



## **Use of surfactant to increase water and nitrogen use efficiency in potato production in hydrophobic sandy soil in Wisconsin, USA**

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Because of hydrophobic properties of sandy soils, we have observed preferential flow of water and excessive nitrate leaching with potato production on sand plains of Wisconsin, USA. Groundwater in these sand plains is relatively close to the soil surface. The problem of nitrate leaching is serious with respect to the environment, as nitrate has been linked to the dead zone in the Gulf of Mexico. Under potato production in Wisconsin, nitrogen is band-applied to the shoulder of the row in an effort to reduce nitrate leaching, as this is a location where it is believed that less water infiltrates. However, we discovered that in sandy soils with potato production the center of the row, where most of the potato plant roots are located, becomes hydrophobic midway through the growing season causing greater preferential flow of water through the shoulders of the row resulting in excessive nitrate leaching. Following this discovery a wetting agent was applied to the center of the potato row resulting in an increase in soil water content in the center of the row by as much as 50% following irrigation or rainfall events. This increase in water content continued throughout the growing season although the surfactant was only applied at planting or at the time of plant emergence, 3 to 4 weeks after planting. By improving water use efficiency there is as much as 35% reduction in the peak soil nitrate nitrogen concentration at 1-m depth, which is well below the root zone of potato. There are greater yields and greater reductions of nitrate leaching when the surfactant is applied at plant emergence compared to application at planting. Surfactant treated plots had greater yield in 2003 and similar yield in 2004 as the control. Further research is needed to better understand the optimum time for surfactant application and to document the potential benefit of using surfactant and other best management practices to reduce nitrate leaching to groundwater.