

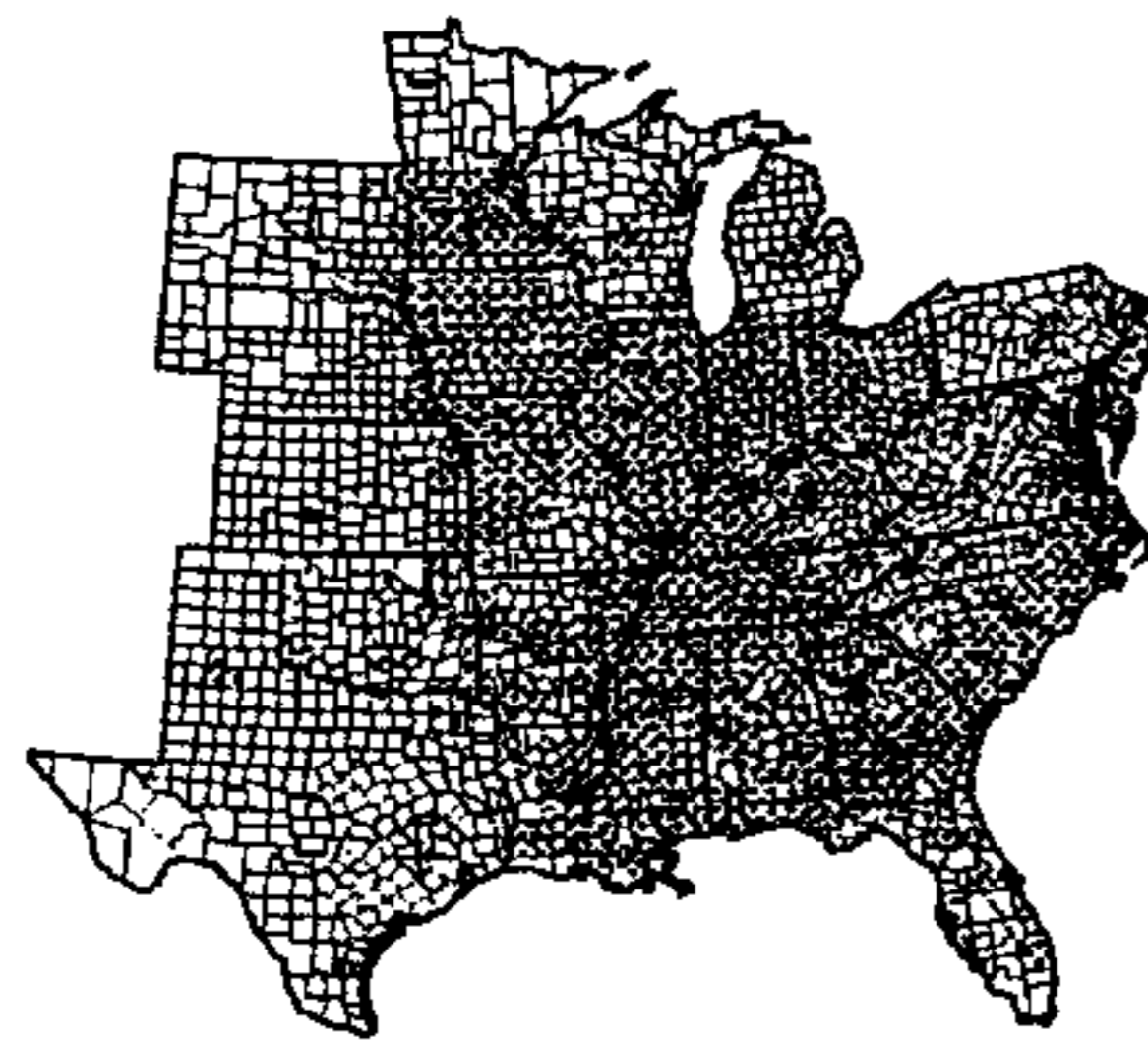
Biology of SCN Slide Series



Biology of Soybean Cyst Nematode

1

SCN Distribution



2

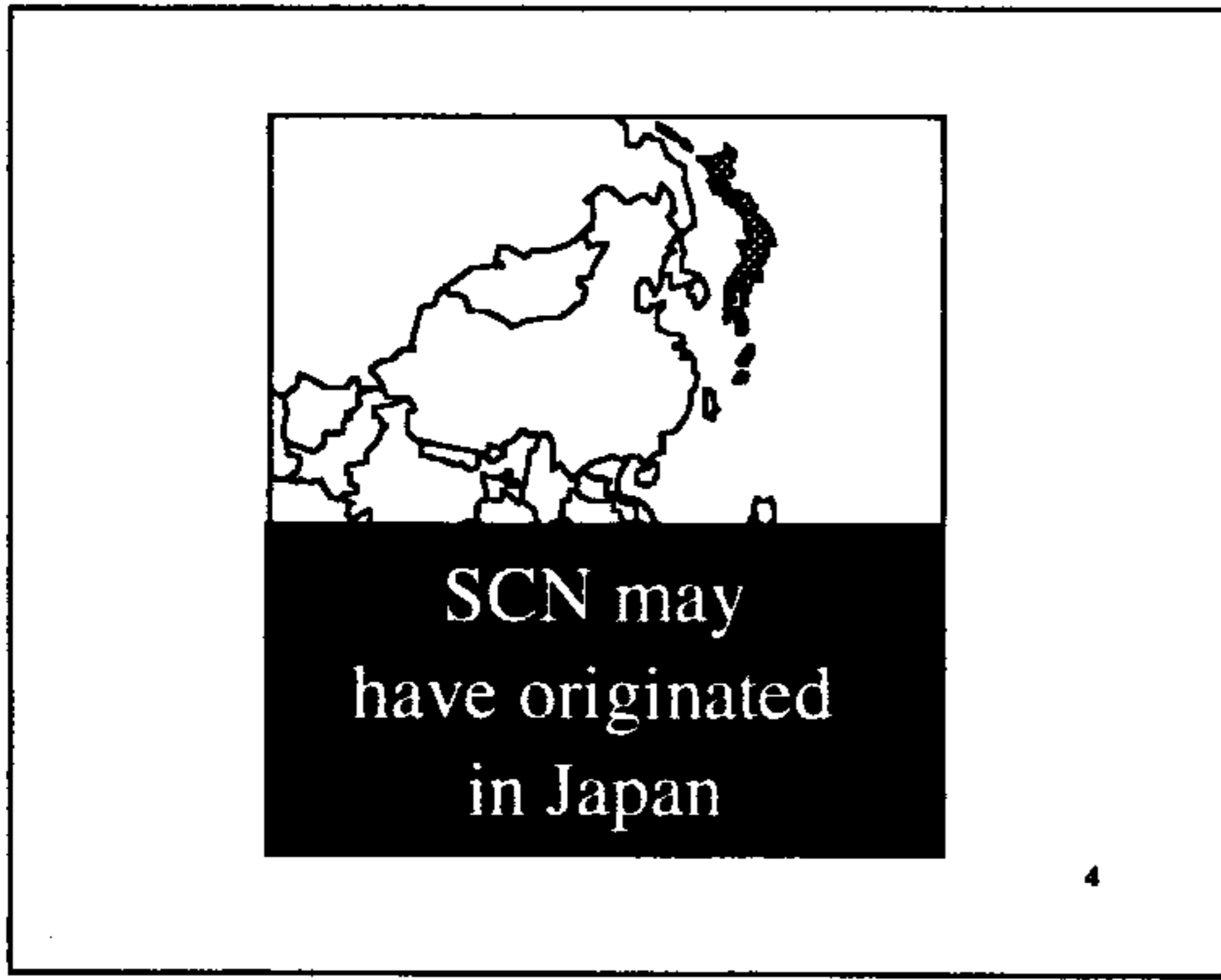
Soybean cyst nematode or SCN is the most important soybean pest in the Midwest. SCN occurs throughout the region and is widespread in every major soybean-producing state. SCN is a perennial problem to soybean farmers. Each year, producers lose profits to SCN. In 1997, soybean cyst nematode reduced soybean yields by 209 million bushels.

