DRY MATTER INTAKE AND LIVEWEIGHT GAIN RELATED TO SWARD CHARACTERISTICS AND QUALITY[1]

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ABSTRACT

A grazing experiment was conducted at the EEMAC, Uruguay, to describe sward characteristics-animal responses relationships of steers rotationally grazing on a rangeland oversowed with *Lotus corniculatus*, L. Four levels of forage allowance (FA) were evaluated: 2.5, 5.0, 7.5 and 10.0 from Abril-July, and 5.0, 7.5, 10.0 and 12.5 kg DM/100 kg BW/day from July-February. Season was the main effect on forage quantity and quality. Organic matter intake (OMI) and average daily gain (ADG) reflected seasonal effects on pasture. The major constraint was metabolizable energy (ME Mcal/kg DM) except during spring, and during winter the sward structure (low kg DM/ha). Seasonal change effects were greater than FA, then there was not a single relationship with FA. A model equation was developed as a multiple regression including FA, ME (Mcal/kg DM) and dead material (%).

KEYWORDS

forage allowance, rotational grazing, steers.

INTRODUCTION

Livestock production in Uruguay and Rio Grande do Sul (South-Brazil) is a forage based system. Animal production is characterized by a large fluctuation during the year, having low productivity indices. The animal production is dependent on quantity and quality of consumed forage, and grazing affects the produtivity of pasture. The knowledge about management systems that optimised the utilization of these pastures as well as the basic relationships that explain the productivity of these systems is small. Thus, the aim of this study was to describe the sward characteristics, the DMI and ADG on different FA, as well as to suggest a simple method to predict intake and animal performance based on forage characteristics.

MATERIALS AND METHODS

A grazing experiment was conducted on a rangeland oversowed with *Lotus corniculatus*, L. at the Experimental Agronomic Station, EEMAC, Uruguay, to describe the sward characteristics-animal responses relationships. Four levels of FA were evaluated: 2.5, 5.0, 7.5 and 10.0 from April-July, and 5.0, 7.5, 10.0 and 12.5kg DM/100kg BW/day from July-February. FA was adjusted by Put&Take technique, using 24 yearling steers as fixed animals, in a rotational grazing system, 7 grazing days and 35 days resting period. Herbage mass (DM/ha) was measured by cut at soil surface at the begining and the end of each grazing period, and pasture height (cm) was measured prior to cut. Pasture quality was assessed in pasture and extrusa samples by IVOMD (%), CP (%) and NDF (%). ME was estimated from IVDMD (MAFF, 1975). Intake (kg DM/d) was estimated from total fecal output and extrusas IVDMD. Fecal output was measured using chromium as external marker, in 8 grazing periods. Liveweight was measured every 28 days, with overnight fasting. ADG was estimated by regression analysis. Datas were analysed by simple and multiple regressions and by analysis of variance.

RESULTS AND DISCUSSION

Characteristics of the pasture. Season was more important as variation factor than treatments, and for this reason the availability of forage during the summer varied from 1680-2258kg DM/ha, while the range obtained in winter varied from 621-1926kg DM/ha in the extreme treatments. Consequentely, the height of the pasture offered varied from 2.72-6.39cm in winter and from 9.22-15.48cm in summer. Due to a predominance of summer species, the quality was lowest during the winter and highest in the spring. Treatment effects over the quality was of secundary importance.

Level of intake. As a consequence of the relative importance of the season and the treatment in quality and availability of pasture, the intake was expressed in compliance with these relationships. With exception of the August period (winter) where death of animals in treatments with lower FA was verified, as well as a superior intake at higher FA treatments (2.14 x 2.66 % BW for lower and higher FA, respectively), no effects of treatment over the intake were found. So, season was determined in the level of intake found. The larger intakes registered were obtained in the spring (3.43% BW) when the combination of quality and availability of forage was favourable. The PC and ME intakes reflected the variations in quantity of FA and compositon (Piaggio et al. 1995). The analysis of these data in relation to the requirements showed that neverthless for the period of higher restriction, the intakes of protein were higher than requirements (410g/animal/d CP consumed x 377g/animal/d CP required). However, the energy intake in the same period was only 69, 77 and 93% of the requirements for ADG of 400g/d, with FA of 7.5, 10 and 12.5kg DM/100 kg BW.

