Prediction Harvesting Date *in the Palo Verde*

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Harvesting onions for dehydration in California starts in the Palo Verde and Imperial Valleys in May or June, proceeds north, and terminates in the Tule Lake area in October or November. Consequently, processing plants do not operate from November to May. To keep costs at a minimum, it is important not to prepare and staff the plants before the onions will be available to dehydrate. Thus, the problem is to predict far enough in advance the time onions will be available, so that employees and onions can arrive at the processing plant at the same time.

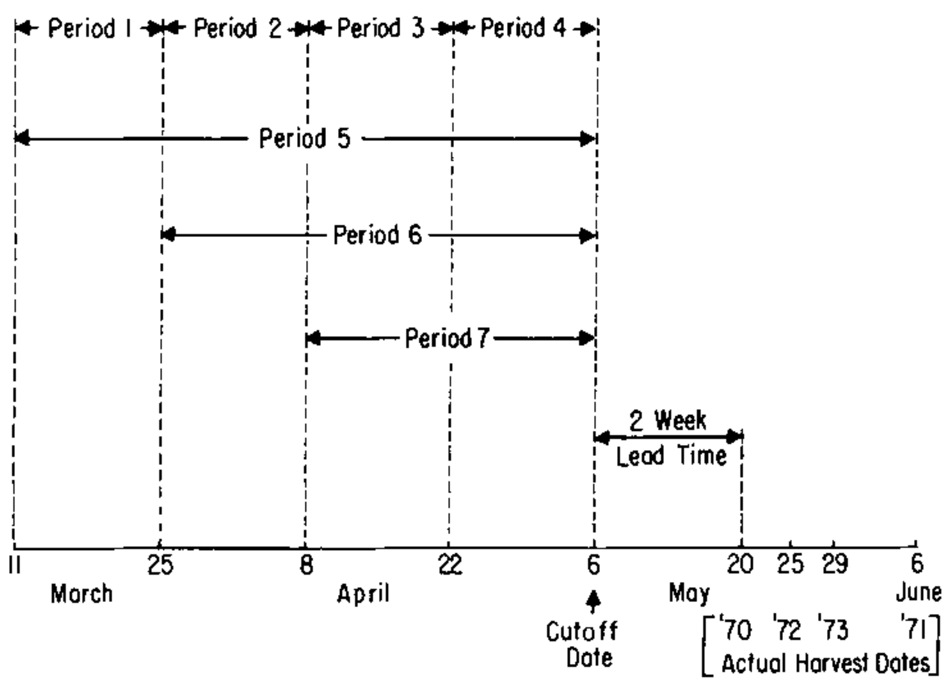
The critical production area is the first one to come into production. In this study, the cooperating processor's first production area was the Palo Verde Valley. Information supplied by the processor indicated that a relationship might exist between air temps in the area and the initial harvesting date. No attempt had previously been made to define this relationship in a predictive model. A restricting factor in attempting to formalize the relationship was the 2-week lead time required to prepare and staff the dehydrating plant. The lead time requirement meant that for the relationship to be of value in minimizing the untimely staffing of the plant, it had to be operational 2 weeks before the earliest recorded start of harvest in the Palo Verde Valley. The cooperating processor supplied the first dates of harvest for the years 1970-73. In these years, the earliest recorded beginning was May 20. Subtracting 2 weeks for the lead time meant that all the information needed to predict when harvesting would begin had to be available before May 6. Therefore, this date was termed the cutoff date for the model, the date by which all temperature information would be needed.

Air temps were derived from weather records for the Blythe FAA airport, and were averaged over various time periods. The temp indices were: average daily temp (ADT = (daily max temp + daily min temp) / 2), average max temp (MAX), and average min temp (MIN). Additionally, a growing degree-day with a base of 10° C was calculated and summed over the time periods (GDD = ADT - 10; negative values set to 0). The 10° C base was used since below this temp onion growth has been reported to be negligible. Computer programs were used to obtain the averages of the temp indices before the cutoff date and to perform correlation analysis. Graph 1 shows relationships of the time periods. The 8-week period prior to May 6 was divided into 2-week segments; these segments, grouped consecutively or individually, were used as the basis for calculating temp indices. Indices were also calculated from the cutoff date to first harvest in each year studied, but none of these indices were significantly correlated to harvest date.

Correlation analysis of temp indices with date of first harvest yielded a number of high correlation coefficients (table 1). However, only those for average max temp for 2 and 4 weeks before the cutoff date (periods 4 and 7) were significant. Although 1 degree of freedom for R is low, it is compensated for by the high value of R required for significance at the respective probability levels.

Information for 1970 was omitted from the analysis when it was learned that the processing plant had been shut down for 2 weeks because the moisture content of the incoming material was too high for economical dehydration. Proof of the validity of the model is indicated by the fact that the additional 2 weeks corresponded with the date

GRAPH 1. TIME LINE SHOWING RELATIONSHIPS OF VARIOUS TIME PERIODS USED IN CORRELATING TEMP INDICES TO DATE OF FIRST HARVEST FOR CREOLE ONIONS GROWN IN THE PALO VERDE VALLEY.



of the First
of Creole Onions
Valley of California

GRAPH 2. RELATIONSHIP OF AVERAGE MAX TEMP TO FIRST HARVEST DATE IN A SPECIFIED TIME PERIOD. THE EQUATIONS FOR PERIOD 4 and PERIOD 7 ARE $Y = 63.08 - 1.67X$ and $Y = 114.00 - 3.47X$, RESPECTIVELY, WHERE Y IS THE NUMBER OF DAYS SINCE 5/20, AND X IS THE AVERAGE MAX TEMP IN THE SPECIFIED PERIOD.

