

Grain preservation with organic acids

Reducing feed wastage – Improving livestock performance

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According to calculations of the FAO the global demand for food will increase sharply in the next decades. This is mainly due to a significant global population growth. But also changing nutrition habits in emerging and developing markets play a major role. Therefore, the demand for grain and other traditional basic foods will shift towards animal protein based foods as meat, fish, egg and dairy products.

However, since livestock production consumes large quantities of grains as feedstuffs, the overall demand for grain will increase enormously. According to the FAO, grain production would have to be extended from currently 2.1 billion tonnes by approximately one billion, in order to meet the global demand in 2050.

Crucial for an expansion of grain production is the availability of cropland and water, energy supply, climate change, new agricultural and technological developments and access to finance resources.

However, depending on the cultivation region many of these factors are restricted, which significantly limits the possibilities of production increase. A further serious problem is the excessive wastage of food and feed. Even if there is no reliable information on the global wastage of food and, in particular, the wastage of feed, it is an undisputed fact that the dimension of grain spoilage during storage is exceeding an acceptable level by far.

Therefore, the reduction of feed waste can provide a crucial contribution to ensure the nutrition of the fast growing population over the next decades.

In this context, the improvement of grain storage management occurs to be a suitable starting point to protect post-harvested grain from spoilage in order to avoid unnecessary losses. Various processes are available for the preservation of grains.

However, for feed grains the option of preservation with organic acids is particularly interesting. Therefore, the following article provides an overview of the principles of grain preservation with organic acids and presents the new innovative grain preservation acid MAXACID/CP+ by PROVITA SUPPLEMENTS.

Grain preservation with organic acids

Freshly harvested grains are mostly not storable, since they often have high moisture contents and a high microbial infestation. The number of germs and the composition of

the germinal flora depend on the weather conditions during the harvest. In the presence of oxygen in combination with a sufficiently high water (> 12.0%) and nutrient content, unwanted microorganisms can proliferate easily. Yeasts, molds and unwanted bacteria are responsible for feed spoilage along with nutrient decomposition as well as for the formation of mycotoxins.

In practice, low but constantly absorbed amounts of mycotoxins often manifest through acute or chronic poisoning symptoms and concomitant performance depressions.

For these reasons, grain contaminated with higher mycotoxins should never be fed to farm animals. Once these poisons have been formed, they can hardly be rendered harmless since they are relatively insensitive to acid and heat treatment. The consequences of the feeding of mycotoxin-contaminated grain range from lower animal benefits up to serious diseases of the animals. Thus, the microbiological spoilage of grain carries an enormous risk for farmers and often leads to major economic losses.

Therefore, it is important to bring lately harvested grain into a storable condition as soon as possible.

Various methods are available for the preservation of grains, with a distinction being made between physical and chemical processes. Physical drying continues to play the most important role since it does not entail any restrictions on the marketability of the preserved grain.

However, the comparatively high process costs of grain drying are a significant disadvantage of this method, so that alternative methods are often used, especially for on-farm grown feed crops. For years, the preservation of feed crops with organic acids has proven particularly successful from both nutritional and economic aspects.

In addition to higher production certainty, best performances in livestock production can be achieved. In particular, in pork production the organic parameters such as growth and feed conversion can be improved by preservation with organic acids. These performance improvements can be traced back to the particular palatability, the stimulation of the digestive enzymes, the antimicrobial effect and the energetic utilisation of the used acids.

Furthermore, losses are minimised by this method and the risk of mycotoxin in grain is also the lowest in comparison to other preservation practices.

The use of chemical preservatives has the advantage of the

direct impact on the microbial flora. Thus, preservatives lower the pH value on the grain surface so that microorganisms adhering to the grain are killed or their replication is prevented. This effect is due to the fact, that the low pH-value environment influences the function of the cell membrane, inhibits the cell division and blocks the enzyme system.

Additionally, the supplementation of acids results in a loss of germination capacity of grains. In particular, propionic acid has proven itself in practice since it shows both a very good bacteriostatic and a fungicidal effectiveness. However, due to the corrosive and highly caustic characteristics of propionic acid, the use shows not only advantages but also disadvantages for humans and technology.

