Nutrient release, top dressing impact on research palette

By MARK LESLIE

At Ohio State University, where Dr. Harry A.J. Hoitink 20 years ago started his research on solid-waste compost in disease suppression, volumes of uncovered secrets of the earth will help people who work the soil for future generations.

Hoitink has kept an average of six people, from students to visiting scientists, busy for 12 hours a day, five and one-half days a week, 11 months a year since 1972. That translates into 380,160 manhours of research — the equivalent of one person working around the clock for 43 years.

So what could possibly remain to be done, and who is doing it?

"Ten to 15 laboratories worldwide are researching this," Hoitink said. "It is exploding rapidly. It is out of the lag phase and into the log phase. There are two reasons for this: Composts are more widely available. And, in field agriculture, they are starting to find the same results as in nurseries."

Hoitink said that using this research, "instead of making mushrooms on compost, we will grow microorganisms that kill plant pathogens."


Dr. Harry Hoitink

But it will take time. His research into inoculating compost for the nursery industry began in 1976. Eric Nelson, formerly Hoitink's student and now a Cornell University associate professor, finished the work in 1982.

Hoitink said his research in the next five years will target:

- predictability of the release of nutrients that support the activity of biocontrol agents; and
- the long-term impact of top dressings with compost on the physical properties of the soil related to drainage, aeration and the retention and infiltration of water — which is being investigated by Dr. Ed McCoy of OSU, in cooperation with Kurtz Bros. of Cleveland.

McCoy has performed basic research on peat for tees and greens for about six years. He has turned his attention to compost.

"As he develops that technology, compost will eventually find a permanent place in the preparation of tees, greens and top dressing," Hoitink said.

Hoitink said that adding compost helps suppress disease:

- By improving competition for organic nutrients and energy between the pathogen and beneficial microorganisms in the soil. "As long as the beneficial organisms win the battle, pathogens cannot infect roots," he said.
- By antibiosis, or antibiotic production, which also requires energy availability in slow-release form (compost or decaying plant organic matter, but not so decayed that it has become humic substances only).

While these two mechanisms cover such pathogens as Pythium species and some Fusaria, which cause different turf diseases, they do not control Rhizoctonia.

"We have these large pathogens [Rhizoctonia] that are not controlled by competition," Hoitink said. "They harbor so much energy that they can germinate on their own any time, and they respond to germinating seeds probably by volatiles given off. Rhizoctonia may grow up to an inch a day until it reaches the plant and kills it."

So, Rhizoctonia, and the diseases it propagates, are a major target for scientists.

"Only those composts that have been made in the natural forests, and have cured for a long time, will suppress Rhizoctonia," Hoitink said. "As soon as you bring it out of the natural forest ... you have a narrower group of species and less diversity, and the chances of getting the goodies in there that can kill Rhizoctonia and a few other pathogens becomes smaller."

Headded: "We can grow beneficials on compost that can kill pathogens... It doesn't take much technology to control the ones that are suppressed by nutrient competition and antibiosis. We have that now.

"Specific organisms such as Rhizoctonia that require specific other organisms — that will take time."

OSU holds patents for controlled inoculation of composts after peak heating with specific biocontrol agents. "We are scaling up this technology for potting mixes with Earthgro (of Lebanon, Conn.).," Hoitink said.

This effort at Earthgro is supported by a U.S. Department of Agriculture Small Business Innovative Research (SBIR) grant.

Scientists will also be investigating how the microflora on the turfgrass root system impacts the resistance in the top of the plant.

"Our main emphasis is looking at that microbiology," said Cornell's Nelson. "If we were to do more studies with root-zone mixes, we would target them for root diseases such as take-all patch, summer patch and necrotic ring spot."