

Factors Affecting Breast Meat Yield in Turkeys

Aviagen Turkeys Ltd ®



Introduction

Breast meat, in the majority of countries, is the most valuable part of the turkey carcass. While breast meat only contributes 26-28% of the weight of the bird, it probably represents 60-70% of the income from the carcass. It is therefore 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 carcass, i.e. the yield (% of the total bird weight).

Breast Meat

Breast meat yield can be expressed in several ways and so the definition of the process of cutting and calculation of data needs to be understood when talking about this subject in order that valid comparisons can be made. The method of carcass dismantling and muscle isolation varies between processing plants, the standard technique used by Aviagen Turkeys Ltd in the collection of data is defined in Technical Advice Sheet – Meat Yield Assessment.

The two components of breast meat measurements are *M. pectoralis superficialis* and the *M. pectoralis profundus*. The weight of these two muscles with all skin removed is then expressed as a percentage of the liveweight of the turkey prior to processing. Body tissues do not grow and develop in complete synchrony. Body tissue growth occurs in a fixed pattern as mature size is approached, i.e. initially there is a wave of growth of nervous tissue, followed by a wave of skeletal growth, then muscle and the latest developing tissue is fat. Similarly muscles grow and develop at different rates, and the breast is one of the latest developing muscles in the turkey.

The point in time when a turkey is killed will therefore affect the final composition of the carcass, in terms of levels of fat, bone and muscle content. In order to maximise profits and minimise wastes and costs it is important to maximise breast meat development and minimise proportions of waste tissue e.g. fat and bone. Killing turkeys at an earlier age may tend to increase the amount of bone relative to muscle and fat, whilst killing turkeys at older ages may tend to increase the ratio of fat to muscle, see figure 1.

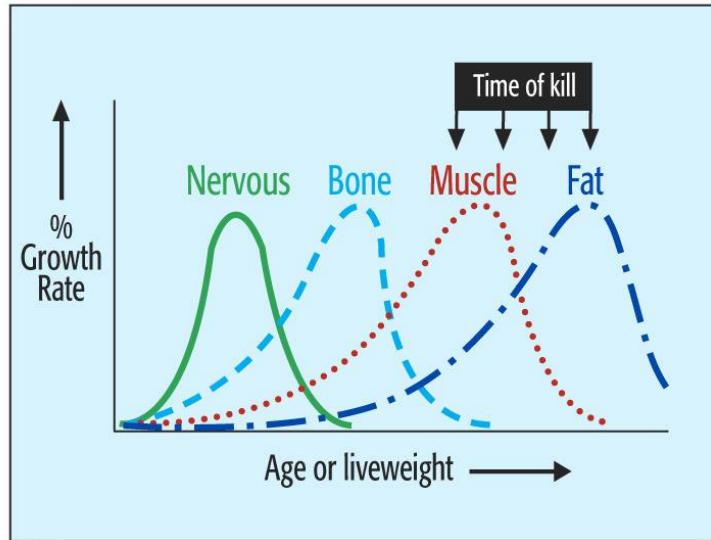


Figure 1: Tissue Growth Patterns

In commercial turkey production the deposition of the breast meat is going to occur in the second half of the growing cycle and there are many factors that can influence growth and muscle development in this period, that are summarised in figure 2.

