



mycostat

- non corrosive mould inhibitor
- protection against yeast activity
- available as a dry granular or liquid product

controlled release mould inhibitor – efficiency with efficacy

kiotechagil
Performance in **aquaculture&agriculture**

mycostat*

mycostat is a noncorrosive acid blend to protect the bulk storage of raw materials and finished feed from mould at low application rates.

mycostat also gives protection against yeast activity, unlike straight propionic acid.

It is available as a dry granular product and as a liquid. Both presentations are used at the same low rate depending on the moisture content of the treated material.

The formulations are based on propionic, acetic and sorbic acid combined with their ammonium salts.

mycostat (dry) is blended with an activated mineral carrier which has two advantages:

- It provides a large surface area to ensure the volatile fraction of the acids are active in their monomeric form. These are better able to effectively penetrate the cereal or feed to exert the mould inhibition.
- The carrier ensures the acid salt components are released at a slow rate to maintain activity in the feed for several months.

mycostat liquid is best distributed by the aid of a fine, even spray onto the raw material or feed mix. The feedstuff should still be mixed thoroughly to ensure a homogeneous dispersion throughout the material.

The cost to the feed industry of cleaning out clogged silos due to mould growth, or corrosion to metal bins and damage to augers from corrosive products, far exceeds the cost of preventative treatment with an effective, non corrosive mould inhibitor.

mould growth

Growth occurs at moisture contents as low as 11% in warm climates and 12-14% in more temperate regions.

Feeds tend to be hygroscopic and absorb moisture from the atmosphere, particularly where storage conditions have a relative humidity above 80-85% and an average ambient temperature above 13%. An additional 1-2% moisture will lead to spore germination and a further 4% to extensive mould development.

As moulds develop they aerobically metabolise carbohydrates to carbon dioxide and water, increasing the moisture content further and exacerbating the problem.



Fungi are ubiquitous and proliferate under a wide range of conditions. They can metabolise a wide range of nutrient sources and grow rapidly to produce mycelial mats which are responsible for "bridging" in feed bins.

Several types of moulds produce highly resistant spores that can withstand both desiccation and high temperatures. These fungal spores can survive for many years and when conditions are suitable will germinate and grow in unprotected raw material and finished feed.

* In some countries the product is marketed under the brand **molstat**

mould inhibition

Propionic acid is the major component of the majority of mould inhibitors. Propionic acid is a member of the carboxyl group of acids which tend to form stable dimers when present in strong solution. The most active form of a carboxyl acid in terms of its antimicrobial activity is the undissociated monomeric form able to penetrate fungal cell walls passively. The monomeric form is only available when the acids are at low concentration, generally as a vapour, or when physically stressed by absorption onto an activated base.

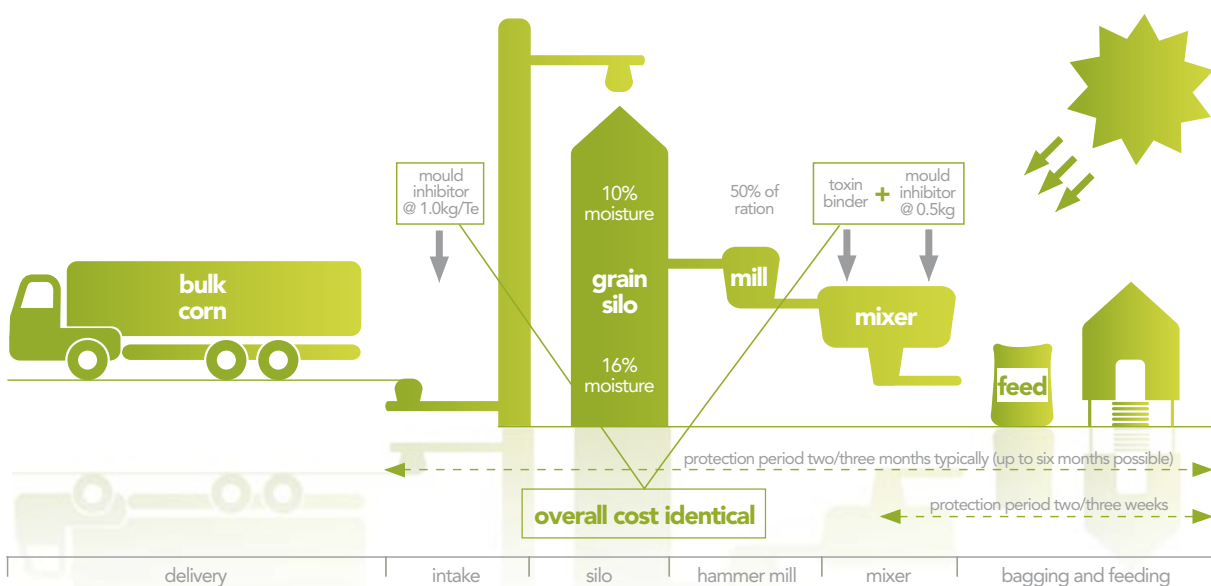
mycostat is a combination of free propionic acid, ammonium propionate and sorbic acid. By being on a carrier system the surface area is high, releasing the free propionic acid as a vapour. This vapour is able to diffuse into the feed raw material or feed much more effectively than the liquid molecule which will be partly absorbed by the feed and needs effective mixing to enable homogeneous dispersement through the material, especially at low application rates.

Mould inhibitors based entirely on salts of propionic acid rely on hydrolysis of the molecule to generate free propionic acid to effect a mould kill. At moisture contents of 11-12% the free water available will not be sufficient to fully hydrolyse the active ingredients, potentially reducing the level of activity below that necessary to protect the feed.

