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Host Status of Commercial Maize Hybrids to *Rotylenchulus reniformis*[1]

G. L. Windham[2] and G. W. Lawrence[3]

Abstract: The host status of 50 commercial maize hybrids for a Mississippi population of *Rotylenchulus reniformis* was determined in greenhouse experiments. Reproduction was measured by determining RF values ([final egg number + juveniles and vermiform adults in soil] ÷ initial egg number) and number of eggs per gram of fresh root. All hybrids maintained *R. reniformis* below the initial population level, indicating that they are relatively poor hosts for this species. RF values for *R. reniformis* among hybrids were different ($P \leq 0.05$) and ranged from 0.03 for 'Pioneer 3147' and 'Pioneer 3136' to 0.60 for 'Hy Performer HS60'. No *R. reniformis* eggs were recovered from the roots of 15 of the maize hybrids.

Key words: corn, host suitability, maize, nematode, reniform nematode, resistance, *Rotylenchulus reniformis, Zea mays.*

The reniform nematode (*Rotylenchulus reniformis* Linford & Oliveira) is a serious pest of cotton (*Gossypium hirsutum* L.), with symptoms ranging from stunting to plant death (3,5,6). *Rotylenchulus reniformis* is distributed throughout the southeastern United States, primarily in cotton production areas (10). Since the isolation of *R. reniformis* from cotton production areas of Mississippi in 1980 (16), growers have initiated crop management practices to keep this nematode below damaging levels. Chemical control of the reniform nematode has successfully limited the effect of this nematode on cotton yields (13,18). Use of crop rotation (7) and nonhosts (8) has also been successful in managing reniform populations below damaging levels on other crops. Maize (*Zea mays* L.) has been recommended for rotation with reniform-susceptible crops because it is a poor host (7).

No information is available on the host status of recently developed commercial maize hybrids for *R. reniformis*. This investigation was conducted to identify commercial maize hybrids that are poor hosts of *R. reniformis* and that could be used as components of crop rotation systems to control this nematode.

Materials and Methods

A population of *R. reniformis* was collected from a cotton field in Tallahatchie County, Mississippi. Inoculum was increased on 'Deltapine 20' cotton in the greenhouse at ca. 28 C. After 8–10 weeks, eggs were collected from cotton roots using NaOCl (11).

Fifty commercial maize hybrids evaluated in the 1989 corn variety trials at Mississippi State University were selected for this study. Single seeds were planted in Super Cell Cone-tainers (Stuewe & Sons, Corvallis, OR) containing 177 g of a methyl bromide-sterilized mixture of sandy loam soil and river sand (mixture was 80% sand, 6% clay, 14% silt). When 7–10 days old, seedlings were inoculated by pipetting a suspension containing 1,200 eggs of *R. reniformis* in 2 ml water into each cell. Seedlings of Deltapine 20 cotton were inoculated at the same time the maize hybrids were inoculated to monitor the viability and infectivity of the nematode eggs. Plants were grown in the greenhouse at an average temperature of ca. 28 C.

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[2] Research Plant Pathologist, USDA ARS, Crop Science Research Laboratory, P.O. Box 5367, Mississippi State, MS 39762.

[3] Assistant Professor of Plant Pathology, Department of Plant Pathology and Weed Science, Mississippi State University.

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Hybrids were arranged in a randomized complete block design with five replications. Sixty days after inoculation, roots were carefully washed free of soil, weighed, and cut into 1-cm segments. Eggs were extracted from each root system using NaOCl (11) and counted. Vermiform stages of *R. reniformis* were extracted from the soil from each cone-tainer using a sieving and centrifugation method (2). Oostenbrink's (15) R factor (RF) ([final egg number + juveniles and vermiform adults in soil] ÷ initial egg number) and the number of eggs per gram of fresh root were determined for each hybrid. The experiment was repeated once at an average temperature of ca. 28 C. Data from both experiments were combined for analyses, and hybrids were compared by least significant differences (LSD) at $P = 0.05$.

Results

Hybrids differed ($P = 0.05$) in their abilities to support *R. reniformis* populations (Table 1). However, all of the maize hybrids evaluated had RF values well below 1.0. 'Hy Performer HS 60' had the highest RF value at 0.6. Hybrids with the lowest RF values (0.03) were 'Pioneer 3147' and 'Pioneer 3136'. The cotton cultivar Deltapine 20, used as a susceptible control, had an RF value of 28.5.

Number of eggs per gram of fresh root were also low for most of the maize hybrids tested. No *R. reniformis* eggs were recovered from 15 of the hybrids, although a few juveniles and vermiform adults were recovered from the soil. The highest number of eggs recovered were 214 and 226 per gram of fresh root from 'Coker 8625' and 'Pioneer 3187', respectively.