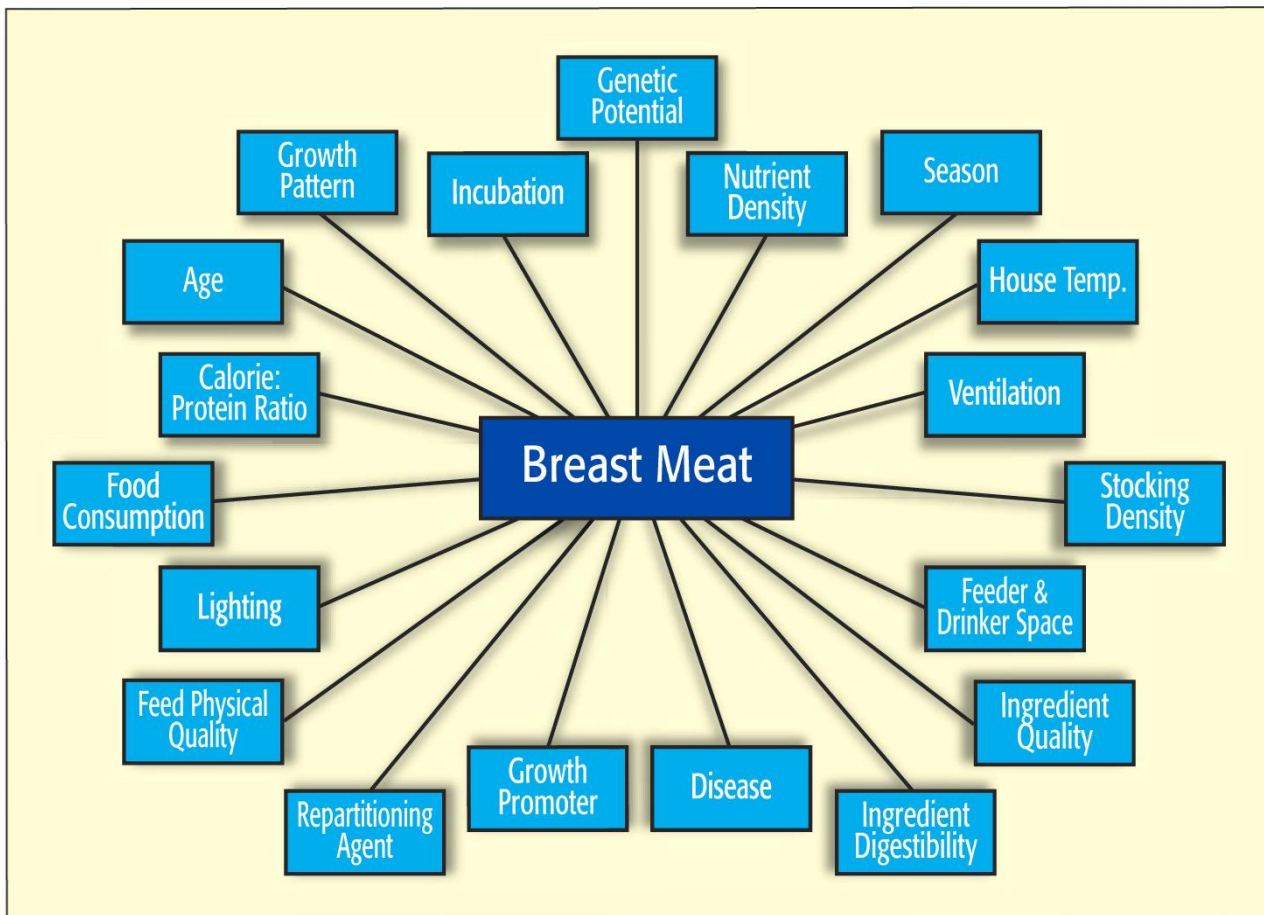


Figure 2: Factors Influencing Growth and Muscle

During this period anything that reduces the turkey's ability to express its genetic potential is going to have a negative effect on the final amount of breast meat.

Genetic Potential

Aviagen Turkeys continuously increases the potential for breast meat in all lines by selecting for increased levels of breast muscle by using either manual estimation of the live turkey by skilled operators, or through dissection of siblings from pedigree lines. As part of a balanced selection program breast meat can be enhanced in the commercial turkey by combining together lines with increased potential for breast meat. The potential of these lines can only be expressed completely if the turkeys are giving the maximum opportunity to develop this potential and the following information will highlight the points in managing turkeys that need to be considered.

Age and Weight

A common question asked is what affects the amount of breast meat – the weight or the age of the turkey. The answer is both! As the turkey increases in age its bodyweight will increase and as the turkeys get older the breast muscle increases in size. It is therefore important to understand the growth potential of the line of turkeys being grown to ensure that if the line turkeys have the potential to produce larger breasts at a later age that they are not processed early, otherwise the growers will not be processing the turkeys at an optimum point. Any shed of turkeys will have a normal distribution of bodyweights and there is a strong correlation between bodyweight and size of the breast muscle. Figures 3 and 4 show how breast meat increases as birds mature. The older the turkeys the higher the % of breast meat and the heavier birds in the population will have more breast meat than smaller ones.

The **Growth pattern** has been shown to influence the amount of breast meat through variable rates of growth relative to target development. Turkeys that are gaining weight on or above the target rate of growth in the period 15 to 21 weeks will have more breast muscle than turkeys that do not grow as quickly in this period.

