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Influence of the method of conservation of lucerne on ruminal degradability. II. Nitrogen

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SUMMARY – An experiment was carried out to evaluate the rumen degradability of the nitrogen of lucerne preserved as hay or dehydrated. Samples from three alternate cuts (spring, summer and autumn) at two phenological stages were taken from a lucerne plot located at Bujaraloz (Zaragoza) in 1998. The technique of nylon bags was used to determine the kinetics of nitrogen degradation. The fractions soluble (A), insoluble potentially degradable (B) and potentially degradable (A + B), the fractional degradation rate of the slowly degradable fraction (C) and the effective degradability (ED) were estimated according to the equation obtained by Orskov and McDonald, (1979). Significant differences were obtained among cuts and conservation methods for A, B, A + B and ED. The interactions conservation method cut and conservation method phenological stage were significant for A, A + B and ED. In general, forage preserved as dehydrated showed lower values of ED than hay forage.

Key words: Lucerne hay, dehydrated lucerne, rumen degradability, cut, phenological stage.

RESUME – "L'influence de la méthode de conservation de la luzerne sur la dégradation de l'azote dans le rumen". Cette expérience a été développée afin d'évaluer la dégradation dans le rumen de l'azote de la luzerne conservée sous forme de foin ou déshydratée. On a collecté des échantillons de trois coupes (printemps, été et automne) à deux stades phénologiques dans une parcelle de luzerne cultivée à Bujaraloz (Zaragoza) en 1998. La technique des sachets de nylon a été utilisée pour déterminer la cinétique de la dégradation de l'azote. Les fractions soluble (A), potentiellement dégradables insolubles (B) et potentiellement dégradables (A + B), le taux de dégradation de la fraction lentement dégradables (C) ainsi que la dégradabilité effective (DE) ont été évalués selon l'équation obtenue par Orskov et McDonald (1979). On a observé des différences significatives entre les coupes et les méthodes de conservation pour A, B, A + B et DE. Les interactions méthode de conservation coupe et méthode de conservation stade phénologique ont été significatives pour A, A + B et DE. En général, le fourrage déshydraté a donné des valeurs de DE plus basses que le foin.

Mots-clés : Foin, déshydratation, dégradabilité de la matière azotée, coupe, stade phénologique.

Introduction

Alfalfa is an important traditional crop in the Ebro Valley holding around 120,000 ha (MAPA, 1999). Hay has been the conservation method traditionally used though nowadays lucerne dehydration has become the most important forage conservation. The quick loss of water in the dehydration process limits the loss of nutrients in the field by respiration. However, according to Goering (1976) the heat action can reduce the nutritive value of forage due to the increase of indigestible compounds which are formed by so called reactions of Maillard. In these reactions, the protein value is one of the most affected.

The aim of this work is to compare the influence of two methods of lucerne conservation in three cuts (spring, summer and autumn) and two phenological states (10% and 50% bloom) on rumen degradability of nitrogen.

Materials and methods

The experimental process has been exposed by Andueza *et al.* (previous chapter in this volume). In order to estimate the nitrogen degradability, analysis of nitrogen (AOAC, 1990) was made on samples of lucerne before their ruminal incubation as well as on the residue obtained after the different periods of ruminal incubation.

Results and discussion

The results obtained in the analysis of variance made for the different parameters of degradation kinetics are shown in Table 1.

Table 1. Significance levels of the different factors obtained in the analysis of variance made for the determinations of fractions soluble (A), insoluble potentially degradable (B) and potentially degradable (A + B), fractional degradation rate of B fraction (C) and effective degradability of nitrogen (ED)[†]

	A (%)	B (%)	A + B (%)	C (%/h)	ED (%)
Con	**	*	*	NS	***
Bl	NS	NS	NS	NS	NS
Cut	***	***	***	NS	***
ps (cut)	NS	NS	NS	NS	NS
Con cut	***	NS	*	NS	*
Con ps (cut)	***	NS	***	NS	***

[†]Abbreviations: Con = conservation method, Bl = block, ps = phenological state, *P < 0.05, **P < 0.01, ***P < 0.001, NS = P > 0.05.

The interactions method of conservation cut and method of conservation phenological state were significant (P < 0.05) for A, A + B and ED of N. The different behaviour of method of conservation in the different cuts for A + B and ED of N is shown in Fig. 1. In general, the alfalfa hay showed higher values in A + B fraction and ED than dehydrated forage. This can be due to the effect of heat. The high temperatures of dehydrated forage could have influenced the change of soluble N into fraction B, and probably, part of this fraction could become undegradable. Mustafa *et al.* (1998) also found similar results working with field peas.

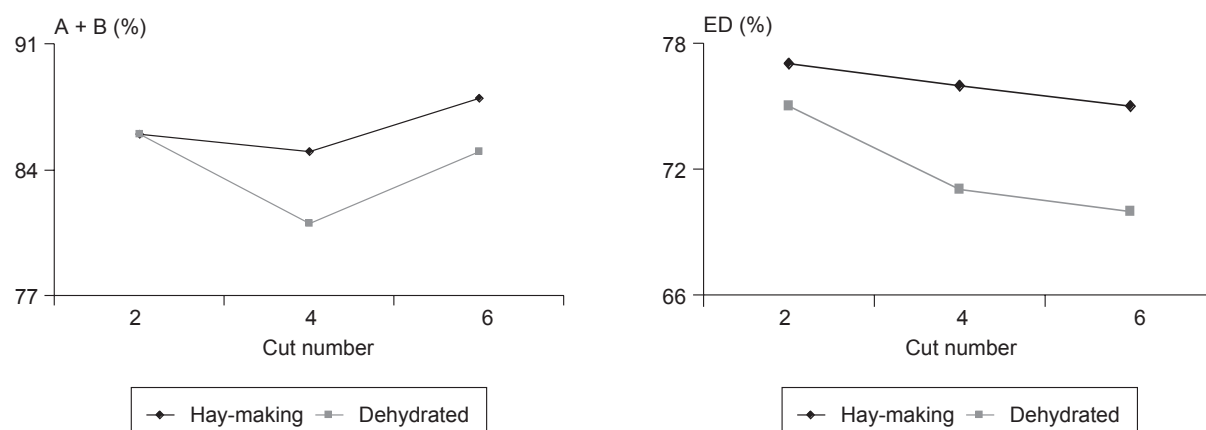


Fig. 1. Evolution of potentially degradable fraction (A + B) and effective degradability (ED) of nitrogen of lucerne preserved as hay or dehydrated in different cuts.

