EVALUATION OF TURKEY MEAT QUALITY AT A COMMERCIAL PORTUGUESE SLAUGHTERHOUSE

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Key Words:
Meat quality, turkey, PSE-condition.

Background

The development of rigor mortis in meat is affected by many intrinsic and extrinsic factors inducing differences on the quality characteristics of meat such as pH, colour, water holding capacity (WHC) and texture. These characteristics can affect consumer acceptability and industrial rentability and have been widely studied in pork and beef. The PSE and DFD conditions are well know in pork and beef, as being affected by the susceptibility of the breed, antemortem handling during transport and at the lairage, stunning methods, slaughter technology and post-mortem processing (chilling conditions). These factors are described by Sams, (1999) as inducing differences on the quality of poultry meat, as well.

On turkey meat the PSE condition has been described in some studies (Froning *et al.*, 1978, Barbut, 1996, Santé *et al.*, 1998). Barbut (1996) has use a fast colour measuring system to evaluate the occurrence of PSE in young turkey breast meat detecting in some study flocks 18% to 34% of breasts with a L>50 and 6% to 17% appearing with a L>51. This colour parameter has a negative significant correlation with WHC and pH meat.

The consumption of raw turkey meat and processed products is very popular in Portugal, however no evaluation study has been made to assess differences on turkey meat quality.

Objective

To evaluate the quality of turkey's breast meat in a Portuguese slaughterhouse in order to differentiate the meat and obtain the best performance and acceptability for consumers and industries.

Methods

Two hundred and twenty three male turkeys from five different flocks (BUT 9 and BIG 6; 16 to 20 weeks old), slaughtered on different days, electrically stunned with a current of 225V/3s and scalded in a bath with a temperature of 81°C/5min., were evaluated to assess meat quality. On slaughter line the pH and temperature were measured on the *Pectoralis* muscle, 15 min. *post-mortem*. The carcasses were fast refrigerated in a tunnel (-2°C/2m.s^{-1}/90%H.R.) during 2h and kept in refrigeration camera (0°C/85%H.R.) until deboning (approximately 24h *post-mortem*). Colour and pH 24h post-mortem (pH_{24h}) were measured on the *Pectoralis* muscles after carcasses deboning.

Scallops of the *Pectoralis major* muscle of some of the carcasses tested were evaluated for drip loss and cooking loss.

<u>pH determination</u>: Made directly on the *Pectoralis major* muscle with a portable pH meter (PTI-9, digital pHmeter) equipped with a electrode Sentix Sp, WTW, A991409014. Each value is an average of three determinations on the muscle.

<u>Temperature determination</u>: Made directly on the *Pectoralis major* muscle with a temperature probe (HI7669/2w, Hanna Instruments) connected to a temperature meter (HI9023, Hanna Instruments)

<u>Colour</u>: On the internal side of the *Pectoralis major* muscle with a Minolta Colorimeter CR-300 (Minolta, Osaka, Japan) using the L, a, b, coordinates (CIELAB colour system), each value being the arithmetic mean value of nine determinations.

<u>Drip loss</u>: Scallops were individually packed and stored at 0°C for 3 days. Drip was evaluated as the loss of weight during this time relative to the initial weight.

<u>Cooking loss</u>: Scallops were weighted, vacuum packed and cooked at 85°C for 15min. After being cooled to 0°C, scallops were weighted again; the loss of weight is expressed in percentage.

Results and discussion

The population evaluated exhibited a $pH_{15\,min.}$ range from 5,71 to 7.00 with a mean value of 6.43 on *Pectoralis* muscles. Being the pH a measure of the glicolysis rate, 4.5% of carcasses denoted a rapid decline with a pH<6.0 at 15min. postmortem, showing a negative correlation (-0.456, Table 1) with muscle temperature (average of 41,7°C, range from 38.8 to 43.4°C). All these cases had a pH_{24h} inferior to 5,9 as we can see on Figure 1, however there isn't any correlation between $pH_{15\,min.}$ and pH_{24h} or between $pH_{15\,min.}$ and the L value. Slow glicolysis muscles can achieve low pH values. In fact no muscle with a rapid glicolysis rate had higher L values, on the contrary they showed lower L values with higher a values.

The average of pH_{24h} on *Pectoralis* muscle was 5.81 (Standard deviation = 0.11) with a minimum value of 5.52 and a maximum of 6.19. The negative correlation found between pH_{24h} and the L value is moderately significant (-0.489, Table 1). Cooking losses vary from 9.69 to 29.01 with an average of 16.23 and are significantly correlated (0.537) with the L value.

