

## Round Bale Silage

Putting silage up as round bales has become a popular option for livestock producers in eastern Canada and the south coastal area of BC. The advantages claimed for round bale silage (RBS) systems include :

- lower capital costs for harvesting, storage and feed-out, especially where a round baler is already used for hay;
- reduced labour requirements at harvesting;
- the ability to put up small quantities of silage as weather permits without having to re-open a bunker or ag-bag;
- the opportunity to salvage a hay crop which cannot be dried down due to weather;
- lower field losses compared with putting the same crop up as hay.

Here are some of the variables to evaluate if you are considering RBS:

### Harvesting and baling

Crops to be put up as RBS should be cut without crimping. The ideal swath will have stems aligned in parallel in the direction of baler travel to facilitate packing. Random alignment allows for entrapment of excess air in the bale.

Forage should be baled at a moisture level of 45-65% (35-55% dry matter). Bales that are put up any wetter are more difficult to handle because of their increased weight and they tend to lose their shape in storage. In addition, wet forage is subject to fermentation by *Clostridia*, bacteria which break down protein and produce butyric acid, reducing palatability and intake. Slime moulds are also more likely to form in wet bales.

Bales that are put up too dry contain excessive air space. The increased supply of oxygen allows the growth of *aerobic* (oxygen-requiring) bacteria, moulds and yeast. Fermentation by these organisms produces heat-damage, reducing the availability of crop protein and carbohydrate. Moulds often render the forage unpalatable and may produce mycotoxins as well as phytoestrogens which can interfere with female reproduction.

There are two basic types of round balers available. In the *fixed-chamber* type, the chamber is initially filled randomly while the forage is rolled with a tumbling action by the bottom and rear rollers (figure 1a). When enough forage accumulates to come into contact with all of the bale-forming rollers, it begins to be compacted into layers. The layers on the outside are progressively pressed down onto the centre of the bale until the desired bale density is reached. Resulting bales are uniform in size, with a soft core, increasing in density towards the outer layers and finishing with a compact, weather resistant skin.

The *variable-chamber* baler uses belts or chains to begin rolling the bale as soon as crop enters the chamber (figure 1b). Bale density is more uniform than in the fixed-chamber baler, and both bale density and bale size can be readily controlled. Ability to adjust the size of bales is essential in controlling their weight. A high-density, high moisture bale 6 feet in diameter may damage the baler and will be virtually impossible to lift and move with any but the largest tractor.

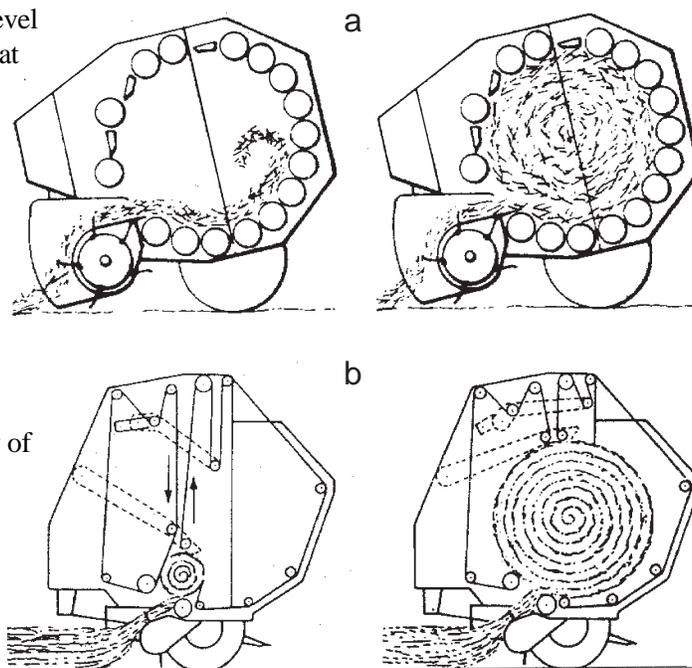


Figure 1 : Fixed-chamber (a) and variable-chamber (b) round balers.