Liveweight gain. The ADG as a function of FA for the different periods showed narrow relationships (R^2 from 0.74-0.99) when the periods were analysed individually. The model of better agreement was a quadratic one were the higher FA diminished the animal performance. The exception was the period of higher restriction (winter) where this relationship was linear. Without doubt, a clear relationship can not be obtained when the periods are analysed all together, due to their variations in the levels of ADG (800g in spring, 650g in summer, 300g in autumn and losing weight in winter). These different performances following the seasons, occured as a response to other factors not related strictly with FA.

Prediction of intake and animal performance. The relationship between levels of intake and ADG with FA did not present a shape that can be expressed in a regression when all cycles were included. This behaviour can be due to a different signification of FA in the differents season, since the forage condition in qualitative and structural terms was more affected by fators involved in the rotational cycles, as phenological stage, than with the FA. If the FA is added to some variable of pasture quality and the possibility or need of selection, it is to be expected that a relationship can be identified between level of intake and pasture characteristics. A new variable was created, product of FA and concentration of ME of forage offered. This new variable represents a availability of energy for the animal and improves the capacity to predict the intake. Also, it was necessary to create a factor of acessibility and/or possibility of selection in this forage offered. Due to simplicity and importance it was considered the proportion of green material (1 - dead material). The Corrected Energetic Pressure (CEP), which was used as a predictor of voluntary intake is calculated by: CEP = FA * Mcal EM/kg pasture offered *(1 - dead material). Figures 1 and 2 show a quadratic relationship and the fitting degree obtained for this new indicator of factors of pasture related to intake and ADG observed. The R^2 can be considered high, considering the variation of situations comprised, therefore, this indicator included the more relevant pasture factors with relation to intake. When the intake is modeled based on a multiple regression against these parameters the fitting is still better but the simplicity of their interpretation is decreased. The intake of CP and ME presented, as expected, the same behaviour, lack of single relationship with FA, and the same relationship with CEP. The R^2 were 0.82 and 0.85 for the intake of ME and CP, respectively. Thus, the index combines simplicity of determination and interpretation, which deserve more research .

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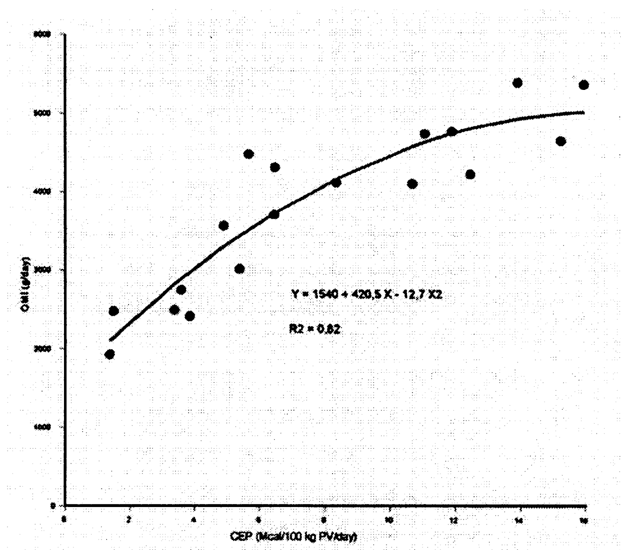

Figure 1
Organic Matter Intake (g/day) in relation to Corrected Energy Pressure for all seasonal cycles

Figure 2
Relationship between Average Liveweight Gain and Corrected Energy Pressure (CEP)