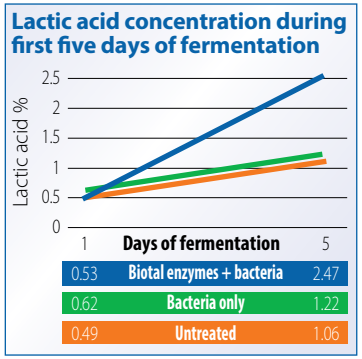
Benefits of using enzymes when making silage

Fermentation Aid

Silage preservation is based on the production of lactic acid from simple sugars carried out by the lactic acid bacteria (LAB). Therefore a certain level of sugar is always required at the start of the process to ensure a rapid and efficient fermentation.

Certain growing conditions (i.e. dry and overcast) can slow the rate of photosynthesis, which can severely affect the sugar content of crops. Also, some crops such as lucerne, red clover or sanfoin are naturally low in sugars. In these cases the bacteria do not have enough sugar to produce the quantity of lactic acid needed to preserve the silage.

The use of Beta-glucanase and Xylanase enzymes allow us to increase the quantity of sugars available at the start of the process. This ensures that the bacteria are able to drop the pH rapidly by producing enough lactic acid.



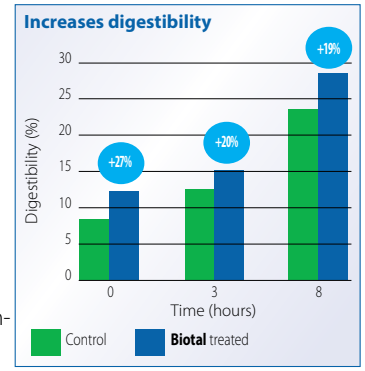
Biotal staff are able to advise and provide you with real-time sugar measurements when walking your crops.

Enhances Digestibility

Once the forage enters the rumen, the digestion of fibre takes time and it is never 100% achieved during the transit time. The use of beta-glucanase and xylanase at ensiling offers a predigestion period which will increase the digestibility value of the forage entering the rumen and consequently increase the energy available from this forage.

Analysis conducted by Oba & Allen (1999) and also Mertens (2006) show that a 1% unit increase in NDF digestibility will increase dry matter intake by 0.17kg and milk yield by 0.25kg.

Silage digestibility is also the most important factor when looking at the performance of beef cattle. Keady et al. (2008) reported that when concentrate constituted 52% of total dry matter intake, each
10 g/kg (1%) increase in D-value resulted in an increase in daily carcass gain of 23 g.



Biotal's Crop and Condition Specific Range

Each season can be different in terms of the challenges faced at harvest. We tailor our product range to offer the best solution for your situation. Contact your local RBM for more details.

