MICHIGAN SUGARBEET REACh

Research & Education Advisory Council

Sugarbeet Cyst Nematodes (SBCN) Impact, Detection and Management Strategies

ECONOMIC IMPACT

SBCN is responsible for 90% of all nematode -related sugarbeet damage. In Michigan, this nematode is a key pest that can significantly lower sugarbeet yield and quality. A random field survey conducted by MSU and Michigan Sugar Company in ***2007 found 22% of the sampled sites had detectable levels of SBCN.*** Research indicates heavily infested fields can suffer yield losses up to 15 tons and reduced sugar with current prices placing these losses over $800 per acre. In fields with relatively low populations of SBCN and no visible foliar symptoms, yield losses can range from 2-4 tons. ***Therefore, the estimate of the economic impact of SBCN to the Michigan Sugar Cooperative is losses of 5-10 million dollars per year*.**

SBCN resistant variety compared to a susceptible.

SBCN IDENTIFICATION

SBCN is a microscopic plant-parasitic roundworm that feeds on beet roots stealing nutrients from the plants. Juvenile nematodes enter roots and establish feeding sites. The juveniles mature and eventually females swell, break through the root tissue, remain attached; at which time they can be seen with the naked eye. ***They are white or yellow in color and are roughly the size of the head of a straight pin.*** If infected, sugarbeets are gently removed from the soil so the hair roots are still attached, females can be observed from about 6 weeks after planting until harvest. When females fill with eggs they die, drop from the roots and become cysts (the dead remains of the females). These cysts often contain up to 300 eggs and can remain in the soil for a decade in the absence of host crops. SBCN can complete at least two generations per year in Michigan. Therefore, population densities can increase very rapidly over short periods of time.

SAMPLING FOR SBCN

Current sugarbeet fields should be sampled in late summer to properly diagnose SBCN infestations. Potential sugarbeet fields should be sampled the fall before planting to avoid SBCN problems. Because of the patchy nature of SBCN an adequate number of soil cores must be taken to minimize false negatives. ***It is recommended that 25 soil cores be taken per tested field.*** Samples can be taken with a soil sampling tube or probe, trowel or shovel. Samples should be taken before any treatment decision is required and when soils are not excessively wet, dry or frozen. Samples should be taken from the root zone by removing the top 2 inches of soil and then sampling to plow depth or up to of 12 inches.

The sample should be placed in a durable, moisture resistant sample bag. Keep the sample cool, ideally 50^{o} F; do not leave in direct sunlight or car trunk, and send or deliver to the laboratory as soon as possible. Samples must be labeled with information (location, soil type, cropping history, current and anticipated crop, last nematicides used, etc.) which may aid in identification and diagnosis. **NOTE:** Approximately one quart of soil should be delivered to the MSU Diagnostic Lab. Remember these samples should not be dried out and need to be kept cool.

FIELD SYMPTOMS

Symptoms caused by SBCN feeding include wilted and under-developed beets, distinct yellowing of leaves, excessive fibrous roots, and/or beets with a forked appearance. SBCN has also been linked to increased incidence of ***Rhizoctonia*** in sugarbeets. In infested fields, symptoms usually appear in patches where SBCN population densities are highest.

STRATEGIES TO MINIMIZE SBCN IMPACT

The best management strategy for SBCN is to avoid contaminating fields from infested sites. Once fields become infested, you must learn to maximize yields in the presence of the nematode because they are virtually impossible to eradicate.

Activities that move soil will move nematodes; this would include equipment movement between fields, soil erosion, and tare soil. Moving tare soil has significantly spread SBCN throughout the beet growing area. Ideally, tare soil should not be returned to the beet field, or at least be only returned to fields that are already known to be infested. Alternative pile sites away from farm fields and composting tare soil are good strategies. ***Remember, the Compliance Agreement requires all tare from "Round-up Ready" beets to be returned to a beet field.***

CONTAINMENT

If SBCN is detected on the farm, steps should be taken to contain the problem as much as possible. ***Containment is principally achieved by having a strong sampling program and employing good sanitation practices.*** Non-infested fields should be worked as a unit. When going from infested to non-infested sites, make sure equipment is cleaned off and preferably power washed. In one study involving Soybean Cyst Nematodes, it was found the soil adhering to one tine of a cultivator contained over 125,000 cyst nematode eggs.

POPULATION REDUCTION

If an SBCN problem develops, it may be necessary to reduce the population density of the pest. This can be accomplished utilizing several tactics alone or in combination*;* ***these tactics include crop rotation, resistant varieties, trap crops, and nematicides.*** The damage threshold for SBCN on a susceptible sugar-beet variety is 100-150 eggs/100 cc of soil collected before planting. This is equal to about one cyst.

