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P. Komárek
Crop Research Institute, Czech Republic

A. Kohoutek
Crop Research Institute, Czech Republic

P. Nerušil
Crop Research Institute, Czech Republic

V. Odstrčilová
Crop Research Institute, Czech Republic

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The impact of direct sowing into sward of permanent grassland on forage production

Komárek, P., Kohoutek, A., Nerušil, P., Odstrčilová, V.

Crop Research Institute, Prague, Research Station in Jevicko K. H. Borovského 461, Jevicko 56 943, Czech Republic.

E-mail komarek-vste@seznam.cz

Key words : grassland , direct sowing , forage production , fertilization

Introduction The introduction of legumes and grasses may positively influence the forage production, botanical composition of grassland and nutritive value of produced forage. Special machines for direct sowing were developed and tested. This significantly influenced further research, development and practical utilization of direct sowing technology in the Czech Republic. If we till the sward into a wider and deeper strip, the growth and development of directly sown plants is significantly faster, which is a primary prerequisite for successful introduction of directly sown species into the grassland.

Materials and methods The trial was established at the Jevicko site, the Czech Republic. Directly sown grassland (DG) was compared with permanent grassland (PG) and temporary grassland (TG). Direct seeding was performed in 1991 and repeated in 1996, 2000, 2003 and 2006 (a seeding machine for strip-sowing—a prototype with the grass sward cultivated into 150 mm deep and wide strips with 450 mm between strips and with a sowing mechanism, yjord) and the same seed mixture and seed quantity were used (29 kg ha⁻¹). Temporary grassland was sown only on the one occasion in 1991. The grass-legume seed mixture comprised: Festulolium hybrid (*Lolium multiflorum* × *Festuca arundinacea*) cv. Felina (12 kg ha⁻¹), Perennial ryegrass (*Lolium perenne*) cv. Sport (8 kg ha⁻¹), Cocksfoot (*Dactylis glomerata*) cv. Niva (4 kg ha⁻¹), Red clover (*Trifolium pratense*) cv. Kvarta (3 kg ha⁻¹), White clover (*Trifolium repens*) cv. Huia (2 kg ha⁻¹). TG was established and sown with the same mixture in 1991. Plot area was 10 m², 4 replicates. All types of grassland (treatments) were fertilized at four levels (no fertilization, P₃₀ K₆₀, N₉₀ P₃₀ K₆₀, N₁₈₀ P₃₀ K₆₀). This paper reports dry matter (DM) yield in 1991-2006. Data were analysed using a General ANOVA model and differences between averages were tested with the Tuckey test.

Results and discussion DM yield was influenced by the type of grassland (Table 1). There was significant (P < 0.01) increase of DM yield after direct sowing (DG) compared with a control (PG) especially in the second and third harvest year after direct sowing. The highest DM increase was observed in the first harvest year in 1992 when DM production increased significantly (P < 0.01) from 5.42 t ha⁻¹ (PG) to 10.18 t ha⁻¹ (TG) and 8.91 t ha⁻¹ (DG). The DM yield increase from (DG) was mainly explained by successful growth of directly sown red clover in the first three years after direct sowing. Average DM yields from 1991-2006 were 8.11 t ha⁻¹ (DG) and 8.45 t ha⁻¹ (TG), which in both cases represent significant increases (P < 0.01), when compared with (PG) 6.93 t ha⁻¹. Positive effect of reseded grassland on DM yield and similar results were also reported by (Søgaard *et al.* 2004). Also mineral fertilizer had a positive effect on DM yield. Average DM yields from 1991-2006 increased non-significantly from 6.25 t ha⁻¹ in the treatment without fertilizer (N₀ P₀ K₀) to 6.72 t ha⁻¹ (N₉₀ P₃₀ K₆₀). DM yield increased significantly (P < 0.01) with N fertilizer to 8.61 t ha⁻¹ with (N₉₀ P₃₀ K₆₀) and a further significant increase to 9.75 t ha⁻¹ with (N₁₈₀ P₃₀ K₆₀).

Table 1 Dry matter yield (DM t ha⁻¹) 1991-2006.

Treatment	DM t ha ⁻¹																
	Years 1991-2006																
	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	avg
PG	3.76	5.42	5.13	5.78	10.51	10.39	7.43	5.36	8.47	7.16	7.49	9.35	6.25	7.23	5.39	5.68	6.93
TG	4.57	10.18	7.51	8.68	12.40	11.11	8.47	6.72	10.89	9.47	9.20	9.53	6.97	7.36	6.23	5.98	8.45
DG	3.24	8.91	6.85	7.92	12.19	10.84	9.95	7.40	10.29	6.37	7.97	9.83	7.64	8.54	6.31	5.53	8.11
LSD _{0.05}	0.47	1.21	0.90	0.86	1.94	0.90	0.70	0.77	0.87	1.11	0.93	0.65	0.71	0.81	0.57	0.46	0.37
LSD _{0.01}	0.61	1.58	1.17	1.12	1.35	1.17	0.91	1.00	1.13	1.44	1.21	0.84	0.93	1.06	0.74	0.60	0.49

PG : permanent grassland , TG : temporary grassland , DG : repeatedly directly sown grassland

Conclusions Repeated direct sowing of legume-grass mixture into the permanent grassland performed every 3-5 years significantly increased forage yield in comparison with permanent grassland. Increasing rate of nitrogen fertilizer increased forage yield. Direct sowing is an alternative technology for the production of quality forage for cattle especially by the introduction of legumes into grasslands.

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Reference

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