79 N-3

Project Number 79-N3
Project Researcher: Labavitch
Project Title: Almond Qualtiy Harvest and Post Harvest

Almonds - Harvest and Postharvest

Annual Report

1. Objectives:

This project had three objectives. The first, and most important, was to evaluate the "early harvest" concept for almonds and to develop a harvest index that growers can use to determine the earliest time at which a successful harvest can be carried out. In addition, the previous year's work on concealed damage (CD) was repeated in order to be more certain about what moisture levels were unacceptable for almond storage. Finally, a first attempt was made to carry out ambient air drying of green, in-hull almonds.

2. Interpretive summary:

The early harvest trial run in southwestern Fresno County gave promising results. Non-pareil trees were efficiently harvested at the time when all nuts showed at least some split along the ventral suture (Figure 1). This was three weeks before the "normal" harvest time for these trees. The nuts dried sufficiently for hulling and storage after 1-2 weeks on the orchard floor (Figures 2, 3, and 4). By this time the kernels had reached full size (Figure 5) and their composition of sugars, oils and protein was essentially that of fully mature almonds. Taste panel studies are now being carried out to determine consumer acceptability of early harvested nuts. These results are based on a single study in one California location. The study will be repeated and carried to other almond growing locales. In spite of these limitations, the results suggest promise for the avoidance of postharvest losses of almonds (chiefly to NOW and CD) by harvesting prior to the time that almonds are fully dry on the tree.

The study on kernel moisture levels and CD produced the same results as the 1978 study. Nuts that are to be exposed to temperatures of 120°F and higher are likely to show CD if kernel moisture content is greater than 13-15%. Kernels with less than 10% moisture should remain free of CD even at elevated temperatures.

The test of forced, ambient air drying of almonds was carried out on freshly-harvested Thompson almonds in Wasco in mid-September. Nuts (both hull and kernel) were dried (Figure 6) by pulling air through a stack that had been placed over a perforated duct. Problems with sticktights (Figure 7) and high levels of mold (Figure 8) suggest the need for care in choosing to dry almonds in this way. Future studies will attempt to define more clearly the conditions under which forced-air drying of almonds should be tried.

3. Experimental Procedures:

Early harvest test: Sets of trees were harvested at weekly intervals beginning 5 weeks prior to the projected harvest for the block. Samples of nuts were taken immediately upon harvest and then at weekly intervals samples were taken from the nuts that were allowed to dry on the ground. These samples were tested in a number of ways:

A) Moisture content was determined by drying kernels and hulls in a forced air oven at 95°F. Drying was judged to be complete when a constant weight was reached.

B) Composition

1) oils were measured in ether extracts of ground samples of dry kernels. Individual fatty acids were measured by gas chromatography.

2) sugars were measured in 80%-ethanol extracts of the ether-extracted kernel samples. Sugars were measured colorimetrically and by gas chromatography.

3) protein was calculated from N content in the extracted residues. N was measured according to a procedure developed by Dr. R. Carlson, UCD Pomology.

C) Hullability was determined by passing small samples of dried, in-hull almonds through a small huller at the UCD Pomology Field Headquarters. The weight of cleanly-hulled kernels was determined for each sample tested.

The efficiency of harvest was determined by counting the nuts remaining in the trees after each harvest. Hull split was determined by eye.

CD Test: All procedures were as described in last year's report.

Ambient Air Drying Test: A metal pipe (1 ft. diameter) was perforated and blocked at one end. A fan was fitted to the other end so as to give an air flow (at the stack surface) of 10 cfm/sq. ft. A stack of freshly harvested Thompson almods was formed. Initial samples were taken for moisture determination (carried out at the Tenneco West Lab). Samples of almonds were taken from the surface of the stack and from 1.5 ft. deep in the pile at 2 day intervals.

Mold and sticktights were evaluated visually.

