

DRYING PROPERTIES OF LUCERNE

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Summary

Drying properties of lucerne relative to those of other forage grass and clover species are investigated. The parameters were water content at time of harvesting, water content at the end of the drying period, and drying rate.

Two series of experiments were conducted:

- a) Field plots of the respective species were cut a different stages of growth in the primary growth; samples were taken immediately after cutting, transferred to laboratory and chopped to pieces of about 10 cm length. 350 g chopped material was placed in aluminum trough with wire-mesh bottom. Two plant materials in eight replications were dried simultaneously in a Memmert drying compartment at 45/50° C for 10 hours.
- b) Field plots of the respective species were cut and subsequently the plant material was prewilted in situ for 32 hours. The prewilted material was transferred to a barn drying equipment consisting of bins with perforated bottom. Each bin was filled with 100 kg prewilted plant material and dried at 30° C by airflow until a water content of about 15% was reached.

The results show that lucerne is better suited for drying than *Trifolium alexandrinum*, *pratense*, and *resupinatum* and that its drying behaviour is similar to the average of forage grasses.

Introduction

Lucerne (*Medicago sativa* L.) is an important forage in feeding systems for farm animals. A considerable proportion of the harvested material is dried by different technical procedures before using it as a feed. Yet little is known about the drying properties of lucerne as compared with other clovers and grasses (Hübner and Wagner 1968, 1975). Jones (1979), Jones and Prickett (1981) and Owen and Wilman (1983) studied the drying characteristics of grasses. Factors that may determine the suitability for drying include the content of water in the plant material at the time of harvest. Both the amount of water remaining in the plant material after a certain drying time, and the necessary drying time in order to reach the desired dry matter percentage reflect the plant's ability to loose water under drying conditions. The objective of our research was to compare such drying properties of lucerne with those of a number of other clovers and grasses.

Materials and Methods

Experiment 1 = compartment drying.

Lucerne, red clover, Persian clover, berseem clover, and withe clover, and 12 grass varieties were cut during their primary growth at four consecutive stages of growth i.e. leaf, prebud/beginning of heading, bud/end of heading, flowering. Representative samples of 350 g were taken at the time of harvesting and, after chopping to pieces of 10 cm length, placed on wire mesh frames into Memmert drying compartments. There were eight replications. During the drying time of 10 hours at 45° C the loss of water was determined by weighing the samples at hourly instalments. The reduction of the relative humidity of the materials during the drying time was calculated from the regression equation $\ln y = a - bt$.

Experiment 2 = barn drying.

Plant material of lucerne, red clover, Persian clover, and berseem clover remained, after cutting, on the ground for approximately 30 hours. The water content of the plant material was determined at the beginning and the end of this prewilting period. The prewilted material was then transferred to a barn drying consisting of bins with perforated bottom. Each bin was filled with 100 kg prewilted material and subjected to aeration at 30° C until a water content of approximately 15% was reached. The water content at the beginning and the end of the barn drying period, and the necessary number of hours of aeration were determined.

Results

Compartment drying

The initial water content of the various plant species is shown in figure 1. Among the leguminous species, lucerne exhibits the lowest water content at all stages of growth, but surpassed, with one exception, the mean water content of 12 grasses. The average water content of lucerne was 82,5% as compared with 89,0% for clovers and 81,6% for grasses, respectively. The water content generally decreases with advancing maturity.

The final water content is shown in figure 2. It is, again, lowest in lucerne at all stages of growth. A notable exception is white clover. The average water content at the end of the drying period is 35,5% for lucerne, 45,3% for clovers, and 41,9% for grasses, respectively.

