



Resilient Cropping

Urease and nitrification inhibitors

There can be large losses of nitrogen from nitrogenous fertilisers. Losses occur when nitrates leach into groundwater and the nitrogen gases volatilise into the atmosphere. This affects the economic efficiency of fertilisers and has a negative environmental impact.

There are several processes involved in nitrogen losses and a number of products on the market designed to slow these processes and reduce losses.

Urease inhibitors

Urea and urea are rapidly transformed (hydrolysed) to ammonium by urease, a soil microbial enzyme. Hydrolysis creates localised alkaline conditions in the soil which allows the ammonium to form ammonia gas. This can then be lost from the soil through volatilisation. Urease inhibitors reduce the conversion of surface applied urea to ammonium until adequate rain or irrigation can wash the urea into the soil.

AGROTAIN® nitrogen stabiliser is a urease inhibitor that was developed in the United States. Its core function is to block urease enzyme activity. In NZ SustaiN® Green is a fertiliser blend created by coating urea granules with Agrotain.

Consider using urea with a urease inhibitor when you are planning to broadcast urea when conditions are less than optimal – hot or windy or rain is not guaranteed within 24 hours.



Ministry for Primary Industries
Manatū Ahu Matua





Nitrification inhibitors

Nitrification is a bacterial process that converts ammonium to nitrite and nitrate. It is a core part of the nitrogen cycle. The bacteria responsible for these processes are specialist Nitrosomonas and Nitrobacter species.

Nitrification takes two to three weeks in warm, aerated soils. In anaerobic conditions the process is reversed by other micro-organisms and denitrification converts nitrate to nitrous oxide and nitrogen gas.

Nitrification inhibitors slow the process by inhibiting the activity of the Nitrosomonas bacteria and ammonium concentrations increase. Most soils have a net negative charge and the positively charged ammonium ion sticks onto the soil exchange surfaces. They are slowly dissolved in the soil water and can be used by plants or immobilised into soil organic matter.

Eco-N and DCn are two nitrification inhibitors on the New Zealand market. Their active ingredient is di-cyandiamide (DCD). These products are seen as being important in reducing the impact of nitrogen losses on the environment and there has been considerable investment in researching their on farm use. However the results have been variable because of the complexity of the soil and farm systems

FAR research on urease and nitrification inhibitors

In FAR funded research on wheat. Seven trials over three years evaluated the plant response to urea, DCn and SustaiN.

Soil mineral N was measured in the trial site to calculate the nitrogen application rates. The fertilisers and nitrification inhibitors were broadcast during stem extension. Yield response was compared with a control.

No advantage to SustaiN was found in five of the seven trials. At most of these sites, rain fell within a few days of treatments being applied, so there was no benefit to using SustaiN over urea or DCn to reduce volatilisation.

Results from maize research trials show that SustaiN may be a useful option where growers are broadcasting fertiliser in dry conditions

Reference; Arable Updates 69 Nitrification and urease inhibitors, and Arable update 193 Comparing urea SustaiN and DCn for broadcasting over wheat

Arable Updates 69, Comparing urea and SustaiN for broadcasting over maize

FAR
03 345 5783
www.far.org.nz

HortNZ
04 472 03795
www.hortnz.co.nz

LandWISE Inc
06 650 4531
www.landwise.org.nz

Tahuri Whenua
06 356 7589
www.tahuriwhenua.org.nz