Protected Urea

Frequently Asked Questions

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With Scotland aiming to reduce its greenhouse gas (GHG) emissions by 75% by 2030 and aiming for net zero by 2045, should we could consider Ireland's approach to meeting similar targets? They have focussed on getting their farmers to switch a proportion of their straight nitrogen fertiliser to using protected urea. This information covers some of the frequently asked questions around protected urea.

Q. How does urea work?

A. Urea is not absorbed directly by plants and needs first to be converted into Ammonia Carbonate. This is done by urease enzymes in the soil. They bind to the urea which decomposes into free ammonia and dissolves in the soil moisture, but can also be lost to the atmosphere under certain conditions, e.g. high temperature (>10^{o}C), soils with high pH recently limed, or sandy texture soils. For these reasons urea has traditionally been recommended for first application in Spring, but even here if soil is drying out under windy conditions, it can result in significant ammonia losses. By contrast, loss of nitrogen by denitrification or leaching is much less than with Ammonia Nitrate.

Q. How does protected urea reduce ammonia losses?

A. Urea is made safe from ammonia gas loss after treatment with a urease inhibitor. This is either coated on the ground surface, or incorporated and binds with the enzyme preventing ammonia loss.

Three urease inhibitors are registered globally – NBPT (N-(n-butyl) thiophosphoric triamide); NPPT (N-(n-propyl) thiophosphoric triamide) and NBPT+NPPT, with most suppliers now offering protected urea.

Q. How does protected urea compare to urea or calcium ammonium nitrate?

A. Protected urea gives around a 78% reduction in ammonia emissions compared to urea. Protected urea could be a solution to concerns that have been raised over ammonia volatilisation from urea. It gives similar favourable results to urea, but 71% reduction in GHG (Nitrous Oxide) compared to calcium ammonium nitrate (CAN). In short, you get the double benefit of reduced ammonia (meaning more N remains in the soil for crop use) and lower level of Nitrous Oxide release (lower pollution risk).

Q. How does it yield?

A. Trial work by Teagasc* over 37 sites for two years confirmed similar yields to CAN or urea.

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Q. What about cost?

A. Protected urea is more expensive than urea, but on a unit cost is cheaper than either CAN or Nitram

	Price per tonne	Price per kg/N
Urea 46%	£260/t	56p/kg N
Protected urea 46%	£290/t	63p/kg N
Nitram 34½%	£225/t	65p/kg N
CAN 27%	£189/t	70p/kg N

Q. Why use protected urea for 1st/2nd round of N in the Spring?

A. Trials* showed that the highest ammonia losses usually occur in March under drying conditions. Protected urea reduced these losses and were also safer form of N in terms of leaching. It also works as quickly as CAN/Nitram.

Q. Any issues with spreading or storing protected urea?

A. Urea is less dense/lighter, so even back in the mid-eighties advice was to recalibrate the fertiliser spreader and spread closer as the granules are also smaller. Urea is highly soluble in water and therefore absorbs moisture. Whilst prilling helps reduce the problem it can still go soft, breakdown and cause caking. This is the main reason why it is treated and bagged quickly following shipment and why protected urea is not available in bulk. It is worth noting that the enzyme inhibitors have a shelf life and will degrade after 6-12 months (NBPT).

Q. How stable is the urease inhibitor in protected urea?

A. The inhibitor remains stable when mixed with Sulphur or Potassium, but is not stable when mixed with Phosphate – the residual acidity from the P breaks the inhibitor down in days and will then only give similar performance to ordinary urea in terms of reducing ammonia loss.

Q. Does protected urea affect soil microbes or water quality?

A. Teagasc trials* (over a 6 year period) did not show any negative impact with soil microbiology as the inhibitors break down quickly in soil. It is deemed to be a safer product in terms of protecting water quality as it is less likely to be leached.

Q. Are inhibitors regulated?

A. Yes, by EU Fertiliser regulations with minimum urease inhibitors inclusion rates set. International studies suggest there are no risks either of NBPT entering the food chain.

Q. Can protected urea be applied after liming?

A. Unlike ordinary urea when you should leave 4-6 weeks to apply after liming, trials suggest protected urea can be applied sooner as the urease inhibitor controls the pH spike around the urea granules during hydrolysis, even in freshly limed soils.

***For more information on the Teagasc work, see** www.teagasc.ie/crops/soil--soil-fertility/protected-urea/