

Indian Mustard May Be Alternative To Fumigation In Cotton

FAYETTEVILLE, ARK.

A winter cover crop of Indian mustard may be an economical and effective alternative to expensive soil fumigation to control soil-borne plant pathogens that can significantly reduce yields of cotton and other crops, says Craig Rothrock, a University of Arkansas Division of Agriculture professor of plant pathology.

Rothrock's research has focused on nematodes, which are microscopic worms that can build up in the soil where a host crop is repeatedly planted and reduce yields. He is studying the potential for mustards and other plants in the brassica family as winter cover crops for cotton and strawberry production.

Division of Agriculture plant pathologists Terry Kirkpatrick and Scott Monfort and graduate students Gary Bates, Kimberly Cochran and Mandy Cox are also working on the project, which is supported by grants from the Cotton Foundation and the USDA Sustainable Agriculture Research and Education program.

"Currently, in many situations the only economical nematode control practice in cotton is the use of pre-plant fumigants such as Telone II or Vapam," Rothrock says. "Commercial strawberry fields usually have to be fumigated with methyl bromide every year to control plant pathogens," he adds.

Brassicas, which include mustards, collards, kale, broccoli, turnips, cauliflower, cabbage, radishes, canola and other vegetable crops, are used as "biofumigants" in Europe and elsewhere, but not in Arkansas or most other states, Rothrock says. Preliminary results from his research suggest that Indian mustard can be used as an effective and economical biofumigant to control nematodes and some seedling disease pathogens in Arkansas cotton fields, he says.

The preliminary results are from greenhouse and small plot experiments in farmers' fields over the last six years. Large-scale strip experiments of Indian mustard as a winter cover crop in cotton fields of cooperating farmers in Ashley County and Mississippi County were planted last fall. The field trials will provide more definitive data on yield and economic benefits, Rothrock says.

Biofumigant experiments in strawberries are not as far along but also show promise in small plots as an organic farming practice and a money-saving practice for conventional growers who now rely on fumigation to control soil-borne pathogens, Rothrock says.

The Fumus variety of Indian mustard, which was developed in Australia as a biofumigant

crop, has been used in most of the Arkansas research.

"Seed of the Fumus variety is expensive, and it appears that more common Indian mustards and other brassicas may work as well. We will verify that in future research," Rothrock says.

Rate and timing of brassica seeding is important, Rothrock says. A high plant population is needed to provide enough biomass for sufficient nematicidal and fungicidal effects. The cover crop must be killed at least four weeks before planting the commercial crop to allow the biomass to break down and not tie up nutrients. This also allows time for the herbicidal effect of



Crops in the brassica family show promise as winter cover crops for "biofumigation." Brassicas include mustards, collards, kale, broccoli, turnips, cauliflower, cabbage, canola and others, and typically have a base of broad, edible leaves and spikes of yellow flowers such as these canola plants, which are grown as an oil-seed crop.

the brassica biomass to dissipate so that crop seedlings will not be damaged.

It is also important to kill the brassica plants before seed heads form so that it will not become a weed in the field, Rothrock adds.

The biocidal effects against fungi, nematodes and other plants are from glucosinolates in brassica plant residue. Rothrock says glucosinolates break down into compounds comparable to the active ingredients in some commercial fumigants.

Mandy Cox, a doctoral students working with Rothrock, is studying changes in the soil microbial ecology that result from use of a brassica cover crop. As do other cover crops, brassicas add organic matter and soil nutrients and reduce runoff from winter rains. Some brassicas, especially tillage radish, can also help break up compacted soil. Δ