

## Increasing nitrogen use efficiency in rice using nitrate and ammonia inhibitors

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Nitrogen fertilizer loss in rice fields, through processes like denitrification, volatilization, and leaching, leads to reduced nitrogen use efficiency (NUE). Nitrogen inhibitors are added to nitrogen-based fertilizers to reduce losses, by slowing down the conversion of nitrogen to forms susceptible to loss. This study was conducted to evaluate the NUE of three selected nitrogen inhibitors in rice variety Bg 352. A field experiment was conducted from May 2024 to August 2024 at Rice research and Development unit, CIC seed farm, Pelwehera, Sri Lanka, in a randomized complete block design (RCBD) with seven treatments each with three replicates. The treatments comprised of varying nitrogen applications and three nitrogen inhibitors: T1 - 100% Department of Agriculture (DOA) recommended dose of urea (RDU), T2 - 75% RDU, T3 - 60% RDU, T4 - 60% RDU with Power nitrogen inhibitor 1 L Mt<sup>-1</sup>, T5 - 60% RDU with Limus inhibitor 1 L Mt<sup>-1</sup>, T6 - 60% RDU with Vibelsol inhibitor 1 L Mt<sup>-1</sup>, and T7 - no urea. Based on the ANOVA results, ( $p > 0.01$ ) the application of 60% RDU did not significantly reduce grain yield ( $5.53 \pm 0.347$  t ha<sup>-1</sup>) compared to 100% RDU ( $6.34 \pm 0.224$  t ha<sup>-1</sup>); however, the reduction was nearly 1 t ha<sup>-1</sup>. The use of nitrogen inhibitors significantly mitigated the yield reductions caused by reduced urea applications. Among the three nitrogen inhibitors tested, Vibelsol showed the most significant results in improving nitrogen use efficiency. The results revealed that there was no significant difference ( $p > 0.01$ ) in actual grain yield between 100% RDU ( $6.34 \pm 0.224$  t ha<sup>-1</sup>) and 60% RDU ( $6.33 \pm 0.197$  t ha<sup>-1</sup>) with Vibelsol inhibitor 1 L Mt<sup>-1</sup>. Additionally, the 60% RDU with Vibelsol inhibitor 1 L Mt<sup>-1</sup> treatment demonstrated the highest NUE ( $10.26 \pm 1.031$ ). These findings suggest that using 60% RDU with Vibelsol inhibitor 1 L Mt<sup>-1</sup> is an effective strategy to enhance NUE and maintain actual grain yield which can reduce the DOA recommended urea dose by 40% while ensuring optimal yield for the Bg 352 rice variety under low-country dry zone conditions in Sri Lanka. Further research is necessary to validate these results under different environmental conditions.

**Keywords:** *Ammonia inhibitor, Nitrate inhibitor, Nitrogen inhibitor, Nitrogen use efficiency, Urea*