Assessing the efficacy of nitrification and urease inhibitors on reducing gaseous N losses in forage seed production of the Saskatchewan Parkland region

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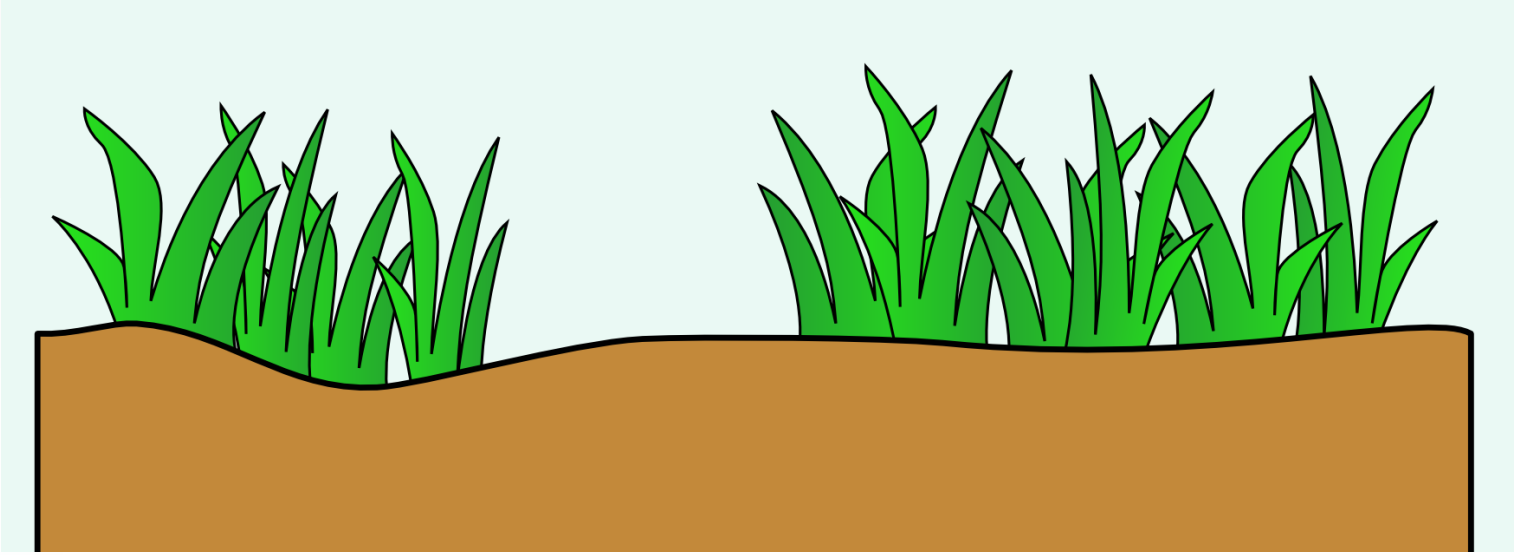
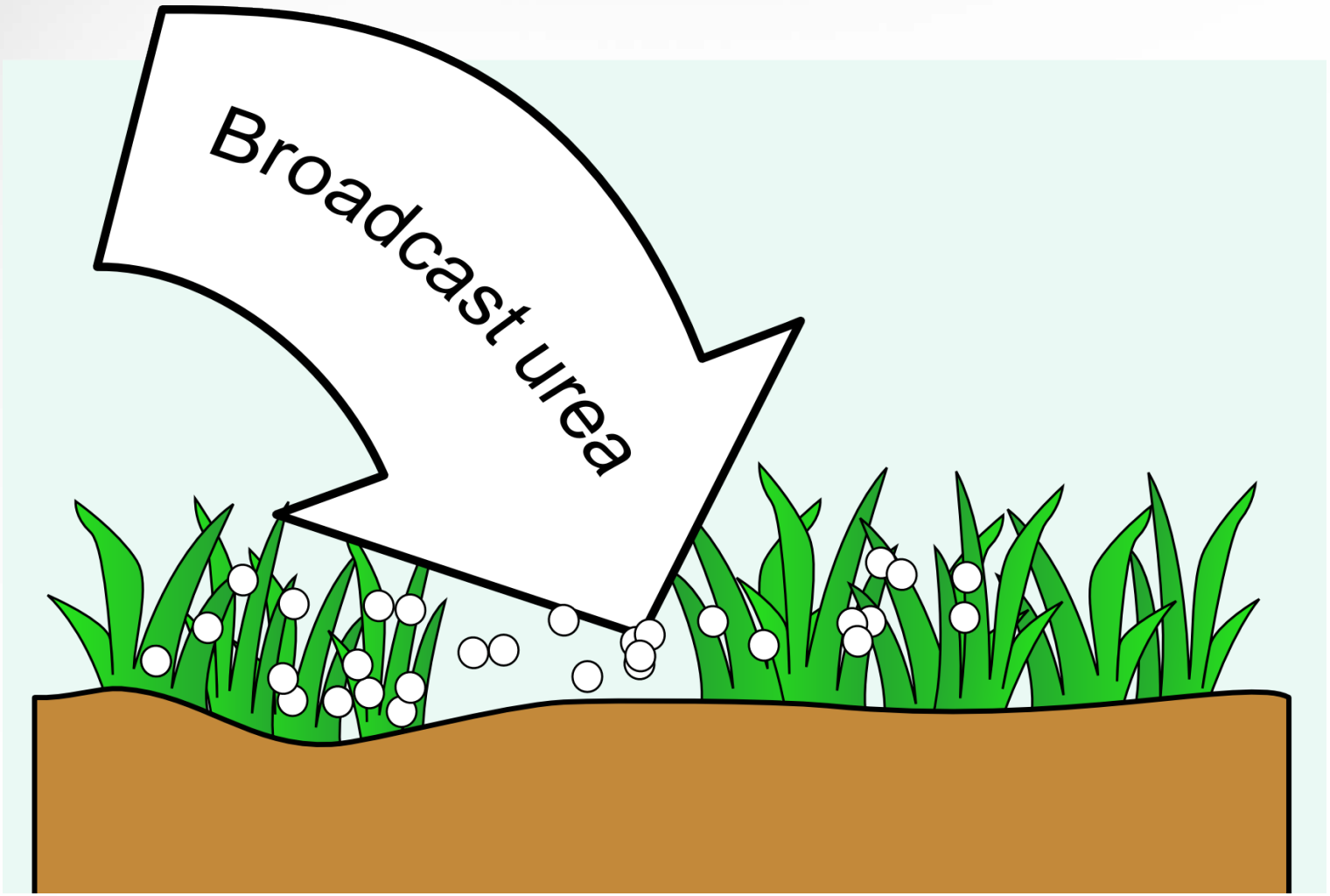
Forage seed production:

- Application of fertilizer into standing crop
- Different fertilizer requirements for both Bromegrass and Timothy (Fall vs. Spring)
- Fertilizer management focuses on seed yield rather than biomass