Lack of above- ground symptoms

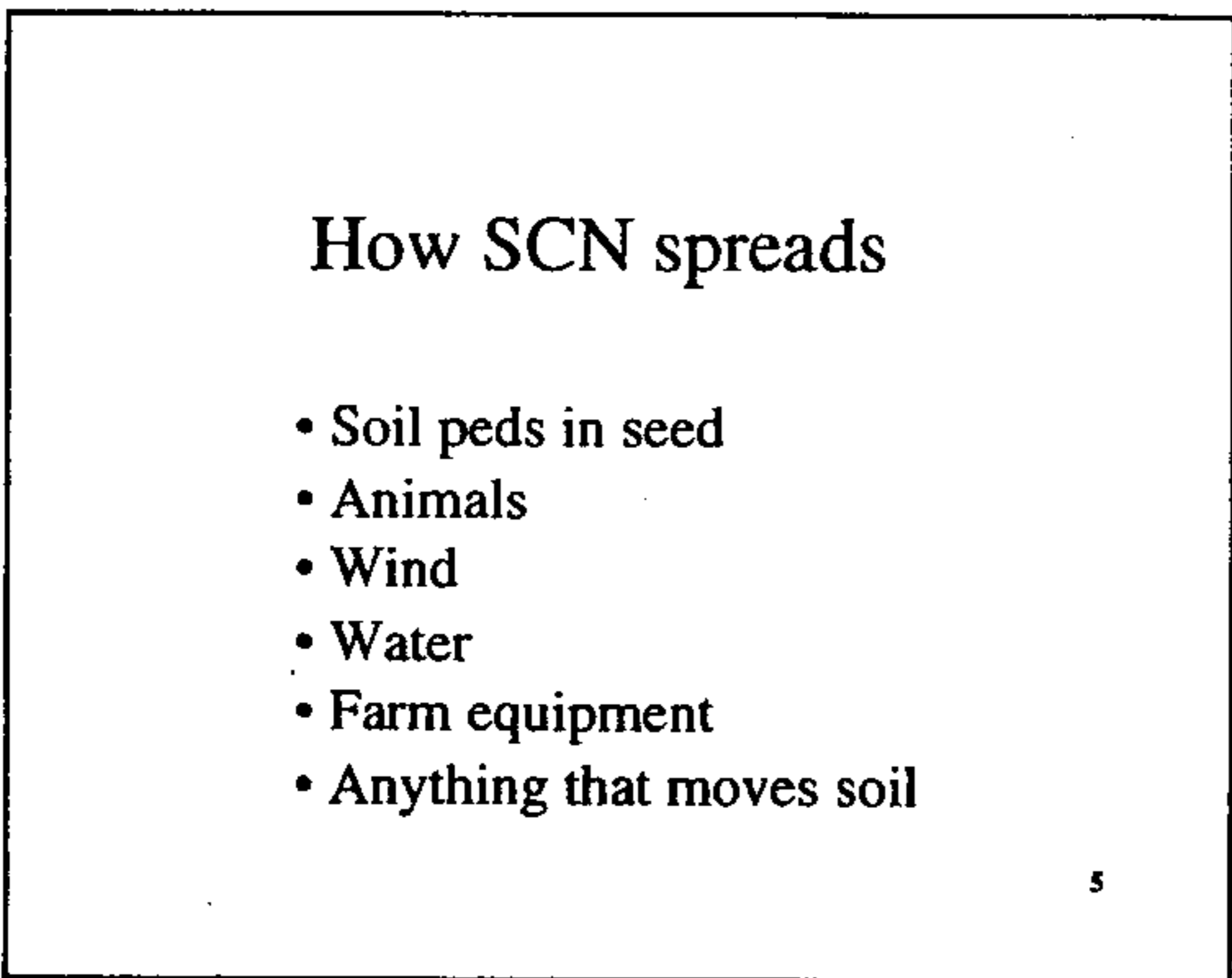


3

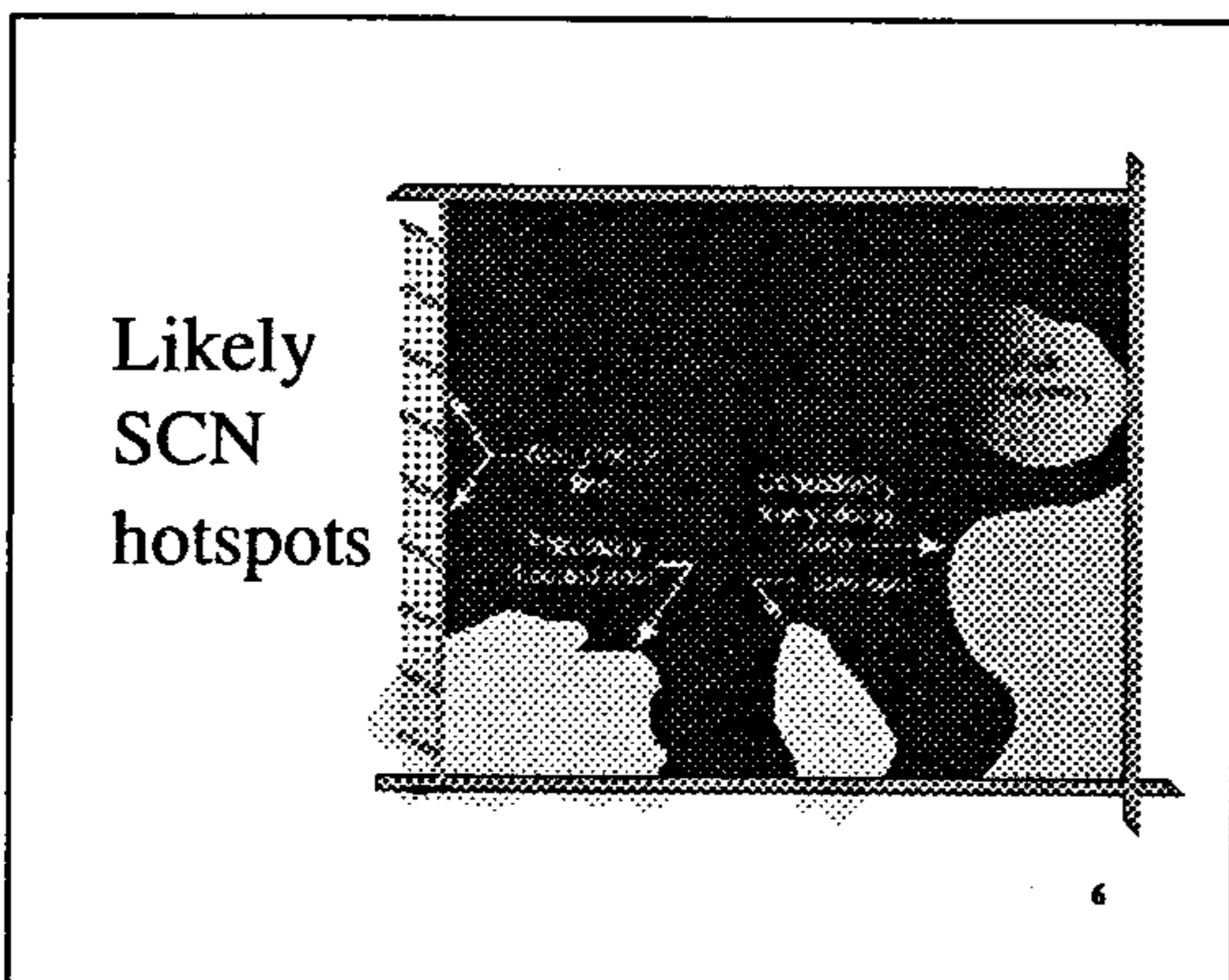
SCN often is a “silent” partner in soybean production, stealing 15%, 25% and up to 40% of your yield without you ever seeing an above-ground disease symptom. Soybean cyst nematode cannot be eliminated but proper management can maximize yields and minimize SCN reproduction.



Soybean cyst nematode is believed by many to have come to the United States from Japan with soil imported from the Orient during the late 1800s to obtain nitrogen-fixing bacteria. SCN was first found in the United States in 1954 in North Carolina and in the Midwest in 1956. Now it can be found in all the major soybean growing states in the Midwest. Each year SCN is discovered in more Midwestern fields and counties.

