UNCOVERING NOVEL INSIGHTS INTO MEAT QUALITY AND POULTRY WELFARE: A COMPARATIVE ANALYSIS OF DIFFERENT SLAUGHTER TECHNIQUES

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I.   INTRODUCTION

Slaughtering is a critical step in the meat production process that affects meat quality, safety, public health and animal welfare. Different methods of slaughter can have an impact on post-mortem muscle metabolism and animal welfare, and the practise of slaughtering animals without stunning is controversial. This study aims to assess the stress parameters influencing welfare and meat quality with different slaughter techniques in slow growing broilers.

II.   MATERIALS AND METHODS

A total of 75 slow-growing broiler chickens (50-day-old males, Plymouth Rock x Red Cornish breeds, multi-coloured) were divided into three experimental groups (Jhatka slaughtered [JS], Halal slaughtered [HS], and slaughter with electrical stunning [ES]) in a completely randomised design. The experiment was replicated on five different occasions with 5 birds in each group (n=25). In JS and HS groups, birds were slaughtered without any stunning. After slaughter, blood and meat samples were collected and analysed for stress-indicating markers, including blood biochemical, enzymatic, and hormonal changes, as well as meat quality parameters. Statistical analysis using a two-way ANOVA was performed with OriginPro software to evaluate the impact of the three slaughter methods during post-mortem storage at 1, 4, 8, 12, and 24 h, considering repeated measures for welfare and meat quality parameters. Least-square means were determined for significant F tests (P<0.05) and differentiated using least significant differences.

III.   RESULTS AND DISCUSSION

The Lactate dehydrogenase (LDH) level was markedly elevated (P<0.05) in electrically stunned (ES) birds relative to Halal slaughtered (HS) and Jhatka slaughtered (JS) group (Table 1). Additionally, the HS group showed a lower (P<0.05) level of creatine kinase (CK) compared to the ES and JS groups. The LDH and CK were reported extensively as indicators of stress and their increased concentration in plasma reflect changes in tissue function or sign of cell injury [1]. The JS group had a higher (P<0.05) level of cortisol and triiodothyronine (T3) compared to the ES and HS groups, and the blood glucose level, creatinine, total protein, alanine aminotransferase (ALT), aspartate aminotransferase (AST), and thyroxine (T4) were found to be nonsignificant (P>0.05) between the three groups. Stress and muscular strain are indicated by elevated blood LDH levels and CK activity [2]. In general, the birds slaughtered with ES and JS exhibited higher level of stress markers relative to HS.
Bleeding efficiency was lowest in ES relative to JS and HS groups. Halal slaughter presented the maximum bleeding compared to others, which might be due to the incidence of ventricular fibrillation and arrest of the heart during application of electric shock (stunning) [3]. The stress induced in ES and JS may cause vasoconstriction limiting the blood flow compared to halal (non-stunned) birds [4]. The meat quality study revealed increase (P<0.05) in the pH levels of the JS group during the 1 h and 4 h post-mortem period as compared to the HS and ES groups. However, there were no significant differences (P<0.05) in pH levels among the three groups during the 8 h, 12 h, and 24 h post-mortem period. No significant difference (P<0.05) in R value, *L* and *b** values was observed among the groups throughout the post-mortem storage period. Higher (P<0.05) *a** value was found in ES followed by HS

and JS group during 1 h post-mortem storage period. Similar results were reported for electrically stunned and non-stunned chicken breast samples [5]. The ES group showed a higher (P<0.05) WHC followed by JS and HS groups. Higher WHC might be due to the Net charge effect [6]. The JS group exhibited a lower (P<0.05) cooked pH than the HS and ES groups. The HS group had higher (P<0.05) shear force than JS and ES groups. However, no significant differences were observed in TBARS, cooking loss %, and MFI % among the JS, HS, and ES groups.

Table 1. Blood biochemical and physio-chemical properties of breast muscle of broiler chickens with different slaughter techniques

	JS	HS	ES	RSE	P-value
Blood biochemical parameters					
Glucose (mg/dl)	244[a]	239[a]	212[a]	0.670	0.096
Creatinine (mg/dl)	0.35[a]	0.40[a]	0.40[a]	0.732	0.125
Total protein (g/dl)	4.95[a]	5.25[a]	4.25[a]	0.808	0.115
Lactate dehydrogenase (LDH) (U/L)	766[ab]	596[b]	863[a]	0.880	<0.05
Creatine kinase (CK) (U/L)	4144[a]	1601[b]	6063[a]	0.847	<0.01
Aspartate Transferase (AST) (IU/L)	240[a]	219[a]	208[a]	0.764	0.302
Alanine aminotransferase (ALT) (IU/L)	18.6[a]	21.6[a]	13.7[a]	0.833	0.15
Cortisol (µg/dl)	0.21[a]	0.15[b]	0.14[b]	0.521	<0.01
Triiodothyronine (T3) (ng/dl)	2.10[a]	1.50[c]	1.88[b]	0.868	<.0.001
Thyroxine (T4) (µg/dl)	3.45[a]	3.56[a]	3.43[a]	0.923	0.315
Meat quality parameters					
Bleeding efficiency (%)	3.61[b]	4.52[a]	2.74[c]	0.812	<0.05
WHC (%)	32.1[b]	30.8[c]	35.0[a]	0.660	<0.001
TBARS	0.04[a]	0.04[a]	0.04[a]	0.863	0.949
Cooked pH	6.28[a]	6.08[b]	5.94[b]	0.539	<0.01
Cooking loss (%)	29.2[a]	30.7[a]	30.3[a]	0.862	0.269
Shear force (N)	14.8[b]	19.3[a]	15.5[b]	0.859	<0.001
MFI (%)	28.4[a]	28.5[a]	28.6[a]	0.860	0.989

[a–c] Means without a common superscript were determined to be significantly different between slaughter methods. JS-jhatka slaughter; HS – halal slaughter; ES – electrical stunning; RSE – residual standard error

IV.   CONCLUSION

The findings indicate that different slaughter techniques had an impact on meat quality as well as animal welfare. By comprehending the changes that occur during the slaughter process, producers can make well-informed decisions about ways to enhance meat production and animal welfare standards.

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