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Screening for Resistance to Cylindrocladium Black Rot in Peanuts (*Arachis hypogaea* L.)[1]

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ABSTRACT

Cylindrocladium black rot (CBR) of peanuts (*Arachis hypogaea*L.), caused by *Calonectria crotalariae* (Loos) Bell & Sobers (*Cylindrocladium crotalariae* (Loos) Bell & Sobers), is potentially one of the most serious peanut diseases in Virginia. Over 60 peanut lines at multiple locations and 140 peanut lines at a single location were screened in the field for resistance to CBR from 1973-1977 in Virginia and North Carolina. Susceptibility to CBR was determined by number of dead plants per plot in 1973 and by percent dead plants per plot in 1974-1977. In addition, in 1974, 1975 and 1977, visual estimates of CBR damage to roots and pods were made. Florigiant, Spancross, VGP 1 and/or NC 3033 were used as checks to determine relative susceptiability.

Results generally indicate that spanish-type peanuts are the most resistant to CBR, valencia-type peanuts the least resistant and virginia-type peanuts intermediate. Florigiant was consistently one of the most susceptible genotypes, while NC 3033, Spancross and VGP 1 were among the most resistant. Four valencia-type peanuts, 22 virginia-type peanuts, 28 spanish-type peanuts, one segregating line, and one wild species (*A. monticola*), with resistance equal to or better than Spancross, NC 3033 and/or VGP 1 were identified. Pod and root damage scores generally corresponded with percent diseased plants. However, differences were observed, indicating separate genetic mechanisms may control pod and root resistance to CBR. The significances of variability among sister lines and locations are discussed.

Key Words: Groundnut, *Cylindrocladium crotalariae; Calonectria crotalariae;* Genetic Vulnerability; Disease Resistance, Plant Breeding.

Cylindrocladium black rot (CBR) of peanuts (*Arachis hypogaea* L.), caused by *Calonectria crotalariae* (Loos) Bell & Sobers (*Cylindrocladium crotalariae* (Loos) Bell & Sobers) (1), has been sporadic in Virginia since first reported in 1970 (8). In 1975 CBR was considered epidemic in the Virginia peanut-growing area (7). In 1977-1979 there was an evident decrease in amount of CBR. This decrease has been attributed to colder winter temperatures during the preceeding winters (15, 16).

Several screening tests (2, 6, 7, 12, 13, 14, 18, 19) have been conducted for resistance to CBR. Results from these tests have shown that spanish-type peanuts are the least susceptible, valencia-type peanuts the most susceptible and virginia-type peanuts intermediate. Exceptions to this rule have been found, however. Wynne *et al.* (19) reported that the most resistant line in their study was a virginia type peanut (NC 3033). Coffelt (6) has reported differences in the susceptibility of roots and pods on the same plant to CBR.

All of the previous reports have been limited in scope, either in the number of lines or types of lines screened, except Hammons *et al.* (12), who screened several lines under laboratory conditions. Only three virginia type peanut lines have been identified as resistant to CBR (3, 5, 12). The objective of this study was to identify additional CBR resistant lines for use in breeding programs.

Materials and Methods

Tests at Multiple Field Locations

In 1973, 31 peanut lines were grown at one location in Virginia (Site-1) and 26 peanut lines were grown at one location in North Carolina (Site-2) 22 entries being common to both locations (Table 1). Florigiant, a susceptible virginia-type cultivar grown on 95% of the Virginia peanut area, and Spancross, a resistant spanish-type cultivar were used as checks. A randomized complete block design wth four replications was used at both locations. Plots were two rows 1.8 m wide and 10.4 m long at Site-1 and 12.2 m long at Site-2. Susceptibility to CBR was determined by the number of dead plants per plot with a maximum of 20 dead plants per plot .

In 1974, 16 peanut lines (Table 2) were grown at one location in Virginia (Site-3) and seven peanut lines from this test were grown at two locations in Virginia in 1975 (Sites-4 and 5), with Spancross included as a resistant check. A randomized complete block design was used at all locations with four replications in 1974 and six replications in 1975. Plots were two rows 1.8 m wide x 7.6 long in 1974 and 6.1 m long in 1975. Susceptibility to CBR was determined by the percent dead plants per plot (6,7), and visual estimates for CBR damage to pods and roots were made (6).