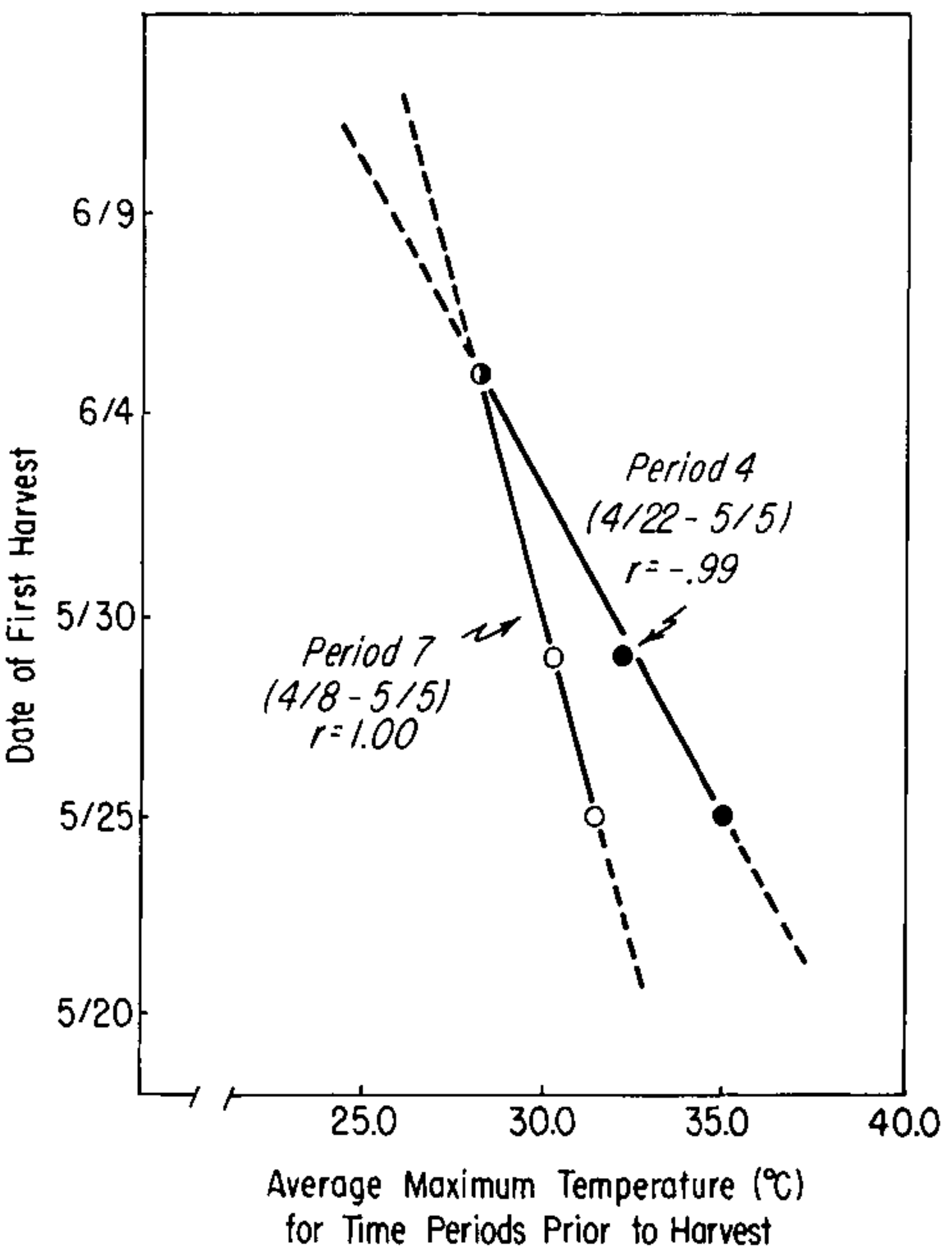


Table 1. Correlation coefficients of temp indices with date of first harvest for 1971-1973 in the Palo Verde Valley

Time period		Temp index			
Number	Dates	ADT	MAX	MIN	GDD
1	3/11-3/24	-.346	-.237	-.620	-.348
2	3/25-4/7	.853	798	.890	.854
3	4/8-4/21	778	.778	.778	778
4	4/22-5/5	-.995	-.999*	-.942	-.994
5	3/11-5/5	-.196	-.099	-.425	-.203
6	3/25-5/5		.024	.078	.185
7	4/8-5/5	-.989	-1.000**	-.912	-.988

*Significant at 5% level with 1 degree of freedom.
**Significant at 1% level with 1 degree of freedom.

that the model predicted plant operations should have begun in 1970.

In addition to providing a useful management tool for scheduling the start of plant operations, the existence of the prediction relationship shown in graph 2 may indicate that a physiological mechanism related to high temp is involved in initiating bulb dormancy. Since there was no relationship between any of the temp indices from May 6 to the beginning of harvest, the mechanism, once initiated, appears to be independent of temp. There are implications that the extension and refinement of the model will permit a prediction of the first day a given field might be harvested for processing. Once the mechanism is understood, control of the initiation of bulb dormancy could be used to equalize the load on the dehydrating plant.

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The authors would like to acknowledge the assistance of Rogers Brothers of California, Inc. in providing data.