Whole-crop cereal silage

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There is increasing interest in growing forage cereals in the pursuit of increasing the amount of home-grown forage. These can provide one or two grazings (wheat, barley, triticale) or more (forage oats), and then be closed for harvest as whole-crop cereal silage, grain or preserved as an ammoniated crop, often referred to as alkalage.

This article discusses what is currently available regarding when and how to make whole-crop cereal silage. Research is ongoing into various species and cultivars, optimum growth stage to ensile, animal performance from these, etc.

Whole-crop cereal silage can be cut at the **flag leaf/boot or vegetative** stage (See Figure 1) or **late milk-soft dough** (See Figure 2) stage of growth. Once a cereal has headed it flowers and then starts to form the grain. Internally, the grain goes through a clear liquid phase, followed by a milk, soft dough, hard dough and hard grain phases, the latter being harvested for flour production or feed grain. The grain in the soft dough stage will be pliant and is similar to squeezing a soft Brie cheese, usually returning to its original shape after a gentle squeeze between the fingernails. Each of the recommended growth stage has its own pros and cons.

Flag leaf/boot stage: At this growth stage the crop will be at its highest nutritive value but much lower yield than if cut at the soft dough stage. The standing crop at the flag leaf/boot stage will have dry matter (DM) of about 12 – 22% DM and will require wilting to about 33 – 40% dry matter before harvesting as bulk chopped silage, or about 38 – 50% DM as baled silage. If harvested under the above lower limits, a poorer fermentation will occur resulting in losses of DM and nutritive value, and silage of low palatability.

Figure 1: Forage cereal at flag leaf/boot stage

Cutting at this stage will mean harvesting early in the season for autumn or winter sown cereals when climatic conditions may not be very conducive to a fast wilt. Using a mower-conditioner with the swath boards set out wide will help increase the wilting rate. A tyned conditioner adjusted to produce an aggressive conditioning and adjusted to produce a

“fluffy” wide windrow is ideal. A roller conditioner set to squash and crimp the stems, also leaving a wide windrow, will increase the speed of wilting.

Tedding straight after mowing will also assist greatly but cereal crops are usually high yielding compared to ryegrass, even at this stage, and may stress tedder equipment if forward speed is too fast. There is also the risk of tedding and raking equipment picking up soil during their operations, a situation to avoid at all times.

Using a fermentation enhancing additive is recommended to greatly increase the chances of a good fermentation, critical in under the desirable dry matter comntents.

Soft dough stage: When cut at the soft dough stage, whole-crop silage will be lower in nutritive value but yield will be about 100 – 150% higher than at the vegetative stage. The standing crop will have dried to near its ideal DM content, 38% DM, but can be harvested in the 35 – 42% DM range as bulk silage or baled at 38 - 45% DM.

The length of period in each phase will vary depending on moisture availability, sunlight hours and temperature. Very broadly speaking, barley, being the quickest species to pass through its grain forming stages, can undergo the soft dough stage in 3 – 5 days drying at approximately 2% DM/day. The other cereals may do so over 7 – 10 days drying at only about 1% DM/day. Guidelines to assist farmers to recognise more accurately when to harvest forage cereals in the soft dough stage are currently being developed.

Figure 2: Grain being squeezed at a soft dough stage

Forage cereals should, ideally, be harvested using a precision chop harvester to produce a very short chop material which can be compacted to exclude air and to ensure the grain heads are intermingled with the rest of the plant. The harvester, preferably, should be fitted with a direct cutting front to minimise grain loss during harvest. Mowing, then raking and harvesting can result in substantial grain loss due to these operations, thereby substantially reducing its nutritive value.

If whole-crop is baled, a chopper baler is preferable to aid compaction. Netwrap for tying instead of string is preferable to minimise damage to the plastic wrap and to leave an even surface between the bale and plastic film. Recently on some balers, netwrap is being replaced by film which results in tighter bales so less air internally, easier to remove and often slightly higher in quality. The bales must have a minimum of four layers, preferably six, if stalky of plastic applied and should be stored on their base to maintain shape.

Mice and rats, being cereal grain lovers, are a major problem of baled whole-crop when cut at the soft dough stage. Preventative measures need to be taken before they arrive to chew holes (See Figure 3) in the plastic searching for the grain heads, resulting in serious losses. Placing the bales on a sprayed out or a graded area or better still, a sand pad, is a minimum since vermin do not like to cross large open areas without protection from flying beaks. Sorry, no guarantees on this strategy but worth considering.

Figure 3: Holes in bales of forage cereal silage caused by mice

Placing rat bait some distance away from the bales so not to attract vermin to the storage area itself is worth trying. Another suggestion is to lay a heaped row of slaked lime around the perimeter of the bales. Apparently mice do not like to climb crumbly surfaces and the alkalinity on their dewy damp claws is also a turn-off.

Spacing rows of bales to allow regular inspections and immediate patching with specific silage tape is essential.

Silage additives from reputable companies, which can support their claims with research, should be also applied to encourage a desirable fermentation. Inoculants vary between companies so must be applied at the correct rate and be mixed and stored as stipulated by their manufacturers. Do not use treated town water. There are also a few other products apart from inoculants which will enhance the fermentation process so investigate these also.

Whole-cereal silages, along with maize, are very prone to aerobic deterioration upon opening of the stack/pit due to the presence of aerobic bacteria, yeasts and moulds. A new range of inoculants containing a particular strain of *Lactobacillis buchneri*, applied at the harvesting, will reduce moulding and heating at feedout. Other additives, apart from inoculants are also available for this purpose.

What happens if crop is too dry? Whole-crop cereals cut in the late dough or hard grain stage, ie. too late, will have a dry matter content too high (over 45% DM) for ensiling. This material will be much too difficult to compact resulting in air in the stack or bale, even if precision chopped very short, leading to aerobic deterioration, yeast and mould growth and poorer fermentation. To make matters worse large losses of grain will result in a much lower quality product, especially if not direct harvested.