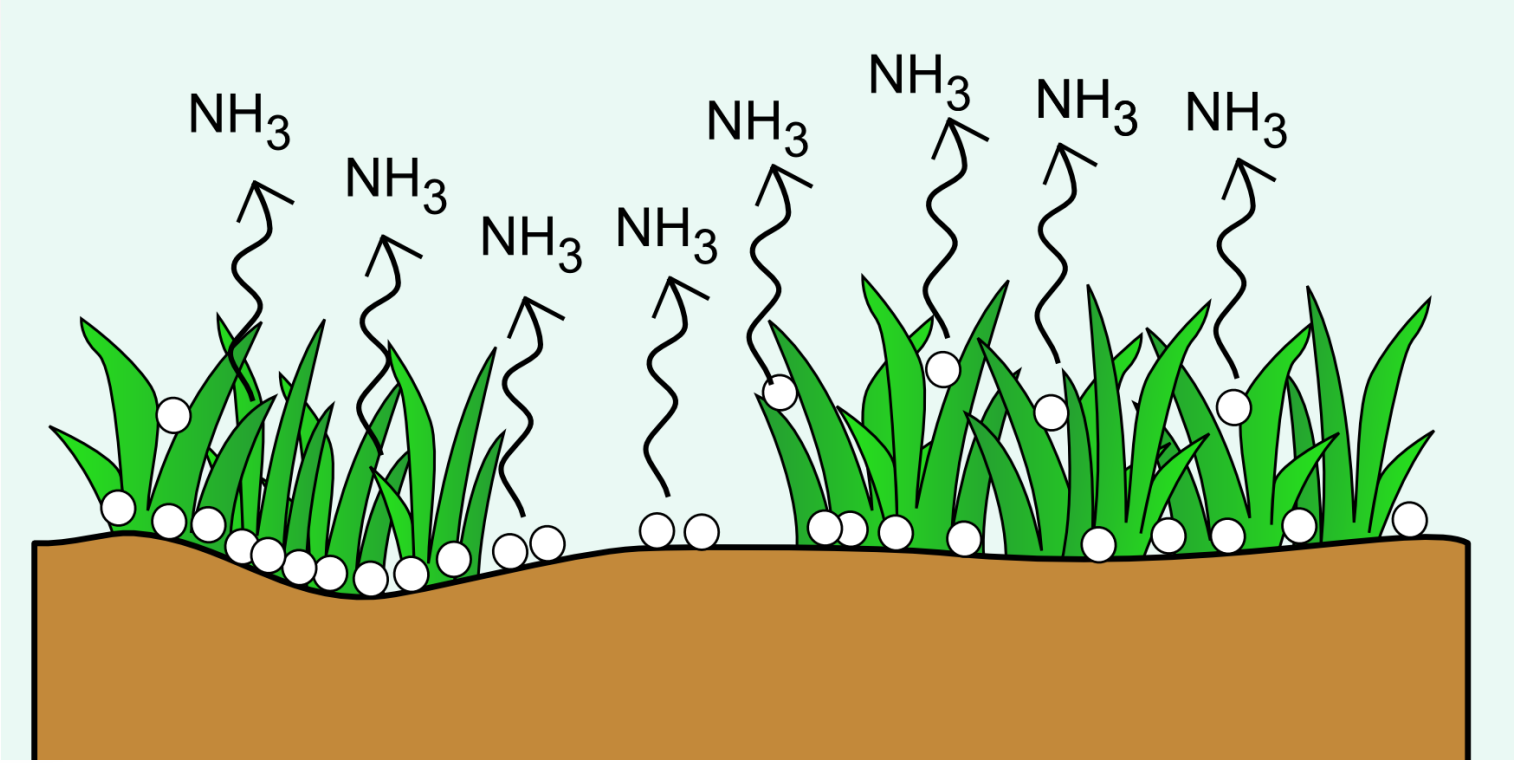


Introduction



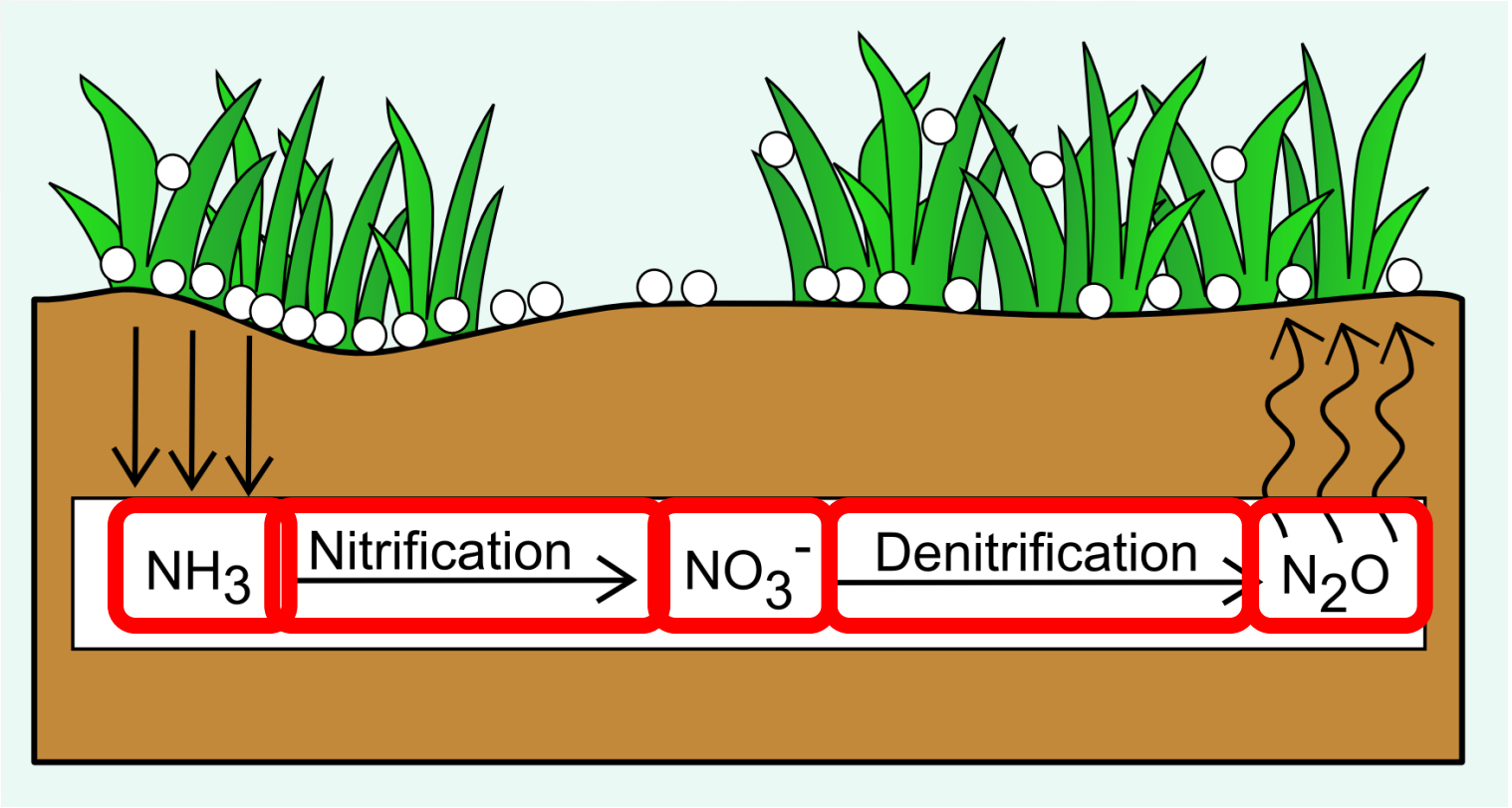
Ammonia (NH_3) volatilization:

