

Factors affecting poultry meat quality

Groom G.M.

in

Sauveur B. (ed.).
L'aviculture en Méditerranée

Montpellier : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 7

1990

pages 205-210

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=CI901594>

To cite this article / Pour citer cet article

Groom G.M. **Factors affecting poultry meat quality.** In : Sauveur B. (ed.). *L'aviculture en Méditerranée.* Montpellier : CIHEAM, 1990. p. 205-210 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 7)



<http://www.ciheam.org/>
<http://om.ciheam.org/>

Factors affecting poultry meat quality

G. M. GROOM

Agricultural Development and Advisory Service (ADAS),
Ministry of Agriculture, Fisheries and Food, Cambridge (UK)

I. – Definition of meat quality

Most papers delivered at this conference have concentrated on the more scientific aspects of poultry meat quality. This paper is concerned with quality in a broad commercial sense and reviews some of the quality attributes which are important in the market place.

There are many definitions of quality, but the one which I prefer is the following since it takes into account the need to match products carefully to the demands of the market place : *"Quality is the composite of those characteristics that differentiate individual units of a product and which have significance in determining the degree of acceptability of that unit to the user"*.

Of course, price is part of the customer's appraisal of what is offered in the market place and sometimes it is the all important feature. In other market places demand massively exceeds supply and distribution is the main marketing concern. If the product has no genuine appeal, then price will certainly be the key feature.

At a recent International Meat Conference in the UK it was suggested that, at least in affluent markets, a formula which describes the current situation is :

$$\text{Value perception} = \frac{\text{Perceived benefits}}{\text{Price}}$$

It is with such markets that I am mostly concerned and with the perception of quality in those markets. I sense that as these markets are generally well supplied, the importance of quality and producing to specification is increasing markedly.

II. – Factors affecting the quality

1. Effect of rearing conditions

In reviewing some of the factors affecting the quality of poultry meat I will begin with those associated with the growing sites. Our experiments concerned with the interaction of temperature, ventilation rate and nutrition have convinced us that they do have significant effects on quality as well as on biological efficiency. In this context, quality is defined in terms of carcass composition. In general terms, cooler temperatures increased yields of lean meat in turkeys with effects on skin weights, and energy to protein ratios are important in determining the extent of fat deposition in the body cavity and in the skin. If fat has to be removed at processing time or the carcasses are to be cut up into portions, then yield is affected detrimentally. If, as is increasingly the case, the carcass is to be cooked before sale, carcasses with high

levels of fat show high losses. Carcasses and portions with high fat content when cooked at home appear to be poorer in value for money terms. This, along with the trend towards healthier eating, seems to have led to a strong demand for skinless cuts, particularly of breast meat. While a good deal of the information needed to produce poultry meat to precise compositional specification is available, genetic improvements to the stock resulting from selection programmes based on feed efficiency rather than on weight for age constitute the longer term solutions to the production of leaner carcasses. While such quality attributes are important to the processor and consumer alike, there are others which are important, either to differentiate the product or to help to ensure a repeat purchase. Eating quality resulting from tenderness, succulence and flavour is particularly important in all sectors of the market. It would be wrong not to mention here the very interesting development of the Label Rouge in France. Here the system of production features strongly in the quality of the poultry meat produced. Poultry are reared on free range, in what might be described as natural conditions and are fed whole grain, natural feeds, as a major part of their diet. Particular attention is also given to the age of the bird when slaughtered, chickens being slaughtered after a growing period twice as long as many intensive broiler chickens. Specially bred strains of poultry are also used.

Technically, differences in meat quality may be due to strain, the age and the nutritional regime, but the overtones of the intensive free range natural system are important to what seems to be an increasingly large market segment. Publicity on production methods in other sectors of the meat industry has increased consumer interest in the production methods in all systems. For some, additive free foods are the only foods considered high in quality and there is a demand in affluent markets for meats produced without the use of drugs, hormones, growth promoters, etc. Indeed, quality standards for livestock feed are now in evidence and "organically grown" and "conservation" products are now produced in modest quantities, but they do feature in supermarkets and in health food shops. Demand is quite strong and premiums are paid.

