

Limus[®]

Urease Inhibitor

TECHNICAL SUPPORT DOCUMENT

FAQ guide for Limus[®]
Protected Urea



 **BASF**

We create chemistry

Why use protected urea?

Nitrogen, whilst essential for crop growth, often comes with an economic and environmental cost.



Ammonia losses from urea based fertilisers can be up to 80% of the total applied nitrogen. In the UK, the DEFRA funded NT26 project concluded that around 20% of applied nitrogen from granular urea is lost as ammonia.

Urease inhibitors slow down the hydrolysis process, minimising losses from ammonia. Limus® reduces ammonia losses by up to 98%, making more nitrogen available to crops.

In March 2022, DEFRA published its response to the consultation on reducing ammonia emissions, in which it supports the industry led proposal “option 4” which will utilise the use of urease inhibitors to protect solid urea and liquid UAN fertilisers, along with farm assurance schemes.

The current guidelines are aimed at reducing 11kt of ammonia emissions by this year, and the government has started collecting data of fertiliser sales, urease inhibitor sales as well as ammonia emissions. If sufficient ammonia reductions are not achieved, the government will consult on regulations.

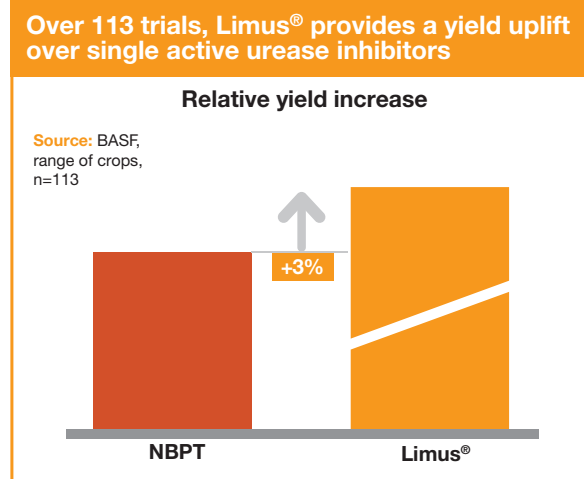
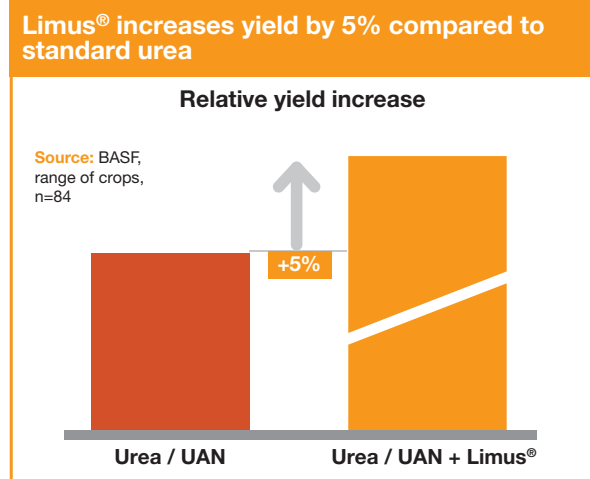
Policy makers may reconsider options that had previously been discussed. Such options had included a complete ban for urea use.

What is Limus®?

Limus®, urease inhibitor technology from BASF, was introduced to the UK market over five years ago.

BASF has been working closely with customers to demonstrate how inhibited solid urea and liquid UAN fertiliser can benefit the grower. Optimal inhibitor technology improves nitrogen use efficiency whilst improving air quality by reducing ammonia emissions.

