Peanut Science (1983) 10, 3-5

Relative Susceptibilities of Component Lines of Peanut Cultivars Early Bunch and Florunner to Early and Late Leafspots[1]

L. F. Jackson[2]

ABSTRACT

Seedlings of component lines of peanut cultivars 'Early Bunch' and 'Florunner' were inoculated in the greenhouse with spore suspensions of each of 18 isolates of both *Cercospora arachidicola* and *Cercosporidium personatum*. Symptoms developed on Florunner lines within 5 to 7 and 9 to 11 days after inoculation with isolates of *C. arachidicola* and *C. personatum*, respectively. Symptoms developed on Early Bunch lines within 6 to 8 and 8 to 10 days after inoculation with isolates of *C. arachidicola* and *C. personatum*, respectively. Defoliation of Florunner and Early Bunch lines began within 11 to 14 and 14 to 17 days, respectively, following inoculation with isolates of *C. arachidicola*. Although variation in disease caused by isolates of the fungi was statistically significant, the susceptibilities of the component lines of the cultivars were not significantly different.

Key Words: *Cercospora arachidicola*, *Cercosporidium personatum*, Multiline, Composite.

Most peanut cultivars released in Florida since the 1920's can be classified as multiline strains or early generation composites because the cultivars are blends of 4 to 10 sister lines selected in the F_4 to F_8 generations (6). For example, the cultivar 'Florunner' was derived from a 1960 cross between a 'Florispan' line (334A-3-14) and an 'Early Runner' line (230-118-3-8-1) (1,8). Four sister lines, selected during the F_3 and F_4 generations, were composited in 1966; one line was removed in 1970, so the present Florunner contains three lines (1). Similarly, the cultivar 'Early Bunch' was derived from a cross made in 1961 between Florida breeding lines F406A and F420, and is a composite of five sister lines (7). It has been suggested (3) that these types of cultivars provide greater stability and genotypic diversity for the crop than the pure line cultivars that they replaced.

Component lines of a cultivar are mechanically blended prior to the several generations of seed increase that precede the distribution of the cultivar to peanut growers. Although the breeder maintains the component lines separately, after the initial blending Florida peanut cultivars are not normally reconstituted. Differences in the reaction of component lines to various selection pressures in the field during seed increases could alter the relative proportions of the components before the cultivar is obtained by peanut growers. A number of differences among component lines of Florunner have been reported. The component lines differ in their susceptibility to colonization by *Aspergillus flavus* Link (5) and in seed size and shape characteristics (2). Differences in the infection of Florispan and one of its component lines by *Diplodia gossypina* were also reported (9).

The relative susceptibilities of the component lines of Florunner and Early Bunch, and the cultivars themselves, to early and late leafspot of peanuts are discussed in this paper. Variations in virulence and aggressiveness among the Florida populations of the causal organisms of these diseases, *Cercospora arachidicola* Hori and *Cercosporidium personatum* (Berk. and Curt.) Deighton, respectively, have been reported (4).

Materials and Methods

Seeds of component lines of Florunner (F439-16-10-3, F439-16-10-3-1, F439-16-10-3-2) and Early Bunch (F459B-3-1-1-b4-2-B, F459B-2-2-1-1-2-2-1-B, F459B-2-2-1-5-3-6-B-B, F459B-2-2-1-5-5-1-1-B, and F459B-2-2-B) and of the cultivars were obtained from seed stocks maintained by the Department of Agronomy, University of Florida. Single-spore isolates of *C. arachidicola* and *C. personatum* were obtained in 1978 from lesions on Florunner plants in border rows in leafspot disease nurseries at the University of Florida Green Acres Agronomy Farm, and University of Florida Agricultural Research Center, Marianna, as previously described (4). Isolates used in the inoculations were selected randomly from the collections representing each area. Eighteen isolates (nine from each area) of each fungus, were used.

Inoculations were performed in a greenhouse without artificial lighting at about three weeks after planting when seedlings had at least four fully expanded leaves. Preparation of inoculum and inoculation and in-

[1]Florida Agricultural Experiment Station Journal Series Paper 3900.

[2]Former Assistant Professor, Department of Plant Pathology, University of Florida, Gainesville 32611. Present address: Agronomy Extension, University of California, Davis, CA 95616.

cubation procedures were similar to those described previously (4). Plants were inoculated with conidial suspensions containing 5000 conidia per ml of water. Inoculated plants were placed in a clear plastic mist chamber where they received intermittent mist (2 seconds every 2 minutes for 1 hour periods 6 times per day) for 48 hours. Plants then were placed on greenhouse benches and observed daily for the onset of symptoms. Two and 2 1/2 weeks after inoculation with conidial suspensions of isolates of *C. arachidicola* and *C. personatum*, respectively, one leaflet per plant was collected from the third fully expanded leaf from the main stem apex. The leaflet area was measured with a leaf area meter (Automatic Area Meter, Model AAM-5, Hayashi Denko Co., Ltd., Tokyo, Japan) and lesion counts were made. In addition, plants inoculated with conidial suspensions of *C. arachidicola* isolates were observed for the onset of defoliation and the amount of defoliation that had occurred after three weeks.