In relation to the cut, Fig. 1 shows the evolution of A + B fraction and ED in the different cuts. Alvir *et al.* (1999) obtained similar results with lucerne hays. According to these authors, differences in the ratio leaf/stem and the chemical composition could explain these results.

Figures 2 and 3 show the values of A + B and ED of hay and dehydrated lucerne obtained in the two phenological states of 2nd and 4th cuts. The lower values obtained for A + B and ED in the 10% bloom of 4th cut are not easily explained. The higher moisture contents of forage in this last case when the dehydration process was applied if compared with the average of the others (41 vs. 30%) could influence

these results. Fadel (1992) obtained higher values of N in the acid detergent fraction, when the time of heating the lucerne forage was increased.

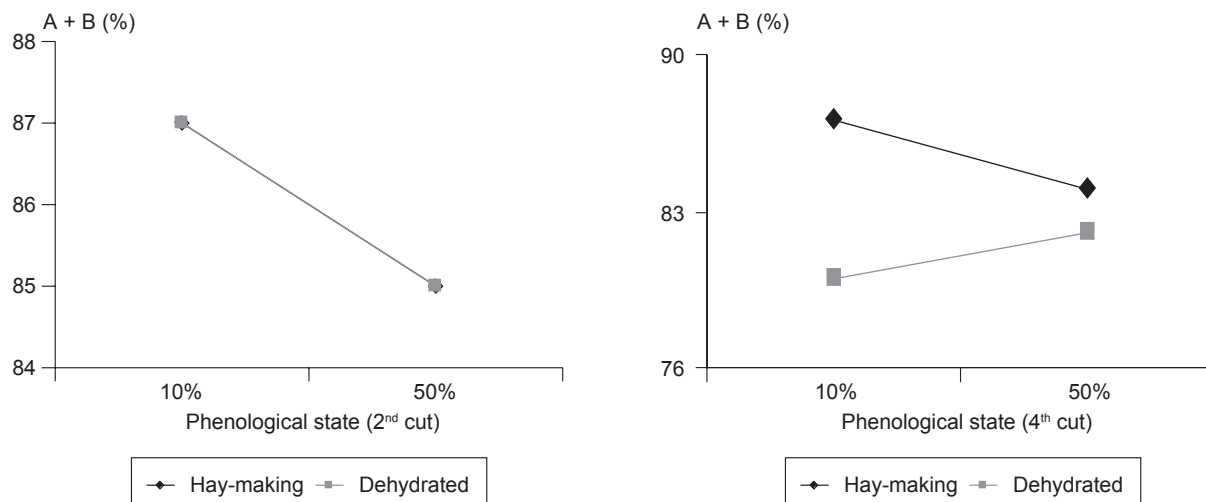


Fig. 2. Evolution of potentially degradable fraction (A + B) of lucerne preserved as hay or dehydrated in two phenological states (10 and 50% bloom) in 2nd and 4th cuts.

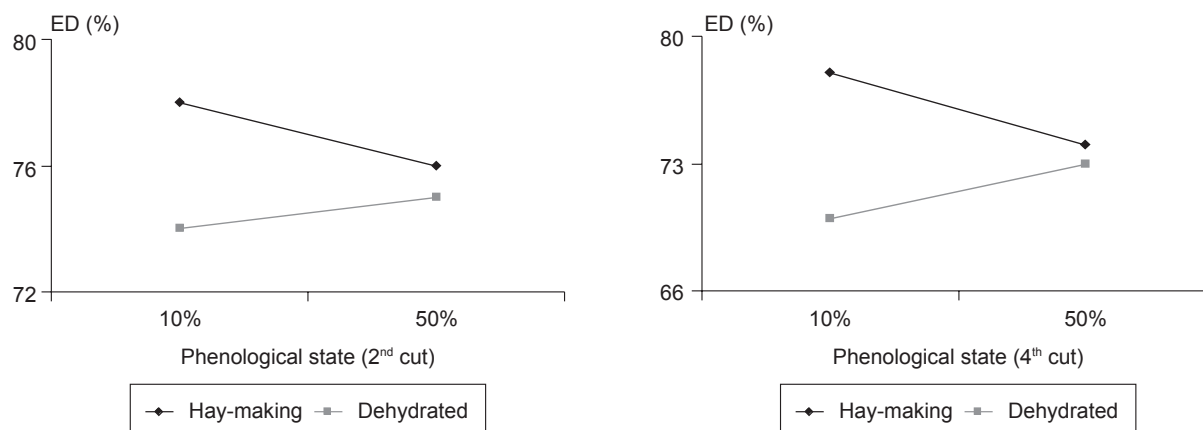


Fig. 3. Evolution of effective degradability (ED) of lucerne preserved as hay or dehydrated in two phenological states (10 and 50% bloom) in 2nd and 4th cuts.

Conclusions

Dehydrated lucerne showed lower values of effective degradability of nitrogen than lucerne hay. The effective degradability of summer cut was lower than that of spring and autumn cuts.

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