Twelve peanut lines (Table 3) were grown at one location in 1976 (Site-7) and two locations in 1977 (Sites-10 and 11) in Virginia. Spancross, VGP 1, and NC 3033 were included as resistant checks and Florigiant as a susceptible check in these tests. A randomized complete block design with six replications was used at all locations. Plots were 2 rows 1.8 m wide and 6.1 m long. Susceptibility to CBR was determined by the percent dead plants per plot (6,7). In addition, at Site-11 visual estimates of CBR damage to pods were made (6).

Tests at Single Field Locations in Virginia

In 1975, 64 peanut lines (Table 4) were screened (Site-6) for resistance to CBR. In 1976, 52 peanut lines (Table 5) were screened in one test (Site-8) and ten lines (Table 6) in another test (Site-9) for resistance to CBR. In 1977, 22 peanut lines (Table 7) were screened (Site-12) for resistance to CBR. Spancross, NC 3033 and Florigiant were used as checks at all locations, except Site-6 were NC 3033 was not included. Randomized

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Table 1. Number of dead plants/plot at two locations (Sites-1 and 2) in 1973.

Line		Number of Dead Plants Site-1	Site-2	Mean
VA 71-332	(VA)+	11.8	-	-
VA 71-399	(VA)	20.0	-	-
VA 71-405	(VA)	17.0	-	-
PI 319178	(VA)	16.3	-	-
PI 341879	(VL)	15.3	-	-
PI 343410	(VA)	15.0	-	-
VA 733136	(VA)	12.5	-	-
VA 733140	(VA)	17.0	-	-
PI 355288	(VA)	16.0	-	-
PI 295170	(VA)	10.5	6.3	8.4
PI 343378	(VA)	18.3	10.5	14.4
PI 355255	(VA)	20.0	11.8	15.9
PI 355260	(VA)	17.3	14.0	15.6
PI 355984	(VL)	19.0	5.3	12.1
PI 355998	(VL)	20.0	7.5	13.8
PI 356002	(VL)	20.0	3.5	11.8
PI 356006	(VL)	20.0	5.8	12.9
Spancross	(SP)	1.8	0.0	0.9
Florigiant	(VA)	12.8	2.8	7.8
F 439-16-6	(VA)	15.0	2.8	8.9
Florigiant Bunch	(VA)	12.0	3.3	7.6
Avoco 11	(VA)	15.8	5.0	10.4
GA 119-20	(VA)	16.0	11.0	13.5
NC 344	(VA)	8.5	8.8	8.6
NC 17165	(VA)	14.0	2.8	8.4
NC 17168	(VA)	5.5	16.0	10.8
VA Bunch 46-2	(VA)	16.5	11.8	14.1
VA 70-Comp.	(VA)	13.5	10.5	12.0
VA 71-354	(VA)	17.3	15.8	16.5
VA 71-365	(VA)	19.0	10.0	14.5
VA 71-402	(VA)	20.0	13.8	16.9
VA 71-331	(VA)	-	15.0	-
VA 71-408	(VA)	-	13.8	-
VA 733221	(VA)	-	13.8	-
VA 733240	(VA)	-	17.3	-
Error Mean Square		15.04	25.08	17.65
Error D. F.		90	75	126
LSD*		5.23	7.00	3.93

+ VA = *A. hypogaea* ssp. *hypogaea* var. *hypogaea*; VL = *A. hypogaea* ssp. *fastigiata* var. *fastigiata*; SP = *A. hypogaea* ssp. *fastigiata* var. *vulgaris*.

* LSD computed according to Duncan's Bayesian K-ratio LSD rule.

complete block designs with six replications were used at all sites, except Site-9 which had eight replications. Susceptibility to CBR was determined by ther percent dead plants per plot at harvest for all sites (6,7). In addition, at Site-6 and Site-12 visual estimates of CBR damage to pods (6) were made and at Site-6 visual estimates of CBR damage to roots were made (6). All plots were 2 rows 1.8 m wide and 6.1 m long.

All sites (1-12) had histories of severe CBR. Results were analyzed by analysis of variance and Duncan's Bayesian K-ratio LSD rule (4). Some lines in this study are identified by trivial names assigned by the originating breeder. A table listing state or country of origin and pedigree will be provided upon request.