- Up to 50% of the applied N can be lost
- Within two weeks after application



Nitrification of NH_3/NH_4^+ to nitrate (NO_3^-):

- Nitrate leaching
- Denitrification of NO_3^- to nitrous oxide (N_2O)



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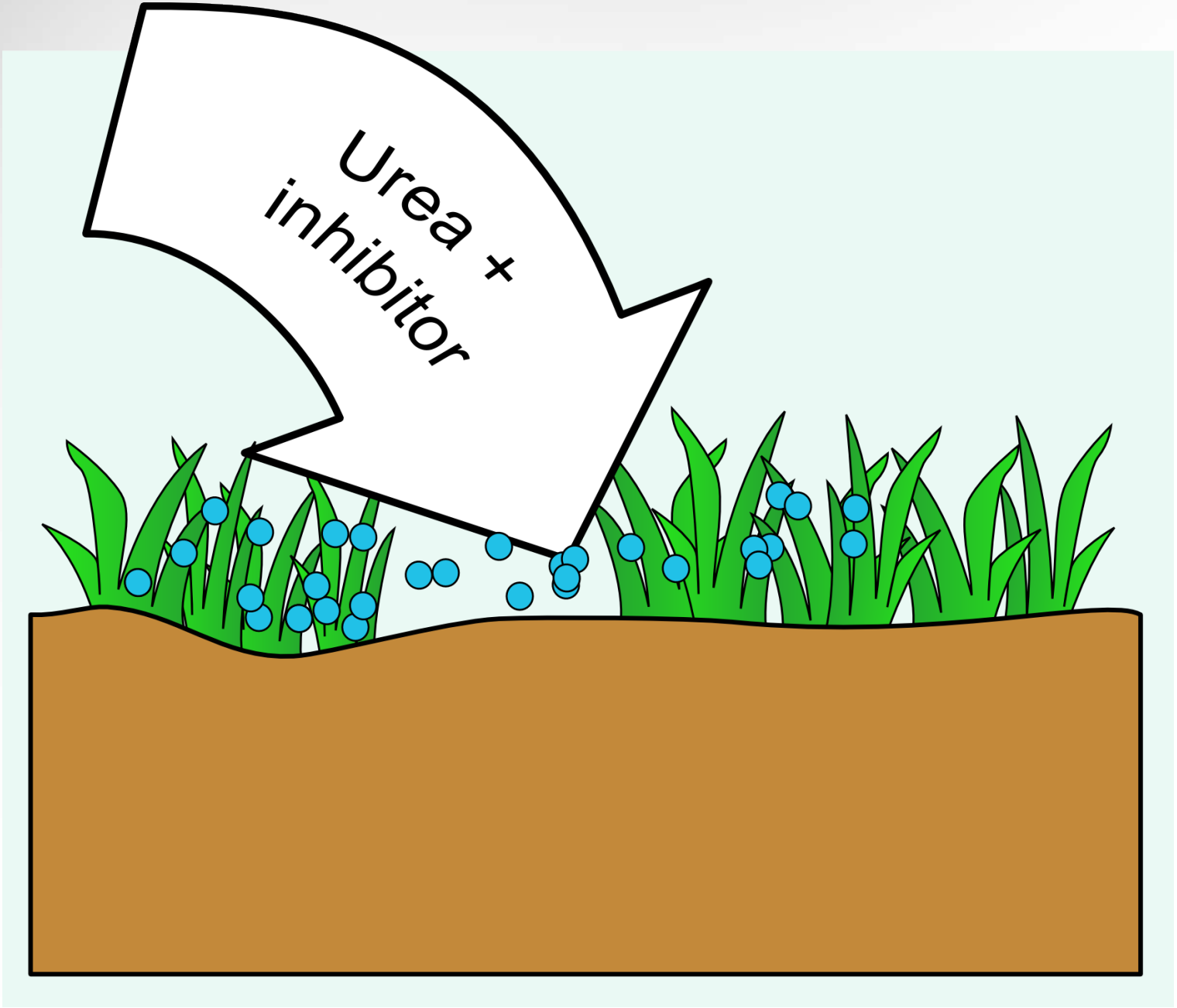
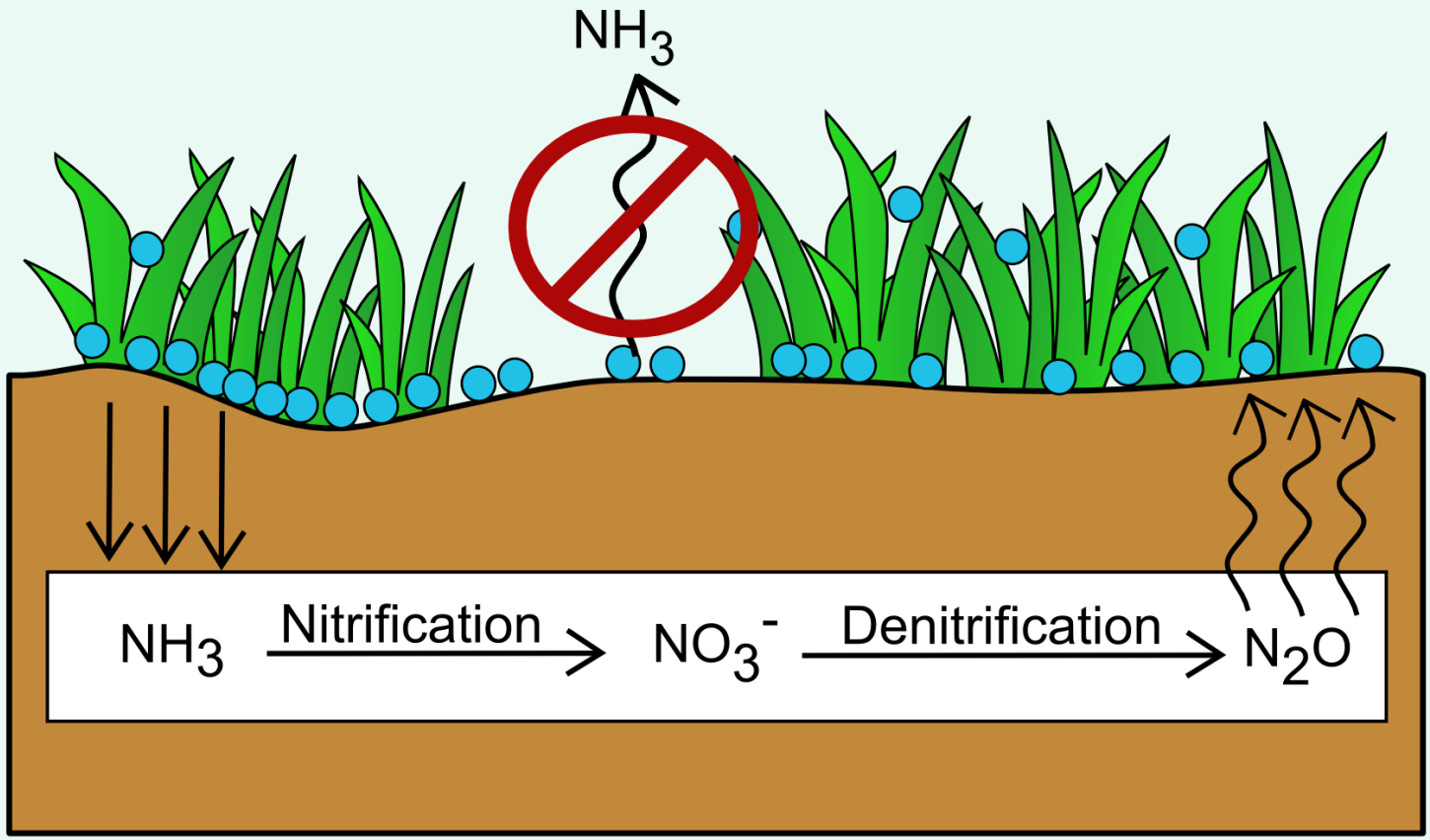
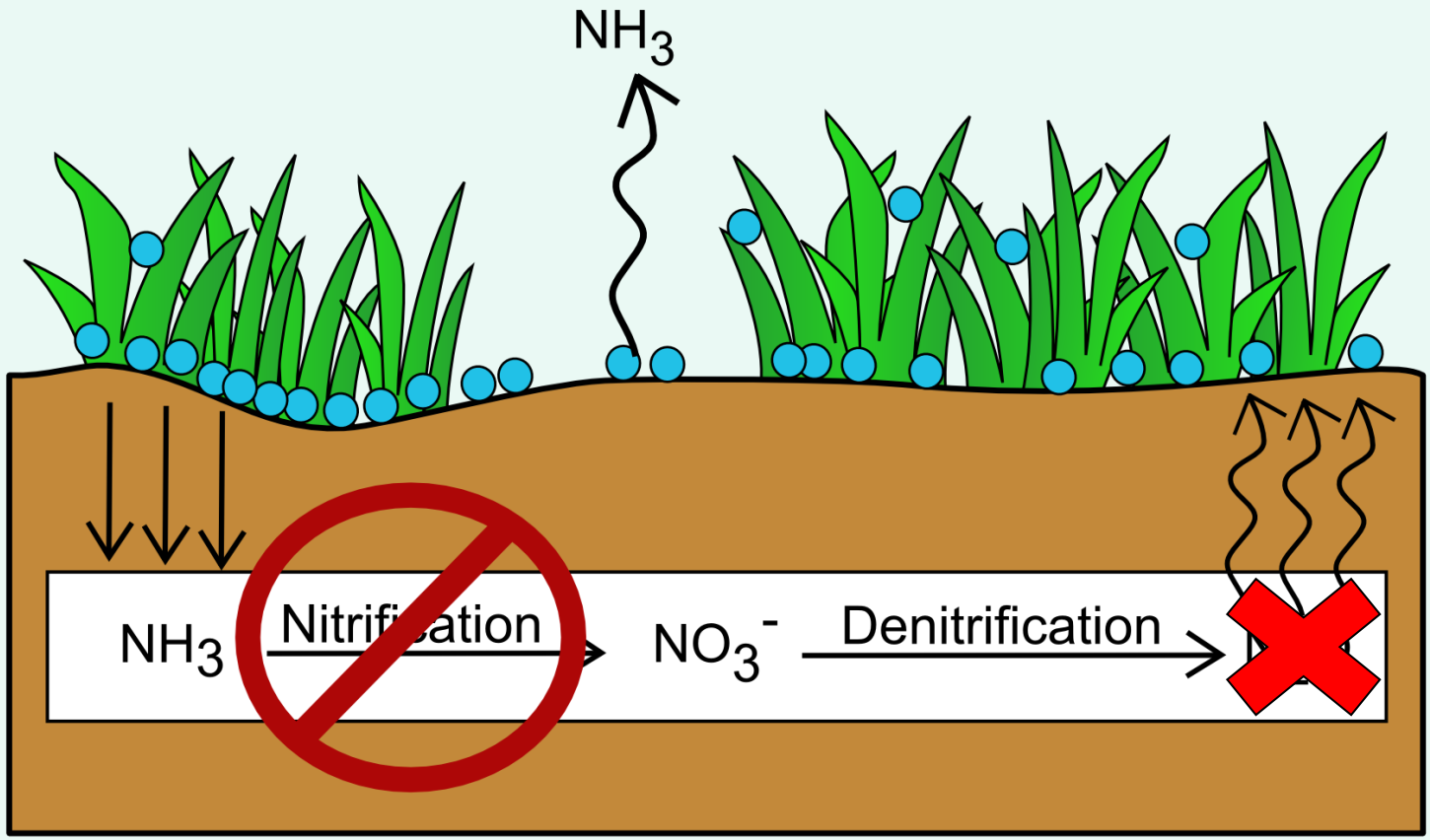


