

Improving marigold cover cropping for nematode management

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One question that often comes up from home gardeners is “How do I control nematode problems in my garden?” Most home gardeners prefer organic approaches for pest management, as most do not have a pesticide license that allows them apply chemical nematicides. Although there are some organic pesticides that target suppressing plant-parasitic nematodes, one alternative method is to grow a ground cover, such as marigold (*Tagetes* spp.), that can serve as a landscaping element while taking care of the nematode problem. However, it is important to know what marigold species or cultivars are available and what species of nematode pests are to be targeted. A summary of which marigold cultivars to use against specific nematode pests is available at CTAHR extension publication (<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-35.pdf>). Among these cultivars, ‘Single Gold’ French marigold (*T. patula*), suppresses multiple genera of plant-parasitic nematodes including *Meloidogyne* (Ploeg, 1999), lesion nematodes, *Pratylenchus* spp. (Evenhuis et al., 2004), and *R. reniformis* (Caswell et al., 1991).

The allelopathic effect of marigold that is responsible for nematode suppression is mainly attributed to α -terthienyl (Gommers and Bakker, 1988). Marigold kills plant-parasitic nematodes as a standing cover crop and is ineffective after soil incorporation. It is found that the nematicidal activity of marigold was only detected in the root exudates but not in the homogenized extracts of roots and leaves (Jagdale et al., 1999).

The most recent research on marigold for nematode management at CTAHR looks at how to improve the nematode-suppressive effect using marigold. We hypothesize that marigolds suppress plant-parasitic nematodes more effectively if it is planted right after a nematode-susceptible host, while targeted nematodes are still in their active yet vulnerable stage. This is because nematodes could undergo a survival stage and avoid coming into contact with allelopathic compounds released from the marigold.



Above: ‘Single Gold’ French marigold at full bloom stage is resistant to root-knot and reniform nematodes, but is good host of mites.

*Below: African marigold, *Tagetes erecta*, is often susceptible to reniform nematodes but some cultivars are resistant to mites*



A greenhouse experiment was conducted to demonstrate that less root-knot nematodes could infect a cucumber plant if a nematode-infested soil was either kept moist by irrigation or poured with cucumber leachate to keep the nematodes in active stage. Initial results supported our hypothesis that more root-knot nematodes remain active in irrigated soil than in dry fallow soil for one month. Marigold was then planted into all of these pre-conditioned soils for another month, where it was allowed to interact with the root-knot nematodes in these soils. Subsequently, we planted cucumber seedlings in all treated soils to examine how many root-knot nematodes could infect the cucumber roots. Preliminary results revealed that fewer root-knot nematodes could infect cucumber roots in the soil previously drained with cucumber leachate or irrigated than in the soil that previously remained dry (Marahatta et al., 2010).

The implication of this research is that we could suppress root-knot nematodes more efficiently by planting marigold close to a nematode infected plant (Fig. 2) or immediately into soil that was recently grown with a root-knot nematode colonized plant host as shown in Fig. 3. The bitter melon plant heavily infected by root-knot nematodes were removed and immediately planted with 'Single Gold' marigold seeds. This will allow marigold to release toxic compounds against the active vulnerable stage of root-knot nematodes. Meanwhile the flowering properties of marigold remain as a good landscape plant in the home garden during this crop rotation cycle.

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Fig. 2. Planting French marigolds under banana plants to suppress plant-parasitic nematodes of banana.



Fig. 3
Above: Roots of bitter melon severely infected by root-knot nematodes were removed, and then
Below: French marigold 'Single Gold' was immediately planted into previous sites where bitter melon plants were grown.



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