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A STUDY OF PATCHINESS IN MID-SEASON DAIRY PASTURES: CONSEQUENCES AND CONTROL

A Thesis Presented in Partial Fulfilment of the Requirements for the Degree of Masterate in Applied Science at Massey University

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ABSTRACT

There is interest among some dairy farmers in increasing herbage intake of cows during spring by increasing pasture cover but without compromising pasture quality into the summer. "Late control" is a grazing management strategy developed in Massey University that meets those requirements (Matthews et al., 1996). In addition, it has been demonstrated in previous trials that Late control increases pasture production in the summer-autumn period by increasing ryegrass tillering vigour. Late control requires a period of lax grazing during spring to allow some reproductive growth development on ryegrass pastures, which is then controlled by hard grazing in late spring before anthesis. However, patchiness may develop in Late control during the lax grazing period when the herbage allowance is high.

The objectives for the present experiment were to compare the pasture characteristics under Late control and conventional "Early control" spring management strategies in December-January, with particular reference to the consequences of vegetation heterogeneity to pasture production and utilisation over this period, and to discuss the implications to spring grazing management. The experiment involved detailed studies on three paddocks chosen from each of two farmlets of 22 paddocks used for a system trial comparing Early and Late control spring management on herds of 120 cows. Herbage mass distributions were estimated by taking 200 capacitance meter readings at random on each paddock. Relationships between herbage mass and utilisation and accumulation were estimated by using two 30 m permanent transects in each paddock. To determine botanical composition and tiller population variability within a sward, five tall patches and five short patches were sampled in each paddock.

Paddocks in Late control before the control phase in December had more herbage mass than paddocks in Early control (3600 vs. 5000 kg DM/ha), but the variability of herbage mass was similar (1000 vs. 1000, standard deviation in kg DM/ha). The skewness of the herbage mass distribution was positive but greater in Early control than in Late control (0.57 vs. 0.32). Botanical composition was similar between treatments and within paddocks. Pasture morphology showed tiller size-density compensation in both treatments. Pasture characteristics in late control were not an impediment for efficient pasture removal in late control and more herbage was harvested than in Early control (1900 vs. 1000 kg DM/ha), although herbage allowance was greater in Early control. Short patches in both treatments were defoliated in less proportion than tall patches, but in Late control the proportion of short patches was less than in Early control. Therefore, low herbage mass and greater proportion of short patches in Early control had a negative effect on total herbage utilisation.

Harvesting efficiency was controlled on Late control paddocks to avoid limitations to herbage intake, and the skewness of the distribution of herbage mass after grazing increased compared to Early control, as well as the proportion of tall poorly utilised patches. Topping of pastures after grazing was effective in removing poorly utilised material and in decreasing patchiness in January. In January, Late control paddocks had more herbage mass, but less patchiness than Early control paddocks (6300 vs. 4700 kg DM/ha). Sward characteristics were affected by treatment, and in general Late control increased ryegrass content and its leafiness during January

compared to Early control. In January, herbage utilisation was greater in Late control than in Early control (3000 vs. 1700 kg DM/ha).

It was concluded that because Late control had greater responses in tall patches, the objective should be to modify management to a longer rotation length before controlling reproductive growth in late spring, to allow a greater proportion of the sward to achieve high herbage mass. The combination of grazing and topping of pastures gave high herbage intakes and effective pasture control. More pasture was produced in Late control than in Early control and the rotation length can also be increased during the summer in Late control, which may benefit further ryegrass tillering.

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Chapter 1. General Introduction and Objectives

In New Zealand the feeding of dairy cows is based on pastures, and efficient utilisation of herbage is important for the economic performance on a dairy farm, even though pasture production is seasonal with year to year variation. Seasonal calving of cows is one strategy used in Dairy farms to match animal requirements to pasture production, by making their peak lactation and high intake requirements coincide with high pasture production during spring (Holmes and Wilson, 1987). However, during late spring pasture becomes reproductive, and this reproductive growth must be controlled to maintain pasture quality. Different management strategies have been recommended to control reproductive growth in pastures. The most used strategy has involved hard grazing throughout the spring accompanied by conservation as required, which has been shown to maintain pasture quality and tiller density into the summer-autumn period (L'Huillier, 1987, 1988; Hoogendoorn et al., 1992). Despite these advantages, it is considered that hard grazing throughout spring limits herbage intake of dairy cows, which often results in loss of body condition that in turn will result in shorter lactation length. There has been an increasing interest over recent years in improving the nutrition of dairy cows during spring to achieve greater milk production and longer lactation. However, to reduce the intensity of grazing has been considered undesirable because pasture quality declines, and on the other hand, the use of large amounts of supplements to better feed dairy cows is not considered economically feasible.

An alternative grazing management strategy for the spring period was developed in Massey University based on tiller dynamics studies. It was found that allowing some development of reproductive growth in ryegrass pastures but controlling it before anthesis ("Late control") increased the ryegrass tiller population, tiller weight, leafiness and growth vigour during the summer-autumn period (Matthew et al., 1989; Xia et al., 1990; Da Silva et al., 1993; Da Silva, 1994; Da Silva et al., 1994; Hernandez, 1995). In practice, Late control requires a period of lax grazing during the spring to allow some reproductive growth development on ryegrass pastures, and then control by hard grazing in late spring before anthesis. Late control has been tested experimentally with dairy cows in the past to evaluate if the extra pasture growth could be converted into extra milk production, with positive results (Da Silva, 1994). There is also interest in Late control among farmers interested in increasing the herbage intake of cows during spring without sacrificing pasture quality into the summer (Matthews et al., 1996).

It has been observed that during the lax grazing period under Late control patchiness develops on the sward, with some areas being grazed more intensively than others. As a consequence, the development stage of reproductive growth may be greater in some patches than others. Then at the time of control during late spring, different patches would be at different development stages of reproductive growth, and this may complicate management.

Patchiness develops in Late control during the lax grazing period when the herbage allowance is high and it is not likely that there is a restriction on intake during this period. But it is not known if patchiness will affect the cows intake and production during the control phase. In a system based assessment of Late control, it has been observed that to obtain an efficient pasture control it is necessary to force the cows to

graze too low for too long so that intake and milk production decline during the control period, and this imposes a critical conflict for Late control management. However, the intensity of grazing between different patches during the control period may be different, and it is not known if this has any effect on ryegrass tillering and its regrowth vigour, or changes in botanical composition. It is necessary to describe the effects of patchiness during the control phase and the consequences in the next grazing period on herbage utilisation. Until the effects of patchiness under Late control are evaluated it is not possible to determine if controlling patchiness will bring extra benefits to the system.

The objectives for the present experiment were to compare the pasture characteristics of swards under Early and Late control spring management strategies in December-January, with particular reference to the consequences of vegetation heterogeneity to pasture production and utilisation over this period, and to discuss the implications to spring grazing management.