- Reduction in ammonia emissions by up to 98% and improvement in nitrogen use efficiency
- Yield improvements of over 5% compared to straight urea in a variety of crops
- The only urease inhibitor product containing the active NPPT
- Compared to straight NBPT products, efficacy is increased by 40% translating into a proven 3% yield uplift, according to ADAS trials



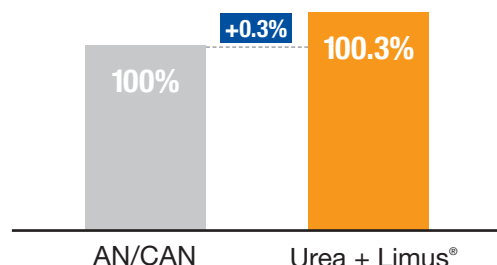
How can it be as good as Ammonium Nitrate?

Limus® is protecting the ammoniacal nitrogen in the urea from volatilising, which means that more of the ammonium is available to the crop.

Limus® is reducing losses to the environment. Across 74 BASF trials, Limus® raised the yield performance of granular urea to the level of ammonium nitrate and calcium ammonium nitrate.

These equivalent yields highlight that provided ammonia losses are minimised and urea is as reliable a source of nitrogen as ammonium nitrate.

Relative yield increase (%) of Limus® vs. AN/CAN



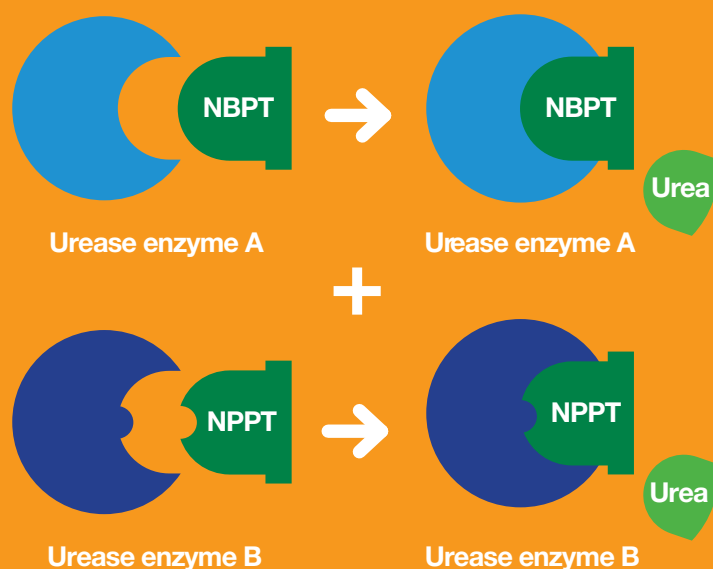
Source: BASF, range of crops, n=74

What makes Limus® unique?

Urease enzymes bind to urea and convert it to ammonium. This creates a pH spike and ammonia gas is often lost.

Urease inhibitors temporarily block urease enzymes, giving time for the urea to move into the soil, buffering the pH spike and minimising losses.

However, different urease enzymes require different urease inhibitors. Limus® is the only urease inhibitor available with two active ingredients (NBPT and NPPT), enabling it to bind to a wider variety of urease enzymes.



Physical characteristics

Why is it yellow? Is this just a coating?

The yellow is a colourant that is added to Limus® so that urea which has been treated is easily identified from untreated urea. Limus® is not a coating. It is absorbed throughout the urea granule, not just coated on the surface.

Is Limus® a slow-release coating for granules?

Limus® is not a coating on the granules of urea. Limus® is absorbed all through the granules and acts upon the urease enzymes in the soil. It does not change the speed of which the granules break down in the soil. As the urea granule breaks down upon contact with the soil water, the Limus® binds to the urease enzymes in the soil.

Does Limus® impact the hardness of urea granules?

No, Limus® does not impact the granule hardness of urea. This has been tested by BASF across various urea sources with no difference found between the granule hardness of untreated urea and urea treated with Limus®. (n=20)



Application considerations

Do I need to alter my application timings if I switch from Ammonium Nitrate?

The timing of all fertilisers should be what is agronomically best for the crop, regardless of the product being used.

If there are restrictions of use which prohibit or compromise the use of a fertiliser product at the correct timing, an alternate should be used. Limus® protected urea can be applied at all timings when ammonium nitrate would be used in emerged arable crops.