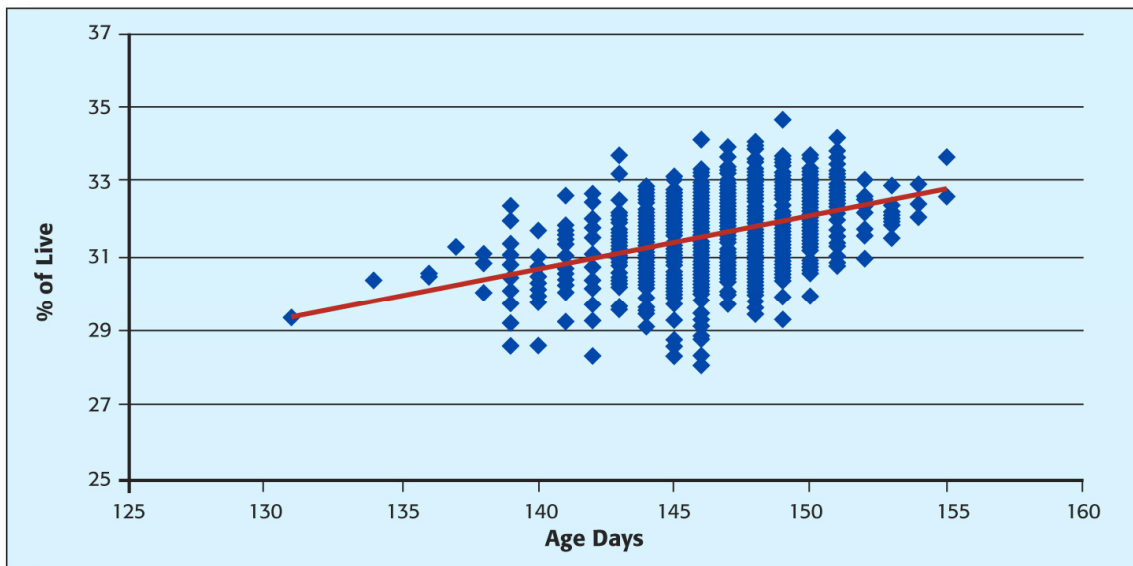


Figure 3: Breast Meat as % of Live v's Age, Days

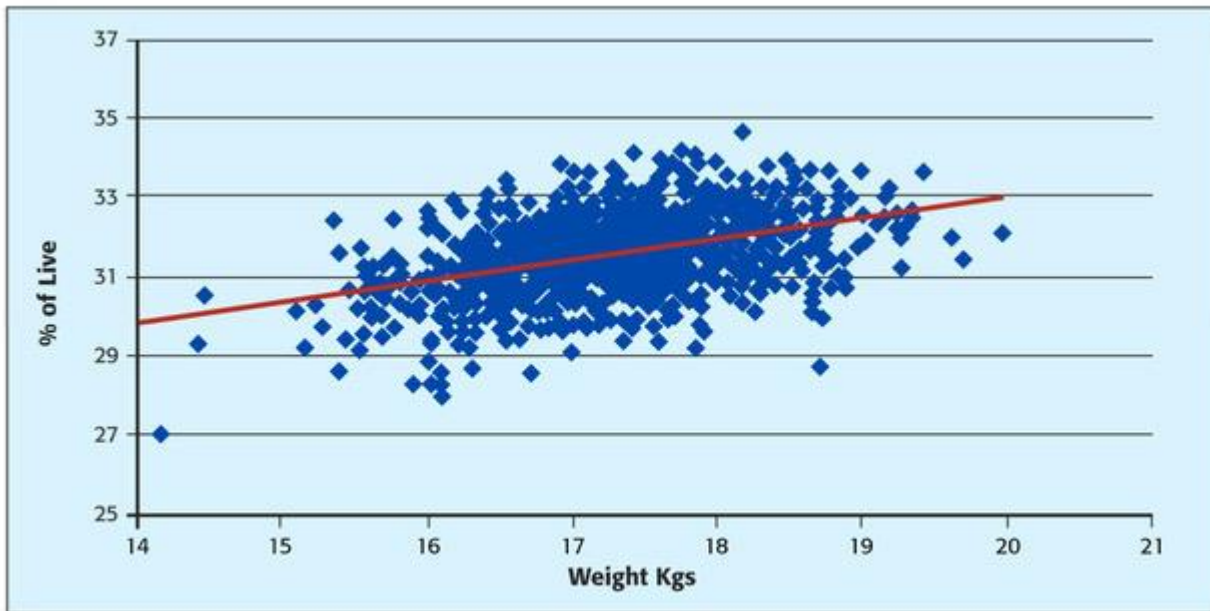


Figure 4: Breast Meat Yield as % of Live v's Liveweight

Physical Environment

To allow the turkeys to express the genetic potential they need to be grown in an environment that has the least amount of limits to their development. Factors that limit the turkey's ability to access the feed, such as the stocking density and feeding space will slow the growth from its potential and so need to be set at levels that encourage the maximum amount of time and room the turkeys have to feed. The temperature the turkeys are exposed to can also limit the development if it is outside of their thermoneutral zone. Many management factors relate to the actual temperature a turkey experiences. Due to the close proximity of other turkeys the individual bird is not always in a situation to lose or gain heat to the environment rapidly enough to control its body temperature, once the turkey is outside of its thermoneutral zone it will attempt to correct its metabolic state by altering something. In a hot environment the first action will be to reduce feed consumption which will then lead to lower growth potential.

The factors that relate to this and which can be controlled by the farmer are the stocking density, the set point temperature for the house, the type and quality of the ventilation. The season will affect the amount of breast meat through the temperature the turkeys are grown in. Even in mild summer conditions of 25-30°C the amount of breast meat will be reduced by 1-2% from the levels found in the cooler winter months. Figure 5 shows the variation in the amount of breast meat that can be seen throughout a year. Improved ventilation and evaporative cooling will offset some of the losses, but if the turkeys reduce feed consumption especially in continuous hot periods the amount of breast meat declines. Lighting levels can influence breast meat development and to maximise the weight of the breast the optimum lighting pattern should include a period of 6 to 8 hours of darkness, which appears to delay some of the sexual development in males ensuring maximum utilisation of nutrients for growth.

