VARIATION IN THE COLOUR OF BRAZILIAN BROILER BREAST FILLET

Adriana L. Soares[1], Jorge A.F. Lara[1], Elza I. Ida[1], Paulo D. Guarnieri[2], Rubison Olivo[3] and Massami Shimokomaki[1,2]
[1]Graduate Program in Food Science, Department of Food and Drugs Technology, Agricultural Sciences Center, Londrina State University, P. O. Box, 6001, CEP 86051-970-Londrina, PR, Brazil; [2]Graduate Course on Food Science, Faculty of Pharmaceutical Sciences, Sao Paulo University, Sao Paulo, Brazil; [3]Globalfood-Advanced Food Technology, São Paulo, SP.

Background

Brazil is the second country in the world for chicken meat production. In the year of 2001, 6.74 millions tons of chicken were produced and the volume for export was 1.25 million tons for 2001 (UBA, 2002). A variety of colour from yellow to red colour is observed in a commercial display for broiler fillets, *Pectoralis major*. The reason for this colour variation has several origins and probably is the consequence of pre-slaughter animal handling conditions like genetic, nutrition, transport and in particular, handlings just before killing and postmortem meat physiology and biochemistry. In view of the recent discovery, in fact, this colour would define at least three types of poultry meat: DFD-like, dark, firm and dry, Normal, and PSE-pale, soft and exudative meat. DFD like has been known to exist in cyanotic chicken carcasses in North America and cases have been reported for condemnation that has a high pH and dark colour (Mallia et al., 2000). PSE meat is a common abnormality found in Brazil (Olivo et al., 2001), North America (Barbut, 1997) and United Kingdom (Wilkins et al., 2000) and presents a low pH and light colour. This work describes a survey of broiler breast fillet colour in a commercial line in Brazil.

Objective

To evaluate the variation of broiler breast fillet colour and its relationship with pH values in a commercial plant.

Methods

Birds from *Cobb* lineage were killed in a commercial plant conditions. After slaughtering and carcasses being refrigerated through water chiller, *Pectoralis major* muscle (n=353) was removed and stored for 24h at 6°C. The pH was measured by inserting electrodes into the breast muscle using a Sentron 1001 pH meter system and a portable Minolta® CR 10 colorimeter was used to evaluate the colour, L* a* b* values, on the posterior surface of the intact skinless *Pectoralis major* muscle (Olivo et al., 2001). Experiment was carried out on January, 2002, one of the hottest month in the south of Brazil. The data was analyzed using Tukey's test, ANOVA and linear regression (STATISTICA). The processing plant, where this work was carried out, is one of major producers of chicken meat and is likely to be representative of Brazil poultry meat industries.

Results and discussions

A survey was conducted to evaluate the colour and pH of chicken breast fillet in a commercial line. A considerable variation in meat colour was observed. From the results shown in Figure 1 it can be observed that the distribution of L* values vary from 38.57 (dark) to 58.50 (pale), being the average of 49.37. Overall, these results were lower than the normally reported from UK that are from 45.00 to 67.30, respectively, a mean of 55.20 (Wilkins et al., 2000). In addition, L* values reported in North America were somehow similar to Brazil's, such as from 35.30, dark, to 55.50, pale, an average of 47.10 (Barbut, 1997). Qiao et al (2001) in USA, analyzed samples from three different commercial plants and obtained results of lighter than normal (L*>53), normal (48< L*< 53), and darker than normal (L*<46), similar to the results reported herein. Therefore, we can select for Brazilian broiler breast fillet three regions to relate fillet colour to meat condition forms. From the Figure 1, we can assume L*< 44.0 as DFD-like, L*>53.0 as PSE and finally 44.0≤ L* ≤ 53.0 should be values for normal breast fillet colour. Taking these values into consideration, our results indicated the incidence was 5.95% for DFD-like meat, 15.86% for PSE meat and finally, 78.19% for normal meat colour. The obtained low percentage of DFD-like meat was predictable because this abnormality seems to happen during winter season (Mallia, et al., 2000).

The overall average pH_{24h} was 6.18 ± 0.13. The relationship between pH and breast meat colour was investigated as shown in Figure 2. A highly significant negative Pearson correlation (r=- 0.6181, p<0.001) was found where decreasing pH_{24h} was associated with increasing lightness. A similar relationship between pH_{24h} and b* values was found (r= - 0.3473, p<0.001).

In Table 1, is shown a significant difference among the three colour groups in L*, b* values. However, pH values were only significantly different between PSE and both normal and DFD-like samples. Our results point out the possibility of having L* value determination to select samples from different meat condition accordingly to the functional properties required for the eventual meat to be processed.

Conclusions

There is an indication of differences in raw broiler breast meat colour in Brazilian poultry industries and these colour results may be used by poultry processor as indicator of fillets with different functional properties.

