

Silage for rare breeds

By Dr Richard Small.



Left: A disadvantage of feeding silage in ring feeders is poaching.

leaves of the vegetation ferment the plant sugars to produce lactic acid. Thus as the fermentation proceeds the acidity of the silage increases; it is important that the fermentation proceeds quickly to prevent other organisms rotting the forage.

Once the acidity reaches around pH 4 all microbial action effectively ends and the silage will be well preserved and stable, provided that air doesn't gain access (eg, through holes created by rodents or accidental damage). A good fermentation will use only 3-5% of the grass dry matter ensiled, but a poor one could waste 10-15% of the dry matter and will also be less palatable to stock. Sometimes additives such as organic acids or cultures of the lactic acid bacteria are mixed with the newly cut forage to accelerate the fermentation.

Grass for silage making is cut earlier than for hay – the aim is to maximise the amount of grass leaf but cut before the flower stems appear. Consequently there can be several cuts a year from a productive ley, and bale silage is a convenient way of utilising surplus grass at any time of the year. However, the increase in silage making is one cause of the decline in biodiversity on farms, as frequent cuts eliminate some plants and destroy the eggs or young of ground nesting birds.

Another potential environmental impact is the liquid that drains from silage clamps, known as silage liquor. Not only does this represent a loss of valuable nutrients but the liquor is also a very potent pollutant, especially in watercourses where its high 'biochemical oxygen demand' (BOD: the amount of oxygen required by micro-organisms to break down organic materials) causes a dramatic reduction in dissolved oxygen concentration that can kill fish and invertebrates. The BOD of silage liquor is 55,000mg per litre, compared to 350mg per litre for untreated human sewage!

For bale silage, once the bale is open spoilage starts so it is desirable to use the bale as quickly as possible. For clamp or

Good quality hay can be fed to all grazing animals but two other stored forages, silage and haylage, are mostly fed to cattle and horses respectively although may be suitable for other species.

In the UK silage is still considered by some as a relatively new way to store forages as it has only become widespread since the 1960s, but it was more common earlier than that on the continent and has been known since classical Greek times. Haylage is a more recent innovation that has become easier to make with the advent of plastic wrap and machines to apply it.

Silage

Silage can be made from grasses, legumes such as clover or lucerne, forage crops such as maize, or cereals specifically grown for 'whole crop silage'.

Whatever the plant material it is cut and finely chopped (often in one operation using a forage harvester); if the vegetation is particularly lush it may be allowed to wilt for up to 24 hours before chopping to achieve 25-30% dry matter content.

After collection the chopped plant material is stored in airtight conditions, either by wrapping in plastic (bale silage) or in a clamp or pit. The aim is to pack the vegetation as

densely as possible to exclude as much air as possible; in a silage pit this may be achieved by repeatedly driving a tractor over the piles of cut forage. Clamp or pit silage is covered by a sheet of heavy duty plastic (often held in place by numerous old car tyres!)

In the absence of oxygen, micro-organisms naturally present on the



Baa baa...

...black sheep, white sheep, big sheep, small sheep: not to mention spotty pigs, delightful pygmy goats, cattle and poultry. Over 500 rare breed animals will take part in this lovely agricultural show, plus demonstrations, crafts and trade stands with a countryside theme.

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“The golden rule of silage making is – look to the consolidation of the sides, and the centre will look after itself.”

Parry et al. Journal of the RASE, 1886.



Silage can be made from a variety of materials including legumes such as clover.

pit silage the exposed face is also subject to spoilage, so should be kept as small as possible. Perhaps for this reason silage is mainly fed to cattle, rather than to small flocks of sheep, although it is perfectly acceptable to all ruminants; equines may find the acidity unpalatable. Other disadvantages for keepers of small flocks or herds are the investment in machinery required (eg, to wrap and handle big bales) and the skill needed to make good quality silage.

Haylage

As the name suggests haylage is somewhere between hay and silage in a number of ways. For example, the grass for haylage is cut later than for silage but often somewhat earlier than hay. The aim is to cut the grass and then partially dry it by tedding (as for hay) but to collect it before it reaches the dryness of hay.

Most often this is done by rolling the cut material up into round bales, which may be large (approximately 200kg) or ‘mini’ (20-35kg). The bales are then wrapped in plastic. Additives such as lactic acid bacteria may be added as the bales are rolled.

The relatively low moisture content of haylage limits the fermentation and the final product has a pH around 5.5 and a dry matter content of approximately 60%. In this condition it will remain stable, once again provided air does not gain ingress. Haylage bales suffer the same disadvantage as silage bales – once opened they must be used quickly as spoilage leads to lower palatability and reduced feed value. As with hay haylage should be dust and mould free with a pleasant smell – indeed one of

the advantages of haylage should be the absence of dust that can occur in even well made hay, so lessening the risk in equines of ‘chronic obstructive respiratory disease’ (COPD, an allergy also known as broken wind, dust cough or dust allergy).

In terms of making, haylage has the advantage of not needing as long a drying period as hay but is perhaps easier to make than silage, provided the requisite machinery is available. However, if buying haylage try to ensure that it really was meant to be haylage rather than failed hay. Merely wrapping hay that caught some weather and calling it haylage is the all too frequent pretence of the unscrupulous.

Digestibility and metabolisable energy

The quality of silage and other conserved forages may be expressed in terms of its digestibility, often referred to as the D-value. The D-value (as a percentage) can be calculated from:

$$100 \times (\text{feed organic matter} - \text{dung organic matter}) / \text{feed dry matter}.$$

Although this can be measured by recording the inputs and outputs for a live animal, it is now more often determined biochemically.

The D-value of grasses and other plants changes during development; in grasses the D-value starts to decline after emergence of the ear and continues as the plant flowers and sets seed. Thus harvesting for forage conservation requires a compromise between low yields and high D-values or higher yields but lower D-values. A guide is to cut when ear emergence reaches 50% (ie, half the plants have emerged ears), but this will vary with location and between years.

As each species of grass matures at a different time (eg, cocksfoot may mature three weeks before timothy) species-rich pastures present an even greater challenge to choosing the optimum time to cut.

Although D-values are widely used as guide to the digestible energy of forage not all of that energy can be used by the animal – there will be losses of energy as methane from the rumen and in the urine. The proportion of the digestible energy that remains after deducting these losses is called metabolisable energy (ME) and is expressed in megajoules (MJ). ME is a better measure for determining the rations required by an animal to meet its needs than D-value; as a rough guide $ME = 0.16 \times D\text{-value}$. Typical ME values (MJ per kg dry matter) for silage vary from 8.5-11.5 and for hay 7.5-10.5 for poor quality to very good quality respectively. More information on D-values and ME can be found in Frame (1992).

Further reading

Frame, J. 1992. Improved Grassland Management. Farming Press, Ipswich.

Mea culpa

I am sorry for the error in my article on hay in the last issue of *The Ark*. I am grateful to all who have corrected my false impression of seed and meadow hay, especially Trevor and Mary Wilson who were first off the mark. I now know that seed hay is made from newly sown or temporary leys, and meadow hay from permanent pastures. My apologies for any confusion caused.

Richard Small