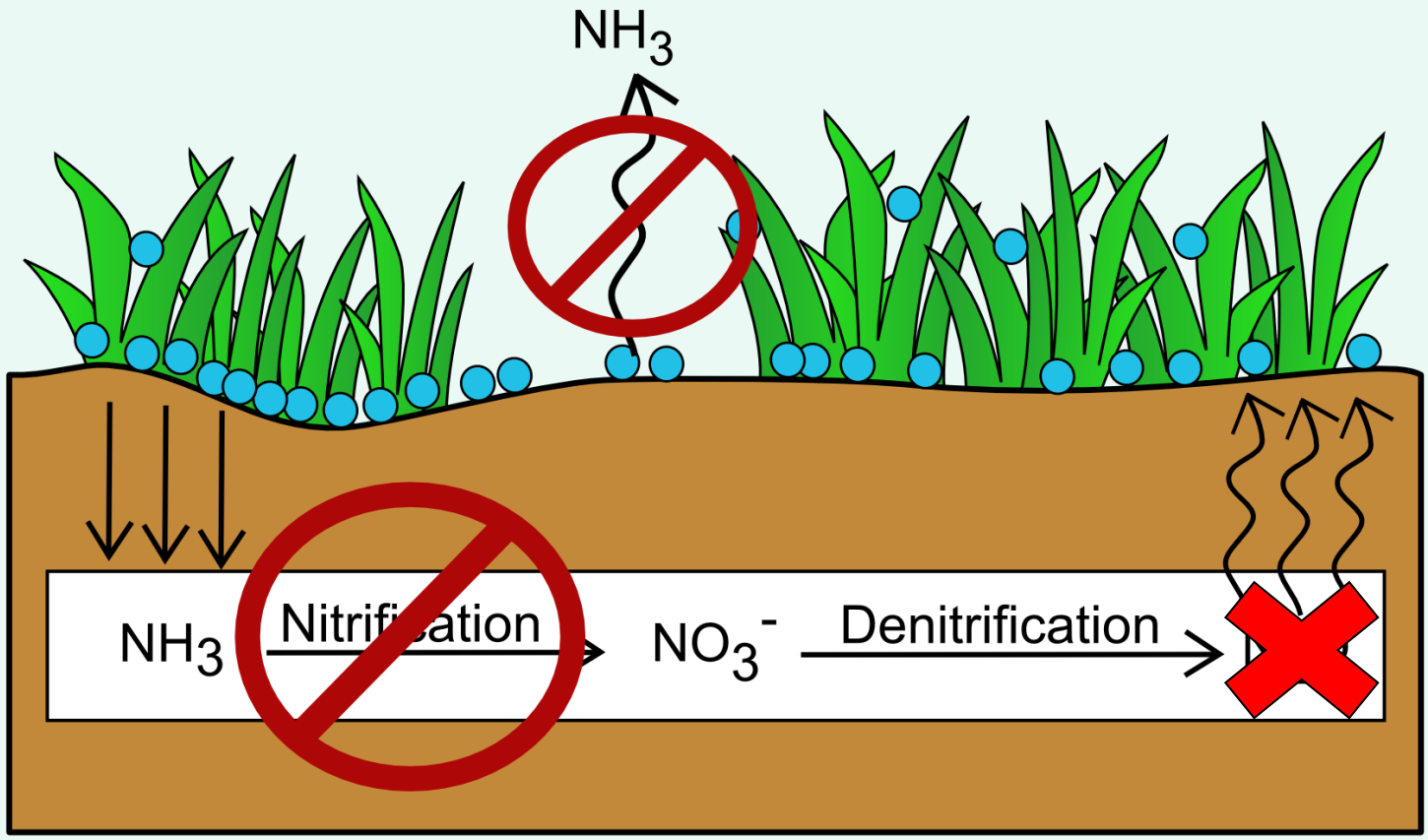
Urease inhibitor (Contained in Agrotain®)



Nitrification inhibitor (Contained in Alzon®)



Double inhibitor (Contained in SuperU®)



Goal of the study

Assess how the type of stabilized fertilizer and time of application affect N losses through

- Ammonia volatilization
- Nitrous oxide emissions

Hypotheses

We hypothesized that:

- Urease inhibitors reduce NH_3 emissions
- Nitrification inhibitors reduce N_2O emissions
- Double inhibitors reduce both NH_3 and N_2O emissions

Experimental design

Four test sites

- Four fertilizer types (90 lb N/ac)
- Fall vs. Spring application
- Gaseous N losses measured in Fall and Spring

Table 1: Properties of different inhibitor-containing urea fertilizers

Fertilizer	Inhibitor	Application to fertilizer
Urea	-	-
Agrotain®	Urease	Surface-coated
Alzon®	Nitrification	Incorporated
SuperU®	Urease + Nitrification	Incorporated

