The Ensiling Process

There are four different stages that makeup the ensiling process. Understanding what take place in the different stages will guide us in our decision on the type of additive to use, why it is a recommended practice, and when to use it.

Aerobic phase: A period starting from the moment the forage or grains are harvested up to few to several hours after the clamp had been closed. The remaining oxygen in the silo is used up by the plants respiratory process as well as by the activities of aerobic organisms like yeast. Degradation of proteins, soluble sugars and starch can be very extensive during this phase.

Fermentation phase: Oxygen has finally been used up and lactic acid bacteria (LAB) have taken control and become the predominant population. Depending on the ensiling condition this phase can last for several weeks. The lactic acid and other fermentation acids produced by the LAB finally drops the pH to levels that will stop the activities of bad bugs like clostridia and enterobacteria.

Stable phase: A period of relative inactivity when lack of oxygen prevents the growth of yeast and mould, while the acid tolerant bugs that are able to survive will remain inactive because of the low pH. Clostridia and bacillus species can also survive but only as spores. Other specialized LAB like the *lactobacillus buchneri* can be active, but at a reduced rate.

Feed out phase: Exposure to air at silo opening kick starts this phase. This is a two stage process where the breakdown of organic acids by yeast and to some extent acetic acid bacteria will first increase the pH. As the temperature rises, spoilage organisms like bacillus species will subsequently become active.

Key points:

1. Nutrient losses take place during the 1st, 2nd and 4th phases of ensilage.
2. Effective additive must be able to act on all of these 3 phases.

Useful tips on making good silage

a. Harvest at the right maturity stage when the nutrient are optimum in the forage or grain.

b. Avoid stop and start during silo filling. Fill and seal silo within 24 hours if possible.

c. Good consolidation is a must. Compact in thin layer and build up until the clamp is filled up.

d. Using a thin layer of plastic before the upper think layer will help to vacuum seal silo and reduce losses on the top.

e. Depending on the type of bacteria in the standing crop, you can get a good fermentation without additives.

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f. Adding additive will however give you the extra assurance, just in case. Also because additives have been repeatedly shown to help to improve the feeding value of the silage it is always worth considering.

g. It is advisable to delay the choice of additive until you have some idea of what the condition is going to be at ensiling. Where it is not possible to delay your order, always select an additive that will not only help to reduce nutrient loss but will give some element of aerobic stability.

h. The different strains of bugs used and their diversity can sometime make it difficult to know what type of inoculant additive to use. The following check list will help:

    a. Check that the additive contain at least 100, 000 CFU of lactic acid bacteria per gram

    b. Contain homofermenter that are able to utilize different sugar sources, are able to dominate the epiphytic bugs (bugs from standing crop), and are able to steer the fermentation toward the production of mainly lactic acid.

    c. If aerobic stability is going to be a problem, as in most dry grass silage and arable silages, it must also contain some heterofermenters that can reduce some of the lactic acid to either acetic acid or propionic acid.

    d. It must be able to reduce the pH to level that will reduce the activities of the so called bad bugs within 48 hours. However, because it can take most of the bugs used in silage additive up to 72 hours before they will effectively dominate fermentation, this is not always possible.

    e. Life additives are already active at point of application and because of this, are able to dominate fermentation quicker (within 48 hours) and reduce pH to a level that will stabilize the silo faster.

    f. The reports on the effects of enzymes in silage additives are not very consistent. So, don't let their lack of presence in an additive blight your choice.

i. The use of organic acids as silage additive is not as popular as they use to be, partly because of the health hazards associated with their use. However, they tend to be very reliable and are better at preventing avoidable losses of nutrients both during ensilage and at feed out.

j. When legumes are ensiled, the use of additive is very important because of their low sugar content and the fact that they have high buffering capacity.

k. With crimp cereals, avoiding nutrient loss and improving aerobic stability should be your top priority in your additive selection criteria.

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l. At feed out, a clean silo face is very important. And, avoid covering back the face after opening as this can create a micro environment for spoilage organisms.

m. Mycotoxins problems are real and trying to control it at feed out is very expensive. Take the necessary preventative measure at ensiling (see the technical note on mould and mycotoxins).

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