

British Veterinary Poultry Association

Keith Gooderham Waterfowl Lecture

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Key Points of Duck Nutrition

Ducks are wonderful creatures that produce quality food protein, down and feathers. They are very efficient convertors, yet many people consider their capability to live on sub-optimal diets as a justification to feed low quality feeds when practicing commercial production. In my experience the duck can benefit greatly from modern feed ingredients, formulation and milling technologies. Attention to the duck's unique nutritional requirements coupled with best management practices on the farm can provide the platform to allow ducks to achieve amazing performance in terms of growth and meat yield.

When we review the key points of duck nutrition one needs to recognize and give due consideration to developing a program that optimizes health, well-being, performance and economic sustainability.

When feeding ducks we need to recognize that they; respond to high quality fortified diets, have the ability to utilize diverse ingredients, are sensitive to mycotoxins and toxin interactions, are capable of very rapid frame growth and breast meat deposition.

Maple Leaf Farms believes that our overarching nutrition goal is to optimize the genetic potential of the duck. Achieving that goal at a commercial level also requires we contribute to other related goals. These include; satisfying the duck's basic nutrient requirements, protect the duck's health and well-being, support the intrinsic rapid growth and feather development and for breeding stock the reproductive performance, while creating an environmentally sustainable performance and efficiency.

To achieve these nutrition goals requires the following tools and practices; well defined ingredient purchasing standards, laboratory analysis of ingredients, computer aided accuracy in formulation of the feeds, well defined milling procedures and quality control practices, laboratory analysis of finished feeds, flock management and barn monitoring, continuous improvement through research of new ingredients and biotechnology. And it is essential to conduct feeding trials to evaluate actual performance and production improvement concepts.

By reviewing a few of these key points that are important when discussing duck nutrition we can help veterinarians, farm managers, feed millers and nutritionists to prevent or solve field problems.

As stated previously, whether developing a nutrition program for egg layer or meat type ducks the nutritionist's primary job is to provide feed that lets the duck fully realize its genetic potential. To do this requires ongoing research and field studies to make sure the feed is providing adequate nutrition for growth or reproduction and additional focus on feather development. As duck feathers have intrinsic value to the duck, as well as significant commercial value, this aspect of the nutrition program should not be overlooked. Nutrient requirements during peak feather growth need to be anticipated to ensure nutrients are not diverted from the concurrently developing immune, muscular and skeletal systems.

When we talk about modern duck nutrition and feeding we are always focused on several factors rolled into one compact and efficient denominator - the pelleted feed presented to the bird. Pelleted feeds are more efficient for ducks to consume due to their flat wide bill. And though ducks share in several of the nutritional requirements of other poultry, they are more than just a waterproof chicken.

Specific to meeting the nutrient requirement of the duck and the areas of focus when formulating diets using computer software, specific attention must be paid to the fortification of commercial diets. A brief list of some essentials for a quality feed formulation include; nutrient values expressed in terms of the major requirements for protein, energy and minerals. These can be expressed in values related to the total or crude content or in terms of digestibility, apparent availability, or metabolizable content.

Energy content needs to focus beyond just the units of Kilocalories or mega-Joules, such as quality of the energy sources, inclusion limits & the targeted fatty acid content, especially Linoleic and Linolenic, limits to Short and Medium Chain Fatty Acids may be necessary, and your desired intake of Omega 3 depending on desired fat consistency and deposition.

Amino Acid supplementation with Lysine, Methionine and Threonine The addition of organic acids, salts and buffers can improve digestibility, reduce heat stress and prevent mold formation in the stored feed, and the inclusion of enzymes to aid in liberating additional nutrients from the fiber portion of ingredients can improve digestion and absorption. Vitamin and trace mineral requirements need to be met with high quality premixes that are of particle size and quantity to evenly disperse throughout the feed.

All of these adjustments must be made with an eye towards the impact on the pellet quality of the finished feed. Sometimes squeezing in those higher levels of nutrients can be a challenge, especially when the bulk grains used in the ingredient matrix are not well dried. It is a bit of a contradiction when making quality feed that we focus on low moisture grain supplies and then we add liquid ingredients and steam the mash to pasteurize and moisten the mix prior to pelleting. Therefore care must be taken to control that injected moisture and the subsequent post pelleting drying of the feed to a level that ensures the feed remains stable and in good quality during on-farm storage.

Moisture content of incoming ingredients also impacts the formulation and finished feed quality. If you do not give the formulator dry grains with optimum nutrient content in a concentrated form then we go down the road of either reducing our nutrient density in our feeds to get a balanced ration or we increase the feed cost using nutrient dense supplements or we play liar's poker and pretend the ingredients are better than they really are. That tends to make life easier when formulating but does not benefit the duck or the rest of the enterprise. Therefore starting with low moisture levels in the ingredients and driving off excess moisture in the pellets ensures your nutrient requirements can be reached not only during formulation but as well in the finished feed. Our experience finds good results with finished feed moisture less than 12%.

