Development of white clover cv. 'Sūduviai' in communities of various grass species

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The white clover cv. 'Sūduviai' competes well in mixtures with grasses. The average clover content in the swards in all years of use and cuts was fairly favourable for livestock feeding and varied within 27.0–52.4%. Investigations of the generative and vegetative development of clover in the communities of various grass species suggest that these characters were most markedly influenced or suppressed by cocksfoot. Clover performed best in a mixture with smooth-stalked meadow grass. In mixed sward with grasses clover formed 4.1–4.5 times fewer inflorescences than in a pure stand. The yield of crude protein of clover/grass mixtures increased in the first year of use 2.6–6.7 times, in the second year 3.7–8.7 times as compared to grasses not fertilised with mineral nitrogen. The digestibility and dry matter yield per ha of mixed swards increased owing to clover.

Key words: breeding, white clover, perennial grasses, crude protein, digestibility

INTRODUCTION

Perennial grasses are an important component in natural and mane-made ecosystems. When establishing new swards it is of vital importance to choose grass species that are well compatible among themselves. The key legume in pasture swards is white clover (*Trifolium repens* L.). Its importance in swards is versatile. By accumulating nitrogen from the atmosphere it enables to minimise mineral nitrogen fertilisation and produce ecologically sustainable foodstuffs [1, 2]. The sward of white clover cv. 'Atoliai' with grasses can secure a high and stable high quality dry matter yield for over ten years without mineral nitrogen application [3]. Frequent grazing, adequate moisture regime and P and K fertilisation, selection of individual components and other factors contribute to a longer persistence of white clover in swards [4, 5]. Breeding plays an important role here too. Various grass breeding institutions are involved in the breeding of not only highly competitive white clover cultivars, but also better adapted cultivars of grasses with a lower suppressive power on clover [6]. Lithuania is not an exception, either. In 1997 the new white clover cultivar 'Sūduviai' was registered. The objective of this study was to assess the effect of various grass species on the development, spread in mixtures, and productivity of the white clover cv. 'Sūduviai'.

MATERIALS AND METHODS

Experiments were carried out at the Department of Lithuanian Institute of Agriculture in the fields of perennial grasses of the six-course crop rotation, in compliance with the methods approved by the institute. A $P_{60}K_{90}$ fertilisation was applied. The size of a record plot was 10.4 m^2, with 4 replications. The following seed rates per ha were sown: white clover (*Trifolium repens* L.,) 8.0 kg, perennial ryegrass (*Lolium perenne* L.,) 16.0 kg, cocksfoot (*Dactylis glomerata* L.,) 12.0 kg, common timothy (*Phleum pratense* L.) 10.0 kg, smooth-stalked meadow grass (Poa pratensis L.,) 12.0 kg and meadow fescue (*Festuca pratensis* Huds,) 18 kg. All mixtures contained 25% of clover and 75% of grass seed.

RESULTS

In the first year of use in the pure stand in the second cut, clover formed 600–650 inflorescences per 1m^2, and in various mixtures clover formed as few inflorescences as 110–298 per 1 m^2. The generative development of clover was most markedly suppressed by cocksfoot, while smooth-stalked meadow grass had the weakest effect; there were found 110–127 and 265–298 inflorescences per 1 m^2, respectively. In the second year of use when hot and dry weather became prevalent, the grass grew poorly, wither-

ed; nevertheless, clover formed a very great number of generative organs in the pure stand (over 5000 per 1 m^2). However, the effect of various grass species on clover remained similar to that in the wet year of 1998.

White clover is a light-demanding plant. In the pure stand the clover height was 25.6 cm in the first year of use, while in a mixture with cocksfoot clover grew as tall as 30.5–32.6 cm. The height of clover growing in the communities of smooth-stalked meadow grass remained within the limits of the control (25.9–26.1 cm). In the second year of use, owing to moisture shortage, clover height in the pure stand declined to 16.3 cm. In the communities with cocksfoot the clover height was 20.9–21.9 cm, with fescue 21.4–21.7 cm. It is worth noting that the suppressive effect on clover the later-ripening cocksfoot ecotype No. 1164 was weaker than that of the cultivar 'Asta'.

In the first year of use the lowest percentage of clover in the sward was determined in the first cut and that of grasses the other way round (Table 1). The averaged data of two years of sward use show that the highest content of clover was determined in the community of smooth-stalked meadow grass (50.6–52.4%), and the lowest content in mixtures with cocksfoot (27.0–33.4%).

In 1998 which was favourable for herbage growth, grasses grown in a pure stand produced quite a good dry matter yield in the first cut. However, in later cuts a shortage of mineral nitrogen resulted in the reduction of yield of grasses. Also in the second year of use when growing conditions were unfavourable and there was a shortage of nutrients, a very low yield was produced. Clover/grass sward in the first year of use gave an insignificantly higher first cut yield than did pure grasses. However, in later cuts an increase in clover content resulted in a dry matter and nutrient yield increase per area unit. In 1998, the annual crude protein yield per ha was as follows: of pure clover 2.80 t, grasses 0.42–0.89 t, clover/grass herbage 1.90–2.70 t (Table 2). The clover/grass mixture produced 2.6–6.6 times more crude protein as compared to pure grasses not treated by nitrogen. In 1999 the herbage of the first cut had a high content of clover, and the mixed sward produced a 3.9–10.4 times higher crude protein yield than did pure grasses. In later cuts when the clover

Table 1. **Content of white clover cv. 'Sūduviai' in a mixture in relation to the species of grasses, number of cuts and years of use**

(Dotnuva, 1998–1999)

