

NITROGEN RESPONSES FROM IRRIGATED ANNUAL RYEGRASS PASTURE

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Nitrogen fertiliser influences the productivity of irrigated, annual ryegrass which is a major source of cool season forage for the subtropical dairy industry. However, there has been no definitive research on the rates required for efficient use of applied nitrogen. This study attempted to quantify the nitrogen responses from irrigated annual ryegrass (*Lolium multiflorum*) at three sites representing the major irrigated dairy production areas in the subtropics. Experiments were established in three consecutive years on a red volcanic soil at Kairi in northern Queensland, on a heavy black clay alluvium at Mutdapilly in south-eastern Queensland and on a lighter clay alluvium at Casino in northern NSW. Nitrogen (N) was applied at rates from 0 to 112.5 kg N/ha/21 days (equivalent to 0 to 150 kgN/ha/month) as urea to irrigated, annual ryegrass. Plots were defoliated to 5 cm every 21 days after an initial establishment period. Nitrogen content of foliage was recorded at each cut. Total yields from each site in each of three years were expressed as a percentage of the site maximum yield and plotted against nitrogen applied in kg N/ha/month. Soil N levels were measured to 1 m depth at the end of each year.

Maximum forage yields averaged around 14 t DM/ha. A value of 90% of maximum yield was considered a realistic target for farmers. From Figure 1, the nitrogen rate required to achieve this was equivalent to 67 kgN/ha/month. Figure. 1 allows an estimation of the nitrogen rate required to achieve other target percentages of maximum yield. The efficiency of nitrogen usage (ie the amount of extra dry matter produced, relative to the control, from each kg of N applied), and the recovery of nitrogen in top growth from N applied, were estimated. The efficiency varied between years and sites but was generally highest (7 to 28 kg DM/kg N) at the lowest rate of N (25 kg N/ha/month) and fell to between 3 and 10 kg DM/kg N at 150 kg N/ha. Recovery of N also varied with site and year but was less influenced by rate of nitrogen and averaged 46% for 25 to 50 kg N/ha/month and 34% for rates 75 to 150 kg N/ha/month. There was no measurable build up of $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ levels in the soil at rates below 75 kg N/ha/month. This suggests that rates between 50 and 60 kg N/ha/month are optimal for use on annual irrigated ryegrass. They are close to the current rates used on commercial dairy farms and confirm that current practice is achieving efficient fertiliser usage.

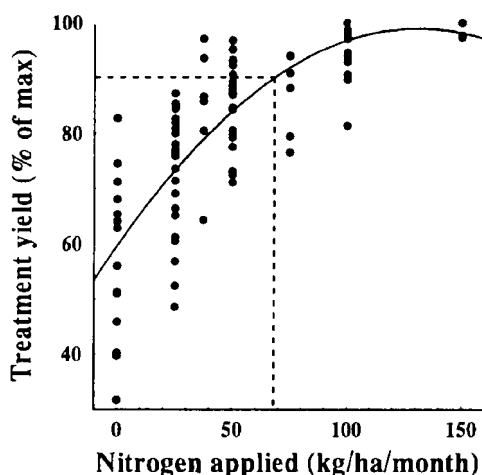


Figure 1. The response of dry matter yield, as a percentage of maximum yield, to nitrogen application rate per month over three years at three sites