

## The effects of the nitrification inhibitor dicyandiamide on herbage production when applied at varying time points and rates in the autumn

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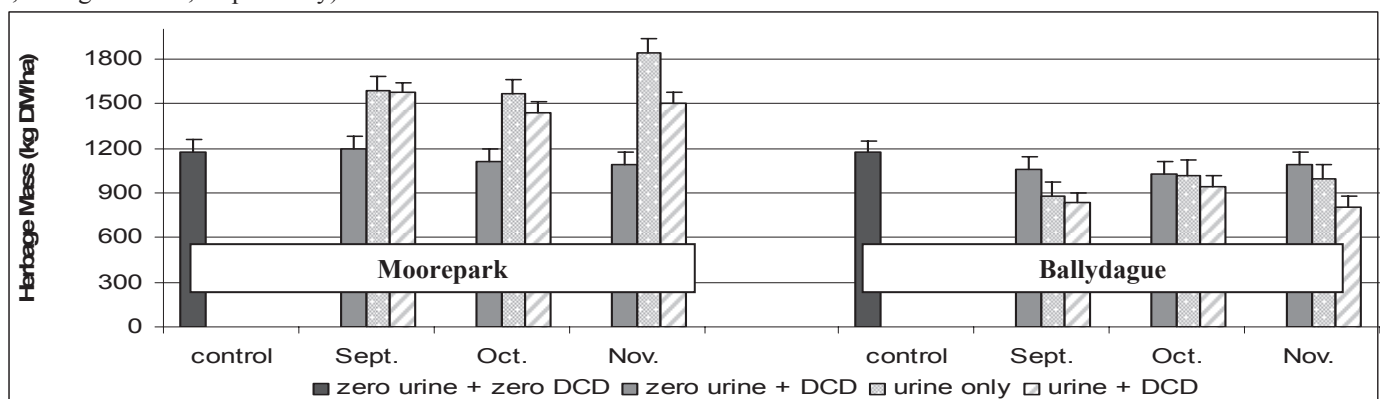
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**Introduction** Nitrification inhibitors such as dicyandiamide (DCD) have been shown to reduce nitrate leaching and nitrous oxide emissions (Moir *et al.*, 2007; Dennis *et al.*, 2008) by slowing the conversion of ammonium to nitrate in the soil. Nitrate is readily taken up by growing plants, but if surplus nitrate is available, such as when plant growth slows in winter, or under urine patches, it is likely to be lost through leaching. As well as reducing N losses, increased spring herbage production has been observed in New Zealand when DCD was applied in autumn and early spring. Moir *et al.* (2007) showed increases of up to 36% in annual herbage production from urine patches and up to 25% in non-urine areas when DCD was applied. The objective of this experiment was to investigate herbage production in spring and total production from February to September following the application of DCD on two soil types at three different times in autumn/early winter.

**Material and methods** This experiment was undertaken at Teagasc Moorepark Research Centre, Fermoy Co. Cork on two contrasting soil types. The soils were (1) free-draining acid brown earth of sandy loam to loam in texture at Moorepark (MPK) and (2) a moderate to heavy brown earth of sandy loam texture with evidence of an iron pan at Ballydague (BD), approximately 5 miles from Moorepark. The experiment was a randomised block design with three replicates of each treatment at each site. Two fertilizer N application rates were applied, 350 kg N/ha and 0 kg N/ha. There were 4 urine application timings, one application in September, October or November or not applied. Artificial urine was used (urea and water mix) and the quantity of N in the artificial urine was 1000 kg N/ha. DCD was applied at rates of 0, 5 and 10 kg/ha as a single application using a Kestrel spray-master sprayer, within 24 hours of each urine application. Plots were harvested every 4 weeks from February to November. All fresh samples were weighed and a sub-sample was dried at 40°C for 48 hours to determine dry matter (DM) yield. Data were analysed using PROC GLM in SAS. Data for each site were analysed separately.

**Results** Spring herbage mass (herbage production from October to March) was significantly ( $P < 0.001$ ) greater at MPK when urine was applied compared to when no urine was applied (Figure 1); and there was no significant effect at BD. There was no significant effect of DCD rate or application time on spring herbage production at either site. There was no significant effect of fertiliser on spring herbage mass. Annual herbage mass (herbage harvested from February to September, inclusive) increased significantly at both sites when fertiliser was applied ( $P < 0.001$ ). Herbage mass was 12,102 kg DM ha<sup>-1</sup> at MPK when fertiliser was applied compared to 6,519 kg DM ha<sup>-1</sup> when no fertiliser was applied. At BD herbage mass was 6,319 kg DM ha<sup>-1</sup> and 4,372 kg DM ha<sup>-1</sup> with and without fertiliser, respectively. There was a significant effect ( $P < 0.01$ ) of urine application on annual herbage mass production at MPK. Herbage mass was 1,808 kg DM ha<sup>-1</sup> greater on swards which received urine in autumn/early winter compared to those that did not receive urine (10,101 v's 8,293 kg DM ha<sup>-1</sup>, respectively).



**Figure 1** Average spring herbage mass production (kg DM/ha) between October and March on plots receiving zero urine, urine in September, October or November with and without DCD.

**Conclusion** There was no significant effect of DCD rate or application on spring or annual herbage mass, at either site. Urine application increased herbage mass irrespective of time off application at Moorepark; however it had no effect at Ballydague. Fertiliser N had no effect on herbage mass in spring but it significantly increased annual herbage mass at both sites. This experiment is currently being repeated for a second winter.

### References

- Dennis, S.J., Richards, K., Cameron, K.C., Di, H.J., Moir, J.L., Fay, D., Staples, V. and Sills, P. 2008 Proceedings of the Agricultural Research Forum 2008, Tullamore, 6.
- Moir, J.L., Cameron, K.C. and Di, H.J. 2007. Soil Use and Management 23, 111-120.