USE OF NON-HOST CROP ROTATION

Population densities can be reduced by growing non-host crops. A SBCN survey conducted in 1998 indicated a strong correlation between numbers of sugarbeet crops grown over the past 20 years and population densities of SBCN. The higher the number of beet crops, the higher the SBCN population densities. From the survey, it appeared 4 or more years between beet crops is necessary to effectively manage the pest using only rotation. Cyst numbers decline by 50% per year in non-host crops. **Grains (grasses), clover, corn, soybeans, dry beans and pickles are good choices as non-host crops.** Wheat under seeded with clover can reduce SBCN and improve soil health.

SUSCEPTIBLE SBCN VARIETY IN THE CENTER — OFF COLOR AND LACKS ROW CLOSURE

SBCN-RESISTANT VARIETIES

Betaseed has recently released ***two SBCN resistant sugarbeet varieties—B-19RR1N and B-18RR4N.*** Use of a resistant variety in fields heavily infested in SBCN has increased yields by 15 tons per acre when compared to non-resistant varieties. It should be noted that SBCN will develop and reproduce on these resistant varieties but poorly. Growers should use these varieties prudently as overuse may lead to a breakdown in the resistance to SBCN.

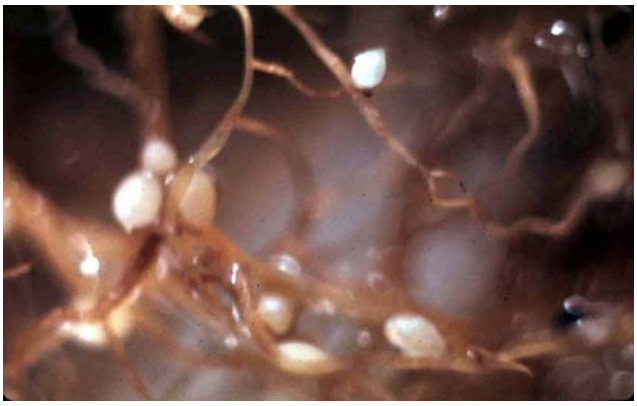
These varieties are very susceptible to Cercospera and Rhizoctonia and fungicides should be used appropriately.

USE OF TRAP CROPS

A trap crop is one that attracts nematodes but often does not allow them to successfully develop, thus reducing population densities up to 80-90%. ***Oilseed radish has been used successfully as a trap crop for SBCN; however, only two cultivars of oilseed radish can be used for this purpose: Defender and Colonel.*** Dakon and generic cultivars are excellent hosts for SBCN and should never be used as trap crops.

OTHER PRODUCTS

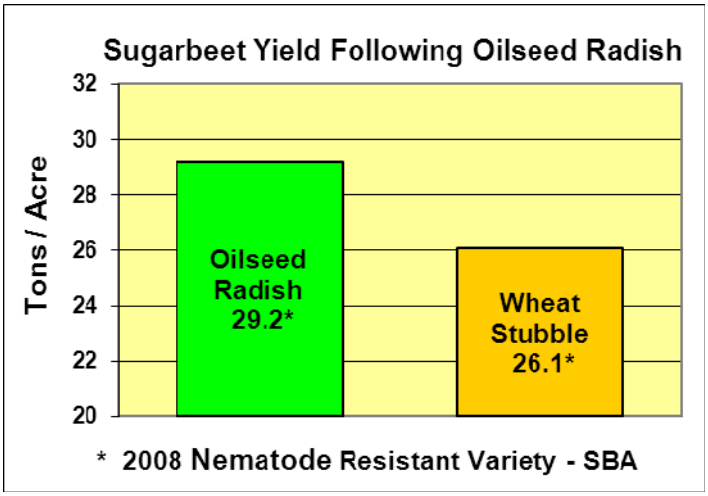
Currently there is ongoing research evaluating potential new products that may be helpful in control of SBCN. These products include seed treatments, foliar applied plant health promoters and soil applied nematicides. If and when effective products are identified information will be forthcoming.



SBCN CYSTS ON HAIR ROOTS

SUMMARY

SBCN is a very serious pest of sugarbeets. All growing and potential beet fields should be monitored and sampled for SBCN. Fields should be sampled in the fall prior to beets being planted or at the end of the beet growing season. Multiple control strategies should be implemented if SBCN is found. This would include lengthening crop rotation, utilizing trap crops and resistant varieties.



Oilseed Radish establish in tilled wheat stubble at a known SBCN field utilizing a resistant variety the following year.

Information resources include your local Michigan agriculturist and/or REACh Research Team; and Fred Warner, MSU Nematode Diagnostician, 517-432-1333.

Samples cost $25.
Send to: DIAGNOSTIC SERVICES
101 Center for Integrated Plant Systems
E. Lansing MI 48824-1311

CIPS office — 517-355-4536
Fax— 517-432-0899
Website: pestid.msu.edu/index.html

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SUGARBEET CYST NEMATODES

Impact, Detection and Management Strategies

SBCN Identification
Sampling for SBCN
Field Symptoms
Containment
Population reduction
Non-host crops
SBCN resistant varieties