Sorbic acid is included in **mycostat** because of its activity against yeasts. Sorbic acid is most active below pH 6.5 as more of the acid will be undissociated in a low pH environment.

alternative scenarios for grain or feed treatment

- A Treatment** of grain at the level appropriate for the **highest** moisture content.
- B No treatment** of grain but use of mould inhibitor on the complete feed PLUS a toxin binder. This may be necessary as fungal activity may result in 'hot spots'. Moisture migration and condensation due to temperature variation may lead to mycelial bridging and toxin development.



problems associated with mould growth

Visible mould growth

- Nutrients lost
- Surface moisture increased
- Increased risk from further damage by moulds, yeasts and insects

General mould growth and mycotoxins

- Production of secondary metabolites, known as mycotoxins
- Mycotoxins have serious consequences for livestock, particularly as a result of liver damage and loss of fertility.
- It is important to appreciate that mould inhibition can prevent mould growth from producing new toxins, but will not affect existing toxins. In this situation an effective toxin binder such as **sorbatox** will be necessary.

Mycoses

Mould spores liberated from feed stuffs can enter wounds or be inhaled directly into lungs of livestock and farm workers. This can result in a range of problems from respiratory diseases such as Aspergillosis to Candidiasis.

Dust

Following fungal attack and mite infestation feed may become dusty which, apart from reducing its value, makes atmospheric moisture absorption more likely.

growth of moulds and insects

Moisture content is an important factor in the activity of both moulds and insects. Rice and maize weevils cannot reproduce in grain with a moisture content below 9%. Flour beetles can produce progeny in flour or grain dust that are extremely dry. During larval development and growth an insect produces metabolic water and heat, making the environment in the stored raw material more hospitable for mould growth. When the density of *Sitophilus oryzae* (weevil) rises from 15 adults to 2100 in a closed container of wheat, the moisture content increases from 15% to 35%. Bulk mass of grain or feeds with moisture contents as low as 11% may develop symptoms of heating.

A small local rise of temperature in a 'hot spot' will accelerate the metabolism of the insects and speed up the rate of population increase. The resulting temperature and moisture increases will create an environment favourable for mould growth.

Insects may also be carriers of moulds in their intestinal flora and so insect infestation may help distribute moulds widely throughout a bulk mass of grain or feed. In addition to weevils there are many species of mites. These mites eat out the germ and shed potential allergens. These allergens can survive through cleaning and contaminate finished feeds. The material in storage is subject to several mutually supporting systems leading to spoilage or deterioration.

Insect Species	Mould Species
<i>Sitophilus oryzae</i>	<i>Aspergillus flavus</i>
<i>S. granaries</i> (weevil)	<i>A.candidus</i>
<i>Oryzaephilus surinamensis</i> (grain beetle)	<i>A.flavus</i> , <i>A.niger</i> , <i>A.ochraceus</i> , <i>A.versicolor</i> , <i>Penicillium rugulosum</i> , <i>Cladosporium spp</i>
<i>Tribolium castaneum</i> (flour beetle) <i>Acarus Tyrophagus</i> and <i>Lepidoglyphos</i> (mites)	<i>A.flavus</i> , <i>A.nigo</i> , <i>A.rubber</i> , <i>A.sydowi</i> , <i>A.glaucus</i> , <i>A.ochraceus</i> , <i>P.islandicum</i>

For further information on control of insects in stored material see **mitex** brochure.

trials

1 Servaco Laboratories, Belgium

Water was added to a typical broiler-chicken feed with a moisture content of 11.5% to give a final value of 15%. Storage was carried out at 22°C and 65% Relative Humidity over a period of 4 weeks and 7 weeks. Mean counts (determined on bulked samples) x 10⁶ of mould propagules recovered are illustrated.

Trial Period	Initial Count	Negative Control	Propionic Acid	Mycostat Dry
4 weeks	0.036	142.3	0.490	0.005
7 weeks	0.052	208.0	0.760	0.008

2 Servaco Laboratories, Belgium

mycostat was compared with propionic acid and sodium propionate in feeds at 12.4%, 14.4% and 17.9% moisture content incubated at 22°C for four weeks.

"**mycostat**, applied in a concentration of 0.5kg/tonne, seems to be equally efficient than propionic acid in a concentration of 2kg/tonne"

In the same trial sodium propionate was found to be less efficient than the other treatments "..... although some fungi static action is observed".

3 Storage Trial, North Greece

"...the (test) period of one year is over and it is apparent from the analysis of the Feed Health Institute, Thessaloniki, and from our macroscopic inspection that the results are absolutely satisfactory.

The Control was impossible to keep because a large amount of deterioration appeared and bridging and we were obliged to empty that bin.

The maize in the bin with **mycostat** remained in an excellent state and after the time period did not have any problem and can be maintained without drying."

application rates

0.5kg or litre/t	when moisture content is below 15%.
1.0kg or litre/t	when moisture content is between 15% and 17% or when feed incorporates raw materials such as molasses.
1.5kg or litre/t	when moisture content is in 17-18% or there is light moulding of raw material or when storage conditions may be arduous.

For application of **mycostat** (dry) it is often advisable to make a premix with 3-5kg of relevant finish-mix ingredients when charging the mixer. For raw material treatment a simple metering auger system should be used with a small hopper and variable speed auger.

Accurate distribution of **mycostat** liquid is aided by a fine even spray onto the raw material or feed mixer. This is essential if there is little opportunity to mix, such as with an auger or conveyor system.

mycostat liquid

200kg drums



mycostat (dry)

25 kg printed
plastic sacks



Distributor:

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Performance in aquaculture & agriculture

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