Productivity Potential and Seasonality of Five Grass Species under Varying Nitrogen Levels at Three Latitudes in Ireland

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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

Productivity potential and seasonality of five grass species under varying Nitrogen levels at three latitudes in Ireland

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Key words : grasses , production , latitude , management

Introduction This multi-site project was initiated in Ireland to address the expected implications of the recent European Union CAP reform (26 June 2003) , which established management directives that curtail soil fertility and animal stocking rates to threshold levels on farms . As this is expected to increase extensification of grassland use , the existing ryegrass based high fertility production systems (DAF 2007 , Gilliland , 2007) need to be re-evaluated for their ability to meet grazing animal needs in comparison with alternative minor grass species . Comparative studies of grass species have been conducted in the past (Frame , 1989 and 1991) but varietal improvements have since been achieved in most species . Furthermore , the interactions between climate , fertility levels and stock grazing strategies for seasonal production have not been adequately determined . Therefore , the primary objectives for the current study were to assess the relative productivity potential of a range of grass species under different fertility and defoliation regimes at widely different climatic locations .

Materials and methods The study was conducted at three locations , Crossnacreevy (54°32′N , 05°52′W) , Backweston (53°22′ N , 06°30′ W) and Moorepark (52°09′ N , 08° 16′W) , which equate to a maximum range of difference in day length of 60 minutes on 16 June (derived from Meeus , 1991) and a wide range in mean daily temperatures , rainfall and photosynthetically active radiation levels . Single (?) varieties of five grasses (*Lolium perenne* , *Phelum pratense* , *Festuca pratensis* , *Festuca arundinacea* and *Dactylis glomerata*) were sown with companion white clover (*Trifolium repens*) in a three replicate field plot experiment at each site in 2006 . Three nitrogen (N) levels : High , 420 kgN ha^{-1} , Medium , 210 kgH ha^{-1} and Low , 105 kgN ha^{-1} were applied . Sward height assessment by rising plate metre was performed fortnightly , January-November 2007 . For the High N and Medium N treatments , coincident , approximately monthly , defoliations were imposed , whereas at the Low N treatment , defoliation frequency was timed independently at each site , occurring when the average sward height of the third tallest species achieved 6 cm above the base defoliation height .

Results and discussion There were significant effects of site , species and nitrogen level on yield and seasonality of production . The differences in seasonality of growth were evident between the sites from early in spring , with first Moorepark (20 March) and then Backweston (27 March) and finally Crossnacreevy (12 April) reaching the initial target defoliation height at the Low N treatment . Total annual production ranged by 2 .1 t/ha between the sites (8.1 t/ha Crossnacreevy to 10.2 t/ha Backweston) , by 1.5 t/ha between species (*D . glomerata* cv , Donata 8 .4 t/ha to *P . pratense* cv , Dolina 9 .9 t/ha) and by 4.0 t/ha between nitrogen treatments (High N , 11 .2 tDM ha^{-1} to 7 .3 tDM ha^{-1} for the Low N) , which also significantly affected companion clover content in all species and sites . Nitrogen use efficiencies and herbage supply profiles were calculated for all species by site combinations and evaluated with reference to the white clover content for each of the three nitrogen treatments .

Conclusions The generally accepted hierarchal ranking of these grass species , which have been long established under temperate maritime growing conditions , was not accurately reproduced . Imposing the fertility and location variables affected the species differentials and it was also concluded that advances in plant breeding had further acted to significantly distort the established production superiority of *L . perenne* over these other minor' grass species .

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