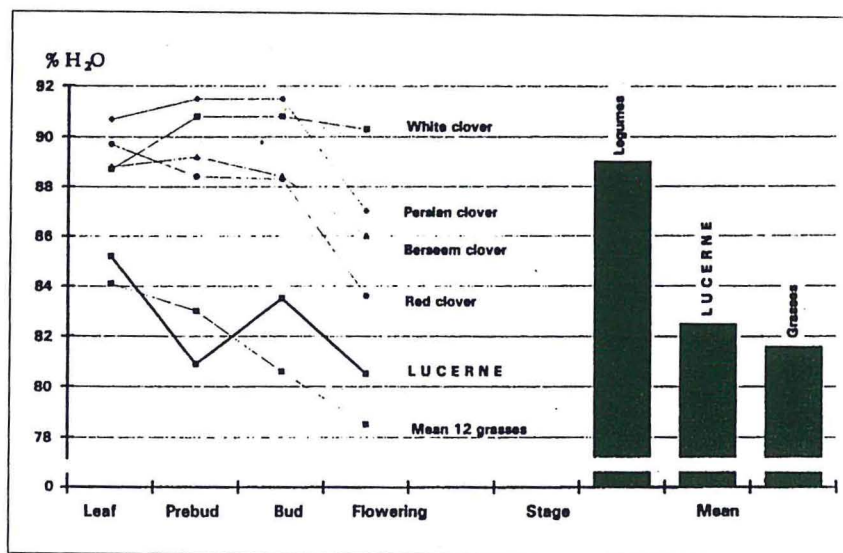


Figure 1 - Initial water content at time of harvest.

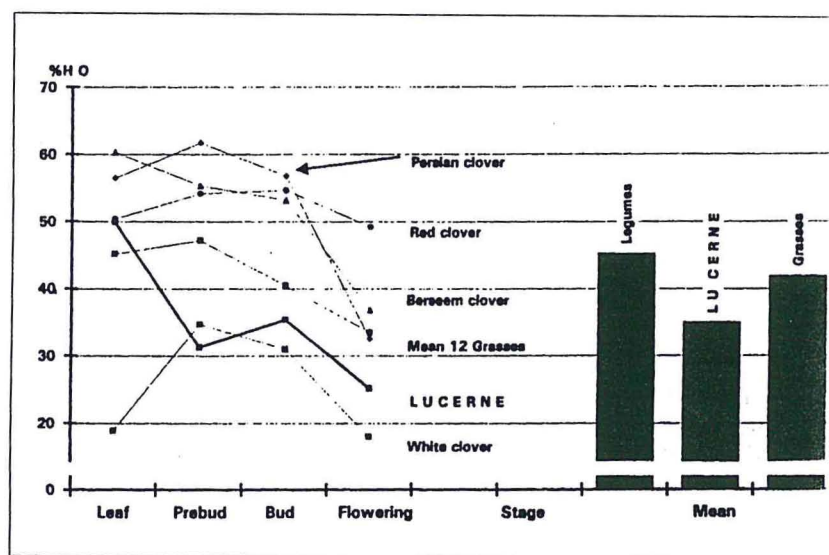


Figure 2 - Water content after 10 hours drying at 45° C in the laboratory.

Figure 3 shows the rate of water loss during the drying period as expressed by the regression coefficient $-b$. The comparison of figures 2 and 3 reflects the inverse relationship of the two characteristics. In most cases the drying rate is fastest in lucerne, with the exception of white clover. It is concluded that the relatively low water content of lucerne after drying is the result of both its lower initial water content and faster drying rate.

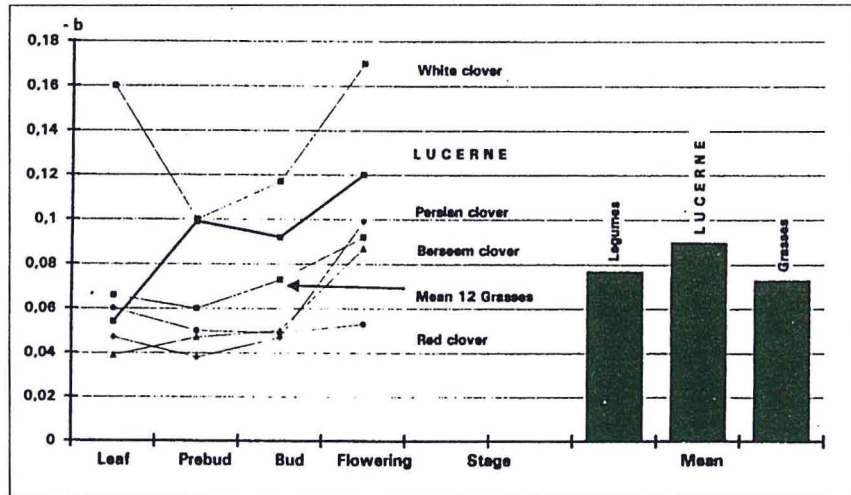


Figure 3 - Rate of water loss (= reg. coeff. $-b$) during 10 hours drying at 45° C in the laboratory.