Another growing concern is animal welfare. Increasingly, poultry meat of acceptable quality needs to come from acceptable systems. A current example in our industry is the problem of burnt hocks in chickens. Here, technological problem causing serious loss of quality are linked back to the production system and are seen as an indicator of a welfare problem by the customer at point of purchase. In fact, we are finding it difficult to solve the problem in every situation, even when broiler flocks are grown to the standards set by our Codes of Practice. Similarly, in the interface between the growing and processing phase of poultry meat production (catching, crating, loading, transport, unloading and hanging onto the conveyor line), efficient and humane methods must be seen to be used if the overall quality image of the poultry meat is to remain high.

2. Effects of handling and slaughtering conditions

The problem, presented daily to both large-scale and small producers of poultry meat, is to maintain the high quality of the bird as grown by modern methods. The handling of the bird between farm and factory is paramount in this and represents the greatest cause of downgrading and therefore of financial loss. Accurate methods of investigation and analysis are required to solve downgrading problems which, of course, appear as a damaged product at the end of the factory process.

Methods of slaughter vary from country to country, but once again humane slaughter and bleeding of the carcass not only have important consequences for aesthetic and physical quality attributes, but are also a matter of animal welfare. Methods of stunning and slaughter are continuously being researched by meat research institutes.

We can probably agree that the customer will at the very least expect the carcass purchased to have been properly handled to avoid bruising and broken bones and later to have been properly slaughtered so as to avoid redness, red wings, broken wings, blood specks and toughness in the meat when carved. The customer will also, quite justifiably, expect the defeathering and evisceration to have been performed to a high standard and in a way appropriate to the product being produced, whether fresh, frozen or cooked.

What else is important? Because freshness is in many markets one of the key quality attributes in food, not just in poultry meat, hygienic standards of a high order are an important feature of quality production. It goes without saying that every effort must be made to reduce the incidence of organisms of public health significance to the lowest possible level. To meet the needs of a high volume market for fresh products, quality assurance programmes must also put very strong emphasis on the control of spoilage organisms which continuously enter the processing plant on the feet and feathers of the poultry. It therefore requires continuous vigilance to control their numbers. Here the major weapons are a fully effective cleaning programme, hygienic processes, efficient cooling and precise temperature control of the finished product.

Again, opinions vary from country to country on some aspects of these processes. There is no doubt however, that in-plant chlorination of water supplies at low levels can be a very effective adjunct to an effective cleaning programme, helping to build into the product a shelf-life long enough to facilitate distribution, retailing and kitchen preparation of the product. Nowadays customers expect to be able to select a fresh product from city supermarket shelves that will meet the needs of modern shopping patterns. Fresh bloom and the absence of strong odours in the carcass and giblets are essential quality attributes.

To achieve these ends using present day processing equipment it is necessary to use large volumes of potable water. Inevitably chicken carcasses pick up some water during the washing and cooling processes. However, a particularly controversial aspect of poultry meat quality is the water content of poultry products, especially of frozen chickens. As it happens, the EEC has one of the strictest regulations concerning this and the water content of frozen chickens is controlled in-plant by regular checks and in the market place by sampling and chemical analysis. To meet the levels set in the Regulations (2,9% and 7,4% on average for dry chilled and wet chilled frozen chickens, respectively) very close supervision and control of the washing, evisceration and chilling processes are necessary. This aspect of quality is important in the customer's perception of value for money and, of course, in trading generally. In this connection the Label Rouge production and marketing programme in France recognises that a certain segment of the market place demands poultry which is not wet chilled and has no water added during processing, so its very detailed specification includes this feature.

The last aspect of importance in relation to poultry growing and processing phases is that of appearance. There are differences between countries and markets in these requirements. The UK has for a long time shown a preference for pale coloration in the skin and for white skin, while other countries may prefer a yellow or dark yellow. The coloration may emanate from the genetic make up of the stock or from the feeding regime. If the coloration is an indication of a particular feeding regime or system, for example "corn fed" or "free range" or "extensive" systems, then it is possible that special quality is perceived and a new market created. Indeed the pigmentation other than in the skin may indicate that a specific breed or strain is used and so carry a benefit. If it happens that the shanks are pigmented, for example, then the quality attributes, perhaps of the whole production process, can be confirmed right through to the dining table. A thoroughly satisfactory experience here will lead to repeat purchases of the particular brand and this is, of course, the life blood of a modern food processing business enterprise.