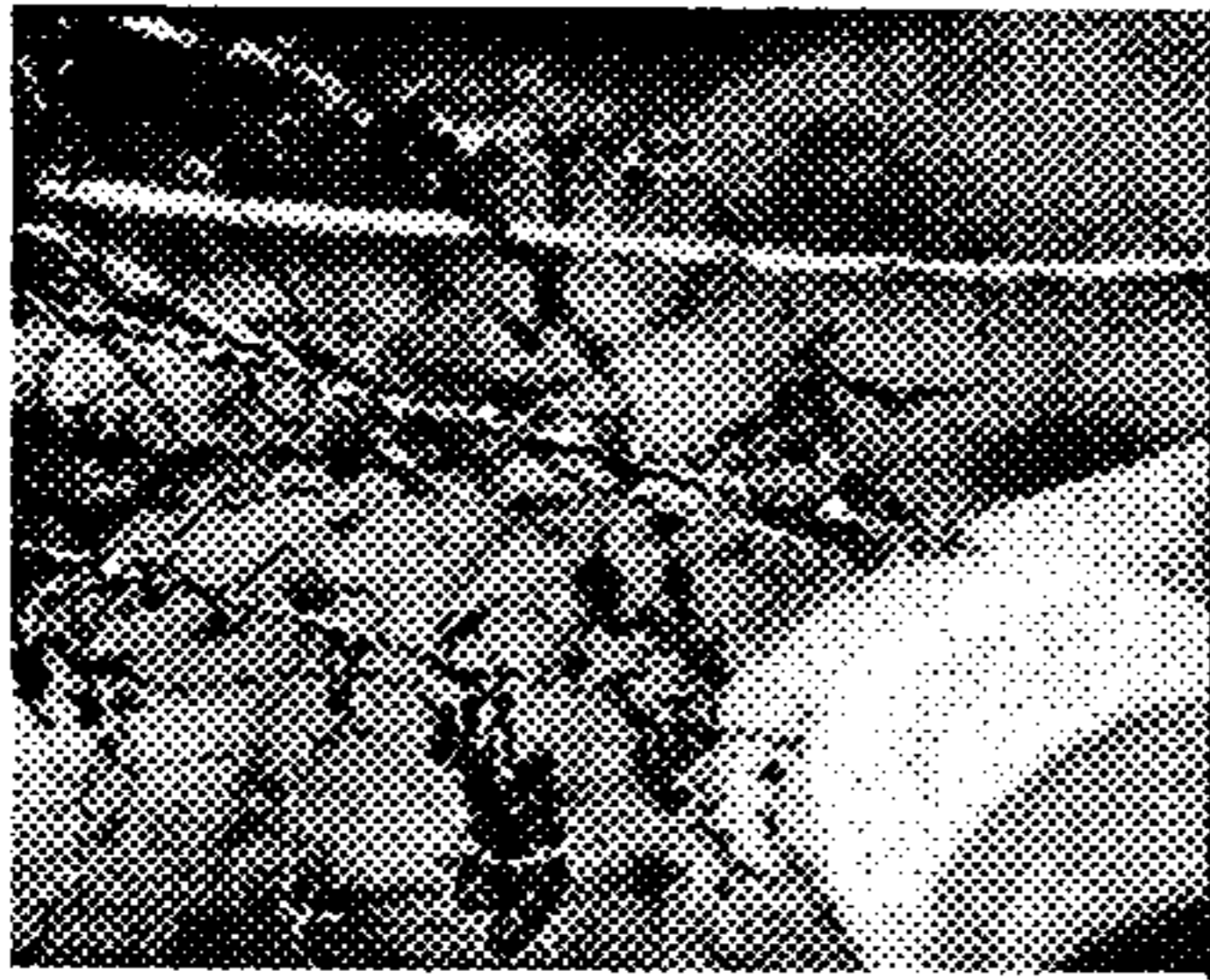


SCN is a tiny roundworm, only about 1/50 of an inch in length, and it cannot move far on its own. It is a soil-borne pest and is spread by anything that moves soil. Soybean cyst nematode can be spread by soil peds in seed from an infested field, by both wild and domestic animals, including by birds, wind, and water. Farm equipment and commercial applicators can spread SCN within a field and between fields.



Soybean cyst nematode distribution within a field is not uniform. SCN numbers may begin to increase first where the nematode was introduced into the field. If SCN was introduced by farm equipment, high SCN population densities might be found at the field entryway. Or nematode numbers may be highest in areas that may have been flooded if SCN was introduced into the field by water.

SCN
on roots

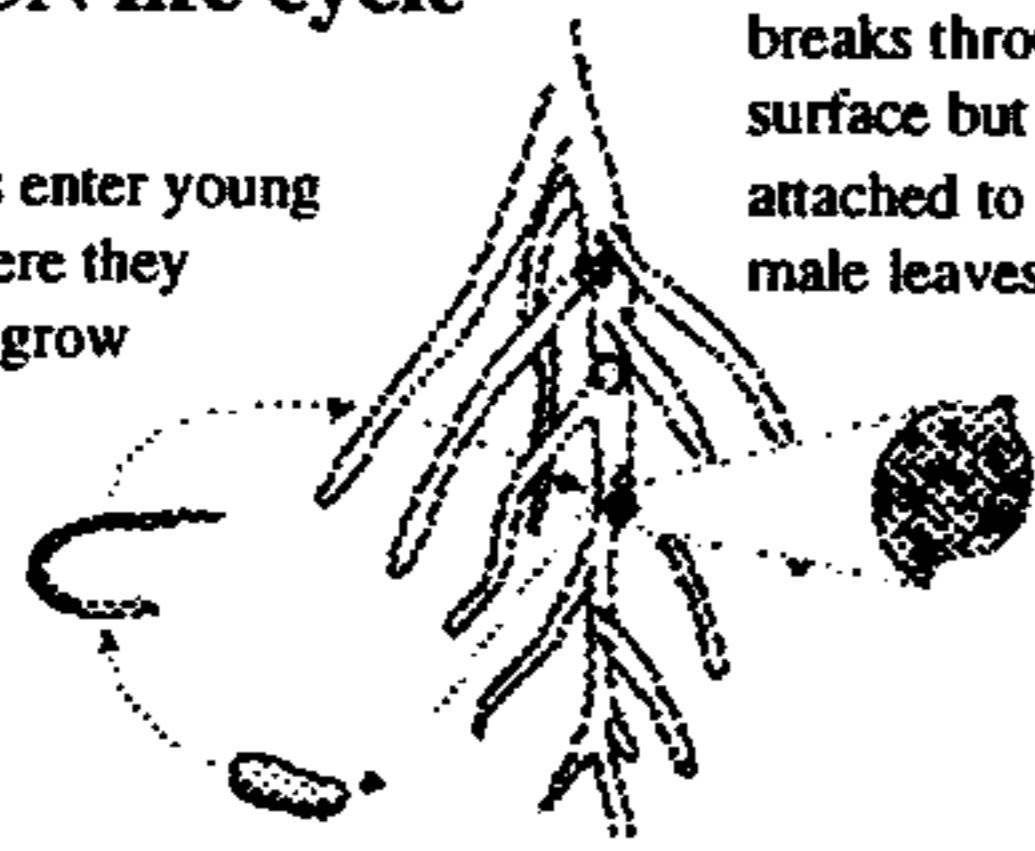


7

Soybean cyst nematode, an obligate parasite, needs soybeans or another host plant to feed and reproduce. Leguminous crops, such as dry beans and green beans, are also SCN hosts. Grass crops, such as corn, wheat and sorghum, are not SCN hosts. Alfalfa and red clover, also are SCN nonhosts. Some weed species – red dead nettle, for example – can act as hosts for SCN, so weed control in nonhost crops is important in managing soybean cyst nematode.

SCN life cycle

Juveniles enter young roots where they feed and grow



Mature female with eggs breaks through the root surface but remains attached to the root; male leaves root

