

Variety testing for grassland species – advanced recordings and analysis

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Introduction: In Austria, new varieties of grassland species are typically tested under standardized conditions at different sites to determine the most suitable ones. The main evaluation criteria are heading time, resistance to plant diseases and weed infestation, re-growth capacity, winter hardiness and yield. Forage quality, however, is only considered by means of crude protein content. To meet the increasing requirements in animal nutrition and also addressing the challenges of climate change, advanced studies and recordings of quality parameters are therefore relevant and these aspects are the subject of this study.

Materials and methods: Variety testing trials at AREC Raumberg-Gumpenstein have been extended in terms of duration and forage qualitative analysis. A strong focus was given to red clover and alfalfa of which selected cultivars were implemented twice in the respective testing trials. For these subsets four different harvesting dates were defined both for the first and second growth and numerous parameters like mean stage by count (MSC) and weight (MSW; not presented here) and some functional traits (length and weight of plants, stem diameter, leaf proportion) were recorded for each of 40 plants per cultivar and sampling date (Sanderson *et al.*, 1989). Advanced chemical analysis (e.g. protein and crude fibre fractionation) were carried out and will provide decision-making support. Analyses of variance and Pearson correlation analyses were performed using SPSS Statistics, version 25.

Results: In contrast to the commonly used BBCH-scheme, estimation of vegetation stage by MSC showed a stronger differentiation between tested red clover cultivars (Table 1). MSC-values were significantly linked with plant length, total plant weight and stem diameter ($P < 0.001$). Two of the observed cultivars (Van and Fregata) clearly differed from the others concerning these plant functional traits but also showed a significant lower leaf proportion compared to Carbo and Panova. Plant length, total plant weight and stem diameter were significantly correlated with each other ($0.79 < R \leq 0.85$).

Table 1. Average vegetation stage and functional traits for red clover cultivars at the time of first harvest (8-6-17).¹

Cultivar (ploidy level)	BBCH ²	MSC	Plant length (cm)	Total plant weight (g)	Leaf proportion (weight-%)	Stem diameter (mm)
Carbo (4n)	61	3.9 a	58.4 a	6.88 a	30.5 a	3.7 a
Van (2n)	61	5.0 a	68.8 b	7.43 a	22.8 b	3.7 a
Panova (4n)	60	3.9 a	56.6 a	6.16 a	29.8 a	3.6 a
Fregata (4n)	64	4.8 a	69.7 b	7.04 a	23.4 b	4.0 a

¹ Means with same letter are not different at 5% level (Duncan's MRT).

² BBCH was standardly estimated for the total plot.

Conclusion: MSC and plant functional traits provide important information that may substantially support the characterization and selection of cultivars for different purposes in grassland management. These functional traits will be linked with outstanding quality parameters to find whether trait measurements could (partly) replace expensive forage quality parameters.

Sanderson M.A. and Wedin W.F. (1989) Phenological stage and herbage quality relationships in temperate grasses and legumes. *Agronomy Journal* 81 (6), 864-869.