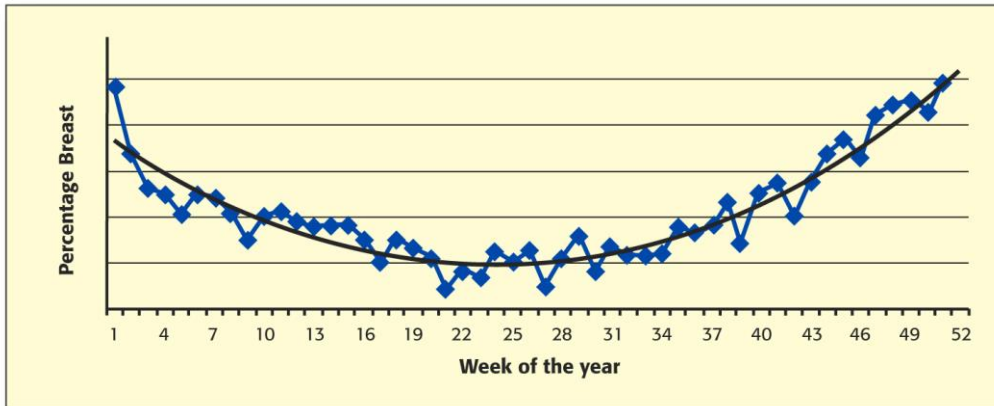


Figure 5: % Breast Yields Affected by Season

Feed Effects

Feed and feed quality can have a large influence on the amount of breast meat on the carcass. The amount of nutrients that a turkey absorbs into its body to convert into tissue is affected by many factors.

The physical quality and the presentation of the feed are key factors in achieving optimal growth and development through the amount of feed that is consumed. Turkeys can adapt too many types of feed presentation from rock hard pellets to mash and perform equally as well. What can interfere with food consumption are variations in quality. Good pellets one day followed by poor dusty feed the next will cause the turkeys to back off consumption.

The key is consistency, whether the feed is given as crumbles, pellets or mash the turkey will respond to what it is given. In the summer when turkeys will tend to consume less due to higher temperatures, especially during the day time, the quality of the feed is very important. When the temperature drops at night the turkeys need to have feed presented in an appetising form to encourage them to increase their intake, to offset what they have not eaten during the peak temperature of the day. Soft pellets and too much fine dusty meal will not encourage them to eat as much feed and this will result in poorer growth.

The quality of the ingredients being used in the diets is also very important and only good quality highly digestible ingredients should be used and this should be adapted to the age of the flock. This will ensure that the turkeys are able to utilise the feed to the maximum. For instance in diets for young poults the use of highly digestible fats, such as soya bean oil will ensure freely available energy, whereas the use of palm oil which cannot be digested by young poults leads to reduced energy availability.

All feed ingredients should be assessed for quality before inclusion into the feed to ensure that only fresh ingredients are used without moulds or mycotoxins and if they are products that contains some anti-nutritive factors these should have been properly heat processed to inactivate these.