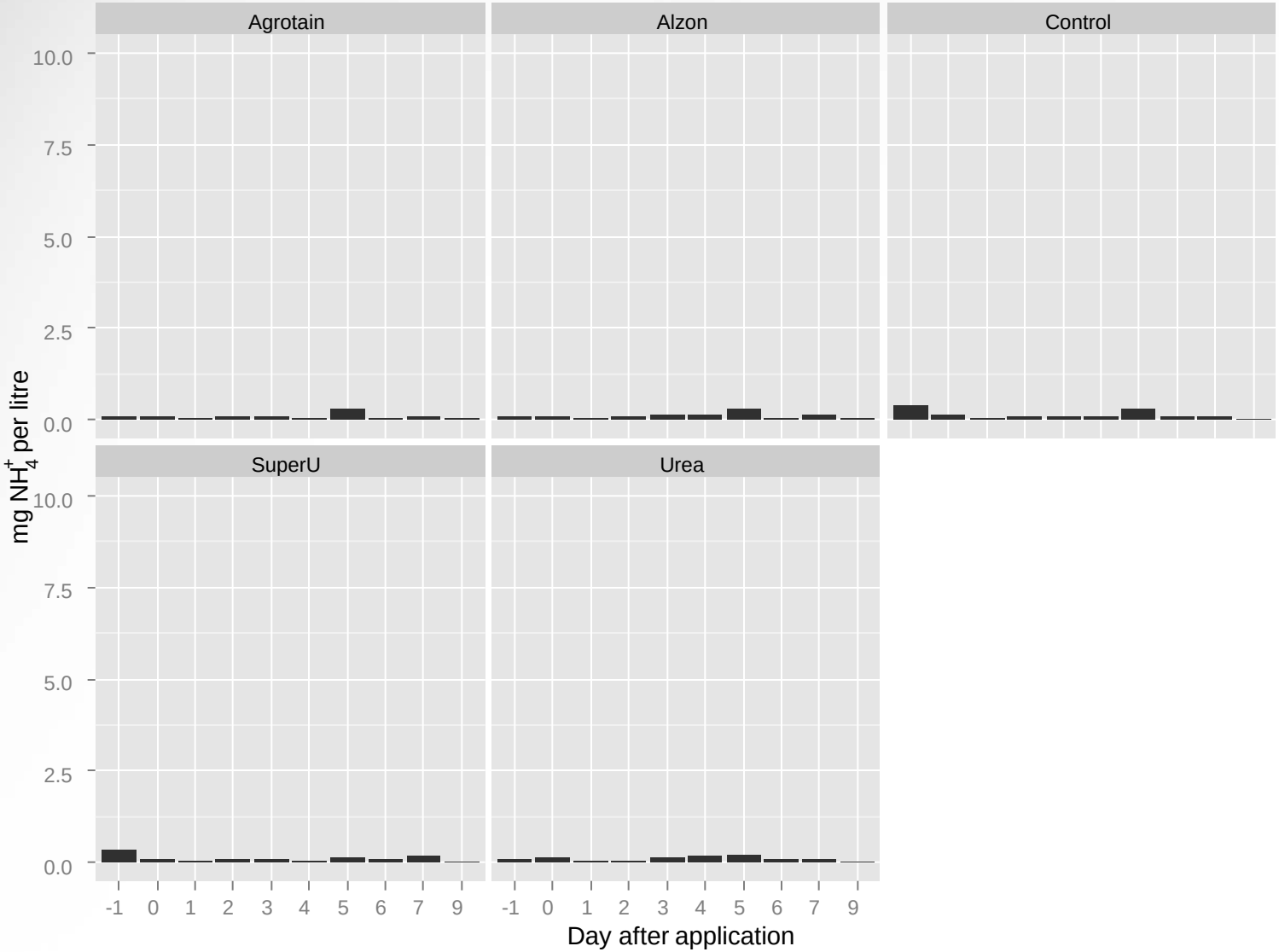
Gaseous nitrogen losses

Ammonia and nitrous oxide were measured using chamber methods

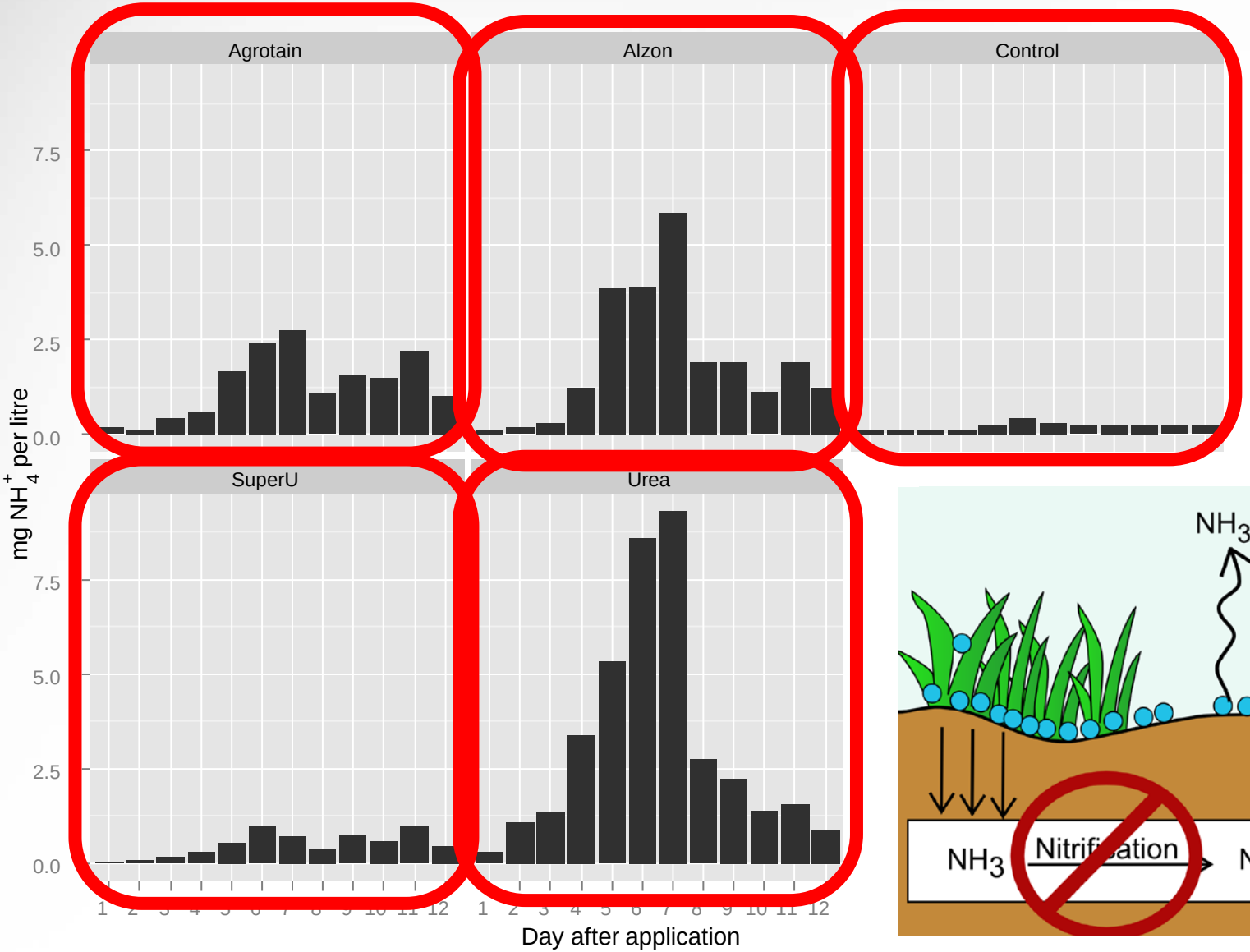
Experimental design

Results

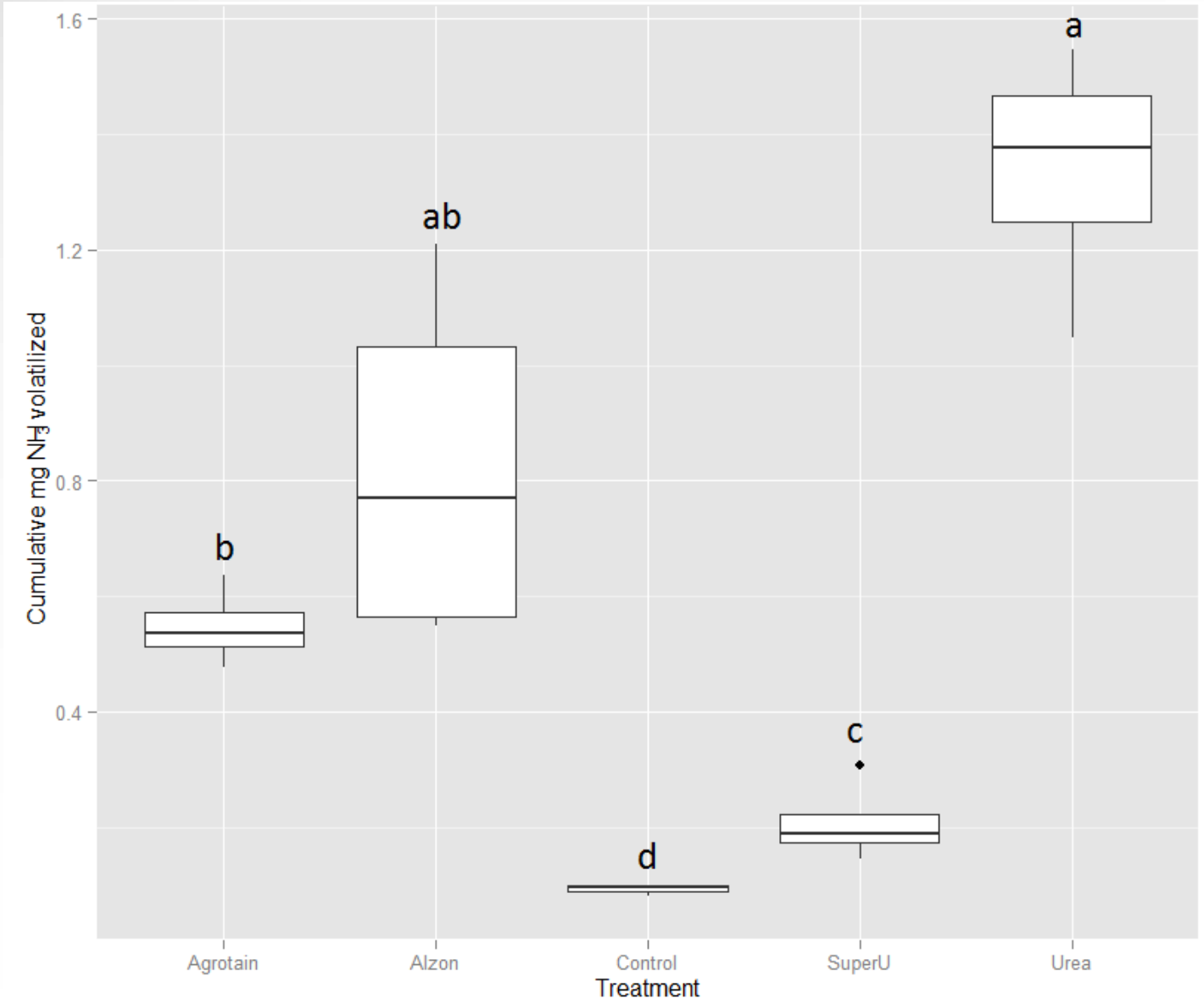
Fall 2012 ammonia emissions



