Introduction

The peanut root-knot nematode, M. arenaria, causes 5-15% annual yield losses to peanut in the southeast. In Georgia, this nematode is responsible for $60-400 million in yield losses and costs $8 million to control (1998 Georgia Plant Disease Loss Estimates). Crop rotation and nematode resistance are the primary management tactics available to growers. However, because of the extensive host range of M. arenaria, growers have few nematode-resistant cultivars to include in rotation. In response, nematode-resistant peanut cultivars would allow the use of certain nematode application and would allow growers greater flexibility in their choice of rotation crops. The first nematode-resistant peanut cultivar, COAN, was developed by introgressing resistance from wild peanut species (Starr and Culbreath, 2001). Although this line has a very high level of resistance to the peanut root-knot nematode, it is not a viable peanut cultivar in the southeast due to its susceptibility to TSWV (Holbrook et al., 2003).

Since 1985, tomato spotted wilt virus (TSWV) has become a major problem in peanut production areas of the southeastern United States. The disease is now common in most peanut-growing areas, including Georgia, Florida, Alabama, Texas, and North Carolina, and has become the most important disease problem for many peanut growers (Culbreath et al., 1997a). Several sources of resistance to TSWV are available in peanut, however, they are all susceptible to the peanut root-knot nematode. The objective of this research was to develop a peanut cultivar adapted to the Southeastern U.S. with resistance to both the peanut root-knot nematode and TSWV.

Methods and Materials

The original population was developed by crossing C-99R (Gerber and Shokes, 2002), a cultivar with good field resistance to TSWV with COAN, a cultivar with near immunity to the peanut root-knot nematode. The population was advanced to the F5 using single seed descent. Individual F6 plants were harvested.

A few seed from each plant were used to evaluate the population for resistance to M. arenaria using the greenhouse screening techniques described by Holbrook et al. (1993) with three replications. The remaining F6 seed were planted the following year in single replication plots at the Gibbs farm in Tift County, GA. Spotted wilt intensity was evaluated in each plot using a disease intensity rating that represents a combination of incidence and severity as described by Culbreath et al. (1997b).

Results and Discussion

The results indicate that Tifguard, the TSWV-resistant line (Table 1) is resistant to M. arenaria (Table 1). Results for Tifguard were very similar to those observed for COAN and NemaTAM, the two nematode-resistant peanut cultivars (Holbrook et al., 2005).

In fields with little or no nematode pressure, COAN and NemaTAM exhibited yields that were significantly lower than those of Georgia Green (Brandle, 1996) (Figure 1). Similar results were observed for COAN in a previous study (Holbrook et al., 2005). Although NemaTAM was chosen to have a higher yield potential than COAN in Texas (Church et al., 2004), the yield difference we observed was not significant. COAN and NemaTAM are not commercially viable cultivars for the southeastern U.S. because of their high susceptibility to TSWV (Figure 2). Tifguard exhibited significantly higher resistance to TSWV than those cultivars in both years of testing. Tifguard also exhibited higher resistance to TSWV than Georgia Green and C-99R, cultivars with moderate levels of resistance to TSWV. Tifguard had significantly higher yield than Georgia Green when grown in fields with little to no nematode pressure (Figure 1). Although a previous study had documented competitive yields in breeding lines with moderate resistance to nematodes (Holbrook et al., 2005), this is the first report of competitive yield potential for a peanut genotype with a high level of nematode resistance when grown under severe pressure from TSWV.

In the peanut production regions of the southeastern United States, TSWV can be induced by nematodes and nematode-resistant peanut cultivars can be reduced by nematode pressure. The yield of currently available nematode-resistant cultivars will be reduced by nematode pressure, and the yield of currently available nematode-resistant cultivars will be reduced by TSWV. Because of its high level of resistance to both TSWV and M. arenaria, Tifguard had significantly higher yield than all other accessions when grown in two locations with high pressure from both pathogens (Figure 3). Root galling indices for Tifguard demonstrated a level of nematode resistance similar to NemaTAM and the nematode resistant germplasm line NR0812 and NR0817 (Anderson et al., 2006) (Figure 4).

In summary, this is the first report of a high-yielding peanut genotype with excellent field resistance to both the peanut root-knot nematode and TSWV. Tifguard should be valuable for peanut growers who have to deal with both pathogens. 1USDA-ARS, Tifton, Georgia; 2University of Georgia, Tifton, Georgia.

Table 1. Root-gall, egg-mass ratings, and Meloidogyne arenaria reproduction on selected peanut genotypes when tested in the greenhouse.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Root-gall index</th>
<th>Egg-mass index</th>
<th>Eggs per gram</th>
<th>Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgia Green</td>
<td>4.52</td>
<td>3.7</td>
<td>8325</td>
<td></td>
</tr>
<tr>
<td>C-99R</td>
<td>4.2</td>
<td>3.2</td>
<td>3563</td>
<td></td>
</tr>
<tr>
<td>COAN</td>
<td>1.5</td>
<td>0.7</td>
<td>206</td>
<td></td>
</tr>
<tr>
<td>Tifguard</td>
<td>1.5</td>
<td>0.5</td>
<td>134</td>
<td></td>
</tr>
<tr>
<td>NemaTAM</td>
<td>1.0</td>
<td>0.5</td>
<td>171</td>
<td></td>
</tr>
<tr>
<td>LSD (P=0.05)</td>
<td>1.0</td>
<td>1.1</td>
<td>7071</td>
<td></td>
</tr>
</tbody>
</table>

1. Root-gall and egg-mass ratings were based on a scale: 0 = none, 1 = slight, 2 = moderate, 3 = heavy, 4 = very heavy.

REFERENCES