Eggs released in soil, develop into juveniles

8

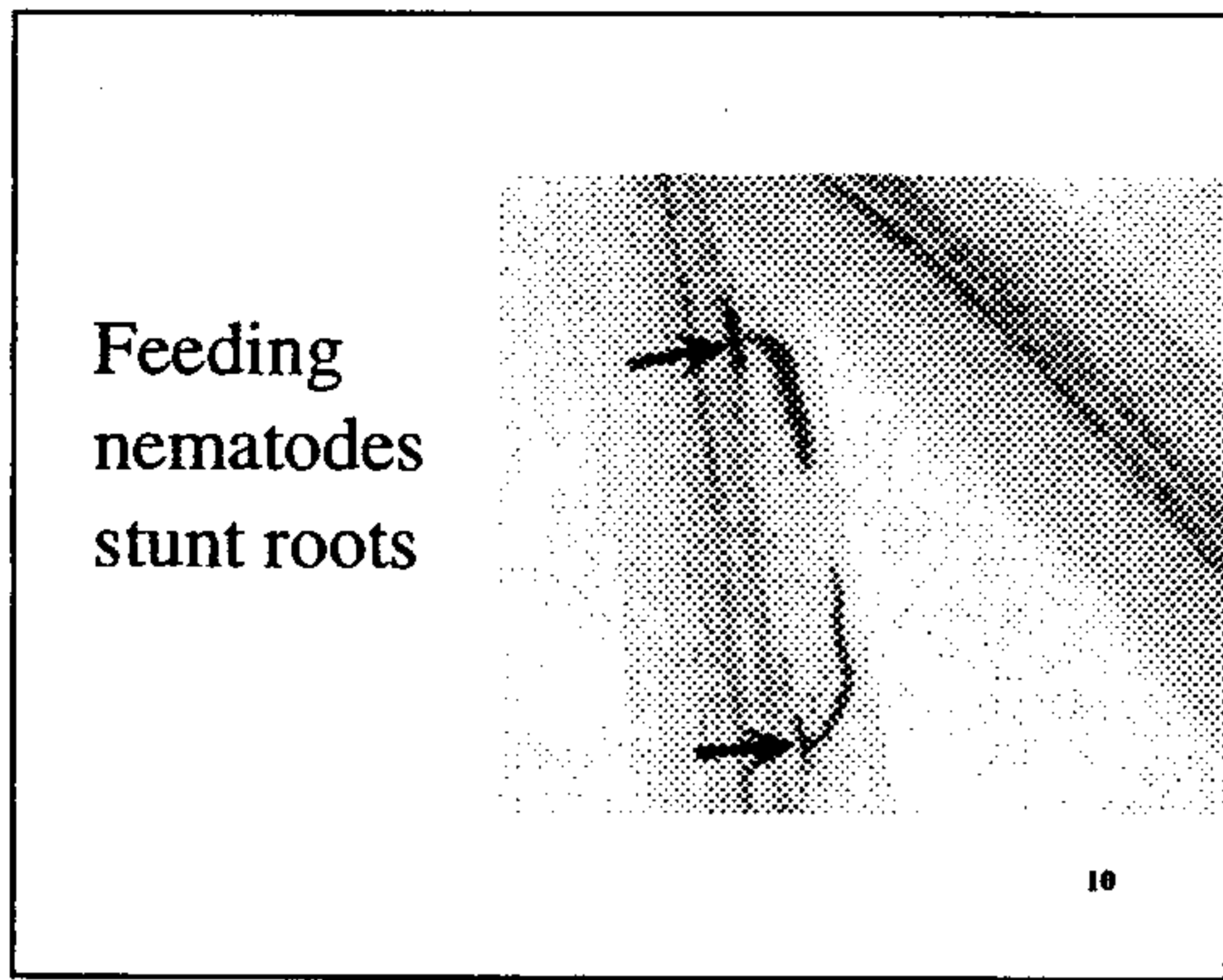
The three main stages of the life cycle – egg, juvenile and mature female – are illustrated here. SCN can complete its life cycle in four weeks under ideal conditions – at soil temperatures of 75° F.