With both baler types, bale density can be increased by slowing down the ground speed and increasing the PTO RPM. Uniform, high-density bales are an advantage when making RBS because :

- dense bales maintain their shape in storage, allowing them to be stacked more successfully;
- tight packing excludes oxygen, allowing less aerobic damage during fermentation.

## Inoculants

A recent trial by Dr. Zahir Mir and his colleagues at the Agriculture and Agri-Food Canada Lethbridge Research Centre demonstrated no beneficial effect of treating RBS with *Lactobacillus* inoculant at either 45% or 60% moisture. Results of this and other trials indicate that the factors affecting the success of inoculant use in RBS are not different from those in chopped silage. These factors are discussed in Alberta Dairy Management article **IS1**.

## Storage

Round bale silage can be stored in a number of ways, including :

- **Covering stacked bales with plastic.** Typically, bales are stacked 3/2/1 with single stacks lined up end-to-end as shown in figure 2 . Stacks are covered with opaque 6-mil poly or reinforced plastic, sealed completely around the perimeter. Anchored fish net or twine is needed to keep the cover tight. This is the lowest cost storage system for RBS but a concerted effort is required to exclude air and prevent its re-entry. A ‘multi-bagger’ is available which inserts stacked bales into large tubes, eliminating the need for perimeter sealing and anchoring and reducing the risk of air entry.
- **Individual bags.** Each bale is lifted with a front-end loader or 3-point hitch mounted spike. A bag is manually pulled over the bale, the bale is placed where it will be stored, the spike is removed and the bag is sealed. Individual bagging incurs a low capital cost, but it is the most labour intensive storage option.

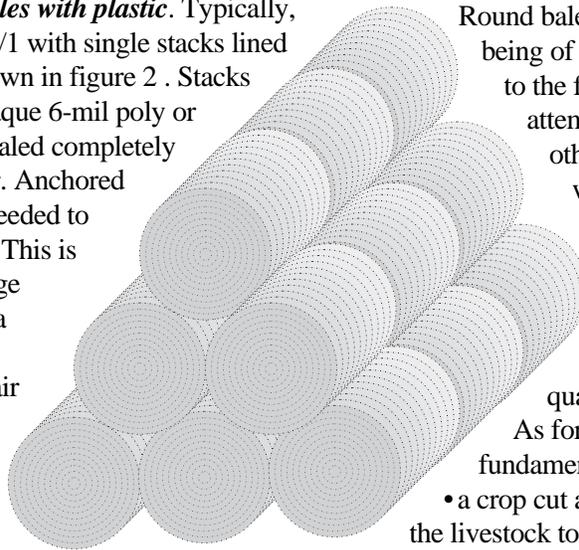


Figure 2 : Round bale stack.

- **Multi-bale tubes.** Several different pieces of equipment are available which facilitate the end-to-end insertion of multiple bales into long plastic tubes. Increased investment is balanced by less labour, lower plastic costs and higher capacity relative to individual bagging.

With any of these 3 methods, an air space may be present between plastic and bale. Oxygen and the accumulation of condensation in this space often leads to the growth of mould on bale surfaces. This problem can be eliminated by removing air using a common shop vac, providing that the plastic is well sealed after evacuation and subsequent puncture of the plastic is prevented.

- **Individual wrapping.** This has become the most popular storage option among west coast dairymen. The bale is picked up and rotated while being wrapped with multiple 20 inch widths of stretchable 1-mil poly. Wrapping eliminates air between bale and plastic. Although the equipment is relatively expensive, minimal manual labour is required.

## Quality

Round bale silage has earned a reputation for being of low quality. This may partly be due to the fact that RBS is often put up in an attempt to salvage a crop which would otherwise have been baled as hay if the weather had cooperated. In most cases, no silage system would make a quality product of such a crop. High quality silage is certainly possible from a round bale system, especially when high quality RBS was the original objective.

As for all other silage systems, the fundamentals are the same :

- a crop cut at the optimum stage of maturity for the livestock to be fed;
- forage ensiled at a moisture level of 45-65%;
- tight packing to eliminate as much air as possible from the silage;
- immediate and tight application of plastic, evacuation of excess air and prevention of subsequent damage to the plastic.

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