Seasonality of growth in grass-clover swards under repetitive nitrogen application

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Introduction The cohabitation of grass and clover is possibly due to asynchrony in their growth patterns, and to the beneficial effects of fixed nitrogen (N) on grass. Incompatibility of clover persistence with N fertilisation has been frequently reported (Nassiri and Elgersma, 2002). However, limited information is available regarding the effect of repetitive application of N in mixed swards. This research aims to study the balance between species in response to application of increasing rates of N throughout the growing season.

Materials and methods Two white clover (cvs. Alice and Gwenda) and two perennial ryegrass (cvs. Barlet and Heraut) were used to make four different mixtures. The mixtures were grown under two N levels, 0 (-N) and 150 kg N ha-1 (+N) in split doses. In +N mixtures, 30 kg ha-1 N was applied five times during the growing season. Monoculture of the clovers (without N) and ryegrasses (with same levels of N as mixtures) were also established. Experimental design was a split plot repeated in two complete randomized blocks (Nassiri and Elgersma, 1998 for details). All plots were cut at an approximate average target yield of 2000 kg dry matter (DM) ha-1, leading to 5 cuts during the growing season. The cut material was separated into grass and clover. DM of species was measured after drying for 48 hours at 70 °C. In this paper average DM of grass and clover cultivars are presented.

Results Relative distribution of annual DM of species over the regrowth periods (Fig. 1) showed maximal grass growth in the first period, declining towards the end of season. The opposite pattern was observed in clover, however. In grass monocultures the seasonal variation in DM (expressed by coefficient of variation, CV) decreased significantly ($P < 0.05$) with increasing N levels. In the +N mixtures the CV of grass and clover DM was lower than in the -N mixtures ($P < 0.05$), but a significantly higher CV of total DM was obtained in the +N mixtures (Fig. 1). This led to a more even distribution of total DM in the -N compared to the +N mixtures (Fig. 1). The distribution of seasonal yield of grass and clover showed similar patterns in mixtures and monocultures. Grass had the highest proportion of its annual DM in the first cut (corresponding to its reproductive growth). This declined remarkably during summer. However, for clover the opposite pattern was observed.

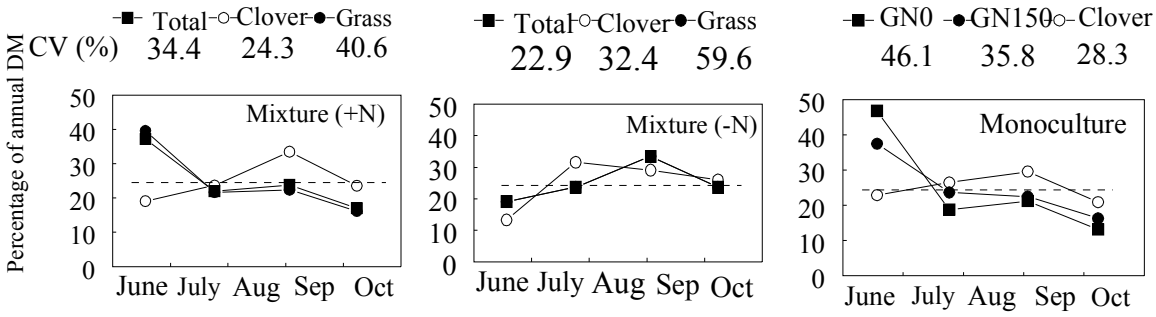

Figure 1 Mean seasonal distribution of grass, clover and total DM expressed as percentage of the total yield of the 5 regrowth periods. Coefficient of variation (CV) is also shown for all regrowth periods.

Conclusions Reliance of grass on N fixed by clover resulted in reduced interspecific competition, increased possibility of coexistence and higher total yield through synchronized growth pattern of species. However, this harmony was disturbed in +N swards, where grass still had a high seasonal variation, while the clover content was not sufficient to overcome this variation. Therefore, the seasonal distribution of the total yield in the +N swards followed the variable pattern of the grass component.

References

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