Results and Discussion

Results from these studies (Tables 1-7) generally support the findings of previous reports (2, 6, 7, 8, 10, 12, 13, 18, 19) that spanish types (*Arachis hypogaea* spp. *fastigiata* var. *vulgaris*) are the most resistant to CBR, valencia types (*Arachis hypogaea* spp. *fastigiata* var. *fastigiata*) the least resistant to CBR, and virginia types (*Arachis hypogaea* spp. *hypogaea* var. *hypogaea*) are intermediate. However, exceptions to this generalization were also found. In addition to the two virginia-type germplasm lines already released, 22 other virginia lines (NC 17168, PI 323238, Tifton-8, VA 750878, VA 7329146, VA 7329064, VA 7329143, PI 295212, GA GC 168, GA C 133, VA 7329043, VA 7329118, PI 343380, PI 342657, VA 7329076, PI 371519, GA 722208, GA 722205, GA 722206, VA 7329017, GA 61-42, and PI 365552) were significantly less susceptible than Florigiant and were equal to or less susceptible than Spancross, NC 3033 and/or VGP 1 (Tables 1, 2, 3, 4, 5, 6). Of these 22 lines, Tifton-8 was the most resistant compared to Florigiant, NC 3033, Spancross and VGP 1 (Table 3). The other 21 lines were consistently lower in percent CBR than Florigiant, but not NC 3033, VGP 1 and/or Spancross.

Four valencia-type peanuts (PI 295215, PI 295212, VA 761060, and PI 341879) were not significantly more susceptible than Spancross (Tables 2, 5, 7) indicating that all valencia types are not highly susceptible as previously proposed (2, 6, 7, 14, 18, 19). Twenty-eight spanish types with resistance equal to or better than Spancross, NC 3033 and/or VGP 1 were identified (Tables 2, 3, 4, 5, 6, 7,). A wider range in susceptibility was also noted for spanish-types (Tables 4, 5, 6), indicating not all spanish types have a high degree of resistance to CBR as previously reported (6). However, the range in susceptibility among spanish types is still not as great as that for virginia types. This may be due to less variability allowed in the botanical classification of spanish types compared to virginia types.

Florigiant, which is grown on over 95% of the peanut acreage in Virginia-North Carolina, was consistently more susceptible than the resistant checks (Table 1, 3-7) as reported previously (7). Spancross has been reported as one of the more resistant lines (6,7). Results from these tests confirm this resistance, except for tests conducted during 1976 (Tables 3, 5, 6). The unexpectedly high susceptibility of Spancross in 1976 may have been due to the presence of a specific race of the pathogen that was particularly virulent to Spancross (9), unusual environmental conditions, a high inoculum density, or errors in determining diseaed plants. Sites 7, 8, and 9 were in different areas of the same field in 1976. These results also confirm the resistance of two Virginia genotypes, NC 3033 (Tables 3, 5, 6, 7) and VGP 1 (Tables 2, 3, 6), which have been released as germplasm resistant to CBR (3,5).

From the regression of pod damage and root damage on percent CBR infected plants, it was found that pod damage scores were significantly and positively correlated with percent CBR infected plants at sites 6, 11, and 12. However, several exceptions were also found. VA 7329043, GA 722109, PI 365550, GA 194V-VV, VA 732838, VA 751749, VA 751763, VA 751710, VA 732827, PI 370327, VA 732830, PI 372303, VA 7329182, PI 370326, VA 7329154, and VA 7329156 had less pod damage than expected, while PI 365552, PI 219824, PI 210553, GA 116, VA 7330077, GA 722106, PI 370329, PI 370332, GA 722207, GA 722107, FESR#4, VA 7329069, and VA 7329167 had more pod damage than expected based on percent CBR infected plants. Root damage scores were positively and significantly correlated with percent CBR infected plants at site 6, except for GA 722207, PI 372580, PI 343380, and VA 7330077 which had more root damage than expected and GA 194V-VV, GA 722109, PI 365550, VA 732830, VA 732834, VA 732838, VA 7329182, VA 751763, and Florigiant which had less root damage than expected based on percent CBR infected plants.

Pod and root damage scores at sites 3, 4, and 5 were not significantly correlated with percent CBR infected plants. There are three possible reasons for these contrasting results. First, the number of lines at sites 3, 4, and 5 was less

Table. 2. Percent CBR infected plants and visual estimates of pod and root damage at three locations (sites - 3, 4, and 5) in 1974-75.

