

## **Abstract:**

### Polymer Coated Urea: Effect on Nitrous Oxide Emissions from Potato Agriculture

Irrigated potato (*Solanum tuberosum* L.) production requires significant inputs of fertilizer N for optimal tuber yield and quality. However, high N rates carry the risk of high N loss, particularly in coarse-textured, well-drained soils where potatoes are commonly grown. Polymer coated controlled-release ureas (PCU) have shown promise in reducing  $\text{NO}_3^-$  leaching, a groundwater quality concern, and may potentially also reduce emissions of  $\text{N}_2\text{O}$ , a greenhouse gas with nearly 300 times the warming potential of carbon dioxide. However, comparisons of multiple PCUs are uncommon. A set of 3-yr studies were conducted to compare N loss (as  $\text{NO}_3^-$  and  $\text{N}_2\text{O}$ ) and yield response from an unfertilized control, split applied conventional N fertilizer (CSA), and two PCU products (PCU-1 and PCU-2) applied at  $270 \text{ kg N ha}^{-1} \text{ yr}^{-1}$ . Tuber yields and leaching did not differ among fertilized treatments. Directly measured  $\text{N}_2\text{O}$  emissions were significantly lower with PCU-1 than CSA. Fertilizer induced emissions were relatively low, ranging from 0.10 to 0.49% of applied N. Indirect  $\text{N}_2\text{O}$  emissions, estimated using the IPCC default emission factor of 0.75% of  $\text{NO}_3^-$  leached, were significantly lower than direct emissions. However, due to uncertainty, indirect emissions could be anywhere from 0.6 to 84.9% of direct. These results show that PCU can potentially reduce  $\text{N}_2\text{O}$  emissions. However, results are product specific and work remains to be done in narrowing the indirect emission factor uncertainty range.