SCN egg
and
juvenile
stage

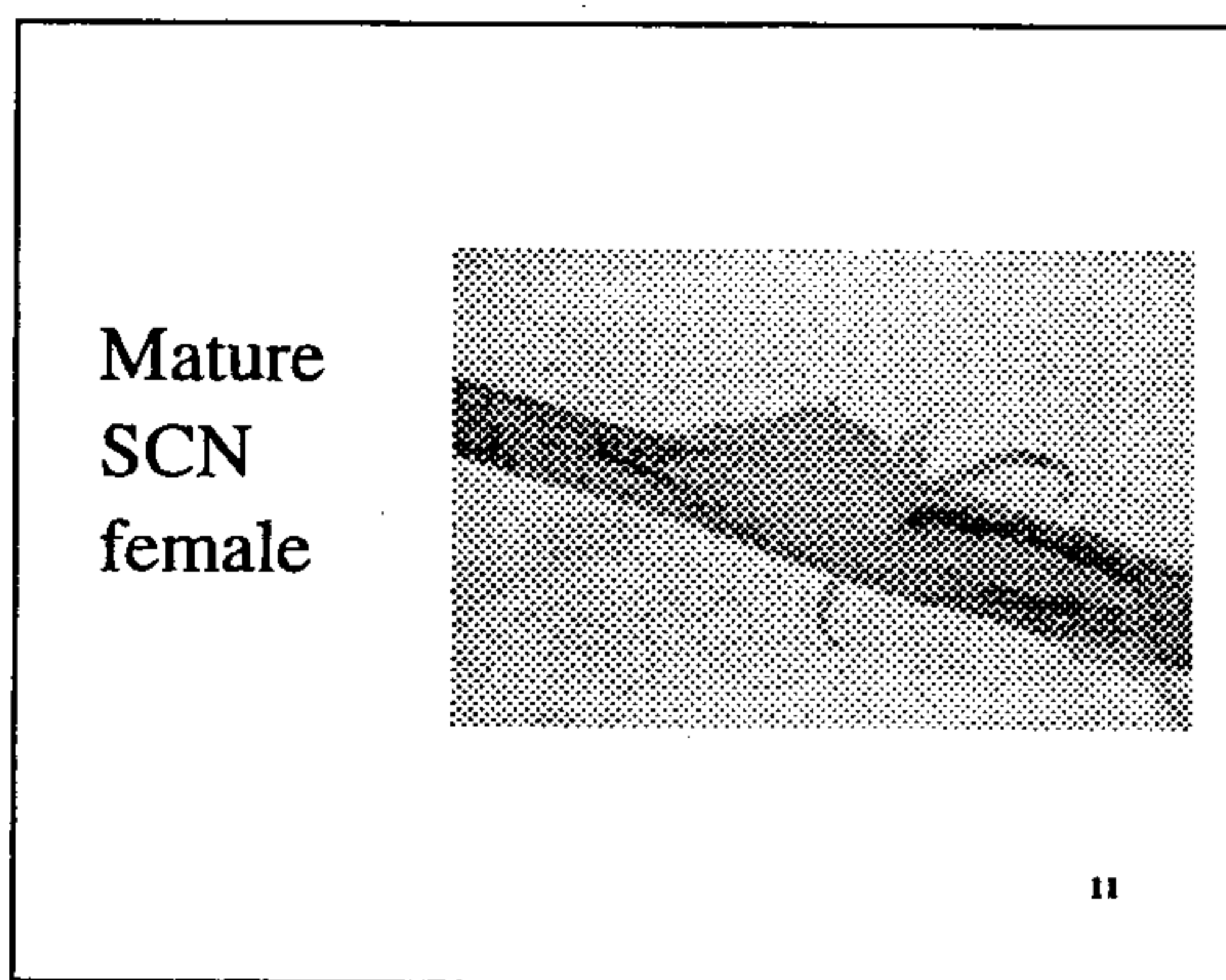


9

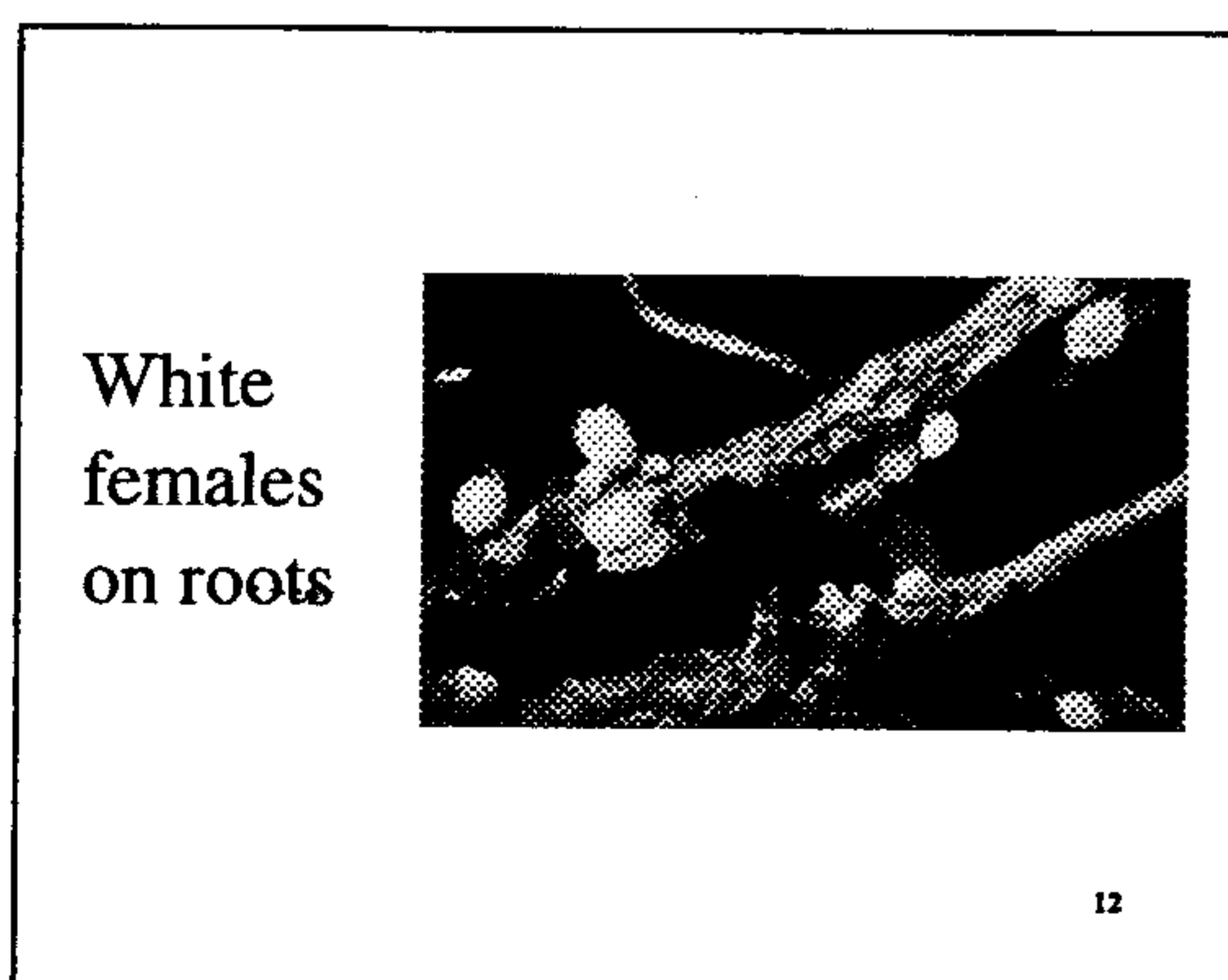
The newly hatched second-stage juvenile shown here is the mobile phase of the nematode. Second-stage juveniles are short-lived and can move only a few inches on their own. When a juvenile comes in contact with a host root, it enters or “infects” it and begins feeding.



The feeding nematodes induce the soybean root to develop specialized root cells that allow the nematode to feed. The nematodes, shown here, have been stained with a pink dye to make them more visible inside the root. Feeding nematodes stunt roots, reducing water absorption; interfere with nodulation by nitrogen-fixing bacteria; siphon off plant nutrients, reducing the number of soybean pods and the size of seeds produced on the plant and ultimately cutting yield. As they feed, SCN grows and molts three times, becoming larger with each molt. Mature males revert back to a long slender worm shape and move out of the roots to find females. The mature females remain attached to the root and continue to feed. Once the males leave the root, they will not re-enter the root or feed again. Consequently, females are more damaging to the soybean root system than males.

