ulated at 60°F during a 12-hour light period and 45°F during the dark period. The low-temperature treatments were given for 1, 2, 3, 4, and 5 days and results compared with untreated plants remaining in the greenhouse. Blanking increased from 11.5% for the untreated plants to 47% for the 5-day treatment as shown in table 2. Grain yield over this same series declined from 26.2 to 15.3 grams per plant.

The studies with the certified fields mentioned earlier suggested that local environmental conditions or management may have been the cause of differences in panicle blanking. Low temperatures, however, occur over large areas and it would appear difficult to ascribe differences in blanking from one field of rice to another to low temperatures alone. Low temperatures must occur during specific stages of pollen development in the panicle, so differences from field to field are possible. Fields are planted at different times and develop at different rates because of differences in fertility and other conditions. Therefore, fields of the same variety could reach the sensitive stage at different times.

Water temperatures may be a factor in the blanking problem. Minimum night temperatures of the water flooding the field are higher than the minimum air temperatures. The developing panicle may be protected somewhat by this 3 to 5°F warmer temperature of the water. Deeper water results in slightly higher minimum water temperatures and covers the growing panicle a little longer. Water depth, therefore, may also be related to blanking. Studies at Davis indicated a somewhat higher percentage of blanking with water depth less than 2 inches, but results with deeper levels up to 8 inches were variable and inconclusive in 1971. Further studies will be conducted on water temperatures and depth in 1972.

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TREE SHAKER THINNING OF FRENCH PRUNES

Mechanical thinning does not reduce the need for annual dormant pruning. Pruning reduces the potential crop, but more importantly it is essential for the renewal of fruit wood and in maintaining the general shape and vigor of the tree. However, this study showed that in a heavy set situation, mechanical thinning is a tool that can be used to increase average fruit size, decrease the percentage of under-size fruit, and *reduce* tree breakage from over-cropping.

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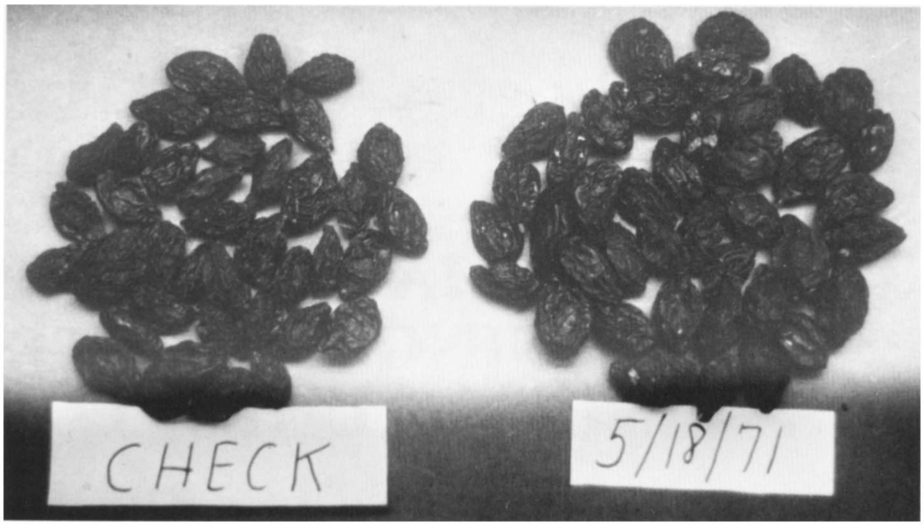
OVER-CROPPING AND SMALL FRUIT size are major problems in French prune orchards in California. Over-cropping can cause shoot die-back and is the most important factor contributing to small fruit size. Over-cropping can usually be prevented by adequate annual pruning. In years when the trees are not dormant-pruned or in years of extremely heavy fruit set as in 1970, fruit thinning is necessary to reduce overcropping.

Dinitro blossom-spray-thinning is one way to reduce the crop, but the spray must be applied before the set is known. A further disadvantage is that the degree of thinning can vary, depending upon uncontrollable factors such as tree vigor and weather conditions, and thus there is a danger of over-thinning. For these reasons, dinitro-blossom-spray thinning has not been widely used by growers.