Nutrient values expressed in terms of digestibility or apparent availability may use similar terms but can be very different nutrient values for various ingredients. Many of the ingredient supplier values we must rely on are originally established using chicken layer or broiler stock models. Therefore duck specific research must fill the knowledge gaps and that is an ongoing process. Duck nutritionists, like all other nutritionists, also keep tabs on what advances are made in other monogastric animal fields, such as turkeys and hogs. From our own experiences and these other fields we have evolved our nutrition theories and then we “Ask The Duck” what they think of our ideas with feeding trials. Sometimes they agree, other times they tell us we have not reached the optimum target.

The feed mill is a hub of activity with ingredients being received, stored and milled into finished feeds ready for shipping. Good procedures and quality control should prevent problems from occurring or lead to rapid traceability if something does go wrong. A few details of what goes on behind the scenes will help you in your investigations. The feed mill takes the recipe and using large bins of ground and screened ingredients weigh batches with the use of computer controlled scales as well as manual hand-added ingredients and liquid ingredients dispersed with spray nozzles. The ingredients are mixed in a large mixer and then sent to the pelleting process.

The combined ingredients or “Mash” are preferably ran through a steam conditioner or equivalent cooking process to help improve the digestibility of the ingredients and pasteurize the mash, reducing the population counts of spoilage and pathogenic microbes. Then the hot mash is forced through an extrusion process by rollers within a perforated spinning die or through a screw and stationary extrusion plate. As the hot formed feed emerges from the die or plate it is cut to a specified length and dropped into a cooler that acts as a dryer to remove residual moisture with forced air.

Once dried the pellets may be coated with ingredients that are not heat stable such as enzymes. Additional fat can be sprayed on the pellets at this time as well. The final step is to screen the pellets prior to shipping to remove broken pellets and pieces and coarse dust particles that we call Fines.

Feed is physically tested with mechanical or pneumatic tumbling of the pellets to verify they are of substantial hardness or “durability” and assigned a Pellet Durability Index score (PDI) prior to shipping.

Records are maintained on the milling procedures and should be available for review when problems arise. Ask for “Batching” or “Mixer” reports to be reviewed when investigating problems. If you suspect the wrong feed was delivered ask that “load out” or “shipping” records be reviewed.

Transporting the finished feeds and delivery to the farm holding bins is another key area where feeds may get misplaced or pellets damaged. Accidentally putting grower feed in front of breeders could create a problem with egg production very quickly. Damaging pellets with rapid unloading or with poorly adjusted equipment creates unacceptable levels of fines that result in nutrients being separated and feed being lost into the bedding. Therefore these are another area for investigation related to performance.

At most mills in the United States the finished duck feed will be gravity fed into the delivery trucks. Trucks transport the feed to the farm and off load using drag and screw augers or pneumatic systems to put the feed in the bin.

If you are seeing high levels of fines in duck feed deliveries check the condition of the pellets as they are being unloaded and as they leave the farm bin as well as the length and adjustment of the feed line. This may reveal the source of the fines.

Feed pellets can be damaged when discharged too quickly from the truck, especially when using screw auger systems. The best pellets in the world can be destroyed if feed delivery is not carefully monitored by the delivery driver. The same can be said of the systems that are used to move feed from the farm feed bin into the barn. Bin lids, cones, boots and slides should be inspected and cleaned regularly.

The Farm Manager and Field Service Representative should monitor the feed for changes in color, appearance and odor and not hesitate to ring up the mill when they see a variance. On-farm bin maintenance to maintain feed in fresh form free of pests and rain help extend the storage quality of the feed. Well adjusted feeders ensure the pellets are delivered in good condition and adequate quantities of whole pellets are available to the ducks.

Barn feed lines should be in good repair and without sharp bends that lead to areas for the pellets to be ground up. Feed pans or feeder bases should be adjusted for adequate but not excessive flow of feed. If you continue to see unacceptable levels of fines point out the problem to Field Service and the Mill with representative visual samples.

Good pellets are required to survive the mechanical grinding along the transportation and in-house feed distribution system. Excessive levels of fines in the house will once again interfere with delivering that well balanced meal.

Think of the pellet as your complete three course meal. If we drop the starter and the entrée into the feeder bottom due to separation, or into the straw due to poor feed line management, then we have our flock dining on desserts only.

