A Technique for Evaluating Peanut Germ Plasm for Resistance to *Pythium myriotylum*

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ABSTRACT

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Peanut seedlings expressed stunt, wilt, and necrosis 6 days after inoculation with *Pythium myriotylum* zoospores. The amount of seedling disease was positively and significantly correlated with the degree of Pythium pod rot in maturing plants of peanut genotypes PI 365553, PI 378012, Toalson, Tamnut 74, and Florunner.

Additional key word: groundnuts

Pythium myriotylum Drechs. causes stunt, wilt, and death of peanut (*Arachis hypogaea* L.) seedlings (1,3,5,7) and pod rot, root rot, and wilt of maturing plants (2,8). The pot rot phase of the disease has contributed to substantial crop losses (2,10), and resistance has been sought as a possible control measure (4,9,12).

Peanut genotypes have been tested for Pythium pod rot resistance in *P. myriotylum*-infested fields (4,9,12). A field test requires 120–140 days to complete and environmental conditions are often unfavorable for pod rot development. A less time-consuming screening method that can be conducted under controlled conditions will expedite evaluation of resistant lines. The long growing period could be eliminated by testing for resistance in the seedling stage. Godoy (3) compared seedling resistance to *P. myriotylum* with adult plant resistance to *P. myriotylum* and obtained a negative correlation. Godoy used mycelium and oospores grown in a sand-oatmeal mixture as inoculum. In this study, we used *P. myriotylum* zoospores to inoculate peanut seedlings and compared seedling and maturing plant resistance.

MATERIALS AND METHODS

Inoculum was prepared from two *P. myriotylum* isolates, one each from peanuts in northern and southern Texas. Three plates (1.5 plates of each isolate) of 2-day-old cultures grown in plastic petri plates (100 × 15 mm) of V-8 juice agar (6) were transferred to a glass aquarium tank (20 × 34 cm) containing 12 L of deionized water. The water temperature was maintained at 28–29 C with a 75W aquarium heater and aerated with 2–3 L of air per minute to provide ample oxygen for zoospore production. Aeration also aided in zoospore distribution throughout the tank. Cultures were incubated in the aquarium for 12–14 hr.

Plant Introduction (PI) 365553 and cultivar of Florunner were grown in a 1:1:1 (v/v/v) pasteurized mixture of sand, peat moss, and vermiculite contained in 430-ml styrofoam cups. Four holes about 5 mm diameter were punched through the side of the cup, near the bottom, to allow water and zoospores to enter. Plants were inoculated 2 days after emergence by placing the cups in polyethylene trays (29 × 54 cm) and adding water containing 1.8×10^3–2×10^3 zoospores per milliliter to a depth of 3.5 cm. The cups remained in the inoculum for 3 hr. An average of 84 ml/cup of inoculum was absorbed. Control plants were placed in trays of deionized water.

The inoculated plants were maintained in a greenhouse for 15–20 days before counting the wilted and necrotic plants. Greenhouse temperature ranged from 24 to 35 C. In one test, plants were covered with a sheet of transparent polyethylene to maintain plants at 41 C for 6 hr.

Five genotypes (Table 1) that showed varying degrees of resistance to Pythium pod rot in field tests (4) were used to compare seedling and mature resistance. Test plants were exposed to 1.8×10^3 zoospores per milliliter for 3 hr, then transferred to a bench maintained at 26–31 C for 20 days. The test was repeated. The percentage of wilted and dead plants and the average pod rot ratings obtained from field plots in 1974–1977 were used to calculate the coefficient of linear correlation between seedling and mature plant resistance.

RESULTS AND DISCUSSION

P. myriotylum penetrated lateral roots of inoculated plants of all five genotypes within 1 hr of inoculation (Fig. 1). Brown rot developed in lateral roots in 4–6 days and wilt symptoms first appeared 6 days after inoculation but continued to develop for 18 days after inoculation in plants subjected to 24–35 C. At 18–26 C, plants of PI 365553 did not wilt, whereas 10% of the Florunner plants wilted (Table 2). All inoculated plants of PI 365553 and Florunner plants exposed to 41 C were severely stunted and few plants survived. Checks were unaffected at 41 C. The

Table 1. Correlation between percentage wilted peanut seedlings infected with *Pythium myriotylum* and field ratings for Pythium pod rot

Genotype	Seedling stage (percentage wilted plants)[a] Test 1	Test 2	Mature plant (pod rot rating)[b]
PI 365553	9	3	0.8
Toalson	21	22	1.4
Tamnut 74	42	58	2.8
Florunner	55	43	3.9
PI 378012	···	71	4.7
	$r^c = +0.99$ ($P = 0.01$)	$r^c = +0.90$ ($P = 0.05$)	

[a] Percentage of permanently wilted and necrotic plants of 34–46 plants for each line, in each test.

[b] Average visual ratings, using a scale of 0–5: 0 = no rot, 5 = 50% or more pods rotted, from field tests conducted in 1974–1977.