4. Results: Figures 1 - 8.

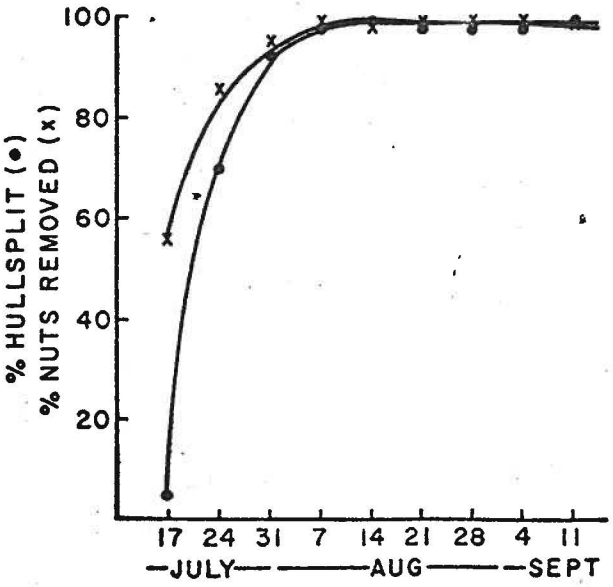

Figure 1: Percent nut-removal is based on counts of nuts on the ground and remaining in the tree following shaking. A hull is "split" when there is a gap along the ventral suture. (Data courtesy of Joe Connell, Wilbur Reil, and Toynette Johnson.)

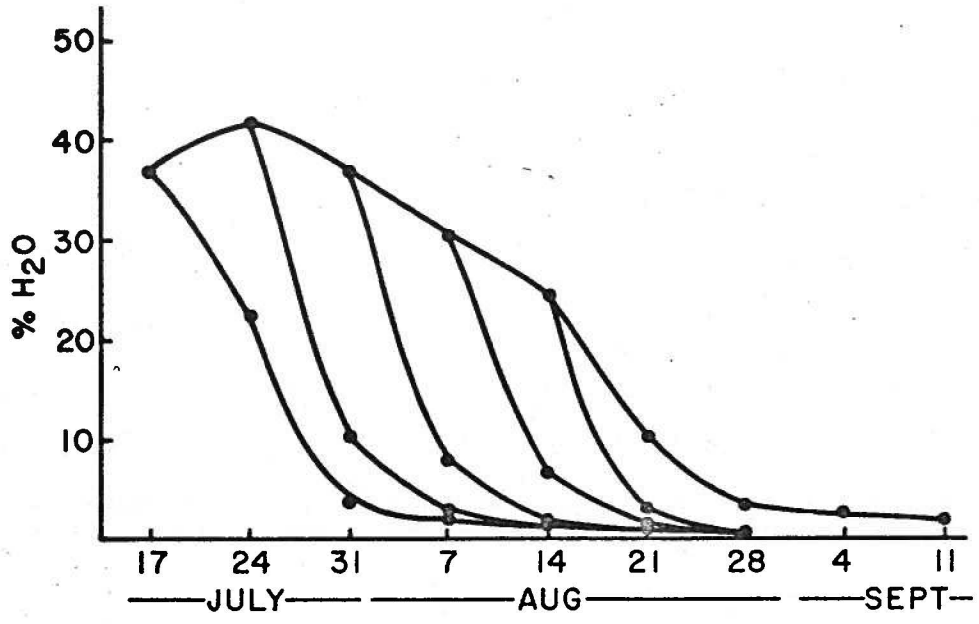

Figure 2: Moisture content of almond (Non-pareil) kernels at the time of harvest (upper curve) and after nuts have been allowed to dry on the ground (curves extending downward). Sampling of nuts in trees and on the ground was done weekly. Moisture content is expressed on a fresh weight basis.

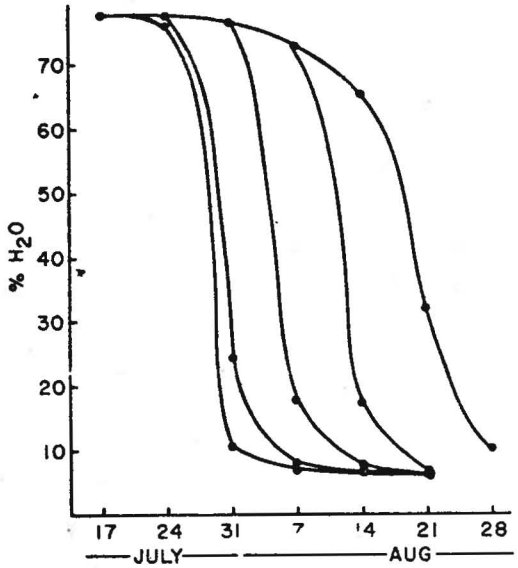

Figure 3: Moisture content of almond (Non-pareil) hulls at the time of harvest (upper curve) and after nuts have been allowed to dry on the ground (curves extending downward). Sampling of nuts in trees and on the ground was done weekly. Moisture content is expressed on a fresh weight basis.

