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1) Response of tolerant and susceptible soybean cultivars to Columbia lance nematode.

Columbia lance nematode, CLN [*Hoplolaimus columbus* Sher], is a migratory endo- and ectoparasite of soybean and commonly causes yield reductions of up to 30% in tolerant cultivars. Complete crop failure may occur on moisture-stressed or susceptible cultivars. First recognized as a major parasite of cotton and soybean in 1967 (Fassultiotis et al., 1968), CLN now infests a large portion of the coastal plain of South Carolina, Georgia, and North Carolina.

No sources of resistance to CLN are known, although tolerance has been demonstrated in some soybean cultivars by comparing relative seed yield of nematicide-treated and nontreated plots (Nyczepir and Lewis, 1979). We are interested in screening Plant Introduction materials for new sources of tolerance or resistance to CLN in addition to studying inheritance of tolerance in known sources; however, we have not known what measurements or criteria to use to assess CLN damage in single plants or segregating populations. The objective of this study was to examine tolerant and susceptible cultivars of soybean growing in a CLN-infested field to determine plant evaluation criteria that may be associated with tolerance.

Materials and methods: Plots of CLN-tolerant 'Foster', 'Centennial', and 'Coker 368', and susceptible 'Braxton' were planted with and without in-row subsoiling in a CLN-infested field near Blackville, SC, on July 17, 1986. Five single plants (replications) were randomly excavated from a predetermined 1-m-row area at 5, 7, and 9 weeks after planting. Due to extreme heat and drought conditions during 1986, growth stages were compressed and, therefore, all cultivars matured together.

Each plant was rated on a scale of relative lateral-root branching from one (least) to five (most), and darkened or necrotic root lesions were counted. CLN were extracted from roots by using a modified Seinhorst mist apparatus and expressed per gram of tissue. Shoots were dried and weighed.

Results: CLN g root⁻¹ measurements in subsoiled plots were highly variable and no significant differences existed at either 5 or 9 weeks after planting; however, Braxton was significantly higher than the tolerant cultivars at 7 weeks (Table 1). In nonsubsoiled plots, where infestation and damage is greatest, CLN g root⁻¹ did not follow predicted tolerance at 5 weeks, but Braxton had values significantly higher than all tolerant cultivars at 7 weeks and higher than Foster and Centennial at 9 weeks. This measurement is sensitive to sampling time and may not be adequate to assess tolerance under field conditions. Under controlled conditions, where age of nematodes and generation time may be more closely controlled, CLN g root⁻¹ may be a useful measurement.

CLN often feeds on secondary root primordia, which may induce lateral root branching (Lewis et al., 1976), and the branching score we used reflected cultivar tolerance well at 5 and 7 weeks in subsoiled plots. Braxton had

Table 1. Columbia lance nematodes per gram of root, branching score, and shoot and root weights for tolerant and susceptible soybean cultivars grown with and without in-row subsoiling and sampled at five, seven, and nine weeks after planting, 1986

Cultivar	Subsoiled				Nonsubsoiled			
	CLN g root ⁻¹	Branch 1 to 5	Shoot g	Root g	CLN g root ⁻¹	Branch 1 to 5	Shoot g	Root g
<u>Five weeks after planting</u>								
Foster	106.3	1.0	0.51	0.49	324.1	4.0	0.18	0.53
Centennial	222.3	1.8	0.15	0.27	557.9	4.2	0.49	1.29
Coker 368	92.1	2.4	0.41	0.55	143.4	3.6	0.57	1.37
Braxton	272.5	3.0	0.28	0.41	282.3	4.4	0.57	1.37
LSD ^a	NS	0.5	0.08	NS	93.5	0.2	0.34	0.27
CV (%)	142	39	46	54	62	11	38	43
<u>Seven weeks after planting</u>								
Foster	94.4	2.2	0.62	4.30	92.7	3.0	0.94	5.00
Centennial	93.0	2.4	0.79	3.44	42.3	4.2	2.18	5.60
Coker 368	63.7	3.0	2.13	4.80	22.2	3.2	0.97	3.92
Braxton	190.6	4.4	0.99	4.06	130.3	4.0	1.39	4.52
LSD	37.1	0.5	0.42	NS	27.2	0.3	0.31	NS
CV (%)	61	15	62	28	59	9	37	28
<u>Nine weeks after planting</u>								
Foster	52.7	2.2	1.85	1.44	108.9	2.6	1.07	1.86
Centennial	57.9	3.0	1.30	1.19	81.9	3.0	3.08	2.51
Coker 368	55.0	2.2	2.52	1.24	183.6	2.6	0.41	0.94
Braxton	27.1	3.2	1.60	2.73	206.5	2.8	0.55	1.36
LSD	NS	NS	NS	0.40	41.3	NS	0.63	0.38
CV (%)	77	30	58	37	53	33	69	36

^aLeast significant difference (0.05 level) calculated only with a significant F test.

significantly higher branching values than the tolerant cultivars and Foster (most tolerant) had the lowest values. We plan to study the utility of this measurement more closely in the greenhouse and in nematicide versus nonnematicide-treated field plots. Branching scores were less reliable for predicting tolerance in nonsubsoiled plots, possibly indicating that extremely high levels of infestation and damage overcome tolerance mechanisms.

Shoot and root weights did not appear to be useful in comparing cultivar tolerance, and may reflect differences between the cultivars themselves regardless of CLN. Shoot and root weights may have more utility when studied under controlled conditions or in fumigated versus nonfumigated plots. Nyczepir and Lewis (1979) demonstrated that individual soybean genotypes usually have higher shoot and root weights when grown in fumigated soil than in CLN-infested soil. Lesions (data not shown) did not correlate to CLN g root⁻¹ measurements and were difficult to discern, possibly due to the presence of other organisms that also cause lesions.

References

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