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BIOTAL

Enzymes in silage

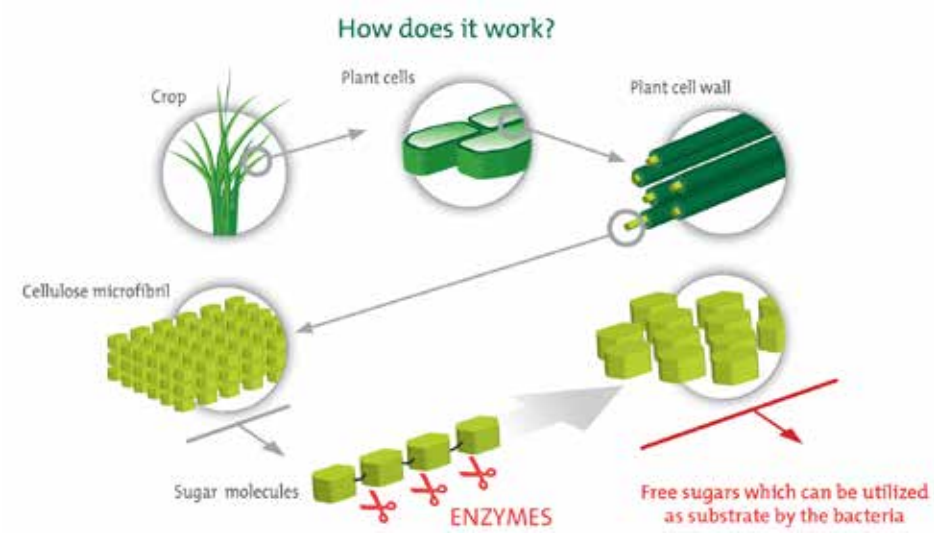
Unleashing the value of your forage

Description & mode of action

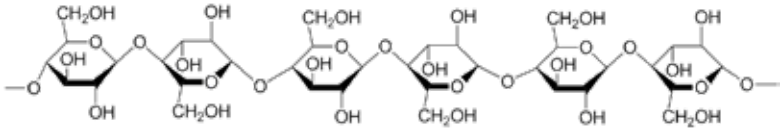
Enzymes are specifically shaped proteins that can be used to facilitate natural reactions. In fact, all bio-chemical reactions involved in life require enzymes.

Enzymes have historically been used in many other industries such as wine-making, baking and detergents, but there are also key benefits that can be gained through their use in silage making.

For silage making, there are two families of enzymes that are of interest; cellulase (Beta-glucanase) and hemicellulase (Xylanase). These enzymes have the ability to unlock some of the structural polymers found in the plant cell wall to create simple sugars which can be used by the bacteria to improve the fermentation.



There is often some confusion about the difference between cellulase activity and beta-glucanase which can be cleared up when looking at how cellulose is broken down.



Cellulose is a very long chain of D-glucose molecules (sometimes thousands) linked by β 1-4 glycosidic bonds. The complete hydrolysis of cellulose is needed to generate one molecule of glucose which can be utilised by the silage bacteria (i.e. the bacteria cannot use any of the linked molecules)

Creating glucose from cellulose

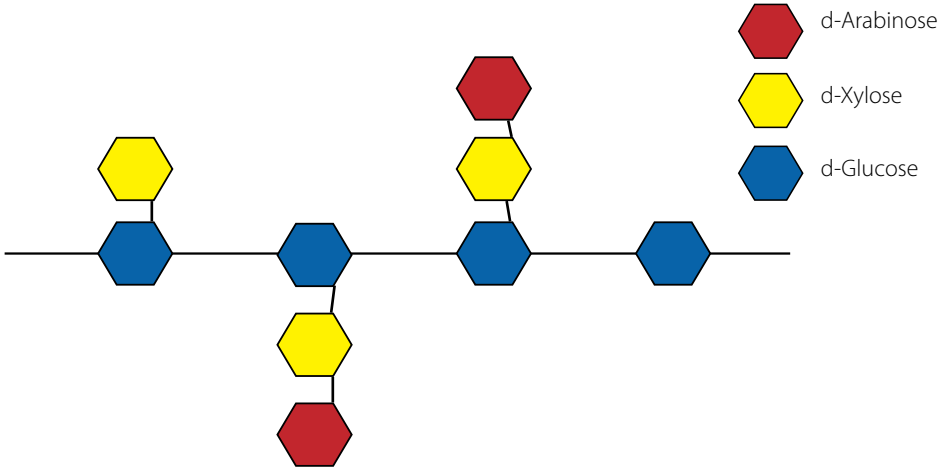
This is achieved through the synergistic action of 3 cellulase enzyme groups:

- **Endoglucanases** - These break down the internal bonds within the chain to create smaller chains called oligosaccharides
- **Exoglucanases** - As the name suggests, these act on the ends of the cellulose chain to produce a two chained glucose structure called cellobiose disaccharide
- **Beta-glucosidases** - This is the final step where the two chained glucose structure is broken down into single glucose molecules

Therefore, without the Beta glucanase activity, it is not possible to provide the glucose molecules needed to fuel the silage bacteria towards a good lactic fermentation.

Hemicellulose & Xylanase

The structure of hemicellulose is made up of a cellulose backbone (as shown on the previous page) and also lateral chains that contain 5 carbon sugars such as xylose and arabinose



The role of Xylanase is to break the lateral bonds and to release the 5 carbon sugars. These sugars can only be used by specialist bacteria and many of the epiphytic species found in a silage clamp are unable to utilise C5 sugars. Fortunately, the Biotal range of inoculants contain the species ***Pediococcus pentosaceus*** which has the ability to do so (pento = 5 and saceus = sugars).
By having access to a substrate that other organisms cannot use, it allows the ***P. pentosaceus*** to rapidly grow and out-compete other organisms during the early stages of fermentation.