

Irrigation systems affect nitrogen requirements and loss from sugarbeets

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A recent Montana State University study shows that proper management of nitrogen fertilizer applications under flood and sprinkler irrigation optimizes sugarbeet yield and reduces nitrogen losses.

Clain Jones, MSU Extension soil fertility specialist in Montana State University's Department of Land Resources and Environmental Sciences, said that a four-year study showed that sugarbeets grown in silty clay soil under sprinkler irrigation need less nitrogen than sugarbeets grown under flood irrigation.

Jones said that the research at MSU's Eastern Agricultural Research Center at Sidney used available nitrogen rates, including fertilizer and residual soil nitrogen, at 100 to 200 pounds of nitrogen per acre. Nitrogen was applied (as 28-0-0) to sugarbeets under flood and sprinkler irrigation on silty clay soil. As the amount of applied nitrogen increased above optimum levels for yield, the amount of root and extractable sucrose yield decreased. Joyce Eckhoff and Charles Flynn conducted the research studies.

Nitrogen management is one of the most important aspects of sugarbeet production and provides a way to improve sucrose yield and quality, said Jones.

"High nitrogen rates result in high root yields, yet reduces extractable sucrose. Low nitrogen rates result in reduced root yields, yet improves sugarbeet sucrose content," said Eckhoff.

Root and extractable sucrose yield was maximized at 175 pounds nitrogen per acre under flood irrigation. However, under sprinkler irrigation, root and extractable sucrose yield was maximized at only 125 pounds nitrogen per acre. "These results indicate that sugarbeets grown in silty clay soil under sprinkler irrigation need less nitrogen than sugarbeets grown under flood irrigation," Jones said.

Flood irrigation delivered about three inches of water per cycle, while sprinkler irrigation delivered about one inch of water per cycle. Approximately two times as many sprinkler cycles were used compared to flood cycles. During the growing season of all four years tested, groundwater nitrate concentrations were greater under flood irrigation than under sprinkler irrigation. In addition, unlike with flood irrigation, there was no drainage water under sprinkler irrigation.

"This demonstrates that less nitrogen was lost through leaching and runoff for sugarbeets grown under sprinkler irrigation than under flood irrigation," Eckhoff said.

"Since nitrogen lost to groundwater or runoff increases producers' nitrogen input costs, it is important to fine-tune nitrogen management to minimize those losses while maintaining sugarbeet root and sucrose yield," said Jones.

Contact your local MSU Extension agent or crop adviser for help with your nitrogen fertilizer decisions or for additional information on soil testing, fertilizer calculations, and placement, see Nutrient Management Modules 1, 3 and 11 on the Web at <http://www.montana.edu/wwwpb/pubs/mt4449.html>.