

In the major pear districts of California it is probably safe to apply the dust between October 15 and October 25. To minimize any possible harmful effects of early defoliation, the dust treatments should be rotated to different blocks each year. Part of the cost of the dust—a lime nitrogen fertilizer—can be subtracted because of its fertilizing value.

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E. J. Layman, Di Giorgio Fruit Corporation, and R. V. Newcomb, Orchard Consultant, assisted in conducting the defoliation tests.

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PROCESSING

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ating season, packing in larger containers tends to result in lower processing cost per pound.

The effect of plant size on costs is illustrated in the graph at the right. A 5,000-pound-per-hour capacity plant packing 10-ounce cartons, for example, would have average costs of $18.29 per 1,000 pounds of product while a 10,000-pound plant would have average costs of only $15.59 per 1,000 pounds, a difference of $2.70 per 1,000 pounds of product. Successive 5,000-pound increments in plant capacity decrease average costs by $0.90, $0.44, and $0.27 per 1,000 pounds with average processing cost becoming $13.98 at an hourly capacity of 25,000 pounds. Most of the economies of scale are realized by plants of 10,000-pounds-per-hour capacity and very little additional economies are obtained by plants of capacity of over 15,000 pounds per hour. The decrease of average cost as plant size increases is due to a combination of the ability of a large plant to make more efficient use of its building, equipment, supervisory personnel, and so forth, and the use of various cost-reducing techniques which are economical only in large plants.

Increasing the number of hours a plant of given capacity rate operates per year, serves to spread many fixed and partially fixed costs over a greater quantity of product, thereby reducing the average processing cost. Cost calculations made for various lengths of operating season indicate that substantial savings can be obtained through increasing operating hours. This effect is most obvious in the shortest seasons and becomes smaller as hours operated become greater.

Berry quality—as measured by the quantity of berries that must be removed from the inspection belt by quality-sort labor—affects total and unit processing costs in two ways. Poor berry quality, for example, increases the costs of sorting a given quantity of raw product. Furthermore, to obtain a given quantity of output a larger quantity of raw product must be handled.

In a plant of 10,000-pounds-per-hour input capacity operating 1,000 hours per season, for example, a sortout of 5% of the berry input volume would cost about $10,500 less per season than with a sortout of 20%. If figured on the basis of 10,000 pounds of product output per hour, rather than on a berry input basis, total costs per season would be approximately $33,000 less per season with 5% as compared with 20% culls. These calculations assume that the raw product is purchased on a quality-grade basis such

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