Attending to Barbut (1996) criteria, who had reported a significant correlation between the L value and pH_{24h} (-0.71) and WHC, the frequency of muscles with an L>50 in the study population was 25/223 (see Figure 2) corresponding to 11.2% presenting a PSE-condition. Nevertheless Figure 2 also reported extreme cases of very dark muscles. These conditions aren't very acceptable to the consumer who prefers a light pink muscle. Santé *et al.* (1998) refer that a low pH<5.8 and high breast muscle temperature (above 35°C) may cause protein denaturation leading to PSE meat. This could explain why the majority of samples with L value over 50 have a pH<5.8 (Figure 3), 8,97% of the study population. On the opposite end of the scale we can find the majority of samples showing an L value under 43 with a pH>5.8, corresponding to 13% of the population. These darker muscles will also show an earlier degradation of their organoleptic and microbiologic characteristics (Allen *et al.*, 1998). This panorama reveals an economic loss either because the meat is less acceptable to the consumer or to the industry.

Table 1: Pearson's correlation coefficients for meat quality parameters.

Quality Parameters	pH 15min. (n=223)	Temperature (n=223)	pH 24h (n=223)	L (n=223)	a (n=223)	b (n=223)	Drip loss (n=38)	Cooking loss (n=38)
pH 15min.	1.000	-0.456 **	0.095 ns	0.077 ns	-0.312 **	0.068 ns	-0.290 ns	-0.056 ns
pH 24h	0.095 ns	0.060 ns	1.000	-0.489 **	-0.184 **	-0.365 **	-0.491 **	-0.304 ns
L	0.077 ns	-0.219 **	-0.489 **	1.000	-0.383 **	0.394 **	0.139 ns	0.537 **

ns= not significant
** Correlation is significant at 0.01 level

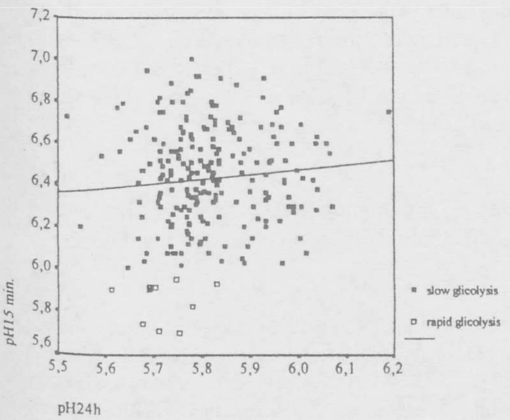

Figure 1: Relationship between $pH_{15\ min.}$ and pH_{24h} values of turkey breast muscles in the study population.

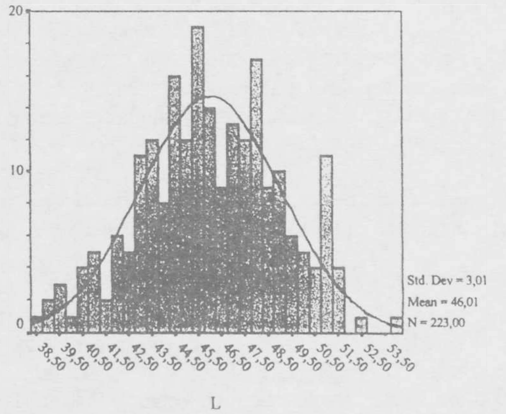

Figure 2: Histogram of L value of turkey breast muscles in the study population.

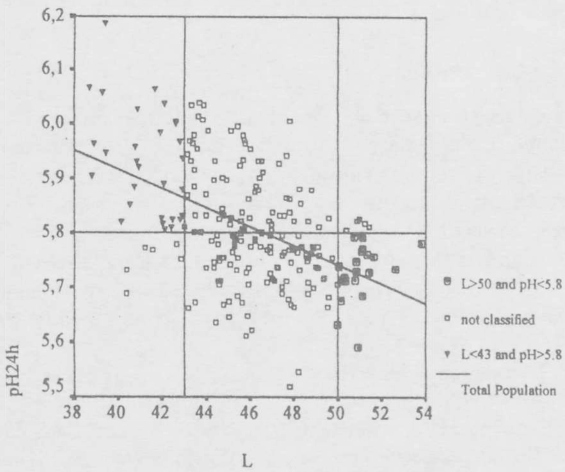

Figure 3: Relationship between pH_{24h} and L values of turkey breast muscles in the study population.

Conclusions

Almost 23% of the turkey breast muscles measured were evaluated as being too dark or too light, compared to the consumer standard of color acceptability. About 9% of the meat have PSE characteristics, with low pH and higher cooking losses. The relationship between pH_{24h} and L value could be useful for the quality differentiation of turkey meat, making it possible to use this meat adequately by the industry.

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