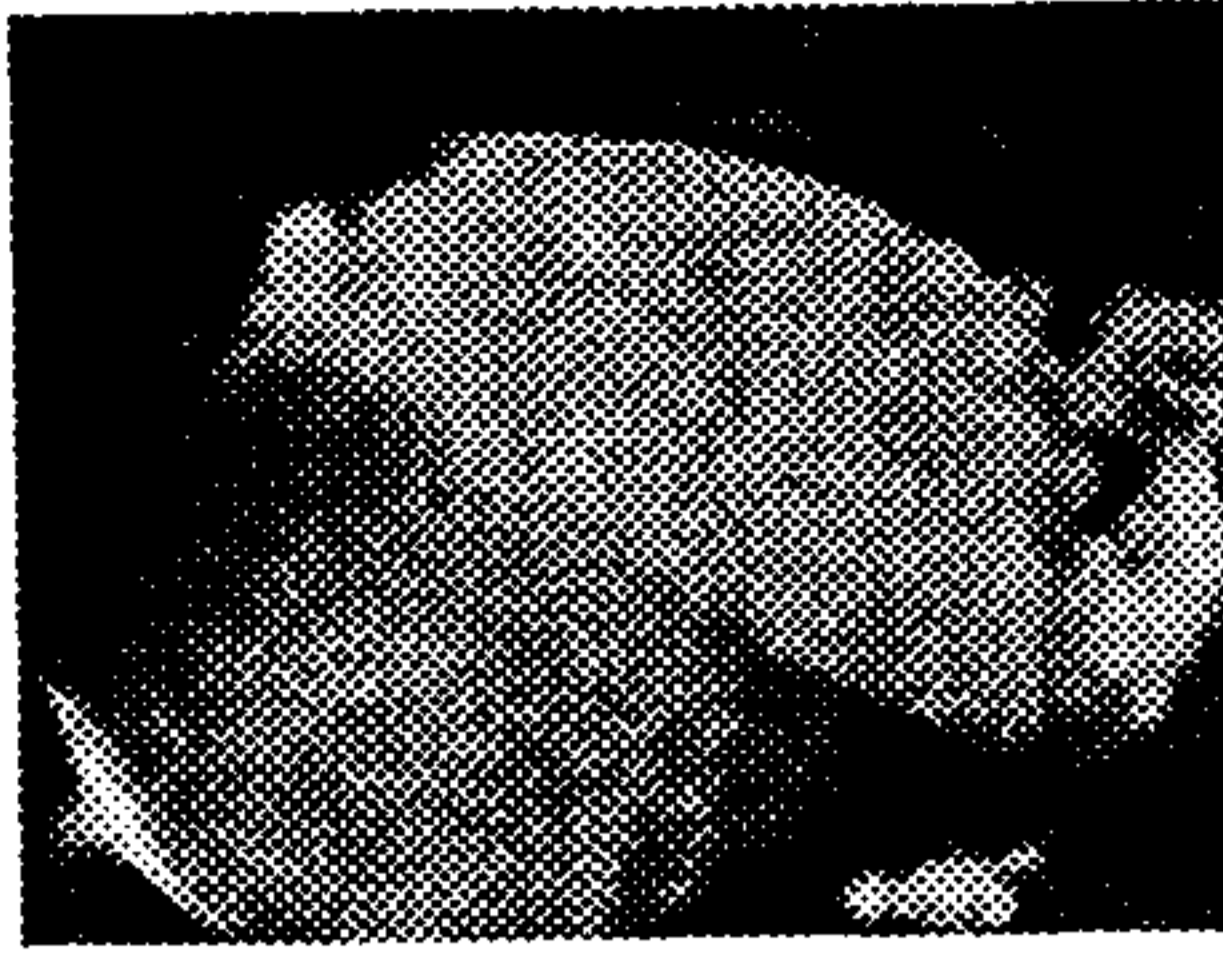


As the female matures, her body swells and ruptures the root. She will mate with one or more males and begin producing eggs. Some eggs – about 50 to 100 – are produced outside of the female in an egg mass, but the majority of the eggs produced – between 150 to 300 – stay within her. These eggs fill up her body ultimately producing the tan or dark brown “lemon-shaped” cyst after the female dies. One female nematode can produce from 200 to 400 eggs.



Adult females are visible with the naked eye on infected roots. They are about the size of the period at the end of a printed sentence. These white females will darken to yellow, then tan and finally to brown as the female matures and eventually dies. The cyst, or old body wall of the dead female nematode, protects the eggs inside. The cyst allows SCN eggs to persist in the soil for 10 or more years in the absence of a host plant.