Species	Cultivar	Cuts				Average	
		I	II	III	IV		
Ryegrass	'Sodrė'	22.6*	36.4	40.6	48.2	37.0	42.4
M. grass	'Gausa'	48.0	60.2	35.4	–	47.9	
Timothy	'Gintaras II'						
	Control						
M. grass	Nº 1059	42.2	44.3	48.3	58.0	48.2	52.4
		60.1	68.7	41.3	–	56.7	
M. grass	'Gausa'	41.5	39.7	42.2	51.9	43.8	50.6
		62.0	70.1	39.7	–	57.3	
Timothy	'Gintaras II'	28.5	35.6	42.9	51.5	39.6	45.8
		56.4	65.3	34.2	–	52.0	
Ryegrass	'Sodrė'	18.1	37.1	36.1	51.3	35.6	44.7
		58.8	66.8	35.7	–	53.8	
Fescue	Nº 1236	26.8	33.9	44.5	52.6	39.4	39.0
		40.3	53.6	22.3	–	38.7	
Fescue	'Dotnuva 1'	18.0	32.9	40.7	54.2	36.4	39.0
		37.2	57.3	29.9	–	41.5	
Cocksfoot	Nº 1164	23.3	32.7	32.9	42.1	32.8	33.4
		35.0	45.0	21.8	–	33.9	
Cocksfoot	'Asta'	14.7	32.2	33.0	41.3	30.3	27.0
		27.2	28.8	15.2	–	23.7	
	LSD_{05}	3.3	4.0	4.5	5.0	3.9	4.5
		5.0	6.6	3.7	–	4.9	

* In the numerator the data of the 1st year of use, in the denominator the data of the 2nd year of use are shown.
* M. grass = smooth-stalked meadow grass.

Table 2. **Productivity and yield of white clover cv. 'Sūduviai', grasses and their mixtures (t/ha)**
Dotnuva, 1998–1999

Species	Cultivar	Dry matter		Crude protein		Dry digestible matter	
		1st yr. of use	2nd yr. of use	1st yr. of use	2nd yr. of use	1st yr. of use	2nd yr. of use
Clover	'Sūduviai'	12.5*	4.3	2.81	0.92	10.3	43.7
Clover	'Sūduviai'	15.2	5.1	2.22	0.87	11.8	3.9
Grasses	'Sodrė' 'Gausa' 'Gintaras II'						
Ryegrass	'Sodrė'	8.4	2.1	0.71	0.23	6.5	1.5
		16.6	5.2	2.44	0.91	13.3	4.1
Fescue	'Dotnuva 1'	7.2	2.2	0.89	0.21	4.4	1.3
		14.8	5.3	2.34	0.85	10.7	3.9
Fescue	'Nr. 1236	8.2	2.7	0.88	0.22	5.0	1.7
		15.6	6.1	2.2	0.89	11.4	4.3
M. grass	'Gausa'	4.2	1.2	0.50	0.11	2.1	0.6
		14.2	5.2	2.44	0.83	9.9	3.6
M. grass	Nr. 1059	3.5	1.0	0.42	0.10	2.0	0.6
		14.9	5.1	2.60	0.89	11.3	3.8
Cocksfoot	'Asta'	8.2	2.5	0.68	0.22	4.6	1.4
		13.5	6.2	1.95	0.86	9.4	4.3
Cocksfoot	Nr. 1164	7.0	2.5	0.63	0.24	4.9	1.7
		13.1	5.8	2.15	0.91	10.1	4.5
Timothy	'Gintaras II'	7.2	1.9	0.76	0.19	4.6	1.3
		13.2	4.5	2.42	0.81	10.6	3.7
	LSD_{05}	1,12	0.41	0.16	0.04	0.43	0.31
		1,67	1.02	0.33	0.11	0.89	0.59

* In the numerator data on pure grasses and in the denominator data on mixtures with clover are shown.
* M. grass = smooth-stalked meadow grass.

content in the sward had declined, the differences in crude protein yield between mixed and one-component grasses became less distinct. In total, grasses that year produced 2.6–4.6 times less crude protein, whereas in the clover/grass communities these differences were not so district. Clover contributed to dry matter digestibility improvement of mixed swards as well as to dry matter yield increase.

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BALTŲJŲ DOBILŲ 'SŪDUVIAI' VYSTYMASIS ĮVAIRIŲ VARPINIŲ ŽOLIŲ RŪŠIŲ BENDRIJOSE

S a n t r a u k a

Baltųjų dobilų veislė 'Sūduviai' gerai konkuruoja mišiniuose su varpinėmis žolėmis – visų naudojimo metų bei pjūčių vidutinis dobilų kiekis žolyne buvo gana palankus gyvuliams šerti: svyravo 27,0–52,4% ribose. Tiriant dobilų generatyvinį bei vegetatyvinį vystymąsi įvairių varpinių žolių rūšių bendrijose nustatyta, kad šiuos požymius ryškiausiai veikė paprastosios šunažolės, geriausiai dobilai vystėsi mišinyje su pievinėmis miglėmis. Mišriame žolyne su varpinėmis žolėmis dobilai formavo 4,1–4,5 karto mažiau žiedynų, negu grynaame pasėlyje. Selekcijos pagalba yra perspektyva sukurti varpinių žolių veisles, geriau prisiderinančias augti bendrijose su baltaisiais dobilais. Žalių proteinų išeiga iš dobilų ir varpinių žolių mišinių padidėjo pirmaisiais naudojimo metais 2,6–6,7, antraisiais – 3,7–8,7 karto, palyginti su netręštomis mineraliniu azotu varpinėmis žolėmis. Dobilai pagerino mišinių žolynų sausųjų medžiagų virškinamumą, didėjo ir šių medžiagų išeiga iš 1 ha.