Exploiting the breast meat potential of modern turkeys

Over the last decade the performance potential of commercial turkey strains have continuously increased due to improved genetics, nutrition and management systems. This is particularly the case in terms of live weight and breast meat yield. Breast meat only contributes 23-26% of the weight of the bird yet represents 60-70% of the income from the carcase.

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Therefore, it is of economic importance to maximise the growth of breast meat in terms of the weight of breast meat per bird and the percentage that it takes up in the carcase. The focus of this article will be on the effect of nutrition and aspects of feed management on breast meat yield and aspects of live-weight development.

Significant advances

There have been significant advances in breast meat development as selection by breeders for this trait has intensified. Typical breast meat improvement over the last 10 years is estimated at 1.6% and the annual rate of improvement is increasing and now estimated to be around +0.2% per annum.

Breast muscle is an increasing proportion of the modern genotype's body mass therefore exploiting the potential for breast meat development is important in terms of optimisation of bodyweight gain if live-weight for age is the principle objective.

The relationship between bodyweight and breast meat yield has been well demonstrated. As the turkey increases in age its bodyweight will increase and as the turkey matures breast muscle increases in size. Body tissues do not grow and develop in synchrony but in a fixed pattern as mature size is approached, muscle and fat are the last tissues to develop. Breast muscle is one of the slowest growing muscles in the body – in fact maximum growth rate of breast muscle occurs much later than that of the whole body mass.

Nutrition throughout the growing phase has an effect on breast meat yield and a feeding programme that produces the most profitable carcase, while minimising feed costs is generally sought.

Most studies have examined the effect of severe feed restrictions or reducing protein density on performance attributes, in most cases significantly reduced diet nutrient density reduces breast meat yield.

Reducing amino acid content, or a combination of essential amino acids (Lys, Met+Cys, Thr, Trp, Arg, Leu, Ile, Phe and Val) has a negative impact on breast meat yield.

The effect of amino acid reduction becomes stronger the later the restriction is imposed in the growing phase and the longer the period of restriction.

Studies show that both live-weight and breast meat yield are sensitive to nutrient restrictions and, generally, there is increased sensitivity to dietary restriction with age.

Breast meat yield is responsive to protein and amino acid levels above that required for growth. Waldroup et al., (1997a) fed large white toms diets formulated to provide 85%-120% of NRC (1994). Maximum breast meat yield was obtained at 105% of NRC recommendations. Stangeland (1999) fed diets with reduced diet protein, while maintaining essential amino acid levels. Regression analyses indicated a higher requirement for breast meat yield compared to growth (96% versus 106% of NRC).

Diet variation

The effect of variation in dietary concentration of essential amino acids depends on the amino acid being considered. Increasing threonine levels in a diet that meets basic protein requirements improves breast meat yield. There is a positive effect of increased methionine when combined with addition of betaine. Addition of betaine improved breast amount and as a percentage of carcase weight in heavy toms.

Waibel et al., (1995) supplemented 100% NRC protein diets with an additional 10% methionine and obtained a breast meat yield response in one of two studies with market turkeys. Increasing lysine levels had a positive effect on BMY and this occurs independently of the relative proportion of arginine.

Studies show that there is a positive correlation between breast meat yield and total amino acid and some specific amino acids. There is less evidence that energy density has the same degree of effect on carcase composition as amino acid density.

The addition of fat as an energy source has been used to improve growth performance, however increasing the dietary fat concentration did not significantly affect breast meat yield. Breast meat yield was reduced when the level of protein to energy (fat) in the feed was not maintained. Veldkamp et al., (2005) showed that increased dietary energy density decreased weight for age and also breast meat yield was reduced.

Feed physical form and feed processing have been shown to have a positive effect on biological performance. Feeding pelletised diets has a positive effect on feed intake resulting in increased nutrient intake. Hydrothermal processing of feed also increases digestibility of feed ingredients via modifications of starch and protein. Improvements in both crumb and

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pellet quality are associated with improved body weight gain, FCR and processing characteristics of turkeys.

Optimal feed physical quality allows the bird to consume feed efficiently resulting in less time and energy engaged in feed prehension. The texture of feed also has an effect on performance; the use of crumbed feed has been shown to improve performance of turkeys relative to feeding mash diets. Birds fed on crumbed diets have been shown to have higher live weight and greater breast meat yield than those fed mash diets.

Some forms of thermal processing technology are associated with improved pellet quality. Fancher et al., (1996) demonstrated that diets processed through an expander gave superior performance than those which were extruded. Practical means of improving pellet quality (pellet durability index) include use of materials which gelatinise and 'bind' materials, along with improved milling practices and conditioning of meal prior to pelletising.

Raw materials can have an effect on performance; breast meat yield was reduced with the inclusion of both canola meal and distillers grains with solubles, however diets containing both materials were considered limiting for both tryptophan and possibly arginine.

These findings stress the need to maintain a balanced protein diet density to ensure all the essential amino requirement levels are being met at all stages of growth.

This approach is best achieved by formulating diets to an 'Ideal Amino Acid Profile'. An ideal or balanced protein is one that contains the exact amount of amino acids needed for the animal without deficiencies or excesses. Providing a diet with the correct nutrient specification will support optimum growth and breast meat yield, however it is also important to provide ingredients which are well digested by the bird. Many turkey diets are still formulated to total amino acids because of the lack of digestibility data for turkeys.

Formulating diets to digestible amino acids optimises bird performance and also reduces the crude protein content of the diet. Reducing excess dietary nitrogen has been associated with improved bird performance, reduced enteric stress, improved litter quality and reduced condemnations, especially foot pad dermatitis.

A healthy gut

Enteric related conditions are often experienced in turkey flocks and associated with decreased performance of turkeys. Maintenance of a healthy gastro intestinal tract ensures optimal digestion and absorption of nutrients.

Antibiotic effect growth promoters have been used as a means to improve growth performance, however these have been withdrawn from the EU and are in the process of being withdrawn in the USA. Alternative approaches are being adopted to mature and stabilise the gut microflora, especially during 'vulnerable' periods where birds are more sensitive to enteric issues.

Direct fed microbial products or organic acids provided in the feed can inhibit the overgrowth of less favourable bacteria during feed changes and maintain gut integrity to reduce the likelihood of dysbacteriosis occurring.

Management of feed on the farm is critical to ensure feed is consumed consistently throughout the entire growing period. Availability of feed is critical, some turkeys need many small meals, while others will eat less often but stay longer at the feeder. Most meals are consumed within two hours of lights coming on and one hour of the lights going off, it is therefore important to have sufficient feeder and drinker space available for all birds, at all ages.

Summary

- The genetic potential of the modern turkey is continuously increasing, the industry must adapt the way birds are fed to exploit this potential.
- Changing economics means there is a need to continuously re-evaluate the diets which deliver maximum profits.
- Supporting growth and attaining maturity rapidly will support breast meat development.
- Breast meat yield is responsive to protein and amino acid levels above that required for growth. The balance of individual amino acids affects breast meat yield to a greater extent than growth.
- Providing quality raw materials and understanding the digestibility of those materials will ensure the nutrient requirements of the bird are being met.
- Supporting the gut microflora and immune system is a vital part of the approach to exploiting genetic potential through nutritional means.
- Providing texturised feed at optimal quality will support efficient nutrient intake, live-weight and breast meat development.
- Management practices will need to be adapted as stocking densities, ventilation and feed management will have an effect on exploiting the potential of the bird. ■

References are available from the author on request