Ammonia volatilisation reduction

A urease inhibitor, such as N-(n-butyl) thiophosphoric triamide (NBPT) reduces the rate that urea is converted to ammonia/ammonium in the soil by de-activating the urease enzyme and this reduces the ammonia gas emission (Bishop & Manning, 2010, Cantarella et al. 2018).

For example, Watson *et al*. (1994) reported that coating urea with 0.28% NBPT reduced ammonia volatilisation by 54 to 95% depending on soil type. Several more recent studies carried out under field conditions in a variety of different situations have also demonstrated substantial mitigating effects of urease inhibitors on ammonia volatilisation from nitrogen fertilisers.

Sanz-Cobena *et al*. (2008) measured a 42% reduction in ammonia emission by using NBPT-coated urea in comparison to uncoated urea in an experiment carried out on a crop of sunflower.

Similarly, Turner *et al*. (2010) showed a dramatic reduction in ammonia volatilisation (from 9.5% to 1.0% of applied N) from the use of NBPT-coated urea in a field experiment growing winter wheat.

Chambers and Dampney (2009) also showed substantial reductions in ammonia volatilisation from urea coated with urease inhibitor in 15 grassland field experiments and 13 winter cereal experiments in the UK.

Smith et al. (2013) reported that emissions of ammonia from urea treated with NBPT were 47% below the emissions from untreated urea.

A review of published and unpublished data by Saggar et al. (2013) reported that ammonia emissions from NBPT urease inhibited urea was on average of 44.7% lower than from untreated urea (with a confidence interval of 39 – 50%) and that on this basis, a New Zealand specific value of 0.055 for FracGASF FNUI (fraction of urease inhibitor treated total fertiliser N emitted as ammonia) was recommended for adoption where urea contains this urease inhibitor.

Nitrous oxide reduction

When ammonia volatilisation is reduced by urease inhibitor, it has an indirect effect on nitrous oxide emissions. In the New Zealand national greenhouse inventory reports, the emission factor of nitrous oxide for ammonia is 0.01, i.e. 1% of the ammonia emitted will be emitted as nitrous oxide sometime down the track, so the reduction by 44.7% of ammonia volatilisation will also reduce nitrous oxide emissions by a small amount.

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