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Outstanding in our field

Cutting grass at the optimum growth stage is crucial for high quality silage.

Output from UK grass-based livestock production is valued at in excess of £8bn representing more than 60% of the total agricultural output of the UK.

Whilst grass is undoubtedly the cheapest source of feed on farm, ranging from £30 - £50/tonne DM silage is still the cheapest winter feeding option ranging from £60 - £120/t DM. With the increase in cereal based feeds due to uncertain global production and the increased use of such crops for biorenewable fuels now is the time more than ever to maximise the value of home-grown winter feed rations. Attention to detail during the silage making process will result in silage with better feed value produced at the same or cheaper cost. The old haymakers' saying 'a good hay is cheaper to make than a bad hay' is probably more true with silage than hay.

The silage making process can be split into three distinct areas - the time up to and including mowing, from immediately post mowing to covering the forage with plastic, be that in a clamp or bale and from then on to feed out. To make top quality silage attention to detail in all of these areas are equally important and failure to adhere to any will result in silage of poorer nutritive value. Within this factsheet we will focus attention on the optimum stage of growth for cutting.

Getting the cutting date right will affect both the chemical composition and the microbiological composition of the silage at feed-out.

Chemical Composition

The ideal date of cutting will vary from farm to farm depending on a number of factors, a key one being the grass varieties or other forage species used. Other factors such as height above sea level and latitude will also play a part and all these variables will alter from one year to the next year on the same farm depending on the season.

Grass

Four key parameters change with time and these are highlighted for grass in Figure 1. The optimum cutting date involves a trade off between reducing yield but obtaining a crop with a crude protein content of between 14 and 17% in grass but with sufficient sugar to enable a good fermentation (preferably as high as possible) and a good D-value. It is important when producing silage intended to be fed to productive animals, be they dairy cows, beef or sheep, to aim for 67 to 70 D-value which is equivalent to

Figure 1. Grass chemical quality

	Early May	+ 2 weeks	+ 4 weeks
DM Yield	3	6	8
CP	25	18	12
WSC	10	15	20
DOMD	75	68	60

Table 1. Milk production from grass silage

	Cutting Date	
	Ideal	**Late**
Dry Matter (g/kg)	24.3	24.8
pH	3.9	4.1
ME (MJ/kg DM)	12.6	10.4
Intake (kg DM)	13	6
Milk Yield (kg)	24	19

50% ear emergence. Research at IGER where the same grass was ensiled at two different D-values is shown in Table 1. The research aimed to show the importance of high D-value grass silage animal performance. Grass from the same field was cut either at the ideal time with an ME of 12.6 or approximately 2 weeks when the ME had dropped 2 units to 10.4. Comparing the optimal ME good practice silage with that of the mature 10.4 ME grass silage gave a 5 litre/day difference in milk yield. So maximising grass quality by cutting at the optimum maturity can result in a big difference in milk yield and thus profitability.

Other key factors are ensuring there is no residual fertilizer nitrogen in the grass prior to cutting, this will help to produce a better quality silage with low ammonia and acetic and butyric acids which will have a better intake potential. Finally if everything else has gone right then the icing on the cake, if possible, is to cut on a sunny day in the afternoon because this will lead to higher levels of sugar required to fuel a good fermentation and raise the level of residual sugar in the silage at feed-out.

Cutting grass at the optimum growth stage - crucial for high quality silage

Red Clover

Interest in alternative forage crops is growing as farmers reduce their reliance on bought in feeds and try to reduce their fertilizer use. Red clover is a high protein forage that fixes nitrogen and is usually grown as part of a mixed grass/clover sward for silage production. As such it requires one or two minor adaptations to normal practice for successful utilisation as a silage crop.

Whilst reduction in D-value does occur with red clover as with grass the reduction is less pronounced and so a bigger window of optimum growth stage is available to silage production. In the establishment year it is critical to allow the first cut to flower before harvesting. This enables root development and the growth of the root nodules with their nitrogen fixing bacteria. Thereafter harvest at 6 – 7 week intervals any time between bud development and early flowering.

Table 2 indicates red clover chemical composition prior to ensilage with the highlighted area indicating the key challenges/benefits. Red clover has a high buffering capacity which means that the crop naturally reduces the pH decline during silage making. Alongside this it is a low sugar crop and so there is little sugar to fuel the fermentation. However it has high levels of good quality true protein and has a high intake potential when fed to cattle and sheep. Good fermentation can be achieved when ryegrass/red clover swards are ensiled after 48 hour wilt with an additive.

Table 2. Red clover crop quality

DM	%FM	28
Starch	%DM	2.0
ADF	%DM	25.9
NDF	%DM	35.8
Buffering	meq/kg	549
Sugar	%DM	2.9
Protein	%DM	22.3

Table 3. Effect of baled red clover silage on feed intake and milk production

(Cows fed 8kg/d concentrates)	Silage DMI (kg/day)	Milk yield (kg/day)
Grass	11.1	24.9
Red Clover	13.5	28.1
Grass: Red Clover*	11.0	28.6

*1:1 ratio

Table 3 gives an indication of the benefits of including baled red clover silage in the ration for milk production, based on the research carried out by IGER. As can be seen from the table inclusion of a 1:1 mix of red clover and grass silage as the forage part of the ration can lead to an increase of 3.2 kg of milk/d over a grass silage only ration.

Microbiological Composition

Many million microorganisms are present on forage in the field. There are good types and bad types. The good ones such as the lactic acid bacteria are generally out numbered by the bad ones by a factor of 1000:1 and under the poor conditions the ration gets even worse. One key group of bad ones are the fungi which are made up of yeasts and moulds. As forages for silage, be they grass, red clover or whole crop cereals, begin to become more mature they begin to die, during this period they become more prone to attack by fungi. These fungi remain in the crop and the silage. Whilst oxygen is present, (for example, in the cut sward, immediately after wrapping before the fermentation has begun to remove the oxygen, in bales with damaged film wrap) they will grow and cause mouldy patches in the silage.

The fungi will remain dormant when the oxygen has been used up but will burst into life once again when oxygen becomes available to them. This will result in increased mouldiness, silage heating up and going off, reduced intake and in the most serious cases diseases caused by the build up of mycotoxins which are toxic end products of fungal growth. Figure 2 shows a picture of whole crop cereals in the field, with and without the presence of fungi. In grasses and clovers this same thing happens but it is less clearly visible to the naked eye.

Figure 2. Fungal attack of whole crop

So in conclusion, be prepared and cut at the optimum D-value to benefit your stock and let the weather conditions be the only factor that affects when you cut your forage for silage.

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