MAXACID/CP+

With MAXACID/CP+, PROVITA SUPPLEMENTS are now offering a new, highly user- and material-friendly acid mixture for grain preservation. In this innovative combination of propionic acid sodium benzoate and sodium propionate is characterised by an unusual high pH-value of 5.0.

Therefore, MAXACID/CP+ is not caustic and only slightly corrosive and, thus, poses hardly any risk for humans and equipment. Concerning the efficacy, MAXACID/CP+ is almost comparable to pure propionic acid, whereby the strong antimicrobial effect can be traced back to the combination effect of the added chemical preservatives.

Moreover, the control of fungi is even more effective than that of pure propionic acid due to the sodium benzoate contained. In addition, the use of MAXACID/CP+ convinces through further advantages. Thus, treated grain can already be fed after treatment period of a few days; enzymatically regulated metabolic



processes in the grain are stopped almost immediately and negative impacts on feed intake due to evaporating acid are not to be expected.

Besides the preservation of grains, MAXACID/CP+ is perfectly suited for the preservation of corncob mix (CCM) silages. In CCM silages with dry contents of 70 percent and above, the natural formation of lactic acid is restricted, which causes a reduced shelf life. The quality of such endangered CCM silages can be ensured with the use of MAXACID/CP+ at low cost.

Furthermore, it is possible to use MAXACID/CP+ to stabilise TMR rations in ruminant nutrition as well as dry and liquid feeds in pig nutrition.

Advantages at a glance

Grain quality – The new MAXACID/CP+ offers a broad spectrum of active ingredients against all common yeast and mould fungi. Therefore, the valuable nutrients are completely preserved for up to 12 months.

Animal performance – Compared to dried grain, the feeding of acid preserved grain leads to an increased daily growth due to a better palatability and the stimulation of the digestive enzymes.

User comfort – The special formulation ensures an uncommon high pH of five for acids. This makes MAXACID/CP+ is not a hazardous good in the sense of the transport ordinance.

Whole-farm nutrient balance – Unlike other NH₃ buffered acid mixtures, MAXACID/CP+ contains no nitrogen and therefore does not negatively affect the whole farm N-balance according to the fertiliser ordinance.

Application and efficacy

In the case of organic acid preservation, treatment of the feed grain is carried out directly after harvesting. The procedure is basically suitable for all farm sizes, since the required minimum equipment only consists of an applicator and a grain conveyor.

For the treatment, the MAXACID/CP+ is metered into the grain conveyor where it becomes mixed with the crop flow. The dosing quantity depends on the type and moisture of the grain.

For further optimisation, acid preservation should be combined with a pre-cleaning process of the grain before acid treatment. Thus, it is possible to effectively reduce crop impurities associated with a potential mycotoxin risk.

Due to the low requirements on the technical equipment, the preservation with organic acids requires only small capital expenditure. In addition, the process is extremely efficient with

an output of 30 to 50 tonnes per hour as compared to on-farm drying with an output of two to four tonnes per hour. In this way, also a crop harvest with high moisture contents can immediately be brought into a stable storage condition. The economic advantage of preservation with organic acids against the drying preservation is therefore unambiguous.

10 tips for successful grain preservation

Exact moisture measurement is the basis for grain preservation success! The average of three measurements per batch should be the basis for the dosage.

In the case of batches with different grain moisture contents, the dosage must be adapted to the wettest batch.

Accurate determination of the flow rate of the screw and adjustment to the dosing capacity of the applicator.

The screw must not be shorter than three mm; the longer, the better the mixing. The screw should be positioned in a lead angle of 45.

At least two nozzles must be installed in a way they cannot become clogged.

Before starting preservation, always calibrate the applicator with an appropriate product. Only use equipment especially designed for this purpose.

When high-pressure blowers are used for transport of preserved crops and at outside temperatures above 35 degrees Celsius, a 10 percent MAXACID/CP+ surcharge is indicated.

When using sheet metal or concrete silos, make an acid resistant protective coating.

Material cones resulting from filling must be levelled after finished grain storage in order to prevent a chimney effect.

Always observe the safety instructions! ☞