References

BARBUT, S. (1997). Problem of pale soft exudative meat in broiler chickens. *British Poultry Science*,38:355-358.
MALLIA, J.G. et al (2000).Roaster breast meat condemned for Cyanosis: a Dark Firm Dry-like condition?. *Poultry Science*, 79:908-912.
OLIVO, R. et al (2001).Dietary vitamin E inhibits poultry PSE and improves meat functional properties. *Journal of Food Biochemistry*, 25:271-283.
QIAO, M. et al (2001).The effect of broiler breast meat color on pH, moisture, water-holding capacity, and emulsification capacity. *Poultry Science*, 80:676-680.
UBA-União Brasileira de Aves- Brazilian Poultry Associantion (2002). Report.
WILKINS, L.J. et al (2000). Variation in the colour of broiler breast fillets in the UK. *British Poultry Science*, 41:308-312.

Acknowledgments

ALS and JAFLA are under CAPES and CNPq scholarship respectively, and EII and MS are CNPq Research Fellows.

Table 1-Meat quality characteristic of DFD-like, pale and normal coloured broiler breast fillet (n=353)

Samples	pH	L*	a*	b*	a*/b*
DFD-like	$6.27^{a} \pm 0.12$	$43.06^{c} \pm 2.07$	$2.23^{a} \pm 1.16$	$10.36^{c} \pm 1.46$	$0.2090^{a} \pm 0.0898$
Normal	$6.20^{a} \pm 0.12$	$48.88^{b} \pm 2.49$	$2.32^{a} \pm 1.18$	$11.66^{b} \pm 1.44$	$0.1969^{a} \pm 0.0921$
PSE	$6.05^{b} \pm 0.11$	$54.71^{a} \pm 1.41$	$2.11^{a} \pm 1.29$	$13.19^{a} \pm 1.50$	$0.1566^{a} \pm 0.0803$

Means within column no common superscript differ significantly ($p<0.001$)

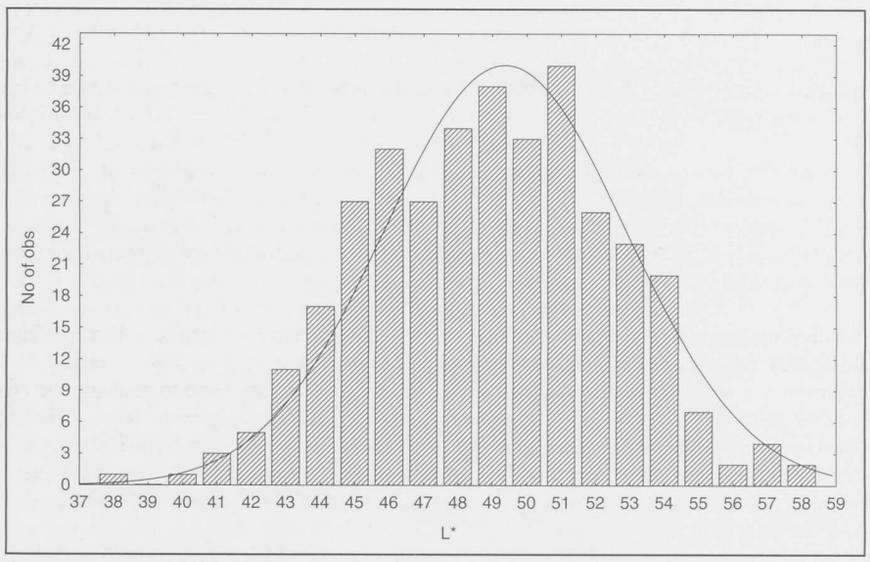

Figure 1 – Histogram representing L* value distribution in broiler breast fillets (n=353)

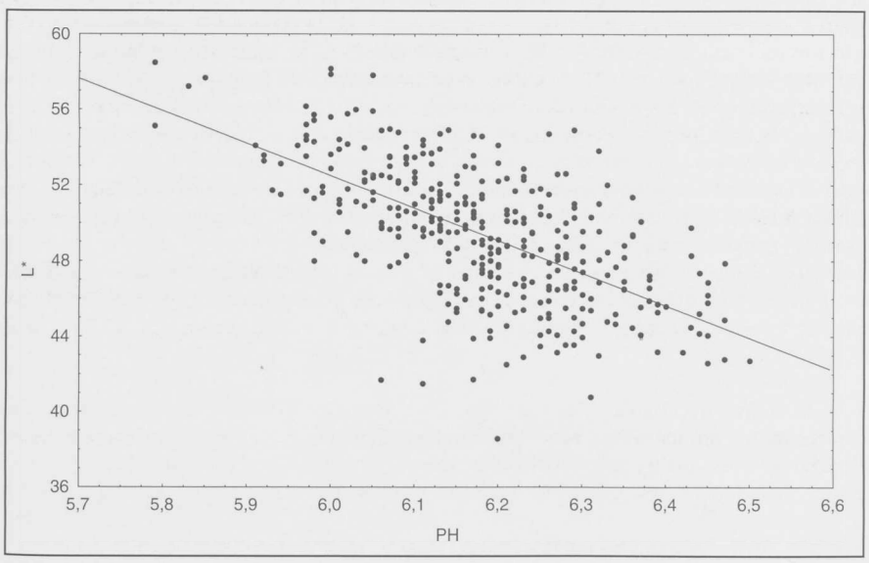

Figure 2 – The relationship between pH and L* values in broiler breast fillets (n=353)