3. Quality maintenance after slaughtering

The maintenance of quality in the distribution and retailing phases centres on the precise control of temperature as well as packaging and handling systems which minimise physical and chemical (taint) damage. For unfrozen poultry, low temperature around 0° centigrade extend shelf-life quite markedly and temperatures of -18°C or lower for frozen poultry are useful to maintain colour and minimise freezer burn. Packaging can also be an important element in the prospectus for high quality. For unfrozen carcasses or cuts, controlled atmosphere packaging using gas flushing and modern laminated films can be most useful in maintaining colour and freshness. The use of barrier bags to vacuum pack poultry can, along with high standards of processing and precise temperature control, also extend shelf-life to enable peak demands to be met or distant markets to be reached.

Packaging is a valuable marketing tool in other ways. It is known as the silent salesman and often is what attracts customers to recognise the product and buy. A warning may be in order here, however. If you have a distinctive pack or a well-known brand then be sure it always carries a repeatable level of product quality. Remember brand recognition can also be the signal "Not to buy!".

Packaging can maintain quality, it should also carry by way of informative labelling all legal labelling requirements and information on product use. Poor instructions on product use, storage, cooking or recipes, etc... lead to product abuse and dissatisfaction leading to an erroneous assessment of product quality by the user. After all, the only time that real quality matters is when the product is in use.

4. Evolution of eating quality

From what I have said about the Label Rouge programme you will have seen that the concept owes much to what we might call traditional methods of production. There are also some social implications and the importance of agricultural cooperation is also a significant feature. In the UK, traditional production methods are also still much in evidence, particularly for turkey production. A product we know as Traditional Farm Fresh turkey (TFF), several millions of which are sold each Christmas, features dry plucking, dry cooling and cold evisceration. This fresh product, which many believe has the highest quality of all as a whole roasting carcass, certainly has a different flavour to other turkeys and may be more uniformly tender. In most seasons it returns a handsome premium over what we might call the "supermarket turkey". However, the sales of the latter greatly exceed those of the traditional product and one particular product which is the result of developments in food technology now comes very close to the TFF turkey in acceptability : the frozen, self-basting turkey, which is injected with a patented basting material containing, among other things, butter or vegetable oils. Sales of this product exceed 30% of our market and approach 40% of the huge American market I believe. It realises a small premium over the non-basted frozen turkey and there are two brands, both of which are extensively advertised.

In this brief review I hope I have shown that quality truly is a "bundle of attributes". The marketing task is to assemble a bundle which can be produced repeatedly and if this is done carefully then it may be possible to "add value" to that particular product line.

III. – Conclusion

For many people the chance to eat a chicken meal is all they ask. For many others freshness, convenience and variety are the driving force in the market place. Indeed, as the pace quickens in the competitive environment it will be necessary for successful food products to offer quickness, quality, fitness and fun.

Annex: Examples of factors affecting carcass composition

Turkeys

1. Temperature

Effect of mean environmental temperature on percentage of white and dark meat

% evis. carcass		Temperature °C			
Stags 20 weeks		12	15	19	23
Heavy strain	White Meat	34.9	32.9	31.2	30.7
	Dark Meat	29.5	29.3	31.2	32.7

2. Nutrition

Effect of increasing lysine levels on percentage of breast meat

% evis. carcass		Lysine Levels			
Heavy strains		1	2	3	4
Stags @ 20 weeks		30.2	31.3	32.0	32.5
Hens @ 16 weeks		29.8	29.5	30.8	30.2

Levels = 1 : C x 0.9

2 : C x 1.1

3 : C x 1.3

4 : C x 1.5

Where C = 0.64 % lysine @ 20 weeks

C = 0.73 % lysine @ 16 weeks

Broilers

Nutrition

High nutrient density diets (high energy + protein) increase breast meat but also abdominal fat:

Nutrient density

% evis.		Low 11.7 MJ/kg	High 13.3 MJ/kg
Carcase		18.8 % CP	19.9 % CP
Breast Meat	Males	20.8	22.5
	Females	21.7	22.4
Abdominal Fat	Males	2.7	3.2
	Females	4.1	4.6

But by altering energy : protein ratio; narrow ratios reduce fat.

Energy : Lysine MJ/g		0.94	1.14	1.38	1.57
% evis carcasse					
Visceral Fat	Males	3.30	3.56	3.64	4.48
	Females	4.50	4.85	4.58	5.07

(Results from trials at Gleadthorpe Experimental Husbandry Farm, Ministry of Agriculture, England)