Line		CBR Infected Plants				Visual Pod Damage Scores				Visual Root Damage Scores			
		Site-3	Site-4	Site-5	Mean	Site-3	Site-4	Site-5	Mean	Site-3	Site-4	Site-5	Mean
Spancross	(SP)+	1.5	4.7	0.7	2.4	1.9	2.3	2.2	2.2	1.2	1.8	1.0	1.4
Dixie Spanish	(SP)	1.8	10.3	2.0	5.0	1.8	2.2	1.7	1.9	1.1	1.5	1.0	1.2
VGP 1	(VA)	0.8	5.4	1.5	2.7	1.9	1.7	1.8	1.8	2.6	1.8	1.5	1.9
PI 323238	(VA)	0.0	6.1	1.7	2.9	1.7	1.8	1.8	1.8	1.6	2.0	1.5	1.7
PI 295216	(SP)	2.5	12.5	2.3	6.2	1.3	2.0	1.7	1.7	1.0	1.7	1.2	1.3
PI 268651	(SP)	2.5	18.0	2.9	8.4	1.4	2.0	1.8	1.8	1.3	1.5	1.5	1.4
PI 295237	(SP)	1.0	15.8	1.4	6.7	1.4	2.0	1.8	1.8	1.1	2.2	1.3	1.6
VA 732108	(SP)	10.5	-	-	-	2.1	-	-	-	2.0	-	-	-
Dixie Giant	(VA)	28.0	-	-	-	2.4	-	-	-	2.8	-	-	-
Early Bunch	(VA)	24.3	-	-	-	2.3	-	-	-	2.9	-	-	-
PI 295170	(VA)	13.3	-	-	-	2.0	-	-	-	2.8	-	-	-
PI 295215	(VL)	1.5	-	-	-	1.3	-	-	-	1.6	-	-	-
PI 341879	(VL)	4.8	-	-	-	1.6	-	-	-	1.6	-	-	-
VA 733140	(VA)	18.0	-	-	-	2.4	-	-	-	2.9	-	-	-
PI 355982	(VL)	12.5	-	-	-	1.8	-	-	-	1.6	-	-	-
PI 355987	(VL)	12.3	-	-	-	2.2	-	-	-	2.0	-	-	-
Error Mean Square		86.78	38.90	6.95	17.95	0.17	0.13	0.19	0.18	0.18	0.14	0.13	0.14
Error D. F.		45	30	30	78	45	30	30	78	45	30	30	78
LSD*		13.26	7.65	5.00	3.00	0.60	0.52	3.00	0.33	0.54	0.52	0.50	0.25

+ VA = *A. hypogaea* ssp. *hypogaea* var. *hypogaea*; VL = *A. hypogaea* ssp. *fastigiata* var. *fastigiata*; SP = *A. hypogaea* ssp. *fastigiata* var. *vulgaris*.

• LSD Computed according to Duncan's Bayesian K-ratio LSD rule.

Table 3. Percent CBR infected plants and visual estimates of pod damage at three locations (Sites - 7, 10, and 11) in 1976-1977.

Line		% CBR Infected Plants				Pod Damage
		Site-7	Site-10	Site-11	Mean	Site-11
Tifton-8	(VA)+	4.0	1.2	6.5	3.9	2.0
VA 7329043	(VA)	10.0	0.4	20.8	10.4	2.0
PI 371520	(VA)	10.9	0.8	33.9	15.2	3.0
VA 7329118	(VA)	13.3	1.1	18.6	11.0	2.3
Spancross	(SP)	31.8	0.2	1.2	11.1	2.0
NC 3033	(VA)	13.9	0.0	7.8	7.2	1.5
Florigiant	(VA)	35.7	0.3	30.4	22.1	2.3
GA C32W	(SP)	11.9	2.7	6.4	7.0	2.0
VA 761742	(SP)	12.3	1.1	5.3	6.2	2.0
T 2172-3	(SP)	12.8	1.2	2.9	5.6	2.0
GA GC 32-20	(SP)	13.7	0.0	10.0	7.9	1.8
VGP 1	(VA)	8.7	0.3	11.2	6.7	2.0
Error Mean Square		78.75	3.42	77.20	53.13	0.09
Error D. F.		55	55	55	165	55
LSD*		9.94	3.00	9.59	4.53	0.33

+ VA = *A. hypogaea* ssp. *hypogaea* var. *hypogaea*; SP = *A. hypogaea* ssp. *fastigiata* var. *vulgaris*.

