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The Use of *Azolla sp.* to Increase N Fertiliser Use Efficiency in Wetland Rice in Dano, Southwestern Burkina Faso

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Abstract

The use efficiency of N fertiliser in lowland rice is often low because of its loss from the soil through biochemical processes. Nitrogen recovery by rice can be as low as 10% and rarely exceeds 60%. Ammonia (NH₃) volatilisation, usually associated with high soil pH and NH₄⁺ concentration, is reportedly an important mechanism for N losses. *Azolla sp.*, a water fern fixing atmospheric nitrogen in symbiosis with *Anabaena azollae* was used as a physical barrier to prevent the volatilisation of NH₃. The influence of *Azolla* on the floodwater chemistry and its relation to NH₃ volatilisation, its impact on N uptake by rice and its impact on rice yields was evaluated.

In a field experiment at the Dreyer Research station farmer's practice (basal application of NPK 16 16 16 and one top-dress of urea) “U1” was used as opposed to a split urea application “U2”. Secondly, the influence of *Azolla* (with and without) was assessed in plots at 0, 40, 80 and 120 kg N ha⁻¹ with respect to floodwater chemistry, NH₃ volatilisation, N uptake, crop growth and grain yield.

Results revealed that full *Azolla* cover on the floodwater surface by the time of urea application prevented rapid increase in floodwater pH in the range of 0.52 to 0.68 with the maximum pH value below 8.0. The absence of *Azolla* resulted in a rise of floodwater pH with a maximum of 8.97 and 8.63 for U2 and U1, respectively. Floodwater temperature was lowered by 1.9–2.0°C by *Azolla*.

In the presence of *Azolla* total dry matter yield increased by 7.8% in U2 and 9.8% in U1 and grain yields increased by 3.9, 6.4 and 3.9% in U2 and 1.8, 7.0 and 5.6% in U1 for N rates at 40, 80 and 120 kg ha⁻¹, respectively. The apparent N-recovery of rice was increased between 13.3 and 16.8% for grain and 39.1 and 42.6% for straw. Plant height, tiller count and panicle count, in plots with *Azolla* were higher.

It was concluded that the application of *Azolla* could be an efficient fertiliser alternative or supplement in flooded rice cropping system in Dano.

Keywords: Ammonia volatilisation, *Anabaena azollae*, *azolla pinnata*, nitrogen fixation