Effect of Planting Date and Date of Spray Initiation on Control of Peanut Leaf Spots in Florida

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ABSTRACT

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The earliest initiation (34 days after planting) of a peanut leaf spot spray program with chlorothalonil gave higher yields and less defoliation than seven progressively later initiation treatments in 3 yr of testing. Each 14-day delay in spray initiation resulted in more lesions than for the preceding beginning date when sampled 91, 105, and 119 days after planting. Late planting (21–23 May) resulted in a sixfold increase in the number of lesions per leaflet and a decrease in yield of 764 kg/ha compared with the early planting date (22–25 April).

Peanut (*Arachis hypogaea* L.) leaf spot diseases caused by *Cercospora arachidicola* Hori and *Cercosporidium personatum* (Berk. & Curt.) Deighton are the most serious peanut diseases worldwide (4,8). Estimates of annual crop losses range from 1 to 50%, depending on disease management (8). Cercospora and Cercosporidium leaf spots (herein referred to as peanut leaf spot) are the major contributors to losses from foliar diseases of peanut in the southeastern United States. In Florida, annual epiphytotics occur where control practices are not employed. High incidence of leaf spot results in severe defoliation and greatly reduced yields.

Fungicides are used extensively on peanuts in the southeastern United States; the most effective fungicide currently available for leaf spot control in north Florida is chlorothalonil (6,7). Spray recommendations include spraying this fungicide every 10–14 days, beginning 30–35 days after planting and continuing throughout the season. Preventing a rapid buildup of inoculum is important in plant disease control; therefore, the timing of the first spray application is important for effective leaf spot control.

Delayed planting dates may also influence disease management, because levels of initial inoculum could be higher for later planted peanut crops in areas where this crop is grown extensively. Farrell et al (3) reported that numbers of *Cercospora arachidicola* lesions were highest in early plantings in Malawi. Chevaugeon (2) found just the opposite with *Cercosporidium personatum* in Senegal. Both leaf spots occur in Florida; *Cercospora arachidicola* is the major pathogen early in the season, and *Cercosporidium personatum* predominates late in the season. We found no reports in the literature on the interaction of planting date and spray initiation date with peanut leaf spot diseases in the United States, so we initiated this study.

MATERIALS AND METHODS

A preliminary study of the effect of scheduling of the initial leaf spot control spray was conducted in 1975 with only one planting date (22 May). In 1976 and 1977, studies were expanded to include three planting dates (22 and 25 April, 5 and 9 May, and 21 and 23 May). All tests were randomized complete blocks with three replications. Each plot consisted of four rows 9.14 m long planted on 0.91-m centers. Fungicide sprays were applied to the center two rows only, and all leaf spot, defoliation, and yield data were taken from these two rows. In all tests, standard management practices were followed except for foliar fungicide treatments.

Incidence and severity of leaf spot were determined 63, 77, 91, 105, and 119 days after planting by counting the lesions on each of 50 leaflets per plot taken randomly midway from the terminal growing point of plants. No attempt was made to separate Cercospora leaf spots from those caused by *Cercosporidium*. Percentage defoliation was assessed visually on the day of digging. Peanuts were dug at maturity (135 days after planting) with a digger-shaker-inverter and picked with a small plot combine after 3 days of drying in windrows.

All fungicide treatments were applied with a backpack sprayer powered by carbon dioxide at 276 kPa in 375 L of water per hectare. Chlorothalonil 6F (tetrachloroisophthalonitrile) at 946 ml a.i./ha was used for all spray treatments. Applications were made 0–7 times (Table 1). All treatments were applied every 14 days from the spray initiation date until 2 wk before harvest.

RESULTS

Timing of the first spray application in the preliminary test in 1975 significantly affected yield, defoliation, and disease ratings. The plots that received seven sprays beginning 34 days after planting yielded 5,343 kg/ha, with only 5% defoliation. Plots where treatment was

Table 1. Effect of spray initiation dates on disease ratings, defoliation, and yield of peanuts, 1976–1977[x]

Initiation date (days after planting)	No. of sprays	Lesions per leaflet[y] 91 days	105 days	119 days	Defoliation[z] (%)	Yield (kg/ha)
34	7	0.1 a	0.3 a	1.6 a	20 a	3,612 a
48	6	0.1 a	0.3 a	2.5 a	24 ab	3,497 a
62	5	0.2 a	0.5 a	2.5 a	30 b	3,415 a
76	4	0.6 b	1.3 a	3.9 a	48 c	3,030 b
90	3	0.7 b	4.3 b	7.4 b	58 d	2,574 c
104	2	0.8 b	5.9 bc	12.1 c	66 de	2,409 cd
118	1	0.7 b	6.8 c	14.5 cd	75 e	2,125 d
Check	0	0.9 b	7.0 c	16.1 d	75 e	2,074 d

[x] Each value represents a mean of three replications for each of three planting dates for 2 yr. Numbers in the same column followed by the same letter are not significantly different ($P = 0.05$), according to Duncan's multiple range test.

