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The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

Proceedings Editor: D. A. McGilloway

Publisher: Wageningen Academic Publishers, The Netherlands

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Field beans and spring wheat as whole crop silage: yield, chemical composition and fermentation characteristics

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Keywords: field bean, fermentation, feed value

Introduction There has been an increasing interest in field beans (*Vicia faba L.*) in recent years because of its N-fixating ability. The objective of this study was to compare the yield, chemical composition and fermentation characteristics of field bean/spring wheat as whole-crop silage ensiled with and without an additive.

The crop was drilled on 27 May 2003 at a seed rate of 205 kg/ha field beans and 68 kg/ha spring wheat. The crop was harvested at four different growth stages (Zadoks *et al.*, 1974); end of blooming, (stage 69), when 50% of the pods had reached full length, (stage 75), pods fully formed, (stage 79) and when 10% of the pods are filled (stage 81). Yield and botanical composition were evaluated. Samples of the forage were analysed for dry matter (DM) and chemical composition at harvest. Forage, at stages 75, 79 and 81 was wilted overnight then chopped (20 mm) and ensiled in 10 kg silos. Half the forage was ensiled untreated (control). The other half was treated with PROENS (60-66% formic acid and 23-29% propionic acid, Perstorp Speciality Chemicals, Sweden) applied at a rate of 6 l/t fresh matter. The silos were incubated for a period of 90 d and then analysed for DM, chemical composition and fermentation characteristics.

Results and conclusions The yield and some chemical characteristics of the fresh crop are presented in Table 1. Chemical composition after ensiling is presented in Table 2. Delaying the harvest gave higher DM and CP yields and also higher starch content while the concentration of NDF was significantly decreased. The use of an acid additive gave a restricted fermentation resulting in a significantly decreased content of volatile fatty acids (VFA), lactic acid and ammonium-N. Also the proportion of soluble protein (SP) was decreased.

Table 1 Production and chemical composition of whole crop field beans/spring wheat cut at different stages of development. Four plots at each stage

	Stage 69	Stage 75	Stage 79	Stage 81	s.e.d	Significance level
Time of harvest	31 July	12 August	21 August	5 September		
CP (g/kg DM)	154	156	152	154	10	NS
Yield (kg DM/ha)	3800	4900	5000	5940	221	***
Field beans (% of total DM)	66	NC	75	75	2	**
WSC (g/kg DM)	NC	100	87	102	15	NS
Buffering capacity (meq/kg)	NC	203	195	179	2	***

* = $P < 0.05$; ** = $P < 0.01$; *** = $P < 0.001$. NS = the difference was not significant. NC = the values were not calculated

Table 2 Chemical composition of whole crop field beans/spring wheat after ensiling. Four replicates of each treatment

	Stage 75		Stage 79		Stage 81		Significance	Significance level	
	Control	Proens	Control	Proens	Control	Proens		Stage	Additive
DM (g/kg)	201	223	282	289	271	277	6	**	NS
NDF (g/kg DM)	490	522	466	501	451	442	18	**	NS
SP (% of CP)	49	42	49	46	49	47	2	NS	*
Starch (g/kg DM)	104	98	149	112	164	169	12	**	NS
VFA (1) (g/kg DM)	19.2	4.0	10.2	3.3	11.5	3.2	2.4	NS	***
Lactic acid (g/kg DM)	83.6	4.1	50.3	3.6	50.7	7.5	3.6	NS	***
Amm.-N (g/kg N)	56	40	55	40	66	44	7	NS	***

(1) Butyric acid was not detected. * = $P < 0.05$; ** = $P < 0.01$; *** = $P < 0.001$. NS = the difference was not significant. There were no significant interactions

References

Zadoks, J.C., T.T. Chang & C.F. Konzak (1974). A decimal code for the growth stages of cereals. *Weed Research*, 14:6, 415-421.