

# Influence of Scab on Late Season Nut Drop of Pecans

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## ABSTRACT

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Pecans (*Carya illinoensis* 'Western') were graded for scab (*Cladosporium caryigenum*) on a scale of 1-5 (1 = no scab, 5 = more than 50% of shuck surface infected). Nut drop between 3 August and 20 October 1981 was directly related to scab grades (coefficient of determination of 0.999). Values on this regression line successfully calculated the total percentage of nut drop for sprayed and unsprayed Western trees in plots in 1979 for which scab grades and total nut counts were available. Thus, the relationship between the percentages of late season loss of nuts and scab grades is a general relationship that should be valid every year.

Additional key words: disease losses, *Fusicladium effusum*

Scab incited by *Cladosporium caryigenum* (Ell. et Lang) Gottwald (= *Fusicladium effusum*) on pecans (*Carya illinoensis* Koch.) occurs as lesions on leaves, twigs, and fruit. Demaree (1) and Nolen (5) reported that early season to midsummer infection on nuts could completely retard nut growth and development and the nuts would either fall or remain on the tree all winter.

Diener (2) used a scab grading scale of 0-4 (0 = clean, 4 = more than 50% of shuck surface infected) for grading results of a fungicide test on Success trees in Alabama. Disease indices of 1.46 or higher were directly related to estimated losses caused by premature drop; however, the method of estimating losses was not described.

Hunter and Roberts (3) adopted the 1-5 grading scale presented by Phillips et al (6) but used the percentages of infection as used by Diener (2) to assign grades to infected nuts. This grading system has been used to identify scab-resistant germ plasm and to determine the efficacy of fungicide treatments.

In my studies on the relationship between scab grades and nut size and shellout percent, nuts are collected when the shucks are beginning to split, usually in October. A scarcity of nuts in grades 4 and 5 in heavily infected trees when the nuts are collected has often been noted.

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Therefore, the fate of infected nuts between August and October was studied. Data on the relationship between scab grades and nut drop during this period are presented and the use of this relationship as a means of estimating losses due to scab are presented.

## MATERIALS AND METHODS

Nuts per cluster and lesions per nut were counted on 31 tagged clusters randomly distributed on six 13-yr-old Western trees that had not been sprayed with fungicides. The trees received adequate fertilizer (400 lb ammonium sulfate per acre) and insecticides and irrigation water as needed. Nuts per cluster were counted at approximately weekly intervals from 19 May until 23 September and again on 20 October 1981. Lesions per nut were counted at approximately weekly intervals from 19 May until 23 July, at which time the number of lesions on a number of nuts were too high to count. On 3 August, the 98 nuts still on the trees in the tagged clusters were graded on a scale of 1-5.

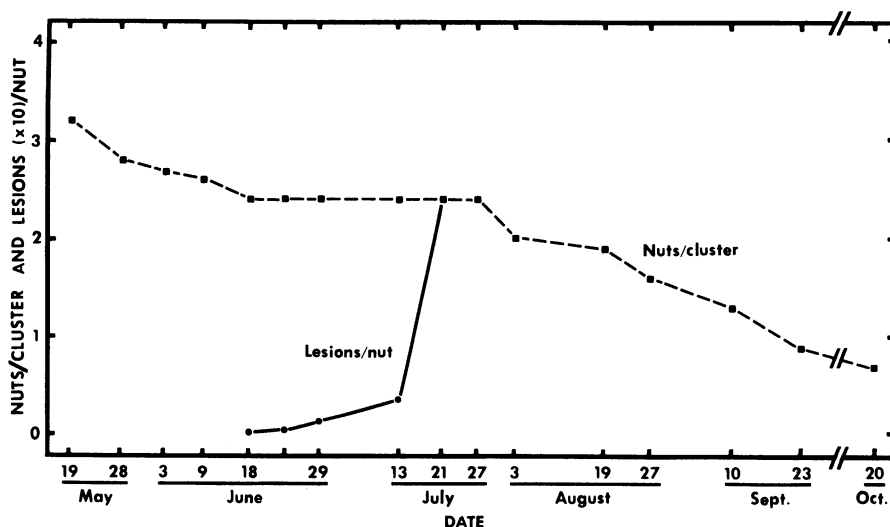


Fig. 1. Nuts per cluster and scab lesions per nut on unsprayed Western pecan trees in 1981.

Also on 3 August, 40 additional clusters were tagged on one of the trees and the 78 nuts in these clusters were graded individually on the 1-5 scale. This total of 176 nuts on six trees was then observed at approximately weekly intervals until 22 September and again on 20 October to determine how many nuts in each grade had dropped. By 20 October, the shucks were beginning to split, indicating the nuts were almost ready to harvest.

The number of nuts in each disease grade that had dropped between 3 August and 20 October was subjected to regression analysis. The validity of the regression formula derived from this analysis was tested by applying it to data obtained in 1979.

