Heat Unit System for Predicting Optimum Peanut-Harvesting Time

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The logical time to dig a peanut crop is when the maximum weight of saleable nuts is available on the plants. Digging too early will result in a reduced yield due to large number of the pods being immature. Immature pods lose about one-half of their weight during the curing process. Digging too late, however, can be just as serious; as the yield is reduced due to field losses of the overmature pods. From the yield curve shown in Fig. 1, it can be seen that the digging time for maximum yields extends over a relatively short period. Digging a week too early (157 days) results in a yield reduction of approximately 300 lb per acre while digging a week too late (178 days) results in a 500 lb per acre reduction. The need for a simple, objective method for determining the optimum digging time has been recognized for many years, but research efforts have not as yet produced such a method. Shibuya (7) describes many factors that influence the fruiting process, but makes no attempt to relate these factors to a correct time to dig. Pickett (4) bordered on the problem while describing the composition of developing peanut seed. Shear and Miller (5, 6) have investigated the effect of planting and digging time on shelling percentage, extra large nuts, etc. A method for predicting maturity of corn has been described by Gilmore and Rogers (1) based on daily air-temperature measurements. Th orphanwaite (8) and Katz (2) describe similar methods for determining when to plant and harvest green cumber pears.

Studies were begun by the author in 1958 to collect pertinent information that might be used to develop a method for determining the correct time to dig peanuts.

Materials and General Methods of Experiment

Data were collected during the months of September and October.

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Numbers in parentheses refer to the appended references.

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Therefore, mean growth would be negative and \( \Delta T \) would by definition go to zero. The effective heat unit for day 1 are then:

\[
EHU = T_{\text{max}} + T_{\text{min}} + \Delta T = \frac{68 + 56 - 0 + 62}{2} = 66
\]

The maximum rooting of 85 F is below the \( T_u \), so the term \( T_{\text{max}} - T_u \) will be negative and \( \Delta T \) will by definition go to zero. The effective heat unit for day 2 are then:

\[
EHU = T_{\text{max}} + T_{\text{min}} + \Delta T = \frac{72 + 56 - 0 + 62}{2} = 66
\]

For Day 3, the computations are:

\[
EHU = \frac{80 + 56 - 0 + 62}{2} = 66
\]

It should be noted that proper correction for minimum temperatures above the optimum cardinal point has not been provided for in this equation. In order to check this method on the three years of data collected, it was necessary to establish the lower cardinal temperature \( T_0 \) and the optimum cardinal temperature \( T_{\text{opt}} \) for each species. The literature revealed some very good work by Lehmann (3) on corn, but very little on other crops and on peas. The author set up an experiment in the laboratory to gain some information on the lower and optimum cardinal points for peas.

Effective heat units (EHU) for the first day are computed as follows:

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\text{EHU} = T_{\text{max}} + T_{\text{min}} + \Delta T = \frac{68 + 56 - 0 + 62}{2} = 66
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which would be ±26 EHU using the average daily number for October. By collecting samples daily the prediction could be made accurate to the day.

A nomograph for determining the number of daily effective heat units directly from the maximum and minimum temperatures has been prepared as shown in Fig. 8. For example, to determine the effective heat units for a day with a maximum reading of 66 °F and a minimum reading of 64 °F, place a straight edge connecting these points, as indicated by the dotted line, and read 9 EHU on the middle scale. Note that a day with a maximum of 86 °F and a minimum of 64 °F would also result in 9 EHU. For all minimum temperatures below 56 °F, the 56 °F point on the left-hand scale should be used.

References