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Effects of the stage of growth and inoculation on proteolysis in field pea silage

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Introduction Ensiling legumes is a good way of providing home-grown protein in dairy farms but severe protein degradation can occur when conserving legumes. Peas (*Pisum sativum* L.) are legumes with a high crude protein and starch content, that provide a high forage yield in a short growing period. Very little information is available on the protein value of field pea silage. The aim of the study was to investigate the effect of stage of maturity and inoculant application on proteolysis in field pea silage in the Po Valley, NW Italy.

Material and methods Stands of semi-leafless field peas were sown on 21 March 2001. The herbage was harvested at 4 progressive morphological stages (end of flowering, I; beginning of pod filling, II; advanced pod filling, III; beginning of ripening, IV) between 1 and 21 June. The herbage was chopped and ensiled in 2-l glass silos with (I) and without (C) an inoculant (*Lactobacillus plantarum* strain for legume crops, CSL, Italy). The silages were analysed after 60 d for the nitrogen fractions and the amino acid content. Free amino acids were determined according to Winters *et al.* (2002) and total amino acids as reported in Cavallarin *et al.* (2005).

Results The stage of growth significantly affected all the nitrogen fraction concentrations. Inoculation treatment lowered the ammonia and total amino acid concentrations in all the silages, except in the first stage. Extensive proteolysis occurred in the I, II and III stages, as shown by the NPN and free amino acid values, while it was significantly reduced in the IV stage. The amino acid composition of silages (d 60) made at the beginning of ripening (IV) was close to that of fresh herbage (d 0), with minimal losses of nutritionally essential amino acids for ruminants. Major changes occurred between 0 and 60 d in silages made beginning of pod filling (II). Differences were also evident, to a lesser extent, in the silages from the I and III stages (data not shown).

Table 1 Nitrogen fractions of control (C) and inoculated (I) pea silages at four stages of growth

S ^A		DM ^B	TN	NH ₃ -N	NPN	FAA	TAA
I	C	143	39	137	782	28.7	29.8
	I	148	39	134	880	29.4	30.1
II	C	163	35	116	728	29.2	28.9
	I	158	36	52	708	23.1	22.3
III	C	188	32	131	708	25.4	32.3
	I	198	32	68	673	24.1	28.6
IV	C	212	33	132	517	17.7	32.2
	I	209	32	105	503	19.0	31.8
	S	** C	***	***	***	***	***
	I	NS	NS	***	NS	NS	*
	SxI	NS	NS	*	NS	**	**

^A S = stage of growth, C = Control, I = inoculation;

^B DM = dry matter (g/kg);

TN = total nitrogen (g/kg DM); NH₃-N and NPN (g/kg TN);

FAA and TAA = free and total amino acids (mol/kg TN);

^C NS = $P > 0.05$; * = $P < 0.05$; ** = $P < 0.01$; *** = $P < 0.001$

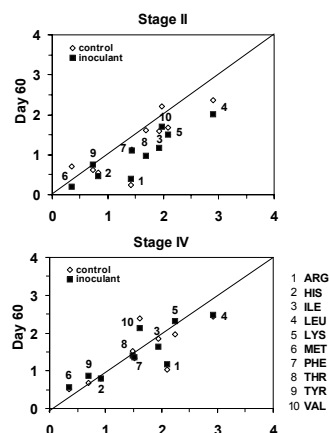


Figure 1 Concentration of essential amino acids (mol/kg TN) in fresh herbage (day 0) plotted against values for 60 d silages

Conclusions In silages at the beginning of ripening proteolysis was reduced in comparison to the earlier stages and the concentration of nutritionally essential amino acids for ruminants was close to that of herbage at cutting.

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