

## Field and Detached-Fruit Tests for Resistance of Cucumber Lines to Fruit Rot Caused by Rhizoctonia solani

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Fruit rot caused by Rhizoctonia solani Kuhn. is one of the 3 most important cucumber diseases in North Carolina. Research on resistance has shown quantitative differences among cucumber lines tested, with a narrow-sense heritability of 0.24 (3). Lines with netted fruit skin seem to be most resistant. Resistance in one study was controlled by a single dominant gene (1). It is not known whether the gene for resistance is the same as the single dominant gene, H, which controls netted fruit skin (2). The objective of this study was to evaluate the most resistant and susceptible lines found in previous studies using inoculated-field and detached-fruit tests. Also, we evaluated the effect of fruit skin removal and fruit firmness on resistance.

Methods. Two studies were run in 1985, a field test and a detached-fruit test. The field test was run at Clinton, N.C. The field was used for screening the previous 3 years, and no fungicides ever used. The soil is inoculated each year when the crop is at vine tip-over stage. A mixture of Rhizoctonia solani isolates growing on oat grains is used for inoculation. Oat grains (6400 grains/m<sup>2</sup>) were spread over the soil to ensure a high disease incidence, and the crop was watered with overhead irrigation 3 times/week (30mm/week).

The isolates of R. solani (R8C and R8D, anastomosis group 4) used in this study were originally collected from cucumber fields in Arkansas. Inoculum was increased by transferring the fungus from stock cultures stored in paraffin oil in test tubes to potato dextrose agar. The final increase of inoculum took place on sterile oat grains as follows. Pieces of about 1 cm of the colonized agar were transferred onto sterile oat grains in autoclavable bags, which were obtained by autoclaving 300 cm of oat grains and 250 ml water 2 times for 1 hr with at least 10 hr between to ensure that all microorganisms were killed. After about 7 days at 20 to 25°C (shaking the bags every 2 days), when the oats were completely colonized by the fungus, they were dried and then stored at 4°C until needed.

The detached-fruit test was run using sterilized soil placed in flats in a mist chamber. The soil was inoculated (as described for the field test) on the day before fruits were harvested and placed on the soil. The fruits and soil were watered every few days as needed to keep the soil moist.

The field test was planted 29 April, and scored for disease on 5 and 11

Table 1. Resistance of 18 lines (out of 85 tested) to *Rhizoctonia* fruit rot in the field and detached-fruit (lab) tests run in 1985.<sup>Z</sup>

Cultivar or line	Seed source	Mean damage		Max. damage		Firm- ness
		Field	Lab	Field	Lab	
Marketmore 76	Asgrow Seed	1	1	5	2	20
Guardian	Northrup King	1	2	6	4	20
M 21	NC State Univ	2	1	7	2	20
M 16	NC State Univ	1	3	6	5	24
PI 63216-B2	India	2	5	8	7	22
Wautoma	Wis.-USDA	2	2	7	3	24
Little Leaf	Univ. Arkansas	2	5	6	10	16
Calypso	Asgrow Seed	2	4	8	7	20
Castlemaster	Castle Seed	2	2	7	4	19
Poinsett 76	PetoSeed	2	2	9	5	20
Carolina	Northrup King	3	5	8	6	23
Sumter	Asgrow Seed	3	4	8	7	23
SMR 18	PetoSeed	4	5	10	9	23
Score	Asgrow Seed	4	3	12	5	23
WI 1701	Wis.-USDA	4	6	15	8	21
WI 2757	Wis.-USDA	6	23	17	34	23
PI 419108-5A	P. Rep. China	11	30	24	50	14
Supergreen	Harris-Moran	10	34	26	35	20
$\bar{x}$		3	7	9	11	21
LSD (5%)		3	11	9	16	4
CV (%)		54	77	58	74	11

<sup>Z</sup>Firmness data were obtained by punching 2 fruits of size grade 3 in each replication and harvest in the field and lab tests. Fruits were chosen that were not touching the soil, and that were free of disease. A Magness-Taylor punch tester with a 5/16" diameter tip was used.

Table 2. Correlations among 85 lines for *Rhizoctonia* fruit rot in the field and detached-fruit (lab) tests run in 1985.

Trait	% fruit damage		Firm- ness
	Field	Lab	
% Fruit damage - Peeled <sup>Z</sup>	0.17*	0.12	-0.11
- Field	-	0.58**	-0.21**
- Lab	-	-	-0.33**

<sup>Z</sup>Two fruits in each plot were peeled and placed in contact with the soil 1 week before measuring damage.

July. The detached-fruit test was planted on 9 May and harvested on 12 and 19 July. On 1 July, the skin was peeled off 2 fruits in each plot where they touched the soil. One fruit in each treatment of the detached-fruit test was peeled at harvest before placing the fruits on the soil in flats.

The field and detached-fruit tests were run with 85 lines, consisting of the most resistant and most susceptible lines from previous tests, along with several cultivars of interest for production in the southern U.S.A. The field test used 3 replications, 2 harvests, and 6 fruits per line. The detached-fruit test used 1 replication, 2 harvests, and 3 fruits per line. Fruits were tested when they reached 50 mm diameter.

Results. The most resistance pickling cucumbers were NCSU M 16 and NCSU M 21 (Table 1). The most resistant slicing cucumbers were 'Marketmore 76' and 'Guardian'. PI 163216 selection B2 showed a useful level of resistance. However, this year, we were careful to allow for its later maturity, and it had more fruit damage as a result. Part of its resistance appears to be due to escape (delayed fruit setting). 'Sumter' and 'Supergreen' are useful as check lines for intermediate and susceptible levels, respectively.

The correlation between field and detached-fruit tests was 0.58, about the same as in 1984 (Table 2). The correlation was highly significant, but not high enough to substitute for the field test. The most useful application for the detached-fruit test is for testing lines that may have low yield, late maturity or low resistance to other prevalent diseases that make field tests difficult to run. In North Carolina, however, the spring field crop can be grown with few disease problems, and insects and nematodes can be controlled with standard cultural practices. Maturity problems have been reduced by using different planting dates.

Firmness was correlated with resistance (Table 2), but not to a very high degree ( $r = 0.33$ ). Also, peeled fruits responded somewhat similarly to unpeeled fruits, but not to a high degree ( $r = 0.17$ ). Thus, some progress will be made by selecting for firm fruits with a resistant skin. However, there are obviously lines that do not fit that pattern since the correlations are low in both cases.

#### Literature Cited

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