

Effects of vegetation structure and plant height when grazed on persistency of meadow fescue pasture

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Introduction An intensive grazing technique using meadow fescue (Mf) pasture has been developed in northern Japan, where soil freezes in winter. It has been shown that the appropriate plant height of Mf pasture when grazed for persistency is about 27 cm. When Mf and perennial ryegrass (Pr) pastures were grazed at the same plant height of 20 cm, vegetation of Mf pasture declined and plant length of Mf pasture was longer than that of Pr pasture (Sudo *et al.*, 2002). These phenomena might be due to the effects of differences in grass species and plant height when grazed on vegetation structure, but the mechanisms are not clear. This study was conducted to elucidate the mechanisms of these phenomena. Data on plant height and length obtained in previous studies were reviewed, and pot tests were carried out to reproduce the phenomena.

Materials and methods Measurements of plant height (natural canopy height) and plant length (length of straightened stem and leaf) before grazing were carried out using a ruler over a period of 7 years in Mf and Pr pastures, and relationships between them were analysed. In addition, Mf and Pr pastures were established in September, and dry weights of Mf and Pr were measured every 5 cm from the ground to 30 cm by the stratified clip method in October of the following year. Pot tests for Mf and Pr were carried out between April and August; seedlings were transplanted in a pot (113 mm in diameter and 140 mm in height) and they were cut when plant length reached a fixed length (24 or 32 cm) to a fixed cutting height (5 or 13 cm). Plant lengths of 24 and 32 cm simulated plant heights of 20 and 27 cm, respectively, and cutting heights of 5 and 13 cm simulated high and low stocking intensities, respectively. The effects of grass species and cutting management on cutting frequencies and above ground production during the test and on root weight and numbers of tillers at the end of the test were analysed as a two-factor factorial design.

Results A positive correlation was found between plant height and length (Figure 1). Although regression coefficients to estimate plant length from plant height could be pooled as 1.13 between Mf and Pr pastures, constants differed 1.8, so plant length of Mf was 1.8 cm greater than that of Pr at the same plant height. Distribution of mass between 0 and 5 cm above ground in the Mf pasture was significantly lower than that in the Pr pasture (Figure 2). In the pot tests, significant differences in cutting frequencies, above ground production and root weight were not found between the species, and interaction between species and cutting management was found in number of tillers. Cutting frequency was higher in the order of plots 24-13, 24-5 and 32-13 (plant length - cutting height cm), and above ground production and root weight were decreased in plot 24-5. The number of tillers in plot 24-5 was less than the numbers in other plots for Mf but not for Pr.

Conclusions Compared to Pr, Mf was a less erect plant type and distribution of mass in the basal part of community was low. Thus herbage mass of Mf pasture after grazing becomes less if plant height after grazing is the same as that of Pr pasture. Moreover root weight and number of tillers of Mf decreased when Mf pasture of 20 cm in plant height was intensely grazed. It is concluded that these Mf properties cause deterioration in conditions of regrowth, resulting in a decline in vegetation.

Reference

Sudo, K., K. Ochiai, T. Ikeda & K. Umemura (2002). Effects of management on yield, nutritive value and persistency of intensively grazed meadow fescue pasture. *Grassland Science*, 48, 421-427.

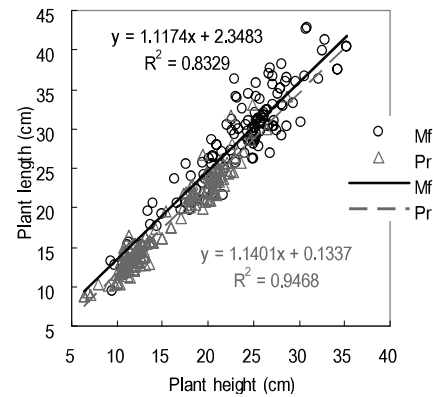


Figure 1 Relationships between plant height and length of Mf and Pr

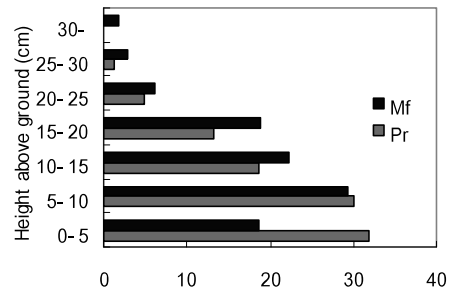


Figure 2 Distribution of mass in every 5 cm above ground in Mf and Pr pastures