The actual nutrient density of the diet needs to be balanced to the turkeys needs at each stage of the flock. A higher nutrient density diet with higher levels of energy and balanced protein can be beneficial in the summer to maintain performance. Selecting the correct energy to protein ratio and the levels of amino acids needs to be balanced against the prevailing economic situation. Breast meat can be increased by increasing the essential amino acids, lysine, methionine and cystine and in some circumstances threonine. These ingredients vary in cost depending on ingredient markets and justifying extra fortification of the diets needs to be balanced against the expected increase in breast meat and the value of that commodity.

Feed additives that can help the absorption of nutrients are the antibiotic digestive enhancers (ADE), however these products are no longer allowed in feeds used with the EU. Another product available in the USA is Ractopamine, a repartitioning agent that is proven to increase the proportion of breast meat when used in the correct way. This product needs to be evaluated for its cost effectiveness based on its cost versus market return for breast meat.

Disease

Turkeys are exposed to many different disease challenges and depending on the fitness of the birds or the protective measures taken by the grower they may succumb to illness. During a disease challenge the amount of nutrients processed into tissue development will decline as the turkeys defence mechanisms divert essential nutrients to support the immune response process. This usually shows up as a reduction in weight gain and maybe more variability in weight within the flock.

Depending on the treatment and the time between recovery and processing final weight and breast meat percentage can be reduced. Ensuring the turkeys are fully vaccinated against known disease challenges and using effective anticoccidial products in the feed will help to combat some of this. However various bacteria and viruses can set off an enteric challenge which can result in scouring problems and this can commonly be linked to poor nutrient utilisation by the turkeys affecting final performance and yield. Rapid diagnosis and treatment when such challenges are seen can minimise the setback in development.

Incubation

Breast muscle is made up of muscle fibres which elongate and increase in diameter as the turkey grows. The amount of muscle fibres present in the breast muscle of a turkey poult at hatch is essentially all the muscle fibres it will ever have. However during the late incubation stage the number of the muscle fibres (myofibrils) is still increasing. Adverse conditions – high temperature and low oxygen at this stage of incubation - in the hatcher during the piping stage may have a detrimental effect on the number of breast fibres that develop and so optimum conditions need to be set up.

Measurement

‘You cannot manage what you do not measure’ – consistent measurement techniques must be developed to know if the amount of breast meat being produced is increasing or decreasing. For further information see the Aviagen Turkeys Meat Yield Assessment Technical Advice Sheet at www.aviagen.com.

Due to the large number of factors affecting the amount of breast meat on a turkey large scale data collection is needed over an extended period to understand the natural variation in yields within any business and then to know whether changes within the process have been able to influence this.

Conclusion

We are in the turkey meat business and the success in developing consumption depends upon production efficiency. Our systems must recognise the need to maximise meat yield on individual birds to ensure that production costs are competitive with other meats. Breed development has focused on this opportunity and, from the contents of this article; we can see many factors that influence yield. Many of these factors can be influenced on farm .The combination of breeds with a higher meat yield potential, good quality feed and expertise on the farm can create lower the production cost of a kilo of meat. Increase your returns by managing for higher breast meat output.

Optimum Conditions to Maximise Breast Meat Yield

Age	Maximum yield will be obtained at >20 weeks of age with heavy males
Growth Pattern	Weight should be on or above target at all times, most important after 15 weeks of age
Stocking Density	Maximum density should be based on UK FAWC recommendations maximum of 45 kg/m ² at 10 weeks of age rising to 59 kg/m ² at 20 weeks of age
Temperature	Male turkeys require the lowest temperature from 10 to 16 weeks of age, to maximise breast meat and weight – this should be no higher than 15°C
Lighting	Minimum 6-6 hours of darkness from 12 weeks of age
Feed Quality	Consistency hard pellets with a PDI > 88% to maximise feed intake, if mashes are fed grist profile needs to be consistent and coarse enough to avoid separation
Feed Ingredients	Highly digestible, free from moulds and mycotoxins, properly processed to maximise nutrient absorption
Nutrient Density	See Aviagen feeding recommendations (www.aviagen.com) use highest density compatible

	with market economics
ADE	Use when permitted
Repartitioning	Use these products when they have been approved by feed regulations and consumers, if they meet market economics
Disease	Appropriate vaccination and full veterinary support allowing rapid treatment of disease outbreaks
Coccidiosis	Use approved control chemicals in the feed, ensure effectiveness by occasional rotation of products
Incubation	Optimise conditions during piping stage

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