We should not talk about nutrition without mentioning the even larger “ingredients” that are contributed beyond those in the feed, of course we are talking about management of the farm and the flock along with the air, the water, and the litter inputs provided during the life of the duck. The overall quality and management of these variables can make the biggest impact on what nutrients the duck needs to be at its optimum performance. Good air, water and bedding quality can reduce challenges in the duck’s environment and thus lower the nutritional requirements that are otherwise consumed and used to fuel the immune system to overcome stress events and those ever present opportunistic pathogens. Controlled environments, in my opinion, are the best way to reduce stresses, variances and diseases. They must be well maintained and kept clean to do the job right, but they can work well for the duck.

Water is one of the most essential and largest nutrients consumed. Water supplies should be tested for quality on a regular basis. Clean water free of pathogens and excessive levels of nitrates, iron and other dissolved minerals is essential for best health and performance. Water nipples should be checked every day to be sure that they are all working. Nipple drinkers reduce the amount of water ducks waste and keep the bedding in better shape. Excessive water consumption and loose stools may indicate excessively high salt levels in the feed, imbalance in other nutrients, or the presence of other irritants such as mycotoxins.

These tools guide our progress in; breeding stock selection, feed formulations, vitamin & trace mineral premixes, diagnostic tools and calibrations, equipment selection, farm management and well-being guidelines.

All the while everyone is busy doing their jobs on the farm and the management teams are monitoring each flock's performance in the field. Field data over periods of time allow the nutritionist to see if new supplements can help flocks through seasonal or farm specific challenges. Problems and trends are noted and with the help of Veterinarians and Poultry Scientists we can often get problems diagnosed in the short term.

To resolve longer term solutions feeding trials in controlled conditions are set up to evaluate ways to address the problems through nutritional supplementation, milling improvements, flock management, and veterinary therapies. Well designed trials in good facilities allow the nutritional impact of formulation changes or new supplements to be estimated and further analysis provides cost and benefit data.

When we find something that improves performance traits, well-being and quality, under these controlled conditions, we can be confident to move it to the field for broader trials and try to replicate the response. If successful we apply those changes to the feed formulas and we have a complete process of continuous improvement.

MLF Biotech, Inc. is a relatively new addition to Maple Leaf Farms and is the branch of the Maple Leaf tree that is producing our proprietary blend of Probiotics we market under the name of Liv Pro. Probiotics provide beneficial bacteria to populate the intestines and reduce opportunities for invasive pathogens to take hold in the gut flora. We have fed probiotics to our ducks for nearly two decades and refined the cultures and applications. This, in combination with prebiotic supplements to aid the colonization of the beneficial bacterial growth, was a major contribution to the fact that we do not include antibiotics in our feeds. In cooperation with our Veterinarians, if a flock needs antibiotic or other medical therapy, due to well-being concerns, they will be provided through the water application systems or by individual injection.

Another Maple Leaf Biotechnology development is our ToxiScreen method of evaluating the cytotoxic effects of various compounds. ToxiScreen is a procedure

to test for toxins in feeds, feed ingredients or water. Healthy cells, when maintained in an appropriate media, continuously divide and multiply over time. Toxic compounds interfere with the process of the cell's growth, which causes a reduction in growth rate or destruction of the cells. The degree of growth inhibition or cell death is related and indicative to the concentration of the toxic compound(s). Therefore this provides a useful tool to evaluate feed quality.

MLF Biotech Technical Services provide a complete platform of duck technology known as InDux®. This technical support is a direct result of over 40 years experience in the field of duck production. Our proprietary breeding stocks demonstrate the benefits of the InDux technology that results from Maple Leaf Farms constantly striving for improvement in our duckling performance. Advancements in genetics, biologics, formulations and management are combined to satisfy the primary goal of optimizing the potential of the duck.

Our company provides ongoing support to increase the knowledge related to duck nutrition and maintains a dedicated research staff and a full time trial building known as EPIC, the acronym for Evaluation of Performance Improvement Concepts. As of 2009, Maple Leaf Farms efforts have resulted in more than 300 research investigations with 128 nutrition based studies. We support multiple university research affiliations and are proud sponsors of the Poultry Science Association Duck Research Award.

In summary the key points of duck nutrition we consider of importance are:

- Ingredient Purchasing Standards
- Laboratory Analysis of Ingredients
- Computer Formulation
- Milling Procedures & Quality Control
- Laboratory Analysis of Finished Feeds
- Flock Management & Monitoring
- Biotechnology, Research & Trials

And always remember when investigating problems to sample the feed frequently for analysis, communicate with the nutritionist and mill on concerns, and be willing to request the feed be removed and replaced when field problems prove acute or difficult to identify to help verify if it is a feed related problem.

We are grateful for our long association with Dr. Keith Gooderham and the knowledge he has shared with Maple Leaf Farms. I appreciate the opportunity to be invited to this lecture series dedicated in his name that provides a forum for waterfowl topics. I also wish to thank the British Veterinary Poultry Association for the gracious hospitality offered during the conference.