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Research Article

EFFECT OF CONVENTIONAL AND SCIENTIFIC SLAUGHTERING METHODS ON CHICKEN QUALITY

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The present study was conducted to evaluate the effect of two different slaughter methods viz., conventional and scientific for identifying different microbial hazards, associated with different stages of poultry slaughtering. Meat samples were collected from different places and are subjected for microbial assessment, physico-chemical parameters and sensory attributes. It was found that total plate count (TPC) and phychrotropic count (PC) level in chicken, slaughtered by conventional method are significantly higher than that of in scientific method. The pH water holding capacity (WHC) and extract release volume (ERV) values of chicken slaughtered by the conventional method were significantly low than that of scientific method. The thiobarbituric acid (TBA) value of conventional method was also higher than in scientific method. The meat obtained from conventionally processed birds showed an early incipient spoilage due to poor hygienic practices.

Key words: Broiler, Chicken quality, Conventional and scientific methods

Poultry is one of the fastest growing segments of the agricultural sector in India with around 8-10% growth rate per annum during the last 40 years and also contributing about seventy thousand crores of rupees to the national GDP and also provides employment to more than 4 million people (Chatterjee and Rajkumar, 2015). But these birds are slaughtered through conventional way and only about 10% of the total birds are slaughtered and processed in modern processing plant (Das and Biswas, 2003). Therefore, a very common question is asked by the

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consumers about the status of such poultry birds in terms of their hygienic standards (Das *et al*., 2004). With the implementation of FSSAI Act and Regulation-2011, this question is becoming more evident and pressures are on from different sectors about the quality of broiler meat processed under such methods of slaughtering. On this background, a study has been conducted to evaluate the effect of conventional and scientific methods on chicken quality with different associated parameters.

MATERIALS AND METHODS

The present study was conducted simultaneously where collection of samples are done both from chickens slaughtered by conventional method (CM) and scientific method (SM). The procedure of scientific method was followed as per the method adopted by the Das *et al.*, 2004 and samples of conventional method were collected from the birds slaughtered and dressed in road side slaughtering places as it where it basis.

The meat samples for conventional slaughter were collected from the local markets of Basirhat, Dumdum, Rajarhat and Bangaon of North 24 pgs district of West Bengal and immediately preserved and stored in a ice-pack container maintaining the temperature (4 ± 1^0C) and carry to the Department of Livestock Products Technology for further experiment. Total 40 nos. of sample were collected randomly (10) from each place. Similarly, for chicken samples slaughtered under scientific method were collected from departmental small poultry processing unit (10) and from Haringhata meat processing plant (10). All these samples viz 20 each were put for evaluation of the different parameters.

Following parameters were studied for all 60 samples for comparison of both the methods.

Physico-chemical characteristics: Water holding capacity (WHC) was determined by modifying the method of Hughes *et al*. (1997) as outlined by Cengiz and Gokoglu (2007). Extract release volume (ERV) and thiobarbituric acid (TBA) were estimated as per the procedures described by Pearson (1968) and Tarladgis *et al*. (1960) respectively. The pH of meat sample was estimated by the standard method (Egbert *et al.*, 1992).

Microbiological parameters: Total plate count (TPC) and phychrotropic count (PC) were carried out as per standard procedures estimated by methods as mentioned by APHA (1992).

Sensory parameters: Cooked samples were organoleptically evaluated for tenderness by 10 member's sensory panel using 8 point descriptive scale (Keeton *et al.*, 1984).

Statistical analysis of the data obtained was carried out using ANOVA technique according to the method described by Snedecor and Cochran (1989).

RESULTS

The mean values of the results of pH (Table 1) of meat samples slaughtered under scientific method at Haringhata meat plant and departmental poultry processing unit were 5.89±0.026 and 5.91±0.003 respectively and the results of pH from the samples slaughtered under conventional methods at Basirhat, Dumdum, Rajarhat and Bangaon were recorded, 6.1±0.129, 6.25±0.398, 5.98±0.033 and 5.95±0.025 respectively. There was no significance difference between these pH values of the meal samples slaughtered in scientific methods. While comparing the pH values in different places of conventional slaughtering, it was noticed that the pH values of Basirhat and Dumdum were significantly higher ($p<0.05$) than Haringhata meat plant and Departmental

Table 1. Effect of scientific and conventional methods on quality attributes of chicken (Mean ± SE)

	Location	Physico-chemical parameters				Microbiological evaluation		Sensory evaluation
		pH	WHC (cm^2)	ERV (mL)	TBA (mg malonaldehyde /kg)	TPC (log cfu/cm^2)	PC (log cfu/cm^2)	TC
Scientific method	Haringhata meat plant (10)	5.89^{a} ± 0.026	2.13^{a} ± 0.036	17.50^{a} ±0.877	0.400^{a} ±0.023	3.91^{a} ±0.028	1.71^{a} ±0.032	5.10^{e} ±0.012
	Departmental poultry slaughter unit (10)	5.91^{a} ± 0.003	2.10^{a} ±0.024	17.00^{a} ±0.008	0.405^{a} ±0.008	3.89^{a} ±0.035	1.70^{a} ±0.024	5.00^{e} ±0.001
Conventional methods	Basirhat (10)	6.10^{ab} ±0.129	1.96^{b} ±0.047	12.90^{c} ±0.023	0.450^{ab} ±0.032	5.15^{c} ±0.048	3.48^{b} ±0.029	4.90^{c} ±0.018
	Dumdum (10)	6.25^{b} ±0.398	1.93^{b} ±0.014	12.70^{c} ±0.037	0.410^{abc} ±0.031	5.70^{e} ±0.022	3.91^{d} ±0.031	4.80^{d} ±0.067
	Rajarhat (10)	5.98^{ab} ±0.033	1.91^{bc} ±0.014	14.20^{b} ±0.067	0.426^{bc} ±0.196	4.98^{b} ±0.028	3.55^{c} ±0.034	4.60^{a} ±0.070
	Bangaon (10)	5.95^{ab} ±0.025	1.87^{c}± 0.026	13.80^{b} ±0.023	0.380^{c} ±0.022	5.42^{d} ±0.030	4.12^{e} ±0.043	4.70^{b} ±0.041

