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LEACHING LOSSES OF NITROGEN FOLLOWING AUTUMN APPLICATIONS OF FARMYARD MANURE

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INTRODUCTION

On all grassland farms, the opportunities for applying farmyard manure (FYM) are limited because of the need to avoid contaminating herbage on grazing land, or to risk compromising the quality of silage from cut swards. In the UK therefore, FYM is commonly applied to grass swards in the autumn (when animals are normally housed) to allow the FYM to become incorporated into the soil and/or dispersed by winter rains. Whilst this makes obvious practical sense, it may be less satisfactory in terms of the environmental impact, since plant growth is limited at this time of year and any nitrogen (N) which is not utilised may be lost to the wider environment. We looked at the leaching losses over winter (2000/01) associated with autumn applications of FYM which had either been stored in a heap since mucking out (spring 2000), or had been actively composted and compared this with an autumn fertilizer application of N on grass plots which had been previously fertilized and cut during the growing season.

METHODS

Twelve field plots (each 6 x 3 m) were situated on gently sloping land on a clay loam soil (stagno-distric gleysol) which was poorly drained over a clay subsoil (at 30cm depth). The site was at the farm of the North Wyke Research Station of the Institute of Grassland and Environmental Research in SW England (50°45'N, 3°50'W). Each plot was hydrologically isolated by a polyethylene barrier, inserted to a depth of 50 cm, separated by 1m wide races. A 15 cm perforated drainage pipe was laid up-slope from the plots at a depth of 50 cm and back- filled with gravel to collect and prevent any water from flowing into the plots. On the down-slope of each plot, 10 cm diameter perforated drainage pipes were placed at a depth of 30 cm, again with a gravel back-fill, to collect surface and sub-surface runoff which emptied into a tipping bucket. The tipping buckets measured the total volume draining from each plot and diverted a flow-proportioned sample into collecting vessels. Samples were collected daily and analysed for nitrate, ammonia and total N. There were four treatments (3 reps. each): 1) FYM (uncomposted) at 20t /ha; 2) COMPOST (composted manure) at 20t /ha; 3) NITRAM (autumn application) at 60 kg N/ha; 4) CONTROL (no autumn fertilizer). All the plots had received fertilizer (120 kg N/ha) and had been cut during the previous summer.

RESULTS AND CONCLUSIONS

The manure treatments supplied 170 and 150 kg total N/ha, (FYM, COMPOST, respectively). A comparison between all plots receiving manures and those which had previously only received fertilizer N, showed that more ($P<0.05$) dissolved organic N (DON) was lost from manure applications, as expected, although at a low level of *ca*. 6 kg DON/ha. About 60% of the total N leached in both the manured plots was DON, whereas this was less than 50% in the plots which had received fertilizer. However, although the total N leached from the plots was in the order NITRAM>FYM>CONTROL>COMPOST, there was no significant difference between treatments (overall mean 11.2 kg N/ha), nor were the amounts of nitrate leached different, even though initially, the NITRAM treatment recorded the highest leachate concentrations. Data were very variable in this treatment and only one of the replicate plots (NITRAM) recorded nitrate-N concentrations that occasionally breached the EU drinking water standard (11.3 ppm). This experiment would have been repeated, but was disrupted by Foot and Mouth restrictions governing the movement of animal manures, but nevertheless confirms the capacity of cut grassland to utilise nutrients (<10% applied N leached), whereas grazed grassland has been shown to be capable of generating much higher leaching potentials.