* LSD computed according to Duncan's Bayesian K-ratio LSD rule.

than at sites 6, 11, and 12. Second, all of the lines tested at the former sites were resistant to CBR, while the lines at the latter sites varied in susceptibility. Third, several of the lines at sites 3, 4, and 5 were exceptions to the generalization that pod and root scores increased with increased percent of CBR infected plants. Spancross had more pod damage than expected, while PI 295216, PI 295237, and PI 268651 had les pod damage than expected based on percent CBR infected plants. VGP 1 and PI 323238 had more root damage, while Dixie Spanish, PI 295216, and PI 268651 had less root damage than expected based on percent CBR infected plants.

This variation between types of disease rating indicates that in a breeding program all three ratings should be made to more accurately reflect the host reaction of a genotype to CBR. More importantly, the variation indicates different genetic mechanisms may control pod and root resistance to CBR (6). A breeding program for resistant varieties may need to make use of crosses between lines with high levels of pod resistance and high levels of root resistance as well as lines with high levels of both pod and root resistance.

There is further evidence from these results to support the theory of Hammons (11, 17) that there is considerable heterogeneity in the composite sister-line cultivars currently being grown. Six sister lines (VA 732827, VA 732828, VA 732829, VA 732830, VA 732832 and VA 732834) from a cross between Florigiant and Chico are

Table 4. Percent CBR infected plants and visual estimates of pod and root damage at Site-6 for 64 peanut lines.

Line		% CBR Infected Plants	Visual Pod Damage Score	Visual Root Damage Score
PI 372298	(VA)+	65.5	2.8	3.0
PI 372317	(VA)	61.3	2.7	2.5
PI 295213	(VL)	49.8	2.7	3.0
VA 751763	(VL)	49.2	2.2	2.2
VA 732838	(VA)	45.9	2.0	2.0
VA 751749	(VA)	45.1	2.2	2.5
PI 370327	(VA)	43.5	2.0	2.3
PI 370331	(VA)	42.6	2.3	2.5
VA 732834	(VA)	40.9	2.3	2.0
VA 732829	(VA)	40.8	2.5	2.5
PI 370326	(VA)	40.8	2.2	2.7
VA 72R	(VA)	40.2	2.8	2.8
PI 366050	(VA)	40.2	2.7	2.3
Florigiant	(VA)	39.3	2.3	2.2
VA 7329182	(VA)	39.1	2.2	2.2
PI 372303	(VA)	38.1	2.2	2.5
PI 366048	(VA)	37.7	2.8	2.3
VA 732830	(VA)	37.6	2.2	2.2
VA 732815	(VA)	37.2	2.5	2.3
VA 751751	(VA)	36.8	2.7	2.5
VA 732813	(VA)	35.9	2.8	2.5
VA 732827	(VA)	35.7	2.2	2.3
PI 365553	(VA)	35.7	2.7	2.7
GA 194V-VV	(VA)	35.0	2.2	2.2
VA 732828	(VA)	34.2	2.7	2.5
PI 365550	(VA)	34.0	2.2	2.0
VA 732818	(VA)	33.6	2.7	2.3
VA 751710	(VA)	33.2	2.2	2.5
VA 732817	(VA)	33.0	2.3	2.3
GA 722109	(SP)	32.6	2.2	2.0
VA 732816	(VA)	30.3	2.7	2.7
PI 371961	(VA)	29.9	2.5	2.3
GA 722108	(VA)	29.3	2.2	2.5
GA 722207	(VA)	28.7	2.5	2.3
PI 370332	(VA)	28.0	2.3	2.2
VA 732832	(VA)	27.6	2.2	2.2
PI 370329	(VA)	27.0	2.5	2.2
GA 722209	(VA)	26.8	2.0	1.8
PI 372580	(SG)	26.1	2.2	2.3
GA 722210	(VA)	24.9	2.0	2.0
GK-19	(SP)	24.3	2.2	2.0
PI 343418	(VA)	24.2	2.2	1.8
PI 371850	(VA)	24.1	2.2	2.0
VA 751759	(SG)	24.1	2.0	2.2
GA 722106	(SP)	23.9	2.7	2.0
VA 7330077	(VA)	23.7	2.7	2.7
PI 343379	(SG)	23.7	2.2	2.2
GA 722107	(SP)	22.4	2.3	2.0
FESR #4	(VA)	22.2	2.3	2.2
PI 276105	(VA)	21.2	2.0	2.2
PI 343380	(VA)	17.8	2.2	2.8
GA 722208	(VA)	17.8	2.0	2.0
GA 722110	(SP)	16.2	1.8	1.8
GA 722205	(VA)	13.9	2.0	1.8
GA 722206	(VA)	13.5	1.8	2.0
Spantex	(SP)	12.7	2.2	1.8
PI 343381	(SG)	12.0	2.0	1.8
GA 123	(SP)	11.9	2.0	2.0
GA 116	(SP)	9.2	2.3	1.8
Spancross	(SP)	6.8	2.0	1.3
VA 7329017	(VA)	6.1	2.0	2.0
Toalson	(SP)	5.8	2.0	1.5
PI 365552	(VA)	4.3	2.5	1.3
GA 722105	(SP)	2.9	1.8	2.0
Error Mean Square		98.90	0.17	0.21
Error D. F.		315	315	315
LSD*		10.38	0.51	0.54

