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MSU faculty see troubling soil acidity levels in Montana agricultural lands

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BOZEMAN – Montana State University scientists are seeing increased soil acidity, meaning low pH, in parts of the state and are urging farmers to keep an eye on their plants and soils to avoid lower crop yields and even crop failure.

Clain Jones, a soil fertility specialist with MSU Extension and a professor in the MSU College of Agriculture's Department of Land Resources and Environmental Sciences, said fields in 20 Montana counties have been found to have pH levels that could harm crop growth.

"This is an emerging issue in the state, where low soil pH has traditionally not been a concern," Jones said.

Acidity is measured on the pH scale, which counts the concentration of hydrogen ions in a solution. It goes from zero to 14, with lower numbers being more acidic.

Fields with soil acidity levels below pH 5 can experience significant yield loss from aluminum toxicity, depending on the crop species. Durum and barley are particularly sensitive to low pH and aluminum toxicity, but other crops can also be affected, according to Rick Engel, professor of soils in the Department of Land Resources and Environmental Sciences. In acidic soils, naturally occurring metals like aluminum become more available to plants, Engel said.

Research by Engel, Jones and others indicates that ammonium fertilizers, including urea, are the major cause of soil acidification, especially when more fertilizer nitrogen is applied than crops can use. Acidity problems can then start in low-lying parts of fields, and the symptoms can spread outward.

"The potential is there for problem areas to grow in size," Jones said.

Acidification can be hard to detect, since it can begin in a small area or be isolated to particular soil depths — meaning that acidic soil can be hidden in standard soil test results.

Jones said that soils tend to become more acidic fairly quickly, even with the recommended levels of fertilizer use.

"This means it's not a question of if, but when, this problem will affect a specific, annually cropped and fertilized field," he said.

Jones' and Engel's research stemmed from an investigation into a troubled field in Chouteau County three years ago and bloomed into a cooperative study involving MSU faculty members, Montana non-profits, agency personnel and producers.

The study, funded by the Montana Fertilizer Advisory Committee and a U.S. Department of Agriculture Western Sustainable Agriculture Research and Education grant, aims to develop prevention, mitigation and adaptation options for Montana croplands with soil acidity challenges.

Jones said he expects the number of acres affected by soil acidity will continue to increase.

“Though at least we will soon be able to recommend liming rates and acid-tolerant cultivars based on MSU research,” he said.

The best advice for producers and their advisers is to test soil pH in the upper three inches in areas that have unexplained growth problems.

“Only after learning whether a field has a low pH problem, and where that problem exists, can appropriate management decisions be made,” Jones said.

Liming, cultivar and crop selection, and fertilizer management are all strategies that can be used to mitigate, adapt to or prevent this problem, Jones said.

For additional information, visit http://landresources.montana.edu/soilfertility/acidif/index.html or contact Jones at cclainj@montana.edu or 406-994-6076.

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A durum wheat field in Choteau County, Montana, shows poor crop growth (middle) due to increased soil acidity. Montana State University soil scientists are seeing acreage across Montana with low pH levels, which can harm crop growth and limit yields. Photo courtesy of Rick Engel