[y] Disease ratings for three sample dates (91, 105, and 119 days after planting). Each number represents a mean of 50 leaflets per plot.

[z] Percentage defoliation is based on visual ratings made on the day of digging.

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initiated 76 days after planting had a mean yield of 2,741 kg/ha, with 57% defoliation. The number of lesions per leaflet was progressively higher the longer the initial treatment was delayed.

In 1976 and 1977, when planting date was added as a parameter, the date when the spray program began was a major factor in determining the amount of disease, percentage defoliation, and yield decrease for all three planting dates. Results of a pooled analysis of these data for the 2 yr over the three planting dates are shown in Table 1. The two earliest sample dates (63 and 77 days after planting) are not included because of low disease incidence. Disease increased between 91 and 119 days after planting regardless of spray initiation date, but each 14-day delay in beginning the spray program resulted in increased disease severity throughout the season. For each 14-day delay, defoliation increased an average 22% and yield decreased an average 220 kg/ha.

Planting date had a substantial influence on the parameters measured. The early planting date produced 764 kg more peanuts per hectare than the late planting date over all treatments for both years (Table 2). Between the early and late planting dates, leaf spot increased sixfold 119 days after planting, but defoliation was only 10% higher across all treatments. There were no significant differences in defoliation or yield between the early and intermediate planting dates, but leaf spot numbers were significantly higher for the intermediate planting date.

Table 2. Effect of planting date on disease ratings, defoliation, and yield of peanuts, 1976–1977[x]

Planting date	Leaf spots per leaflet[y]			Defoliation[z] (%)	Yield (kg/ha)
	91 days	105 days	119 days		
22–25 April	0.2 a	0.4 a	2.4 a	46 a	3,103 a
5–9 May	0.3 b	2.1 a	5.6 b	47 ab	3,081 a
21–23 May	1.0 c	7.4 b	14.6 c	56 b	2,339 b

[x] Each value represents a mean of three replications for each of eight treatments for 2 yr. Numbers in the same column followed by the same letter are not significantly different ($P = 0.05$), according to Duncan's multiple range test.

[y] Disease ratings for three sample dates (91, 105, and 119 days after planting). Each value represents a mean of 50 leaflets per plot.

[z] Percentage defoliation is based on visual ratings made on the day of digging.

DISCUSSION

Effective control of peanut leaf spot is essential for maximum pod yields. Three epidemiologic strategies are suggested by Berger (1) to control plant disease. One strategy, reducing the initial inoculum, is achieved by crop rotation and sanitation (deep plowing) in peanut leaf spot control programs. Because these cultural practices are insufficient for adequate control and because resistant commercial cultivars are not available, use of an effective fungicide is recommended to slow the rate of disease increase. Slowing the progress of an epiphytotic with protective fungicides requires early-season application. Every delay of 2 wk or more in starting the leaf spot spray program results in more severe leaf spotting by the end of the season and decreases yields. Delaying spray initiation may also increase the amount of inoculum for the next year if no rotation is used.

Shortening the time the crop is exposed to the pathogen, Berger's third disease control strategy, is indirectly achieved in this case through early planting. Although a peanut crop of the cultivar Florunner requires at least 135 days to mature, early planting reduces its exposure time to high inoculum densities. Disease pressure builds throughout the season and may be very high in August and September. Total days of exposure to inoculum are fewer also, because lesions do not usually develop in north Florida until early June. Early planting resulted in improved leaf spot control in this study.

Recent reports indicate an increased incidence of *Cercosporidium personatum* in the southeast (5,7,8). More information is needed on the effects of spray initiation dates on each of the two leaf spot organisms. Termination date also needs to be researched to determine the effect of early termination of a spray program in relation to the two leaf spots. Every possible attempt should be made to develop adequate peanut leaf spot control programs with minimum reliance on fungicides for both economic and environmental reasons.

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