Seventeen tests with component lines of either Florunner or Early Bunch and isolates of either *C. arachidicola* or *C. personatum* were performed. Each test was designed as a randomized complete block. Each treatment (one line-one isolate) in a test was represented by three plants with each plant treated as a replicate. Each test was analyzed separately to determine the effects of lines, isolates and line x isolate interactions. Duncan's multiple range test was applied when analysis of variance showed a significant ($P < 0.05$) effect of any of the measured parameters. A square root transformation [((Number of lesions + 1)/cm^2)$^{1/2}$] was applied to lesion counts and an angular transformation [arcsine (percent defoliation)$^{1/2}$ x 57.2] was applied to percent defoliation measurements to make variances homogeneous.

Results

Component lines were not a significant source of variation for any of the leafspot disease assessment characters in 10 of the 17 tests, including all tests with component lines of Early Bunch. Therefore, multiple range tests for lines of Early Bunch are not presented. Conversely, in most tests there were significant differences among isolates of both *C. arachidicola* and *C. personatum*. Multiple range tests for isolates are not presented but they confirm previous findings (4) that isolates differ significantly for pathogenicity attributes. Line x isolate interactions were rarely observed. In instances where component lines of the cultivars were a significant source of variation, the relative susceptibilities of the component lines depended on the parameter assessed, the source of inoculum, and the individual test (Table 1). For instance, in test 1 using isolates 1 to 9 of *C. arachidicola*, the Florunner lines were a significant source of variation when number of days to defoliation, percent defoliation, and number of lesions per cm^2 leaflet area were assessed. The rankings of lines in order of increasing susceptibilities according to these criteria were 4<3=2=1, 4<3<2=1, and 2=1=3<4, respectively. Similarly, although Florunner lines differed significantly in percent defoliation in tests 1, 3, and 4, the order of ranking of the lines differed in each instance (Table 1).

Mean values of the disease assessment parameters (number of days to onset of symptoms, number of days to the onset of defoliation, angular transformation of percent defoliation, and square root transformation of number of lesions per cm^2 leaflet area) ranged from 5.3 to 6.8 days, 11.2 to 13.7 days, 62.2 to 67.3, and 1.5 to 2.9, respectively, for Florunner-*C. arachidicola* combinations, and 6.5 to 7.5 days, 14.5 to 16.6 days, 38.8 to 46.9, and 1.9 to 2.5, respectively, for Early Bunch-*C. arachidicola* combinations. Corresponding coefficients of variation ranged from 8.6 to 10.0, 7.9 to 13.2, 13.6 to 20.1, and 17.7 to 37.4, respectively, for Florunner-*C. arachidicola* combi-

Table 1. Relative susceptibilities of component lines† of cv. 'Florunner' peanut to isolates of *Cercospora arachidicola* and *Cercosporidium personatum*.

	C. arachidicola										*C. personatum*			
	Test§										Test#			
Assessment†	1		3		5		4		6		12		14	
	Line		Line		Line		Line		Line		Line		Line	
SYM	1	5.9 a¶	4	5.4 a	4	7.1 a	4	6.6 a	3	6.3 a	4	10.1 a	3	10.4 a
	4	5.7 ab	3	5.3 a	2	6.9 a	3	6.5 a	4	6.2 ab	3	9.9 a	4	10.1 ab
	3	5.7 ab	2	5.3 a	1	6.7 ab	2	6.4 a	1	6.1 ab	1	9.1 b	1	9.8 b
	2	5.6 b	1	5.2 a	3	6.4 b	1	6.3 a	2	6.0 b	2	9.0 b	2	9.7 b
DEF	4	12.7 a	1	12.4 a	1	12.9 a	1	13.8 a	3	11.6 a				
	3	11.2 b	3	12.2 a	2	12.8 a	2	13.4 ab	1	11.2 a				
	2	11.2 b	2	11.9 a	4	12.7 a	3	13.3 ab	4	11.1 a				
	1	11.1 b	4	11.8 a	3	12.1 a	4	12.7 b	2	11.1 a				
ARDEF	4	54.6 c	3	60.0 b	3	62.4 a	3	60.3 b	3	65.3 a				
	3	64.2 b	1	63.2 b	2	67.6 a	1	62.8 b	1	66.7 a				
	2	70.9 a	2	66.2 ab	1	68.0 a	2	64.8 ab	2	68.1 a				
	1	71.5 a	4	70.6 a	4	69.4 a	4	68.4 a	4	69.1 a				
SLCM	2	1.2 b	4	2.6 a	3	1.9 b	2	2.2 a	1	2.0 a				
	1	1.2 b	2	2.7 a	1	1.9 b	4	2.3 a	4	2.1 a				
	3	1.5 b	1	2.7 a	4	2.2 ab	3	2.3 a	2	2.3 a				
	4	1.9 a	3	2.8 a	2	2.3 a	1	2.3 a	3	2.4 a				