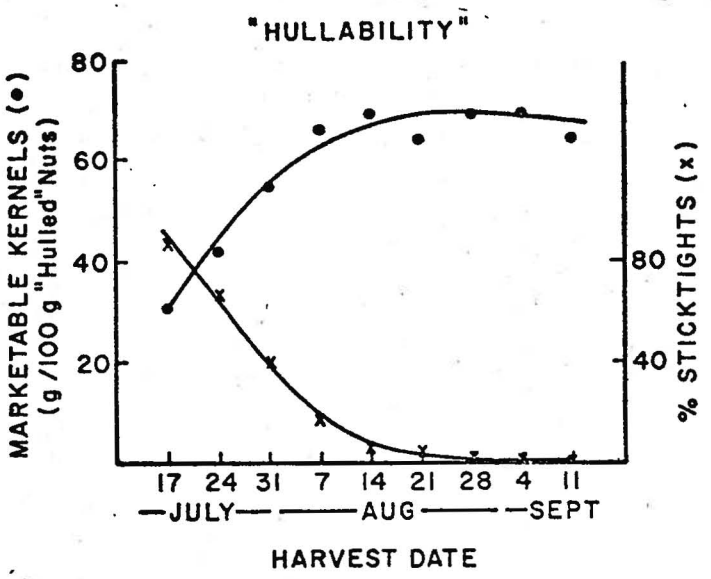

Figure 4: "Hullability" was determined by passage of small samples through a huller. This was not done on a commercial scale. All "hullability" tests were run at the end of the season (i.e: after nuts had fully dried on the ground). Data courtesy of Wilbur Reil and Toynette Johnson.

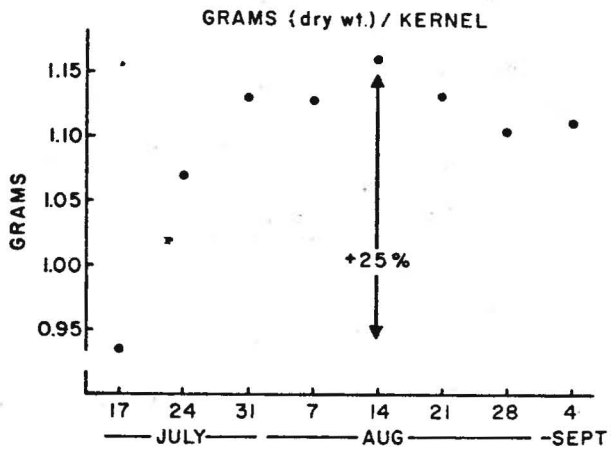

Figure 5: Dry weight of Non-pareil almond kernels harvested on the dates indicated.

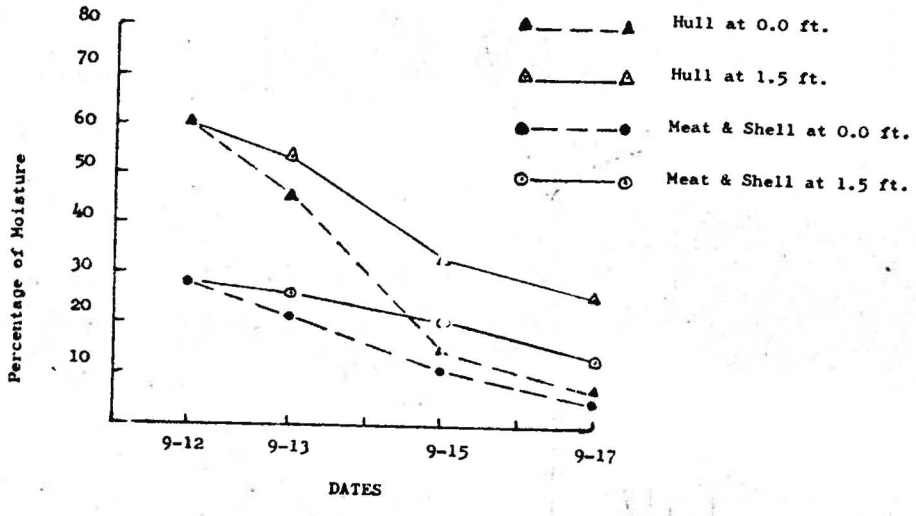

Figure 6: Moisture content (dry weight basis) of Thompson almonds at the start of drying (9/12) and after the start of ambient air drying (9/12, 9/15 and 9/17). Samples for analysis were taken from the stack surface and at the 1.5 ft. depth. Data courtesy of Mario Viveros.