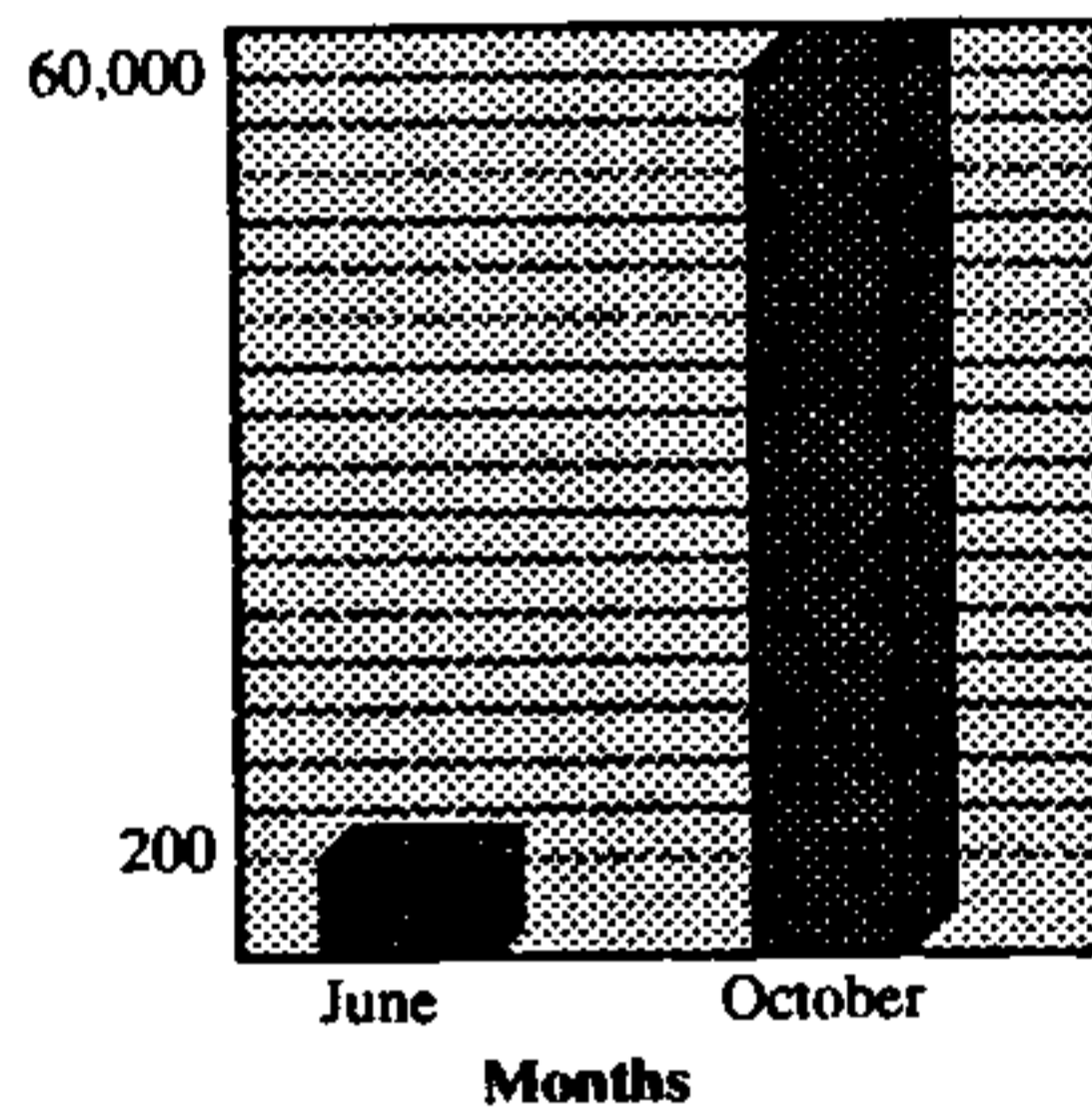
SCN cyst ruptures, releases eggs



13

As noted earlier, a single female can produce between 200 to 400 nematode eggs. The life cycle of the cyst nematode is short – between three to five weeks, depending on soil temperature. The warmer the soil, the shorter the life cycle. Because of this short life cycle, SCN can produce from two to four generations in a single season in the Midwest. There are fewer generations in Minnesota, South Dakota and Wisconsin where the growing season is shorter, and more generations in Missouri and southern Illinois where the temperatures are warmer and the growing season longer.

Number of Eggs



14

Source: Iowa State University

Soybean cyst nematode numbers can increase rapidly, going from low level infestations to high level infestations in a single growing season. This slide shows actual field data from a plot of susceptible soybeans planted near Ames, Iowa, in 1992. Shown are the number of SCN eggs in 100 cc or about a half-cup of soil. In early June, fewer than 200 SCN eggs per half-cup of soil were added to previously uninfested field plots. By October, SCN numbers had increased to more than 60,000 eggs in the same soil volume.

