Penn State studies cadmium toxicity

UNIVERSITY PARK — Soil scientists at Penn State report that cadmium, a toxic heavy metal, is "tied up" or held onto by tiny organisms known as microflora in the soil. This absorption keeps cadmium from contaminating the food chain of plants, animals, and man.

The Penn State experiments show that microflora, not visible to the naked eye, can take up considerable amounts of cadmium, a heavy metal sometimes entering the soil in sewage sludge.

Direct observations of cadmium accumulation by soil microflora is a "first" for scientists in the College of Agriculture.

Until recently, scientists had given little attention to soil microbes as possible accumulators of cadmium. It is well known in research, however, that cadmium can be held onto strongly by clay minerals, metal oxides, or organic materials such as humus in the soil.

Directing Penn State studies of soil microbes is Jean-Marc Bollag, microbiologist. he said one of the most important factors determining the possible uptake of cadmium by plants is its binding or absorption by various soil particles. Such binding of cadmium obviously decreases its toxic effect.

Bollag said cadmium is a poison affecting microbes, plants, animals, and man. Many people exposed to cadmium have developed serious diseases, giving much attention to cadmium in recent years. Where the soil is contaminated, plants can absorb and accumulate cadmium – thus endangering the food chain.

While the research is encouraging, Bollag said no one should expect all cadmium to be removed by microflora. He pointed out that farmers using sludge from sewage treatment plants should use only acceptable sludges containing no more than 25 parts per million of cadmium. Moreover, these farmers should have their soils tested annually for levels of cadmium and other heavy metals.

Carrying out the most recent studies of microflora at Penn State was Radha Chanmugathas, graduate student from Sri Lanka. Ms. Chanmugathas investigated the ability of microbes to remove cadmium from a liquid, and compared the microbial uptake with the absorption of other soil particles.

"When similar amounts of clay, sand, and live or dead bacterial cells were incubated with cadmium, we found that bacteria removed the largest amount of cadmium from a liquid," she stated.

"An explanation for this phenomenon could be," she said, "that microorganisms have more binding sites than other soil components."

Absorption or bioaccumulation of a heavy metal by soil microbes has received much attention as a potential industrial method for recovering various metals or for wast water purification, it was pointed out.

Amounts of bacteria in the experiments were similar to those present in the top layer of different soils, the Penn Staters said. However, the amounts of sand or clay were much lower than their actual abundance in a typical soil.

When the soil components were present in about the same concentration as they occur normally, clay at a concentration of 5 percent was the most effective, but it removed only twice as much cadmium as dead bacteria.

Bollag and various graduate students have found that dead bacterial cells can take up more cadmium than live cells. He believes this is significant, since dead microbes outnumber live cells in the soil environment and are still effective in holding onto the cadmium.

N.J. field crop guide

FLEMINGTON, N.J. — The "Production Recommendations for New Jersey Field Crops, 1984" is available for distribution by the Cooperative Extension Service offices in Hunterdon, Somerset, Mercer and other New Jersey counties. This 72-page guide to field crop production is prepared by Extension Specialists on Rutgers' Cook College.

Contributors are specialists in soils, grain and forage crops, weed, insect, and disease control, agricultural engineering, and Rutgers' pesticide coordinator. The recommendations are based on research conducted at the various stations located in the state as well as related research in neighboring states.

Included are chapters dealing with information for all crops, tillage systems, selection and calibration of sprayers. Chapters are devoted to field corn; soybeans; small grains, that's wheat, barley, oats; grain sorghum; forages, pasture and hay; and pesticide safety.

Descriptions of varieties and hybrids adaptable to New Jersey are part of the information provided on each crop. Control measures for weeds, insects and diseases are discussed.

A new policy was set by Cooperative Extension administration on the first of the year to charge for publications of this type.