Barn drying

The initial water content and that after ± 30 hours prewilting the cut material on the ground is presented in figure 4. It is clear that lucerne compares favourably with the investigated clover species regardless whether harvested at the same date or at different dates. The difference between lucerne and clovers is even more striking at the end of the prewilting period. For this reason the plant material of lucerne, after a similar prewilting duration, is already drier than that of clover when the barn drying period starts. Consequently the necessary barn drying time is significantly lowest in lucerne (shown in figure 5). Clovers require from approximately 3 to 5 times longer drying time than lucerne in order to reach the same degree of dryness.

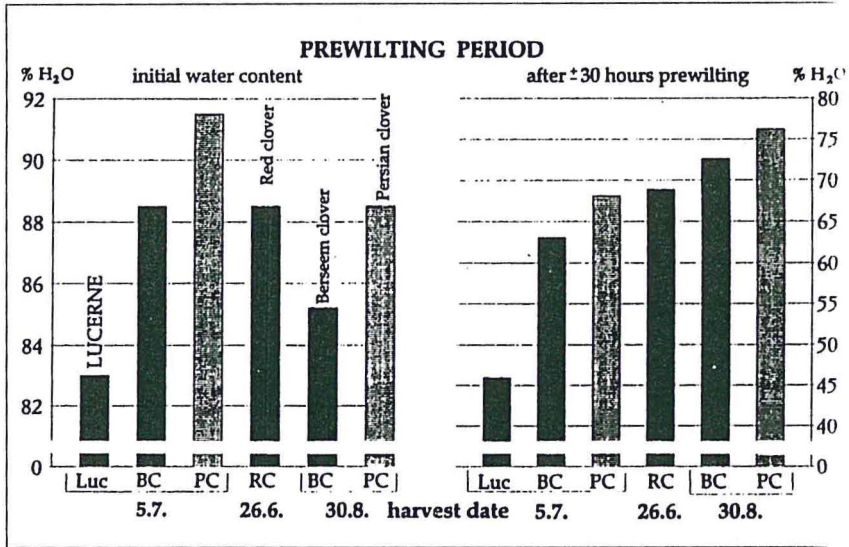


Figure 4 - Water content at beginning and end of ± 30 hours prewilting in field.

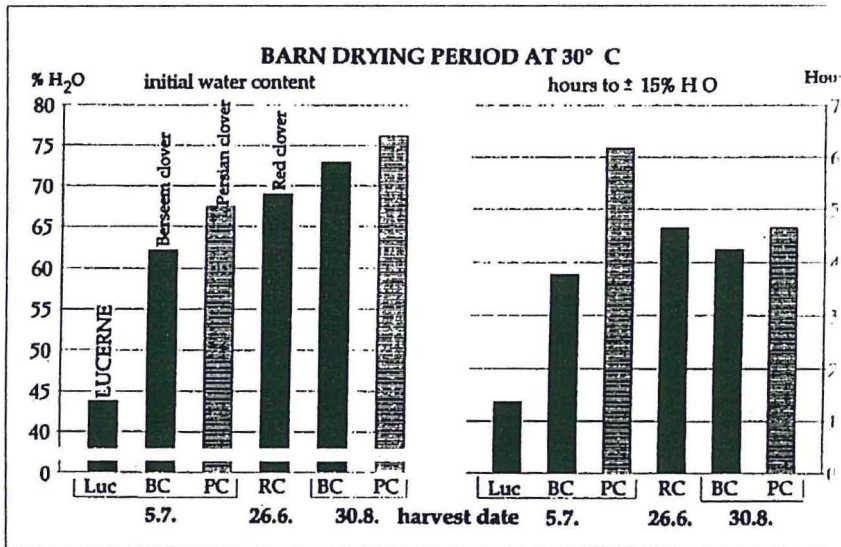


Figure 5 - Initial water content and time to reach ± 15% water content in the barn drying period.