The data for 1979 were obtained from an orchard of 47-yr-old Western trees in which a fungicide test had been conducted. This orchard had received the same cultural care as the 13-yr-old Western trees except two rows of trees had received fungicide sprays of hydroxytriphenyltin that had partially controlled scab; another two rows of trees had served as a check and had received a water spray without fungicide. Fungicide sprays were applied on 31 May, 14 June, 5 July, 1 August, and 22 August with an air-blast sprayer at the rate of 27 g of formulated hydroxytriphenyltin (Du-Ter 47.5W) in 53 L of water per tree. Disease grades were made on 12 and 13 August on 50 nuts randomly selected from each of three trees in both the fungicide-sprayed and unsprayed plots. A disease index for each tree was determined by summing the products of each disease grade by the number of nuts in that grade and dividing

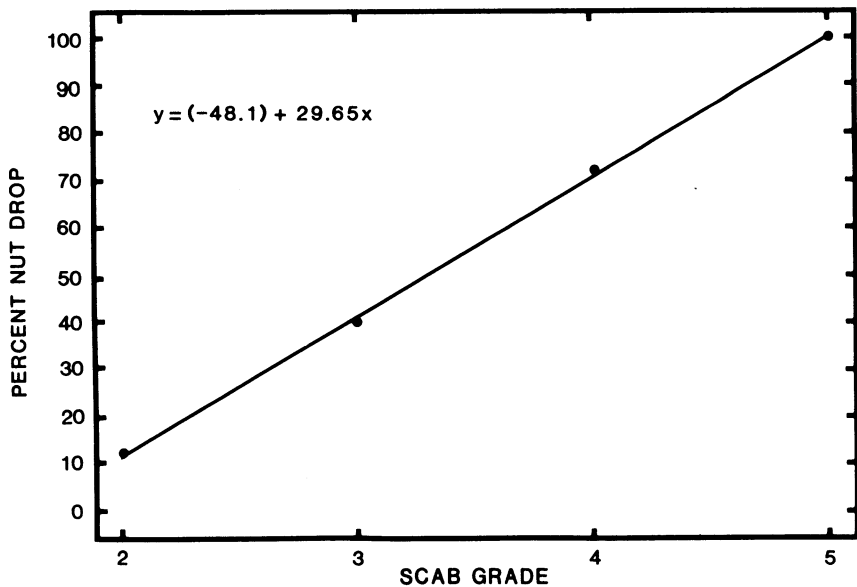


Fig. 2. Regression line showing the relationship of percent nut drop to scab grades from 2 to 5 ( $r^2 = 0.999$ ). Circles are points for actual data from which the regression formula was derived. The scab disease grading scale is: 2 = 1–10% of shuck surface infected, 3 = 11–25% infected, 4 = 26–50% infected, and 5 = 51% or more infected.

the sum by the total number of nuts graded. The mean of the three tree disease indices was determined to give a mean disease index for the sprayed and unsprayed plots.

Ten nut clusters selected at random in each of the trees in which disease grades were made were tagged and the total nuts counted on 15 August and again on 24 September. The nuts matured earlier in 1979 than in 1981 and the shucks were beginning to split on 24 September 1979. From the nut counts made in August and September, the percent of nuts dropped was calculated for the sprayed and unsprayed plots.

## RESULTS

There was a steady nut drop in 1981 between 19 May and 18 June. The drop during this period was referred to by Woodroof et al (7) as the “first” and “May” drops. For the remainder of June and most of July, there was no further loss of nuts until nuts began to drop after a rapid increase in shuck lesions on the nuts in July (Fig. 1). This late summer drop began after 27 July and continued for the rest of the summer.

The scab grades on 3 August and the number of nuts in each grade that

dropped between 3 August and 20 October 1981 had a direct relationship with a coefficient of determination of 0.999 (Fig. 2).

By applying the regression formula derived from the 1981 data to the mean disease index of 4.45 for the unsprayed plot in 1979, a nut drop value of 83.8% was obtained. This compared favorably with the actual nut drop of 82.4% that had been obtained by counting nuts at the time of grading and again just before harvest. Furthermore, a nut drop value of 21.6% for the sprayed plot (mean disease index of 2.35) calculated from the regression formula compared favorably with the actual nut drop of 22.8%.

## DISCUSSION

It has been known for some time that severely infected pecans did not mature but either dropped or hung on the tree all winter (1,5). In studying the effect of relative humidity on dissemination of *C. caryigenum* conidia Latham (4) reported that severely infected pecans fell from the trees before 28 August. Diener (2) showed a relationship between scab disease indices and estimated losses due to premature drop. This study showed that disease grades and nut drop values are

directly related and confirmed this relationship by successfully applying the derived regression formula to data from a second orchard.

It should be noted that the data from which the regression formula was derived and the data on which it was confirmed were obtained in both cases from Western trees in central Texas. There is no reason, however, to doubt that similar relationships could not be found for other varieties in other parts of the pecan belt.

Knowledge of the relationship between scab disease indices obtained before any diseased nuts fell and the number of nuts that fell before harvest could be an important tool in estimating losses due to scab. Yield tests are difficult for the pathologist to conduct in pecans because of the space needed, the irregular bearing habit of the tree, and the irregular occurrence of the disease.

The relationship between scab disease indices and nut losses would also be important in assessing the efficacy of fungicide treatments. Many pecan pathologists have used the term “percent commercial control,” which is the percentage of nuts in grades 1, 2, and 3 of the total number of nuts graded. This study shows that many of the nuts in grade 3 will fall to the ground before harvest and will be totally lost or deteriorate badly on the ground before they are harvested.

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