[c] Coefficient of correlation between percentage wilt and pod rot ratings.

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Table 2. Percentage of peanut wilt in PI 365553 and Florunner seedlings inoculated with *Pythium myriotylum* and subjected to three soil temperature regimes

Genotype	Temperature (C)	Wilted plants[a] (%)
PI 365553	18–26	0
	24–35	19
	22–41	84
Florunner	18–26	10
	24–35	82
	22–41	97
Check[b]	18–26	0
	24–35	0
	22–41	0

[a]Included permanently wilted and necrotic plants.
[b]Check was an equal number of uninoculated PI 365553 and Florunner seedlings.

largest difference in the number of wilted and dead Florunner and PI 365553 plants was observed at 24–35 C.

The correlation between the percentage of peanut wilt in seedlings and pod rot ratings in mature plants was highly significant ($P = 0.01$) in test 1 and significant ($P = 0.05$) in test 2 (Table 1). The positive correlation indicates that the technique can be used to identify Pythium pod rot-resistant genotypes in the seedling stage. For example, PI 365553 was the most resistant genotype in all seedling tests. It was also the most resistant genotype to pod rot. Toalson had moderate pod rot resistance (11) and moderate resistance to *P. myriotylum* in the seedling stage (Table 1). PI 378012 was the most susceptible to both wilt and pod rot.

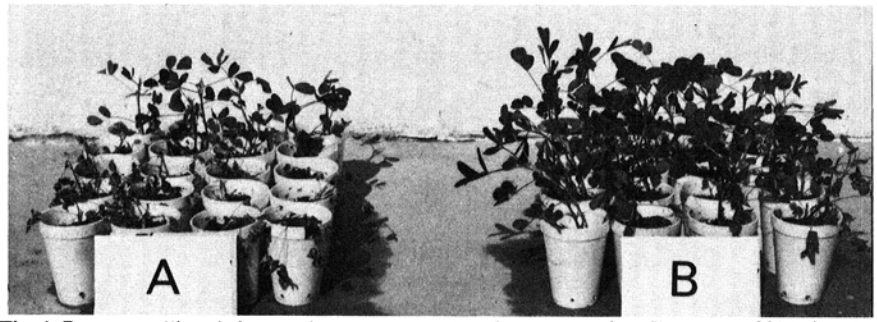

Fig. 1. Peanut seedlings infected with *Pythium myriotylum*: **(A)** cultivar Florunner (82% of plants diseased) and **(B)** resistant plant introduction 365553 (19% of plants diseased).

For the technique to work properly, temperature control was essential. Below 26 C was too low for symptom expression and 41 C was too high. The temperatures of 26–31 C used in this study approximate the average minimum and maximum soil temperature 10 cm below the surface in peanut fields of northern Texas (4).

LITERATURE CITED

1. Bell, D. K., and Minton, N. A. 1973. Post-emergence damping-off of peanut plants caused by *Pythium myriotylum*. Phytopathology 63:1544-1545.
2. Garren, K. H. 1966. Peanut (Groundnut) microfloras and pathogenesis in peanut pod-rot. Phytopathol. Z. 55:359-367.
3. Godoy, R. 1981. Structural, physiological, and pathological comparisons of peanut genotypes differing in pod rot resistance. Ph.D. dissertation. Texas A&M University, College Station.
4. Jones, B. L. 1976. Screening peanuts for resistance to diseases. Texas A&M University Research and Extension Center. Res. Rep. 82-2. 12 pp.
5. Jones, B. L. 1981. The occurrence of peanut wilt and stunt, incited by *Pythium myriotylum* in Texas. Proc. Am. Peanut Res. Ed. Soc. 13:91.
6. McCarter, S. M., and Littrell, R. H. 1973. Factors influencing zoospore production by *Pythium aphanidermatum* and *Pythium myriotylum*. Bull. Ga. Acad. Sci. 31:183-190.
7. Perry, D. A. 1967. Premature death of groundnut in Northern Nigeria. Exp. Agric. 3:211-214.
8. Porter, D. M. 1970. Peanut wilt caused by *Pythium myriotylum*. Phytopathology 60:393-394.
9. Porter, D. M., Garren, K. H., and van Schaik, P. H. 1975. Pod breakdown resistance in peanuts. Peanut Sci. 2:15-18.
10. Smith, O. D., and Boswell, T. E. 1980. Breeding for resistance to pod rot and lesion nematodes. Proc. Am. Peanut Res. Educ. Soc. 12:54.
11. Smith, O. D., Simpson, C. E., Howard, E. R., Boswell, T. E., Taber, R. A., and Pettit, R. E. 1979. Toalson spanish peanut. Tex. Agric. Exp. Stn. Misc. Pub. 1419.
12. van Schaik, P. H., Garren, K. H., and Porter, D. M. 1972. Potential sources of resistance to pod breakdown in peanuts. J. Am. Peanut Res. Educ. Assoc. 4:14-17.