+ VA = *A. hypogaea* ssp. *hypogaea* var. *hypogaea*; VL = *A. hypogaea*, ssp. *fastigiata* var. *fastigiata*; SP = *A. hypogaea* ssp. *fastigiata* var. *vulgaris*; SG = Segregating var.

* LSD computed according to Duncan's Bayesian K-ratio LSD rule.

phenotypically alike, but vary in percent CBR diseased plants from 27.6% - 40.9% (Table 4). This variability was also evident in phenotypically alike sister lines from a cross between Early Runner and Argentine. Two virginia-type sister lines (GA 722206 and GA 722207) were significantly different in percent dead plants per plot and visual score for pod damage (Table 4). Also, two spanish-type sister lines (GA 722105 and GA 722107) were significantly different in percent dead plants per plot (Table 4). These results indicate not only that current cultivars composited of sister lines may not be as genetically vulnerable as pure line varieties (11), but also that future varieties could be intentionally composited from sister lines that differ in disease reaction but are phenotypically alike to meet the strict requirements of the peanut growers and market classification system. Contrasting results were observed for reaction of some of these lines to Sclerotinia

Table 5. Percent CBR infected plants at Site-8 for 52 peanut lines.

Line		% CBR Infected Plants	Line		% CBR Infected Plants
Early Bunch	(VA)+	52.6	PI 362143	(SP)	24.9
VA 7329144-H	(VA)	48.4	PI 371521	(VA)	24.7
UF 714021	(VA)	46.4	VA 7329152	(VA)	24.5
PI 371517	(VA)	39.8	PI 362130	(VA)	24.1
A-2	(VA)	39.8	PI 413758	(SP)	21.7
VA 732603B	(VA)	39.1	VA 7329064	(VA)	21.5
Jenkins Jumbo	(VA)	39.0	VA 7329143	(VA)	21.3
VA 750917	(VA)	37.2	GA GC 32-22	(SP)	21.0
VA 750918	(VA)	36.6	PI 295212	(VL)	20.2
PI 372578	(SP)	36.2	PI 295195	(SP)	20.0
Florigiant	(VA)	35.7	GA GC 168	(VA)	20.0
VA 750915	(VA)	35.5	T 2172-5	(SP)	19.9
A-69	(VA)	34.4	VA 750878	(VA)	19.7
VA 750916	(VA)	33.9	PI 355278	(SP)	19.7
Spancross	(SP)	31.8	GA C 32	(SP)	19.5
PI 343411	(SG)	30.2	VA 7329146	(VA)	19.3
GA C 134	(VA)	29.7	GA C 133	(VA)	19.0
GA 194 R	(VA)	29.2	PI 342657	(VA)	18.5
VA 732601	(VA)	28.5	VA 7329076	(VA)	18.3
VA 732603A	(VA)	27.5	PI 371519	(VA)	17.5
PI 372577	(VA)	27.4	T 2173-2	(SP)	17.5
PI 298115	(VA)	26.7	GA GC 32-13	(SP)	16.8
PI 362129	(VA)	26.6	GA 61-42	(VA)	16.5
UF 73307	(VA)	26.4	PI 315613	(SP)	16.5
GK-3	(VA)	26.1	T 2173-6	(SP)	14.4
GK-19	(SP)	25.9	NC 3033	(VA)	13.9
Error Mean Square		138.81			
Error D. F.		255			
LSD*		13.73			

+ VA =*A. hypogaea* ssp. *hypogaea* var. *hypogaea* var. *hypogaea*; VL = *A. hypogaea* ssp. *fastigiata* var. *fastigiata*; SP = *A. hypogaea* ssp. *fastigiata* var. *vulgaris*; SG = Segregating var.