Crops and timings when urea (treated or untreated) would not be appropriate e.g. in the seedbed of some crops, should be avoided. Ongoing work is being undertaken with these.

Will the nitrogen release from urea in cold weather conditions be too slow for an optimal nitrogen supply? Is a stabilized urea further slowing down the nitrogen-release and leading to a nitrogen-under supply?

No. If the temperature is so low that there is no transition of urea to ammonia, plants are also not actively taking up nitrogen. Under such conditions, there is also enough plant available nitrogen in the soil to cover the low needs of the crop.

Does soil type and soil pH affect product performance?

Soil properties that can change the rate of ammonia volatilisation and the interaction with Limus® are:

- pH - higher soil pH results in greater ammonia losses, therefore the greater the need for Limus®
- CEC (cation exchange capacity) - the lower the CEC, the higher the ammonia losses, therefore the greater the need for Limus®
- Urease activity - the higher the activity, also depending on the urease enzyme composition, the greater the losses of ammonia, therefore the need for more Limus®

Is Limus® also suitable for no-till crop production systems?

Yes, it is particularly suitable for no-till systems as incorporation of urea into the soil will mitigate ammonia losses. Urease activity in no-till systems is higher compared to conventional cropping systems.

Is the product treated at the manufacturing plant and is urea made by BASF?

Our partners source urea independently. BASF have chosen partners that source reliable and high-quality urea. Limus® is then applied to the urea prior to bagging at a partner's plant.

Does Limus® affect spread patterns of urea?

Best practice is that each new product which is used in the fertiliser spreader should be tray tested and calibrated. Some machinery will have settings for treated urea, others may not. Refer to your machinery manufacturer's guide.

Does it leave a build-up of residue on the spreader vanes?

Urea is hygroscopic and will absorb some moisture from the atmosphere. The lower the relative humidity, the more likely that build-up may occur on vanes. Some fertiliser spreaders may be more greatly affected than others.

Observations of residue build-up on spreader vanes are more likely when applying urea compared to other fertilisers. The colourant in Limus® often makes it appear worse and highlights build-up more than untreated urea.

Are there any safety considerations when using Limus® protected urea?

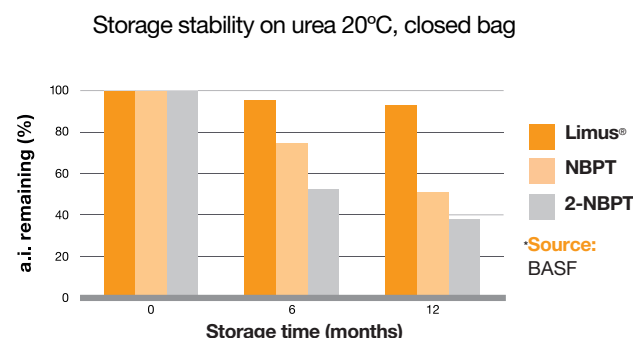
When using Limus® protected urea, operators should adhere to the same precautions from their on-farm COSHH assessments for handling and applying granular urea. An MSDS should be supplied with Limus® treated urea. Please contact your supplier for a copy of this should you require it to complete a COSHH assessment.

Storability

What happens if I need to carry over Limus® from one season to the next? / How long can I safely store Limus® protected urea?

BASF support the use and storage of Limus® protected urea that has been stored in a closed bag for up to 12 months.

Store Limus® for up to 12 months With BASF Formulation Expertise



Does Limus® store at different temperatures?

BASF support the use and storage of Limus® protected urea that has been stored in a closed bag for up to 12 months. Limus® can withstand the significant variances in temperature expected in a mild climate. BASF trial data shows a.i. recovery remaining above 80% across an 18 month period.

Limus® can be applied throughout the season

Can be applied independent of weather conditions*



*As with all fertiliser, avoid use during periods of drought and snow and when ground is waterlogged.