

# Integrating control of the sugar beet cyst nematode

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**A** successful combining of control practices through grower cooperation and University of California research has enabled farmers to cope with one of the most serious pest problems of sugar beets, the sugar beet cyst nematode.

The tiny root-attacking worm, *Heterodera schachtii*, was discovered in the Imperial Valley in 1957. It thrives in the valley's blistering summers and in all of its soils. No chemical control has been universally successful. And it has the unique ability, among nematodes, of protecting its eggs by packing them tightly inside cysts which are the dead female bodies. These cysts are readily transported by muddy feet and on agricultural equipment to fields where they can survive for years until a suitable crop is planted, whose roots the nematodes promptly attack and severely injure.

Fortunately the sugar beet nematode has a preference for only a few plants: sugar beets, crucifers such as cabbage and broccoli, and several weeds. Most of Imperial Valley's big crops are not hosts for the nematode and are not injured by it. If their preferred host plants are not present the nematodes decline in numbers. A three- to five-year crop rotation period is adequate for greatly reducing the cyst nematode population.

Researchers decided early that effective control depended primarily upon knowing where the nematode was and how serious each infestation was. They evolved a method of taking soil samples from delivered beets. A sampling device was placed under conveyor belt rollers to catch a pint of soil, which was then processed in sugar refinery laboratories to recover nematode cysts. More than 115,000 samples, representing in excess of 700,000 acres of beets, were analyzed. By 1972 the sampling method had revealed some 50,000 acres of Imperial Valley land to be infested.

**Staff Research Associate Harold E. McKinney, University of California, Riverside, shows how cups containing samples of soil rotate on chain drive attached to a three-wheeled vehicle. Inset: Sample drops into removable chamber.**

Another method of sampling soil for nematode numbers was developed for application directly on the land. First, researchers learned how to process soil samples to extract the egg-containing cysts. The cysts were "homogenized" and the eggs were counted—expressing the population as eggs per gram of soil. At the same time, field sampling was improved and speeded by the use of a mechanical soil sampler mounted on a three-wheeled all-terrain vehicle.

The essential threshold level of injury had to be established. This was done through field and greenhouse trials—both designed to relate nematode numbers to the harvest of sugar beet roots. The results showed that in most cases one to two eggs per gram of soil caused enough injury to warrant either a preplant chemical treatment of the soil or continued rotation of the field to non-host crops. The grower had to decide which course to follow—a decision dic-

tated by expected prices of sugar, availability of low-nematode land, ability to grow other commercial crops profitably, and effective chemical control procedures.

The state of the pest management program for sugar beet cyst nematode at present is not fully integrated, in the sense of combining all possible IPM techniques. However, it does combine four recognized IPM methods: (1) reliable and economical pest sampling; (2) established relationships between initial population density and subsequent root injury in California's several climatic regions and soil types suitable for beets; (3) knowledge of anticipated yield responses to chemical treatments; and (4) the predictability of nematode population declines as a result of field rotation to non-host crops.

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