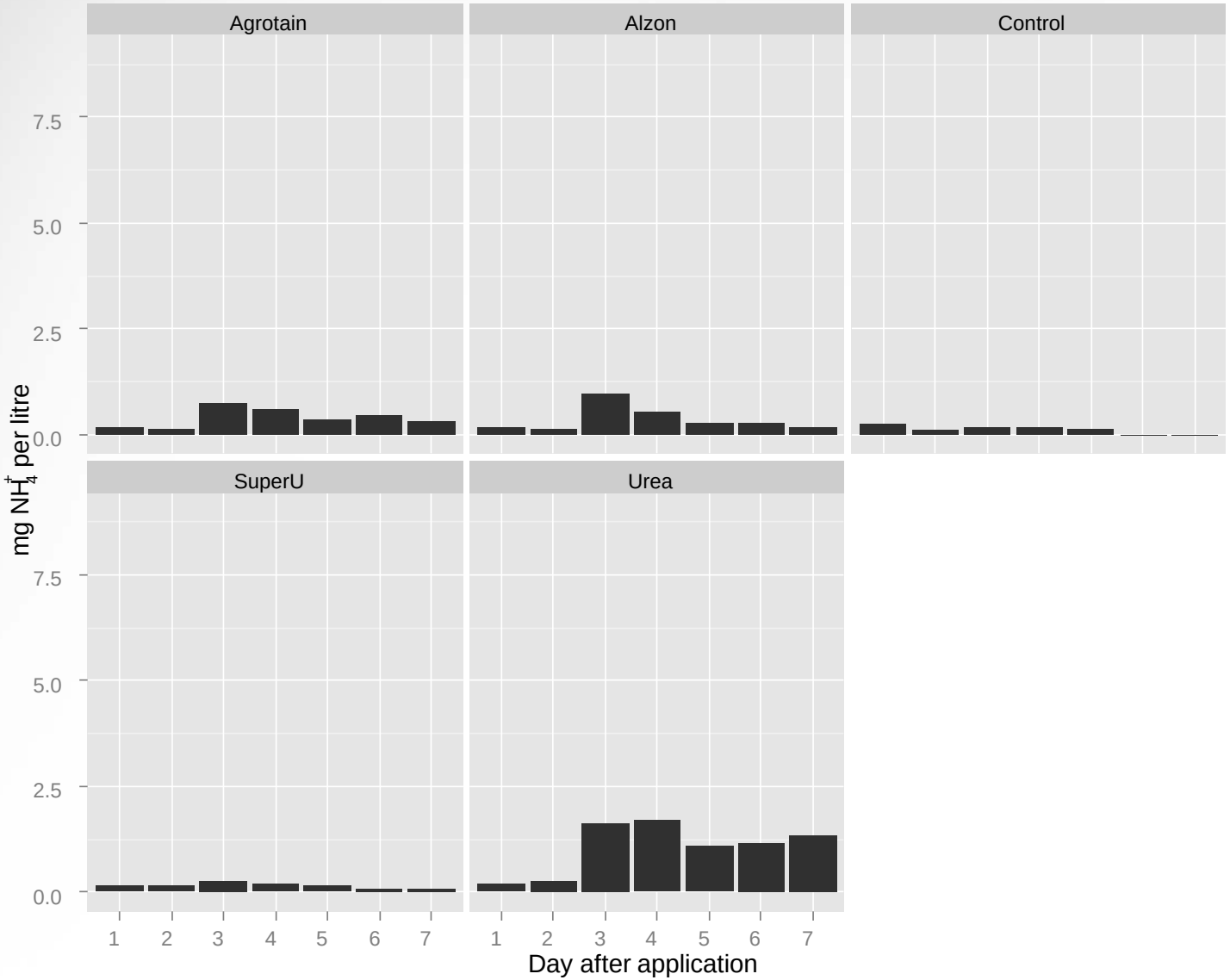
Spring 2013 ammonia emissions



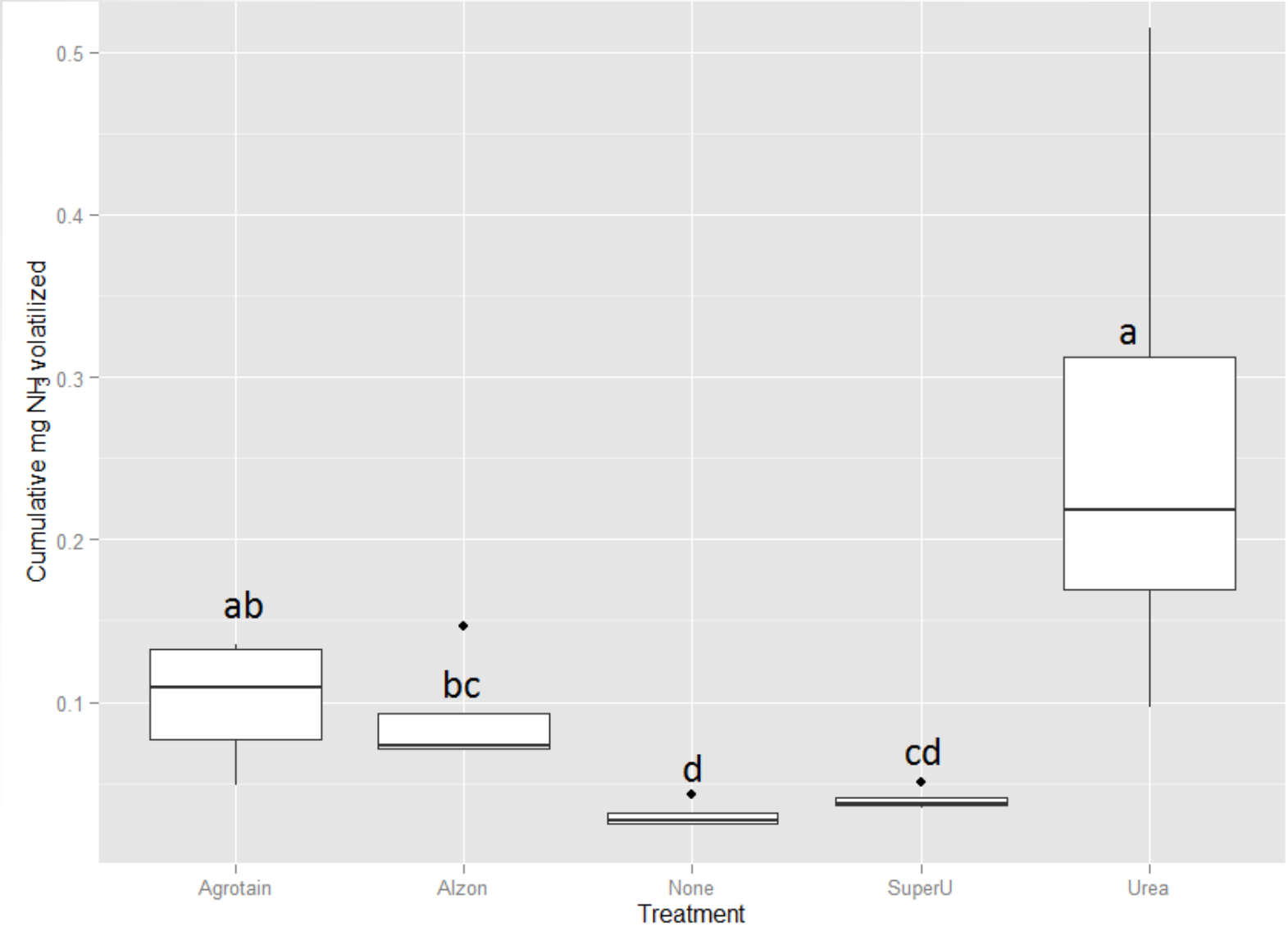
Spring 2013 ammonia emissions



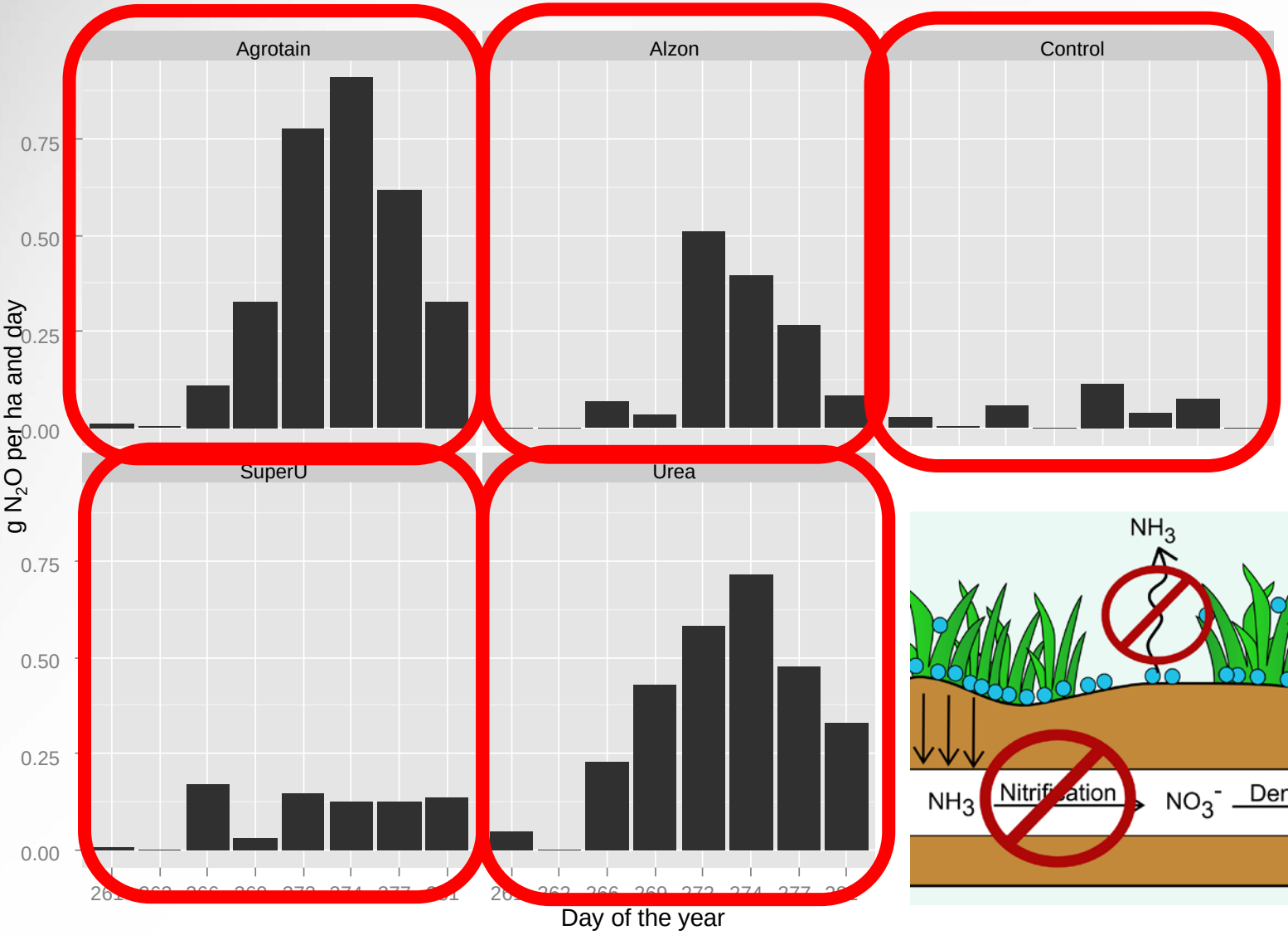
Fall 2013 ammonia emissions



Fall 2013 ammonia emissions



Fall 2013 Nitrous oxide emission



Conclusions

- Urease inhibitors reduce NH_3 emissions from surface applied urea fertilizers
- This effect was stronger
  - in the spring, compared to the fall
  - On the high-pH site
- Double inhibitors reduce both NH_3 and N_2O emissions

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