SCN is forever

- Population densities increase rapidly
- Single female = hundreds of eggs
- Multiple generations in one season
- Cyst protects unhatched eggs
- SCN survives in soil for years


15

The biology of the nematode makes SCN a long-term management problem. SCN population density in a field can increase rapidly since a single female can produce hundreds of eggs and the short life cycle allows for multiple generations of SCN in a growing season. Also, the cyst provides protection for the unhatched eggs, allowing soybean cyst nematode to survive in the soil for many years even if soybeans or another host crop are not planted.

Infested?

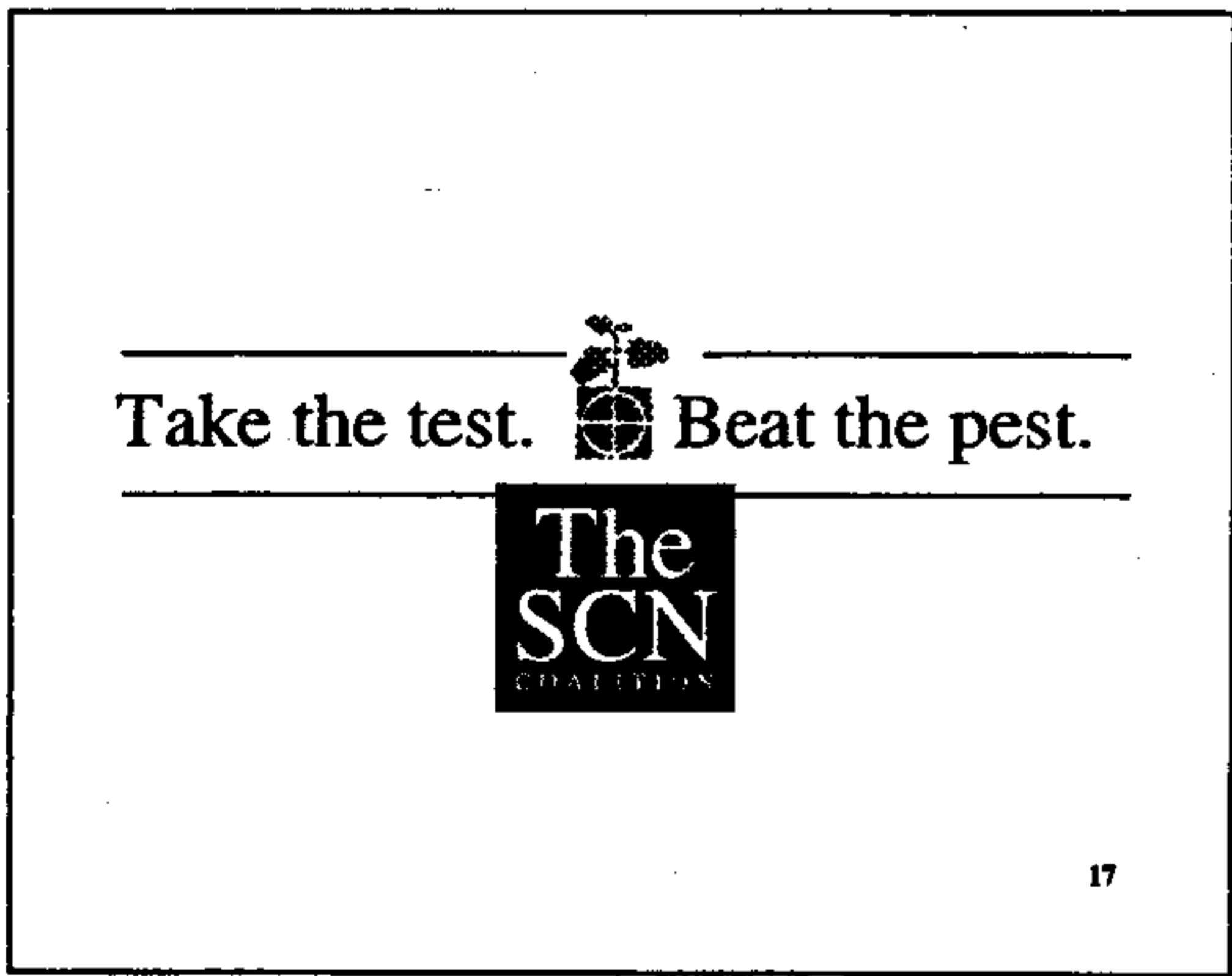
YES NO

DON'T KNOW



16

The damage from SCN is not always obvious in a field. The best way to know if you have soybean cyst nematode is to take a soil sample and have it tested. If you find out you have SCN, don't panic. Although SCN is a serious soybean pest, it can be managed and managed profitably.



Before you can beat the pest, you must take the test.