The Changing Face Of Soybean Cyst Nematode Management

Dr. Pat Donald
Research Plant Pathologist, USDA ARS

Managing SCN has become more complex as more is learned about the nematode- plant interaction. There are increasing numbers of reports of fields where a resistant variety has been planted but the SCN population density exploded and yield loss is observed even with the resistant variety.

Traditional strategies to manage soybean cyst nematode, once SCN is detected, is use of resistant soybean varieties rotated with crops which do not support SCN reproduction (Niblack and Tylka, 2008). This works well if the SCN egg population density is low and can be maintained at a low level with soybean production every two or three years. The next iteration was on the plant side and suggested rotation of the sources of plant resistance to slow adaptation of SCN to the different sources of soybean resistance. Although over 120 different sources of soybean resistance have been identified in Glycine max (soybean), 90-97% of commercial soybean varieties derive their resistance from the same source. Even with the different sources of SCN resistance in soybean germplasm, there is evidence that these sources produce similar morphological reactions in the presence of SCN. However, variety selection is extremely important because not all varieties respond to SCN identically even with the same source of resistance.

The other part of the plant-nematode interaction is measurement of the nematode virulence phenotype. Virulence is measured through a bioassay response of the nematode to different sources of resistance. Virulence phenotypes are on some seed bags expressed as SCN race. Within the scientific community virulence phenotypes are now expressed as HG Type (Niblack et al, 2002). This test is an expansion of the race test incorporating more sources of resistance.

Soybean production fields were sampled for presence of H. glycines. Soil samples were 50 cores per 25 acre subsamples from random soybean fields. Samples were processed with a semi-automatic elutriator and cyst counted using a stereo microscope. Soil samples containing ≥ 6 cysts were retained for greenhouse bioassay. Soil samples with 2 or more H. glycines cysts were increased by planting susceptible cv Hutcheson soybeans to provide inoculum for population characterization. Samples containing more than 100 cysts advanced to characterization. Plants were grown in 3" diameter pots containing 200 cm3 of steam sterilized field soil (three parts sand: one part sandy loam soil (3:1 v:v)). The air temperature was 27 C with heat applied directly under the bench. Water was supplied as needed and the water was heated to 20 C from October through April prior to application to the pots. Inoculum was obtained by crushing cysts and releasing the eggs and second-stage juveniles (Niblack et al., 2003, Faghihi and Ferris, 2000). Each sample was planted in three replications with two seed of the seven HG Type indicator lines: PI 548402, 88788, 90763, 437654, 209332, 89772, and 548316 in addition to PI 548658, the standard susceptible (Niblack et al., 2002) (U.S. Regional Soybean Laboratory, Urbana, IL). After 1 month, seedlings were examined for development of cysts. New cysts were collected as described above.

In Tennessee where cultivars with PI 88788-derived resistance have been used since 1978, every H. glycines field population with a high egg population density had ≥10% reproduction on PI 88788, and no HG Type 0 populations were found. Only one population was rated as HG Type 7. These fall into the race 3 category. Most Tennessee populations were found to be HG Type 1.2.5.7. Of 1,400 soil samples, 882 (63%) were infested but only 26 (3%) had a high enough egg population density and reproductive rate for characterization within 60 days of greenhouse bioassay initiation. Of the 26 Tennessee populations characterized, 24 (93%) reproduced ≥10% on PI 88788, whereas 20 (78%) reproduced ≥ 10% on PI 548402 (Peking).

Comparisons of SCN population characterizations from 1988 and 1993 (date 1) with those conducted in 2006-2009 (date 2) in Tennessee show a change from date 1 where 50% of the SCN populations were able to reproduce on PI 88788, the most common source of resistance to SCN, to date 2 where 85% of the populations which were characterized reproduced ≥ 10% on PI 88788. Complete HG Type tests were done on the date 2 populations to get a baseline on changes in virulence in the future.

Because there are only a limited number of source of resistance in commercial varieties, some labs conduct a partial HG Type test reflecting options available to producers. Making the correct variety selection requires knowledge of each field situation. Some fields have SCN at low levels over a long period of time with or without the presence of other yield-limiting diseases. Other fields have large fluctuations in SCN egg population density which require careful monitoring to reduce the SCN egg population density and associated yield loss risk. Δ

References:

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