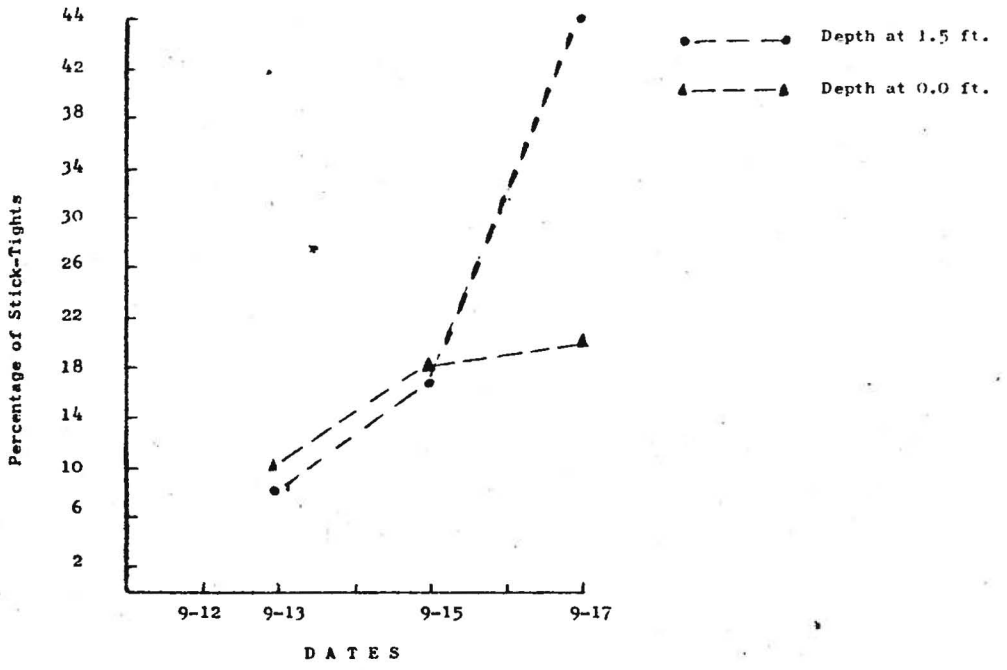

Figure 7: Sticktights in ambient air dried almonds. Data courtesy of Mario Viveros.

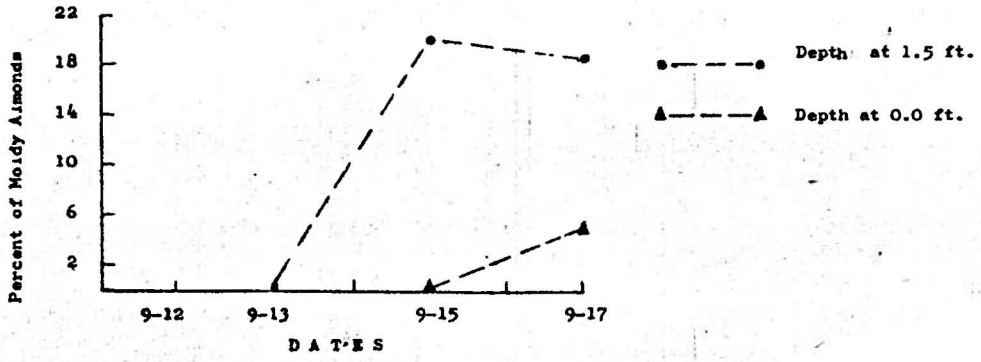

Figure 8: The rise in mold infestation during ambient air drying. Data courtesy of Mario Viveros.

5. Discussion:

At this point, it appears to be feasable to carry out an early harvest. The study must be repeated and expanded. It is vital that harvested nuts be able to dry on the ground. Drying rates could vary across the state and with climatic conditions and various densities of orchard canopy. It is also quite important that any harvest index developed be useful statewide. This year's work (1980) will attempt to supply important data.

Jim Thompson and I intend to repeat this year's drying test using a set up that would permit higher air flows and, thus, give more rapid drying. This may reduce the mold problem. In view of the difficulty with sticktights it is probably important to have complete hullsplit prior to stacking green almonds.

6. Publications: None to date. Following taste panel evaluations Joe Connell and I intend to put the information together into a "popular publication" article on the "early harvest."