



An Ally in the War Against Nematode Pests: Using Sunn Hemp as a Cover Crop to Suppress Root-Knot Nematodes

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What are root-knot nematodes?

Nematodes, also known as roundworms, are one of the most common phyla of animals and can be free-living or parasites of plants and animals. Root-knot nematodes are a group of nematodes that exclusively attack plant roots (Photo 1). Many important crops are susceptible to damage from these nematodes. After infecting the roots, their feeding causes development of knot-like structures known as galls (Photo 2). Several root-knot nematode females may be found within each gall. As parasites, nematodes take energy and nutrients away from the plant to support their own survival. Root-knot nematodes can severely damage crops by reducing their yield and quality. Severe infestations can lead to the death of a large number of plants and financial hardship for farmers.



1. Juvenile root-knot nematode, 0.3 mm long, shown 300 times actual size.

Suppressing root-knot nematodes without the aid of chemical pesticides

For the past 50 years, control of root-knot nematodes in agriculture has traditionally relied on pesticides. Nematicides and soil fumigants are typically applied to the soil before planting the cash crop. However, their limited availability in many developing countries, potential for polluting the environment, health hazards, and high cost are causing them to be replaced by other control methods. Also, they are not reliably effective when there are high populations of nematodes in the soil. Thus, alternative, non-chemical control methods for nematode management are needed.

Applying organic amendments such as cover crops to the soil is an alternative strategy that is safer to the



2. Galls (circled) caused by root-knot nematodes on tomato roots.

environment. Numerous plants have been found to contain compounds toxic to plant-parasitic nematodes. When grown in a field and incorporated into the soil, these plants can reduce root-knot nematode populations. Organic amendments may also increase populations of organisms that are antagonistic to nematodes. Nematode-trapping fungi, for example, are affected by soil organic content.

'Tropic Sun' sunn hemp

Sunn hemp, *Crotalaria juncea* L. (Photo 3), is a vigorous, fast-growing legume that is used as a cover crop in many tropical and subtropical areas. The sunn hemp cultivar 'Tropic Sun' was developed in Hawaii and is recommended for use here. In addition to its ability to suppress root-knot nematodes, when incorporated into the soil as a green manure, sunn hemp adds organic matter and nitrogen to the soil. When left on the soil surface as mulch, sunn hemp can reduce soil erosion and weed growth.

Nematode suppression

The ability of sunn hemp to suppress plant-parasitic nematodes has been known for decades. Some studies have shown that sunn hemp suppresses some root-knot nematode species better than chemical nematicides, because unlike a nematicide, which only kills nematodes at the time of application, sunn hemp incorporated into the soil continues to suppress nematode populations while the crop is growing.

Mechanisms of nematode suppression

Sunn hemp and other nematode-suppressing plants may work in one or more ways; they may

- be a non-host (or a poor host) of nematodes
- produce chemicals that are toxic to nematodes or inhibit their development
- stimulate activity of naturally occurring soil organisms that compete with or attack nematodes
- serve as a trap crop, attracting nematodes present in the soil and, in some cases, preventing them from reproducing; in other cases, the crop has to be destroyed to kill the nematodes (sunn hemp, however, does not work as a trap crop).



3. 'Tropic Sun' sunn hemp at the early-flowering stage (pictured, Khamphout Chandara).

Combining sunn hemp with other root-knot nematode suppression tactics

While sunn hemp has shown potential for managing root-knot nematodes, its effect after incorporation into the soil is short-term—probably 2–3 weeks. Afterward, nematode numbers can resurge to damaging levels and injure the crop. This suggests that growing sunn hemp should be combined with other nematode management strategies. These may include

- practicing crop rotation, growing plants that are not a host of, or are resistant to, root-knot nematodes
- using soil solarization, which involves covering the soil with a transparent plastic mulch and using the sun to raise the soil temperature to levels high enough to kill nematodes
- practicing field sanitation, destroying crops soon after final harvest so that they do not continue to support nematodes, and keeping the fields clean of weeds that may also host nematodes
- avoiding the use of soil-applied pesticides, if the management strategies include increasing the numbers of beneficial soil organisms that feed on or are antagonistic to nematodes.

When to incorporate sunn hemp

Research has not yet been done to find out the best time to till sunn hemp into the soil for maximum nematode control. However, if allowed to grow beyond the early flowering stage, sunn hemp becomes fibrous and difficult both to mow and till under. Also, the maximum amount of nitrogen that sunn hemp will contribute to the soil is present during the early to mid-bloom growth stages. If sunn hemp is incorporated too late, nitrogen may be tied up rather than made available for crop uptake.

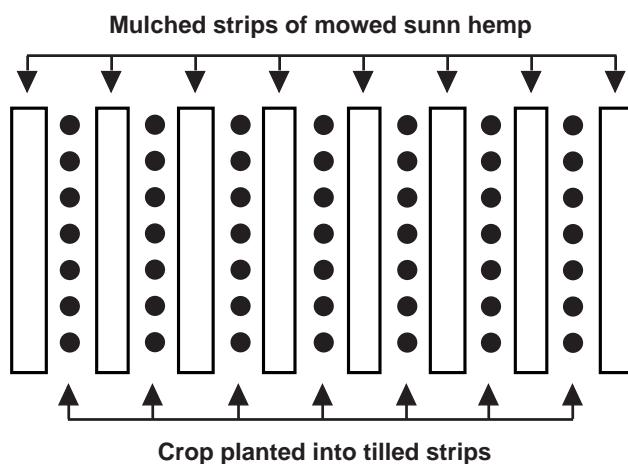
One cover cropping strategy involves mowing the entire sunn hemp field, allowing the mowed portion to remain on the soil as surface mulch, and tilling under the sunn hemp as green manure only in row areas where the cash crop is to be planted.

A cover cropping strategy that combines mowing, mulching, and green manuring

Step 1. Plant sunn hemp (sow seed at 40–60 lb/acre), allow it to grow to early flowering stage, and mow.

Step 2. Till strips into the mowed field.

Step 3. After a week, plant the cash crop into the tilled strips.



Seed availability

Sunn hemp seed is not always readily available owing to the fact that the United States relies heavily on international imports. However, these seed sources are not fully reliable, and on numerous occasions there has been a shortage of sunn hemp seeds. Growers who wish to use this cover crop are encouraged upon initial receipt of seeds to start producing their own sunn hemp seed source. 'Tropic Sun' seed may become commercially available from sources in Hawai'i in the future.

References and further reading

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