Another way to prevent overcropping is to mechanically remove some of the fruit after the set is known. In the series of trials described here, two mechanical



Prune fruit size comparison between mechanically thinned (right) and unthinned (left) trees. There were 40 fruit in each pile for this photo and fruit size of the unthinned trees was 91 fruit per pound, as compared with 69 fruit per pound from the thinned trees.

tree shakers were used in several Butte and Sutter County orchards to reduce the number of fruit on the trees. The results of this thinning performed between May 11 and May 19, 1971 are shown in the table.

The total number of fruit per tree at thinning time was estimated by removing all of the fruit from a typical tree in the trial area. Counts of the prunes removed in thinning were then made to obtain the fruit removal percentages shown in the table.

The data indicate that the amount of fruit which should be removed by thinning varies, depending on the initial set and the ability of the orchard to size that crop. For example, in orchard A and orchard B the percentage of fruit removal was about the same. Orchard A, with a lighter potential crop, was over-thinned, whereas orchard B, with a larger potential crop, was thinned to near its maximum return to the grower. Over-thinning is indicated in orchard A by the large fruit size. Under the present pricing system, there is no economic incentive to produce prunes which average larger than around 70 dry fruit per pound.

Orchards similar

Orchards C and D were very similar in crop and fruit size as seen by comparing the data for the unthinned trees. Twenty-two per cent fruit removal in orchard C appears to have been somewhat less than desired, since the average fruit size of the thinned trees was only 82 dry prunes per pound. In orchard D, good results were obtained where 32 per cent of the fruit was removed and the average size at harvest was 69 dry prunes per pound.

Thinning effects

In all cases, thinning substantially reduced the percentage of undersized fruit at harvest. Using a $^{25}/_{32}$-inch screen, the undersize fruit in orchard A was reduced from 37 to 5%, in orchard B from 42 to 16%, in orchard C from 34 to 24 %, and in orchard D from 32 to 7%.

Fruit injury was apparent on the fruit remaining in the trees shortly after the thinning. However, the percentage of off-grade fruit at harvest was not affected by the mid-May mechanical thinning treatments.

As expected, fruit-soluble-solids were increased and the drying ratio was improved by thinning. This, along with the increased size of the fresh prunes, resulted in increased dried fruit size.

Previous thinning work has shown that the earlier the thinning, the greater the increase in fruit size. Mechanical thinning earlier than mid-May might be desirable, but additional study of thinning in this time period is needed. This will be explored in mechanical shaker thinning research planned for this season. Later thinning, on the other hand, would be expected to produce less favorable results than those obtained in these trials.

Mechanical tree-shaker thinning has been shown to be an effective means of increasing French prune fruit size. The number of fruit that any given tree can size is dependent upon many factors, including tree age, soil type, climate, and management practices. But in general, in an overset situation, the removal of 25 to 40 per cent of the prunes in mid-May should significantly increase fruit size and per-acre- return to the grower. It is up to the individual grower to determine the amount of crop that he wants his trees to support and to adjust that crop accordingly.

In young trees, 15 or less years in age, fruit size is not generally a problem but over-cropping can cause serious limb breakage. In this situation mechanical-tree-shaker thinning may not be needed to improve fruit size, but could significantly reduce tree breakage.

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The trunk shaker was provided by Orchard Machinery Corporation, Yuba City. Fruit was processed and graded by Sunsweet Dryers and Sunsweet Growers, Inc. Grower Cooperators were Robert N. Kells, Libby McNeill & Libby, Lewis E. Reynolds, Joseph C. Ruzich, and Sam Zall.

RESULTS OF THINNING WITH MECHANICAL TREE SHAKERS TO REDUCE THE NUMBER OF FRUIT ON PRUNE TREES IN BUTTE AND SUTTER ORCHARDS BETWEEN MAY 11 AND MAY 19, 1971

Orchard		Fruit removal	Yield	Dry prune size	Return per acre†
		%	dry tons	ave. ct/lb.	$
A	Unthinned	–	2.7**	90**	152
	Thinned	36	1.6	62	164
B	Unthinned	–	3.4	100**	148
	Thinned	38	2.7	78	250
C	Unthinned	–	2.9	92	82
	Thinned	22	2.1	82	128
D	Unthinned	–	2.9	91**	74
	Thinned	32	2.2	69	232

† Based on Sunsweet's 1970 prices and 1970 reserve pool values and deducting harvesting, rying, sorting, handling, and thinning costs.
** Results for unthinned and thinned significantly different at the 0.01 level.