†Line 1 = F439-16-10-3, 2 = F439-16-10-3-1, 3 = F439-16-10-3-2, 4 = 'Florunner' cultivar.
‡SYM = Number of days from inoculation to onset of symptoms, DEF = number of days from inoculation to onset of defoliation, ARDEF = Arcsine (percent defoliation/100)$^{1/2}$ x 57.3, SLCM = ((Number of lesions + 1)/cm^2 leaflet area)$^{1/2}$.
§Isolates 1-9 of C. arachidicola were used in tests 1, 3, and 5; isolates 10-18 were used in tests 4 and 6. Values represent the reactions of lines averaged for all isolates used in that test.
¶Numbers followed by the same letter in a column for the respective assessment characters do not differ at P = 0.05 according to Duncan's multiple range test.
#Isolates 1-7 of C. personatum were used in test 12; isolates 11-18 were used in test 14. Values represent the reaction of lines averaged for all isolates used in that test.

nations, and 7.9 to 10.7, 11.3 to 14.3, 25.5 to 35.6, and 18.2 to 29.9, respectively, for Early Bunch-*C. arachidicola* combinations.

For inoculations with isolates of *C. personatum*, mean values of the number of days to the onset of symptoms and the square root transformation of the number of lesions per cm^2 leaflet area ranged from 9.4 to 10.8 days and 1.5 to 1.8, respectively, for Florunner-*C. personatum* combinations, and 8.4 to 10.0 days and 1.1 to 1.7, respectively, for Early Bunch-*C. personatum* combinations. Corresponding coefficients of variation ranged from 6.4 to 11.6 and 18.9 to 26.8 for Florunner-*C. personatum* combinations and 4.9 to 17.8 and 26.7 to 33.9 for Early Bunch-*C. personatum* combinations.

Discussion

Component lines of Florunner differ little, if any, in susceptibility to both early and late leafspot diseases although extensive variation in virulence and aggressiveness characterizes the fungi that cause these diseases (4). In the instances where there were significant differences in susceptibility of Florunner lines, the relative susceptibilities of the lines differed from test to test and from criterion to criterion, which suggests some environmental interaction. Component lines of Early Bunch did not differ in susceptibility to either early or late leafspot in any test or by any criterion. A large number of isolates of each fungus was used in the greenhouse inoculations so that disease reactions of the lines would be similar to those expected in the field. A major reason for reported differences between reactions of peanut genotypes in the greenhouse and field has been the use of only one or a few isolates as inoculum sources in the greenhouse, thereby not adequately representing the pathogenic capabilities of the fungal populations (4). Since no large differences in the relative susceptibilities of the component lines of either Florunner or Early Bunch were detected, it is unlikely that leafspot disease pressure will alter the relative proportions of the component lines of either cultivar.

Literature Cited

1. Anonymous, 1975. The Florunner: a look at its background and special characteristics. Southeastern Peanut Farmer 13:10.
2. Davidson, J. I., V. Chew and R. O. Hammons. 1976. An objective method of evaluating size and shape characteristics of peanut seed. Proc. Amer. Peanut Res. Educ. Assoc. 8:27-43.
3. Hammons, R. O. 1976. Peanuts: genetic vulnerability and breeding strategy. Crop Sci. 16:527-530.
4. Jackson, L. F. 1982. Variations in virulence and aggressiveness of *Cercospora arachidicola* and *Cercosporidium personatum* on Florunner peanuts. Peanut Sci.: (In press).
5. Kushalappa, A. C. 1976. Factors influencing the tolerance of peanut (*Arachis hypogaea* L.) pods to colonization by *Aspergillus flavus* Link. Ph.D. Thesis, University of Florida, Gainesville. 54 p.
6. Norden, A. J. 1973. Breeding of the cultivated peanut (*Arachis hypogaea* L.). pp. 175-208 *In:* Peanuts, Culture, and Uses. Amer. Peanut Res. & Educ. Assoc., Stillwater, OK.
7. Norden, A. J., R. O. Hammons and D. W. Gorbet. 1978. Registration of Early Bunch peanut. Crop. Sci. 18:913-914.
8. Norden, A. J., R. W. Lipscomb and W. A. Carver. 1969. Registration of Florunner peanut. Crop Sci. 9:850.
9. Porter, D. M., and R. O. Hammons. 1975. Differences in plant and pod reaction of peanut lines to infection by *Diplodia gossypina*. Peanut Sci. 2:23-25.

Accepted February 23, 1983