University of Kentucky
UKnowledge

International Grassland Congress Proceedings | XX International Grassland Congress

Effects of Stage of Growth and Inoculation on Fermentation Quality of Field Pea Silage

G. Borreani
Università degli Studi di Torino, Italy

L. Cavallarin
Istituto di Scienze delle Produzioni Alimentari, Italy

S. Antoniazzi
Istituto di Scienze delle Produzioni Alimentari, Italy

E. Tobacco
Università degli Studi di Torino, Italy

Follow this and additional works at: https://uknowledge.uky.edu/igc

 Part of the Agricultural Science Commons, Agronomy and Crop Sciences Commons, Plant Biology Commons, Plant Pathology Commons, Soil Science Commons, and the Weed Science Commons

This document is available at https://uknowledge.uky.edu/igc/20/satellitesymposium2/4

The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. 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

© Wageningen Academic Publishers, The Netherlands, 2005

The copyright holder has granted the permission for posting the proceedings here.

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Effects of stage of growth and inoculation on fermentation quality of field pea silage

G. Borreani[1], L. Cavallarin[2], S. Antoniazzi[2] and E. Tabacco[1]
[1]*Dip. Agronomia, Selvicoltura e Gestione del Territorio, Università degli Studi di Torino, Via Leonardo da Vinci, 44, 10095 Grugliasco, Italy, Email: giorgio.borreani@unito.it,* [2]*Istituto di Scienze delle Produzioni Alimentari, CNR, Via L.da Vinci44, 10095 Grugliasco, Italy*

Keywords: legume, field pea, lactic acid bacteria, stage of development

Introduction Field peas (*Pisum sativum* L.) are a short-term catch crop with a high crude protein content, which provides a high forage yield in a short growing period. Since field peas are a succulent crop and are difficult to field cure, it is preferable to directly ensile them to prevent weather damage and excessive grain losses. The onset of lodging is delayed in field pea varieties, since the crop is supported by the tendrils in a more erect manner, and this allows easy harvesting without soil contamination even at advanced stages of maturity (Koivisto *et al*., 2003). To our knowledge, no information is available on the ensiling of peas in Southern Europe. The aim of the study was to investigate the effect of the stage of maturity and inoculant application on the quality of silage produced from directly-cut field peas in the Po Valley, NW Italy.

Material and methods Stands of semi-leafless cv. Baccara field pea were sown on 21 March 2001. Herbage was harvested 4 times at progressive morphological stages (end of flowering, I; beginning of pod filling, II; advanced pod filling, III; beginning of ripening, IV) over the period 1-21 June. The herbage was chopped and directly ensiled in 2-litre laboratory glass silos with an inoculant (I) (*Lactobacillus plantarum)* and without an inoculant (C). Silages were analysed for fermentation quality after 60 days of conservation.

Results High levels of ethanol and volatile fatty acids, especially lactic and acetic acid, were observed in all the silages. Despite the low pH values, all the silages showed detectable levels of butyric acid. The silages prepared from forage harvested at the IV stage had a significantly lower lactic acid content than silages made from forage at the three previous stages. Ethanol content significantly increased with increasing forage maturity. The inoculation treatment affected the pH and lowered the ethanol and ammonia concentrations in all the silages, with the exception of the first stage. The occurrence of butyric acid in the silages is likely to have been the result of the ensilability characteristics of the herbage. Legumes have a two-fold disadvantage in being both highly buffered and having a low WSC content, and as a consequence clostridia tend to dominate the fermentation of these crops. The high buffering capacity of the herbage (data not shown) especially in the first stages, probably caused a slow drop in pH and the fermentation proceeded on different pathways. At the same time the high levels of WSC at ensiling (130, 189, 198, 111 g/kg DM for stage I, II, III, IV, respectively) led to high levels of lactic acid in the silages.

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

Stage of growth	I		II		III		IV				
Inoculation	C	I	C	I	C	I	C	I	S [A]	I	S x I
DM (g/kg)	143	148	163	158	188	198	212	209			
pH	4.2	4.4	4.2	3.9	4.2	3.9	4.8	4.1	* [B]	*	NS
Lactic acid (g/kg DM)	160	120	140	185	138	162	63	99	***	NS	*
Acetic acid (g/kg DM)	28	49	20	22	17	19	14	21	***	**	*
Butyric acid (g/kg DM)	5.1	14.2	4.0	4.7	8.7	2.7	26.9	2.3	NS	NS	NS
Propionic acid (g/kg DM)	5.7	4.6	0.0	1.5	2.0	2.0	3.2	2.2	NS	NS	NS
Ethanol (g/kg DM)	5.0	2.0	8.5	6.2	17	15	26	13	***	***	**
WSC (g/kg DM)	13	8.0	42	15	26	25	4.0	5.0	***	***	***
Total N (g/kg DM)	39	39	35	36	32	32	33	32	***	NS	NS
NH3-N (g/kg TN)	137	134	116	52	131	68	132	105	***	***	*

[A] S = stage of growth, I= inoculation
[B] NS = $P>0.05$; * = $P<0.05$; ** = $P<0.01$; *** = $P<0.001$.

Conclusions The data show that field peas can be successfully directly ensiled at advanced stages of maturity with the aid of LAB inoculum.

References

Koivisto, J., L. Benjamin, G. Lane & W. Davies (2003). Forage potential of semi-leafless grain peas. *Grass and Forage Science*, 58, 220-223.