

# Some early lessons from field trials using enhanced efficiency fertilisers

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## Abstract

The SIX EASY STEPS program is recognised as the basis for best practice nutrient management in the Australian sugar industry. Although the SIX EASY STEPS N guidelines are generally appropriate, scope exists for fine-tuning of N application rates for specific circumstances. Nitrogen use efficiency (NUE) is useful for alerting growers/advisors to inefficiencies or circumstance where alternative N management options are worth considering. Enhanced efficiency fertilisers (EEFs), such as urea coated with 3,4-dimethylpyrazole phosphate (DMPP-coated urea) and polymer-coated urea, offer promise to improve NUE.

Two field trials were conducted to assess EEFs as alternatives to standard urea. The Bundaberg trial (sub-tropical semi-irrigated conditions) compared EEFs with various split applications of standard urea totalling 120 and 160 kg N/ha in a randomised complete block design with four replicates. The control received 40 kg N/ha in the plant crop and zero N in the first ratoon (1R). The trial was located on a red clay loam in a well-drained position. The Herbert trial (moist tropical conditions), laid out in a randomised complete block design with three replicates, aimed to establish yield response curves to EEFs versus standard urea (0, 60, 120, 160, 100 kg N/ha). The trial was located on a clay soil in a poorly drained position.

There were no significant yield responses to applied N, split applications or use of EEFs in the Bundaberg trial in either the plant or 1R crops. The rainfall measured during these particular seasons would not have resulted in excessively wet conditions at the trial site and may have contributed to the lack of responses to EEFs. Increased N-uptake by the crop, due to the use of N strategies away from the standard practice (i.e. by using EEFs or split applications of urea), improved NUE values based on crop N, but this did not always translate into any improvements in yield. The highest partial net returns in the plant and 1R crop corresponded to the control treatments. Urea applied at 120 kg N/ha in a single application resulted in the next best partial net returns in both crops. This appeared to be the most appropriate strategy to minimise risk to growers. The cost of EEF fertilisers negatively affected the partial net returns, with DMPP-coated urea being more affordable than the poly-coated urea.

As expected, no yield responses occurred to applied N in the plant crop in the Herbert trial. The 1R crop showed significant responses to applied N but no differences were apparent amongst the fertiliser formulations (EEFs versus standard urea). The lack of response to EEFs was possibly due to the seasonal rainfall pattern that did not favour marked N losses due to waterlogging or leaching. Despite reports from other projects of reduced N losses and potential maintenance of sugarcane yields when EEFs were used at lower N application rates, the results from this trial indicated that an N rate of 120 kg N/ha would have been appropriate irrespective of the N fertiliser formulation.

Further work, across seasons (dry, wet and 'normal'), is needed to evaluate more fully the potential of EEFs for use in specific circumstances.

**Keywords:** sugarcane, nitrogen, urea, enhanced efficiency fertilisers (EEFs), split applications