Discussion

All 50 maize hybrids evaluated were considered poor hosts for the Mississippi population of *R. reniformis* because reproduction by the nematode was very limited (RF < 1.0). Our study confirmed and extended findings of others that maize is a

TABLE 1. Reproduction of *Rotylenchulus reniformis* on 50 commercial maize hybrids after 60 days.

Hybrid no.	Brand name	RF†	Eggs/g fresh root
HS60	Hy Performer	0.60	7.0
TR402E	Terra	0.45	61.0
7400	Sunbelt	0.42	41.0
DP5750	Deltapine	0.39	27.0
8625	Coker	0.27	214.0
DP5666	Deltapine	0.25	160.0
SX-5	Longest	0.23	11.0
8027	Cargill	0.21	11.0
7990	Cargill	0.17	3.0
5509	Asgrow	0.17	3.0
G4868	Funk	0.16	37.0
G4733	Funk	0.15	5.0
DK789	Dekalb	0.15	4.0
3187	Pioneer	0.14	226.0
1802	Sunbelt	0.13	4.0
1860	Sunbelt	0.13	9.0
HS64	Hy Performer	0.12	4.0
DPX9986	Deltapine	0.12	0.7
2570	Asgrow	0.12	0.6
NKS8645	Northrup King	0.11	30.0
150	Oro	0.11	31.0
NKS7686	Northrup King	0.11	5.0
7800	McCurdy	0.10	14.0
8696	Coker	0.10	0.0
1827	Sunbelt	0.10	0.0
3140	Pioneer	0.10	0.0
3358	Pioneer	0.09	6.0
SX352	Cargill	0.09	6.0
DK711	Dekalb	0.09	1.0
3343	Pioneer	0.09	0.0
180	Oro	0.09	9.0
7777	McCurdy	0.08	3.0
G4543	Funk	0.08	4.0
3295	Pioneer	0.08	0.0
3389	Pioneer	0.08	0.0
X9086	Asgrow	0.08	0.0
NKS7759	Northrup King	0.08	0.0
TR365E	Terra	0.08	13.0
7046X	Funk	0.08	6.0
AP670	Agri-Pro	0.07	0.0
AP850	Agri-Pro	0.07	2.0
NKPX9540	Northrup King	0.07	0.0
1876	Sunbelt	0.06	1.0
DK689	Dekalb	0.06	0.0
3055	Pioneer	0.06	0.0
HS97	Hy Performer	0.06	0.0
TR364E	Terra	0.05	38.0
NK508	Northrup King	0.05	0.0
3147	Pioneer	0.03	7.0
3136	Pioneer	0.03	0.0
LSD ($P = 0.05$)		0.26	163.0

† RF = (Final egg number + juveniles and vermiform adults in soil) ÷ initial egg number. Reproduction of *R. reniformis* on susceptible cotton cv. Deltapine 20 was an average RF of 28.5.

poor host of *R. reniformis* (4,16). Populations of *R. reniformis* may vary in their ability to reproduce on maize; of 10 *R. reniformis* populations tested in India, only one reproduced on maize (9).

Few viable options are available for control of *R. reniformis* on cotton. Although nematicides have been successful in maintaining cotton yield in reniform-infested fields, nematode populations remain at levels comparable to or greater than levels in untreated plots and create problems for subsequent crops (13,17). Also, due to the environmental issues associated with nematicides, chemical control may not remain an option if nematicides continue to be eliminated from the U.S. market. Resistance to *R. reniformis* has been identified in cotton (12,14,22), but at present no resistant cultivars are commercially available. However, resistant cotton cultivars may become available in the near future.

Crop rotation is one of the oldest and most effective methods for managing plant-parasitic nematodes (1). However, many growers do not use this form of nematode management because of limited land availability and the low economic value of many nonhost crops. Maize has been successfully used in rotation to limit reniform nematode effects on sweet potato yields (7). Rotation with maize may be a possible method of managing *R. reniformis* populations below damaging levels in cotton in the Southeast.

Several of the maize hybrids that were poor hosts for *R. reniformis* in this study are also poor hosts for other plant-parasitic nematodes. Pioneer 3147 and Northrup King 508 are resistant to *Meloidogyne arenaria* (Neal) Chitwood race 2 (20) and *M. javanica* (Treub) Chitwood (21). Both cultivars are very susceptible to *M. incognita* (Kofoid & White) Chitwood. Plant breeders are incorporating *M. incognita* resistance into maize, which would enhance its value in crop rotation systems (19).

We have demonstrated that many commercial maize hybrids are available with resistance to *R. reniformis*. Maize may become an important component of crop rotation systems to limit the effect of *R. reniformis* on yields of cotton and other reniform-susceptible crops.

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