



Dietary Phytase to Reduce Phosphorus Losses from Animal Manure

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Definition:

Dietary phytase is a term used to describe a suite of enzymes that cleave inorganic phosphorus (P) from organic forms of P in grains (inositol phosphates, also referred to as phytate) to increase grain P availability to animals.

Purpose:

Adding phytase to animal feeds makes grain P more available to animals, thereby reducing the amount of supplemental P needed for optimum animal performance.

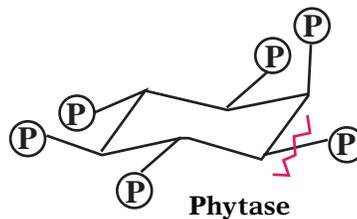
How Does This Practice Work?

Most of the P present in grains fed to livestock (i.e., corn and soybeans) is phytate-P. This organic P form is not readily available to animals, particularly monogastric animals like poultry and swine.

In conventional diets, mineral P in the form of monocalcium phosphate, dicalcium phosphate or deflourinated phosphate is added to livestock feed to increase bioavailable P.

Phytase enzymes produced by bacteria or fungi can cleave inorganic P from the phytate molecule to increase the amount of bioavailable P in feed grains. By increasing grain P bioavailability, the amount of supplemental mineral P needed to balance the feed ration is reduced.

Producers can use dietary phytase to reduce the amount of supplemental P used in feed rations, thereby decreasing the total amount of P fed to animals. By decreasing the total amount of P fed, producers also can decrease total P excreted by their livestock, and thus reduce the total amount of P that can potentially be lost to streams and rivers.



Phytase cleaves inorganic P from inositol phosphates.

Where This Practice Applies and Its Limitations:

Dietary phytase can be added to any livestock feed ration. However, phytase-supplemented feeds would not be expected to significantly impact P utilization in ruminants (cattle, sheep and goats), since the microbial populations in the rumen produce phytase naturally. The greatest demonstrated impact for phytase has been with monogastric animals like poultry and swine. Some studies have shown increased soluble phosphorus levels in manure from animals fed phytase diets.

Dietary phytase can be purchased in liquid and powder forms, and can be added to diets in a number of different ways. Phytase can be added to diets before being pelletized. However, heating that occurs during the pelleting process denatures some of the phytase, so feed mill operators will commonly add more phytase than necessary to ensure that sufficient phytase is

still active following the pelleting process. Heat-stable phytases are currently being developed.

Phytase also can be applied after pelleting a diet, but this increases the number of times the entire diet must be handled. Diets that are not pelletized can be sprayed with phytase as the ingredients are mixed.

Dietary phytase can be used with other best management practices, such as inclusion of low phytase P grains in the diet. Studies conducted using both of these best management practices have shown very promising results.

Effectiveness:

Phytase-supplemented diets commonly contain 15 to 25 percent less total P than conventional diets. As a result manure P excretion from animals provided phytase-supplemented diets is reduced 15 to 25 percent compared to manure from animals provided conventional diets.

Cost of Establishing and Putting the Practice in Place:

Phytase-supplemented feeds can be purchased from feed mills or dealers. Many feed mills own and maintain the equipment necessary to add phytase to feeds.

Producers who mix their own feeds will need to purchase equipment to either spray small amounts of concentrated liquid phytase on feeds before mixing the feed, or add trace amounts of powdered or granular phytase to mixed feed. Costs of supplemental phosphorus additions to diets tend to be higher than costs of adding phytase to diet.

If conventional diets and phytase-supplemented diets are to be used in the same operation, additional storage space may be required to handle the phytase-supplemented feed.

Operation and Maintenance:

If feeds are purchased from feed mills, producers could switch to phytase-supplemented feed rations without any changes to their production practices.

Producers who use phytase-supplemented feeds and mix their own feeds will need to maintain the equipment used to add phytase to the diets.

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For Further Information:

For further information on this practice, contact your state Cooperative Extension Service, feed sales representative or feed dealer.