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Formulation of Animal By-product Free Feeds

Introduction

Developing feeds and feeding programs for commercial turkeys requires excellent technical knowledge in order to achieve desired performance and economic return. The nutritionist must decide for each diet in the feeding program which commodities can be best economically used to manufacture all feeds. One particular commodity, meat meal, has been used extensively as an ingredient in manufacturing turkey feeds. Meat meal supplies a fraction of the amino acid, calcium, phosphorus and sodium amounts required in turkey feeds. Meat meal inclusion into turkey feeds also allows the practical formulation of high energy turkey feeds that improve feed efficiency and bodyweight gain of turkeys.

In recent years, government regulations and consumer demand have prohibited or decreased the inclusion of meat meal and other animal by-product ingredients in the manufacture of turkey feeds. Formulation of these non-traditional feeds has required the nutritionist to consider technical issues that are unique to animal by-product free feeds. These technical issues are discussed in this paper to assist the nutritionist to properly formulate animal by-product free feeds that achieve performance and economic return in turkey growing facilities comparable to feeds that contain meat meal and animal fat.

Protein Ingredient Selection

The proper selection of high protein ingredients is critical to accurately formulate animal by-product free turkey feeds. This is most important in turkey starter diets because of the high inclusion rate of soybean meal in these feeds. Greater than 400-440 kg of soybean meal per metric tonne of turkey starter can result in wet fecal droppings and poor growth rates. The wet droppings can also be very sticky and may adhere to footpads resulting in pododermatitis. Reducing the level of soybean meal in turkey starter diets can be accomplished by considering alternative high protein ingredients such as high quality fish meal, corn gluten meal and isolated soy protein (soy protein concentrate).

Maximizing the inclusion rate of synthetic amino acids can further reduce soybean meal requirements in turkey feeds. The synthetic amino acids that should be considered for use in the manufacture of every turkey feed are lysine, methionine and threonine. Threonine is often not available as an ingredient in many feed mills but should be considered because its inclusion into feeds often results in reduced feed costs and reduced crude protein levels. Formulating feeds to specific amino acid amounts rather than to crude protein levels will always result in lower inclusion rates of soybean meal.

Feed Enzymes

Feed enzyme technology has improved recently and should be considered, especially when formulating animal by-product free feeds. Proper use of these ingredients should include routine testing for percent recovery in feed, especially if the feed is pelleted or if an ingredient is added to feed that may compromise enzyme activity. Because all feed enzymes require a substrate for activity, the nutritionist should ensure that all ingredients in the feed contain sufficient enzyme substrate. Combining different feed enzyme products in the same feed should be done carefully to ensure enzyme compatibility.

Use of enzymes such as phytase, should be considered in animal by-product free feeds, since their inclusion into feeds will replace some dicalcium phosphate and limestone with resultant feed cost savings. Phytase will improve the metabolizable energy content and amino acid availability of the feed, however, those improvements are negligible such that many nutritionists do not ascribe any such nutrient value except calcium and available phosphorus to the enzyme.

Non-starch polysaccharide (NSP) enzymes are ingredient specific for corn, wheat, barley or soybean. Most nutritionists have more experience with

wheat-soy and barley-soy NSP enzymes than with corn-soy NSP enzymes. All of these feed enzymes have the benefit of improving the metabolizable energy content of the feed which can help decrease the amount of added fat in the feed. The extent of improvement in the metabolizable energy content of the feed is not a constant value, and is affected by ingredient composition of the feed and by grain quality. Therefore, an energy value must be ascribed to the NSP enzyme when formulating feeds which could differ depending on ingredient selection and quality. Aside from improving the metabolizable energy content of feeds, NSP enzymes can also improve the development and health of the gastro-intestinal system.

High Energy Ration Formulation

The formulation of high energy feeds is more difficult when meat meal cannot be used as an ingredient. To improve the energy density of an animal by-product free feed, vegetable oil must be used which adds great expense to the feed. Vegetable oil inclusion in feeds, however, is limited because excessive dietary amounts reduce carcass fat firmness which may be undesirable to the consumer. For these reasons, nutritionists often formulate animal by-product free feeds that can be 10-15% less calorically-dense than those feeds that contain meat meal. Enhancing the energy density of animal by-product free feeds, without greatly increasing vegetable oil inclusion, can

be achieved by utilizing NSP enzymes in these feeds. In addition, adding phytase will further improve energy density, but mostly by reducing the dicalcium phosphate and limestone in the feed.

Minerals and Vitamins

Sometimes certain minerals and vitamins may be overlooked without realizing that their nutritional importance is affected when a turkey feed is animal by-product free.

Turkeys on these diets have an increased risk of wet fecal droppings due to the higher level of soybean meal. To help reduce this risk, many nutritionists will formulate diets whereby a portion of the sodium requirement is supplied by sodium bicarbonate instead of sodium chloride (salt). Reducing the chloride content of the feed is an effective way to reduce the moisture content of fecal droppings. Many nutritionists will also formulate to a maximum of 0.20-0.25% chloride in feed to achieve drier fecal droppings. When formulating feeds with a chloride maximum, it is important to have accurate chloride specifications for all the ingredients present in feed; most importantly that for lysine hydrochloride. Many nutritionists will always have a minimum amount of salt in every turkey feed, such that most feeds will contain both salt and sodium bicarbonate.

In situations where wet fecal droppings occur transiently because of feed and barn management issues, many

nutritionists will add betaine to their turkey feeds as an osmolyte to reduce fecal moisture content. Further, organically-complexed trace minerals may be added to feeds in these situations to help protect footpads from infection.

Consumer interpretation of “animal by-product free” feed may extend beyond major feed ingredients such as meat meal, feather meal, blood meal and animal fat to include vitamin products that contain gelatine coatings. In these circumstances, gelatine free vitamins must be used. Another potential issue is that Vitamin D₃ is synthesized from sheep lanolin and may be prohibited in some animal by-product free feeds. In this situation, 25-hydroxy vitamin D₃ can be used to fully replace Vitamin D₃.

Summary

Proper formulation of animal by-product free feeds is not a simple extension of the knowledge required for successfully formulating feeds containing meat meal. Understanding the limitations of excessive use of some ingredients such as soybean meal, salt, and vegetable oil can prevent problems from occurring when feeding turkeys and also at the processing plant. Strategic use of some ingredients not commonly used in diets containing meat meal, can be invaluable in achieving optimal turkey performance and economic expectations with Hybrid commercial turkeys.