

QUALITY ISSUES OF BROILER BREAST MEAT ABNORMALITIES

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Abstract – This study aimed at investigating the implications of the occurrence of novel muscle abnormalities on quality traits and proximate composition of meat. For this purpose, two experiments were run by using a total of 80 *Pectoralis major* muscles, classified according to the presence of white-stripping, wooden breast and poor cohesion defects and analyzed in order to assess ultimate pH value, colour and proximate composition. Overall, the occurrence of muscle abnormalities significantly affected ultimate pH and proximate composition of meat. In detail, significantly higher ultimate pH values, moisture, lipid and collagen contents coupled with a remarkably lower protein level were found in the *Pectoralis major* muscles affected by novel abnormalities. Thus, the occurrence of novel abnormalities, either alone or combined on the same *Pectoralis major* muscle, did not impair only appearance of breast meat but also led to altered traits.

Key Words – poor cohesion, white-stripping, wooden breast

I. INTRODUCTION

In the past few decades, the meat industry of the Western countries has experienced an overall increase in the demand of poultry meat. Therefore, selection programs were carried out for several years in order to increase the production traits in broiler chickens and obtain high-growth rate and breast yield hybrids. However, changes in muscle structure and its metabolic status led to a remarkable increased incidence of several muscular abnormalities mainly affecting the *Pectoralis major* muscles. Among them, white-stripping (WS), wooden breast (WB) and poor cohesion (PC) or “spaghetti-meat” defects are of relevant importance with an overall incidence up to 47% in high-breast yield hybrids flocks [1]. Within this scenario, this study aimed at investigating the implications of the occurrence of these muscle abnormalities on quality traits and proximate composition of meat.

II. MATERIALS AND METHODS

Experiment 1. A total of 40 boneless, skinless, broiler *Pectoralis major* muscles were selected at 3 h *post-mortem* from a homogeneous flock (males, 52 d of age and 3.7 kg of live weight at slaughter) in the deboning area of a commercial processing plant and classified according to the presence of WS and WB abnormalities: 10 Normal (N), 10 WS, 10 WB and 10 WS/WB.

Experiment 2. A total of 40 broiler *Pectoralis major* muscles were selected from a homogeneous flocks (males, 47 d of age and 2.8 kg of live weight at slaughter) and classified according to the presence of WS and PC defects: 10 Normal (N), 10 WS, 10 PC and 10 WS/PC.

Meat quality analysis. At 24 h *post-mortem*, colour (CIE; L* = lightness, a* = redness and b* = yellowness) was measured in triplicate on the bone-side surface of the *Pectoralis major* muscles using a Chroma Meter CR-400 (Minolta Corp., Milan, Italy). Subsequently, a sub-sample was excised from the cranial portion of the fillet and used to assess ultimate pH value. Then, after being finely ground, the samples were used to assess moisture, protein and lipid (following standard methods [2]) and collagen content as well [3].

Statistical analysis. In each experiment, data were analysed by one-way ANOVA considering the muscular abnormality as the main variable and means were separated with Tukey's-HSD multiple comparison test.

III. RESULTS AND DISCUSSION

Overall, as shown in Tables 1 and 2, the findings of the present experiments revealed that the occurrence of muscular abnormalities resulted in significantly higher ultimate pH values, ascribable to an altered glucose metabolism [4]. With regard to proximate composition, significantly higher moisture and lipid contents coupled with an overall reduction in protein level were found in *Pectoralis major* muscles affected by muscular abnormalities. Likely, these differences are related to the alterations in muscle structure

previously observed in WS and/or WB cases [5]. Similarly, the increased collagen content observed in WB (Table 1) can be explained by considering fibrosis and the increased deposition of loose connective tissue [5,6].

Table 1 Effect of white-stripping (WS) and wooden breast (WB) abnormalities, alone or combined, on quality traits and proximate composition of meat (Experiment 1). ^{a,c} = P<0.05; esm = standard error of mean; NS = not significant.

Item	Abnormality group				esm	P-value
	Normal	WS	WB	WS/WB		
Ultimate pH	5.87 ^b	5.99 ^b	6.00 ^b	6.05 ^a	0.02	<0.01
Lightness (L*)	54.50	53.11	54.23	52.52	0.34	NS
Redness (a*)	0.82	1.15	0.99	1.41	0.11	NS
Yellowness (b*)	3.92	3.83	3.58	3.62	0.14	NS
Moisture (%)	73.78 ^c	74.78 ^{bc}	77.26 ^a	74.99 ^b	0.34	<0.001
Protein (%)	24.65 ^a	22.98 ^b	21.60 ^b	22.06 ^b	0.36	<0.01
Lipid (%)	0.85 ^c	1.27 ^b	1.07 ^b	1.66 ^a	0.08	<0.001
Collagen (%)	1.15 ^b	1.20 ^b	1.42 ^a	1.34 ^{ab}	0.04	<0.05

Table 2 Effect of white-stripping (WS) and poor cohesion (PC) abnormalities, alone or combined, on quality traits and proximate composition of meat (Experiment 2). ^{a,c} = P<0.05; esm = standard error of mean; NS = not significant.

Item	Abnormality group				esm	P-value
	Normal	WS	PC	WS/PC		
Ultimate pH	5.90 ^b	6.15 ^a	6.02 ^{ab}	6.11 ^a	0.02	<0.001
Lightness (L*)	55.47	55.72	56.88	56.60	0.36	NS
Redness (a*)	0.48	0.38	0.99	0.95	0.14	NS
Yellowness (b*)	11.10	10.80	13.16	13.53	0.50	NS
Moisture (%)	75.33 ^b	76.88 ^a	75.83 ^{ab}	76.56 ^{ab}	0.19	<0.001
Protein (%)	23.81 ^a	21.71 ^b	22.36 ^b	21.73 ^b	0.23	<0.001
Lipid (%)	1.43 ^b	1.71 ^b	2.59 ^a	2.58 ^a	0.12	<0.05
Collagen (%)	1.20	1.12	1.16	1.11	0.01	NS

IV. CONCLUSION

The occurrence of novel abnormalities, either alone or combined in the same *Pectoralis major* muscle, not only impaired appearance but also led to altered quality traits of breast meat. In detail, significantly higher ultimate pH values, moisture, lipid and collagen contents coupled with a remarkably lower protein level were found in *Pectoralis major* muscles affected by abnormalities. As a consequence, since these abnormal meats are normally downgraded, care should be taken in order to properly divert them for further processing.

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