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CHLOROTIC LESION RESISTANCE TO
HELMINTHOSPORIUM MAYDIS IN MAIZE

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An apparently new type of resistance to Helminthosporium maydis Nisik. & Miyake (Cochliobolus heterostrophus Drechs.) has been observed by the Federal Department of Agricultural Research in Nigeria. Maize inbreds derived from the Kenyan maize selection AFRO P. 59. 289 exhibited small, chlorotic circular lesions when inoculated with H. maydis as seedlings and at later stages of development. Earlier reports indicate that resistance in maize to H. maydis is not clearly expressed in the seedling stage (1, 4). In addition, the usual type of resistance is expressed by reduction in number of lesions rather than by a change in type of lesion.

MATERIALS AND METHODS

Seedlings of the S₂ maize inbreds 024-2-3 and 013-21-3, hereinafter referred to as resistant and susceptible respectively, were grown in the greenhouse and inoculated with H. maydis at the fourth leaf stage by using a single inoculum on all plants in one test. The seedlings were inoculated by atomizing with a spore and mycelial suspension of H. maydis and kept under conditions of high humidity for 20 hours. Seedlings were observed for number of lesions, length of lesions, and occurrence of sporulation at various periods after inoculation.

RESULTS

Number of Lesions: Small chlorotic spots, which indicated infection by H. maydis, appeared on leaves of inoculated seedlings within 2 days after inoculation. Three days after inoculation we counted the number of lesions in an area of 1.9 cm², selected at random on the third leaf of resistant and susceptible plants. Statistical analysis of the results (Table 1) showed no significant difference in number of lesions between the resistant and susceptible maize lines which had 0.41 lesions per cm² and 0.51 lesions per cm², respectively.

Length of Lesions: We observed the length of lesions 9 days after inoculation. At this time seedlings of the susceptible maize inbred exhibited the tan, rectangular lesions characteristic of infection by H. maydis; lesions on resistant seedlings were small, circular and chlorotic (Fig. 1).

Three lesions were selected at random on the third leaf of 20 plants of each maize line. The length of selected lesions was measured to the nearest 0.5 mm. Statistical analyses of the results (Table 1) showed significant differences in lengths of lesions between resistant and susceptible maize seedlings with mean lesion lengths of 1.6 mm and 12.9 mm, respectively.

Table 1. Number and length of lesions on resistant and susceptible maize seedlings inoculated with Helminthosporium maydis.

Seedling reaction	Lesion No. /cm ² leaf ^a	Lesion length ^b
Resistant	0.41	1.6**mm
Susceptible	0.51	12.9 mm

^aMean of 36 observations.

^bMean of 60 observations.

**Difference between reaction types significant at the 1% level.

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FIGURE 1. Lesions on chlorotic lesion resistant (left) and susceptible (right) maize seedlings inoculated with Helminthosporium maydis.

Sporulation: Seven days after inoculating 13 resistant seedlings and 18 susceptible seedlings, we placed them in a moist chamber and kept them under conditions of high humidity for 24 hours. After removal from the moist chamber, lesions on the fourth leaf of each plant were examined microscopically for sporulation of H. maydis.

Resistant and susceptible seedlings were inoculated but were not held in the moist chamber. Eight days after inoculation we removed leaf sections from each type and placed these on moist filter paper in Petri dishes. Observations for sporulation of H. maydis were made after 48, 68, 92 and 164 hours of incubation.

The results (Tables 2 and 3) showed that sporulation of H. maydis is inhibited by the chlorotic lesion type of resistance. After 24 hours in the moist chamber, no sporulation occurred

Table 2. Occurrence of sporulation on resistant and susceptible maize seedlings, inoculated with Helminthosporium maydis, after 24 hours in moist chamber.

Seedling reaction	% Plants showing sporulation ^a
Resistant	0**
Susceptible	78

^aObservations made on 13 resistant and 18 susceptible seedlings.

**Difference between reaction types significant at 1% level.

Table 3. Occurrence of sporulation on leaf sections from resistant and susceptible maize seedlings, inoculated with Helminthosporium maydis after periods of incubation.

Seedling reaction	% Leaf sections ^a		Sporulating/hour		Incubation
	: 48 hours	68 hours :	: 92 hours	164 hours	
Resistant	0%**	19%**	37%**		69%*
Susceptible	87%	100%	100%		100%

^aLeaf sections taken from 16 plants of each reaction type.

**Differences in percentages between reaction types significant at 1% level.

*Differences in percentages between reaction types significant at 5% level.

on the resistant seedlings; 78% of the susceptible seedlings had sporulating lesions.

Excised leaf sections of the resistant seedlings showed no sporulation after 48 hours of incubation; sporulation occurred on 19, 37, and 69% of these leaf sections after 68, 92 and 164 hours of incubation, respectively. Sporulation was observed on 87% of excised leaf sections of susceptible seedlings after 48 hours of incubation; 100% showed sporulation after 68 hours of incubation.

DISCUSSION

Results indicate that the chlorotic lesion type resistance to *H. maydis* restricts size of lesion, delays lesion necrosis, and delays sporulation of the pathogen on the lesion.

Hooker (3) reported a chlorotic lesion type of resistance in maize to *Helminthosporium turcicum* Pass. (*Trichometasphaeria turcica* Luttrell). The effects of chlorotic lesion resistance on *H. turcicum*, restriction of lesion size, delay in lesion necrosis, and inhibition of sporulation of the pathogen appear similar to those observed by Hilu and Hooker (2) for chlorotic lesion resistance to *H. maydis*.

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