* LSD computed according to Duncan's Bayesian K-ratio LSD rule.

Table 6. Percent CBR infected plants at Site-9 for 10 peanut lines.

Line		% CBR Infected Plants
Florigiant	(VA)+	32.6
PI 295216	(SP)	32.3
Spancross	(SP)	26.8
Toalson	(SP)	22.0
Tamnut-74	(SP)	16.7
GA 722105	(SP)	16.6
PI 323238	(VA)	15.4
NC 3033	(VA)	7.9
PI 365552	(VA)	7.2
VGP 1	(VA)	6.8
Error Mean Square		79.39
Error D. F.		63
LSD*		8.35

+ VA = *A. hypogaea* ssp. *hypogaea* var. *hypogaea*; SP = *A. hypogaea* ssp. *fastigiata* var. *vulgaris*.

* LSD computed according to Duncan's Bayesian K-ratio LSD rule.

Table 7. Percent CBR infected plants and visual estimates of pod damage at Site-12 for 22 peanut lines.

Line		% CBR Infected Plants	Visual Pod Damage Score
VA 7329037	(VA)+	78.5	2.8
PI 365442	(VA)	32.9	2.3
VA 7329136	(VA)	32.1	2.7
GA 150	(VA)	24.1	2.7
VA 750876	(VL)	24.1	2.3
VA 7329156	(VA)	21.1	2.0
VA 7329063	(VA)	21.0	2.7
Florigiant	(VA)	18.1	2.5
VA 7329154	(VA)	16.5	2.2
VA 7329069	(VA)	12.9	2.7
VA 7329166	(VA)	12.0	2.0
VA 750913	(VA)	10.1	2.2
VA 7329167	(VA)	8.7	2.5
VA 760415	(VA)	8.1	2.0
PI 295255	(SP)	6.9	1.7
VA 761060	(VL)	5.9	2.0
PI 210553	(AM)	5.9	2.8
PI 219824	(AM)	5.8	3.0
NC 3033	(VA)	5.8	1.5
PI 295313	(SP)	5.3	1.8
PI 295267	(SP)	3.8	2.0
Spancross	(SP)	0.8	2.2
Error Mean Square		101.55	0.16
Error D. F.		105	105
LSD*		10.33	0.44

\+ VA = A. hypogaea ssp. hypogaea var. hypogaea; VL = A. hypogaea ssp. fastigiata var. fastigiata; SP = A. hypogaea ssp. fastigiata var. vulgaris; AM = A. Monticola.

* LSD computed according to Duncan's Bayesian K-ratio LSD rule.

blight (Coffelt and Porter unpublished). This emphasizes the need to screen sister lines of potential composites to pathogens before release in order to take advantage of any variability in disease resistance that may be present.

The variability in reaction to CBR present in these advanced generation sister lines from crosses between resistant (Chico and Argentine) and susceptible (Florigiant and Early Runner) parents supports the proposal by Coffelt (6) that selection for resistance to CBR could be done in later generations after characters such as yield and market type have been selected for in early generations. This is in contrast to, but not in conflict with the proposal by Hadley *et al.* (10), that selection for resistance can be done in early generations. Either method of selection for resistance can probably be used to obtain CBR resistant varieties, depending upon the capabilities, methods, and goals of a breeding project.

Significant differences between locations and significant line x location interactions (Tables 1, 2, 3) indicate that different races or strains of the pathogen, environmental conditions, initial inoculum levels or a combination of these or other factors existed in these tests (6,7). The presence of different races or strains of Cylindrocladium is also strongly suggested by the differential reaction of NC 17168 and NC 344 at Sites-1 and 2 (Table 1). While all other genotypes had fewer dead plants per plot at Site-2 than at Site-1, NC 17168 and NC 344 both had more dead plants per plot at Site-2 than at Site-1. The possibility of different races or strains of *Cylindrocladium* developing has been reported by Hadley *et al.* (9). If different races or strains of *Cylindrocladium* are present or develop in the future, breeding for resistance will be more complex.

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