Means in the same column bearing different superscript differ significantly ($p<0.05$)
WHC= Water holding capacity, ERV= Extract release volume, TBA= Thiobarbituric acid, TPC=Total plate count, PC= Phychrotropic count , TC= Tenderness score (8 point scale- 8 denoted extremely desirable and 1 denoted extremely poor)

meat processing unit where scientific slaughtering were conducted.

The mean values of the results of WHC (Table 1) of meat samples slaughtered under scientific method at Haringhata meat plant and departmental poultry processing unit were 2.13±0.036 cm^2, 2.10±0.024 cm^2 and the results of the samples slaughtered under conventional methods at Basirhat, Dumdum, Rajarhat and Bangaon were recorded 1.96±0.047cm^2, 1.93±0.014cm^2, 1.91±0.014 cm^2 and 1.87±0.026 cm^2 respectively. While comparing the WHC values in different places of conventional slaughtering, it was noticed that the WHC level of meat samples slaughtered under conventional method were significantly decreased ($p<0.05$).

The mean values of the results of ERV (Table 1) of meat samples slaughtered under scientific method at Haringhata meat plant and departmental poultry processing unit were 17.5±0.877 mL, 17.0±0.008 mL respectively and also the results of ERV from the samples slaughtered under conventional methods at Basirhat, Dumdum, Rajarhat and Bangaon were recorded, 12.9±0.023 mL, 12.7±0.037 mL, 12.7±0.037 mL and 13.8±0.023 mL respectively. While comparing the ERV values in different places of conventional slaughtering, it was found that the ERV values of meat samples slaughtered under conventional method were significantly decreased ($p<0.05$). The mean values of the results of TBA (Table 1) of meat samples slaughtered under scientific method at Haringhata meat plant and departmental poultry processing unit were 0.400±0.023mg malonaldehyde/kg, 0.405±0.008 mg malonaldehyde/kg respectively and also the results of TBA from the samples slaughtered under conventional methods at Basirhat, Dumdum, Rajarhat and Bangaon were recorded 0.450±0.032 mg malonaldehyde/kg, 0.410±0.031 mg malonaldehyde/kg, 0.426±0.196 mg malonaldehyde/kg and 0.380±0.022 mg malonaldehyde/kg respectively.

It was found that the microbial load in terms of TPC (log CFU/cm^2) and PC ((log CFU/cm^2) were highly significant ($p<0.05$) in conventional method than scientific method.

DISCUSSION

The present study was conducted owing to the fact that there are some major differences of the above two methods of slaughter which are very specific relating to quality and wholesome production and processing of chicken.

In scientific method of slaughter, humane slaughter method was practiced with stunning, off fed for 12-24 hrs prior to slaughter, supply of *ad libidum* potable water, ante- mortem care and inspection, post-mortem inspection, proper cleaning and washing before & after slaughter, whereas, in conventional methods, ritual

slaughter methods were practiced without maintained proper hygiene and above such practices.

Therefore, in conventional methods of slaughter, there may have the chances of more microbial contamination with less keeping quality of meat.

The above results showed that scientific methods having positive impact over conventional method of slaughter and as such meat produced by scientific slaughter are more sound and wholesome. But in case of other places of conventional methods of slaughter in relation to pH such difference were not much pronounced. The difference in pH might be due to the fact that in conventional method, the observation of pH was recorded within 2 hrs of slaughter but in scientific methods, the pH was recorded after 4-6 hrs when the different stages of rigor mortis was completed after ageing. This may be due to depletion of muscle glycogen level resulting in the present observation in terms of pH. This finding is in agreement with the citation of Lawrie (1985) and also in agreement with Das *et al*. (2004). The above results are also in agreement with the results of Natarajan and Siddique (1981); Biswas *et al*. (2011) and Kandeepan and Biswas (2007), they also observed an increase level of pH with storage period in different species meats.

The differences of WHC in both the methods can be substantiated with the observation of Lawrie (1985). Where he stated that the muscle pH has a large role in affecting the WHC and it is minimum at ultimate pH of muscle. Increased WHC with advancement of storage period was also reported by Pearson (1968).

The differences of ERV values of different methods may be looked with pH values of the corresponding hours and methods as ERV value is highly correlated with pH. Reduction in ERV is more pronounced at higher pH (Murthy and Bachhil, 1980) and with an increased in microbial load (Strange *et al*., 1977). Reduction of ERV with advancement of storage period was in agreement with the finding of Bachhil (1982), who reported that decreased of ERV was mostly due to increase of microbial load (mainly phychrotropic) during refrigerated storage and consequent breakdown of proteins and other biochemical changes (Vijayakuma and Biswas, 2006).

The Table 1 showed that the difference of TBA (mg malonaldehyde/kg sample) might be explained as processing probably cause disruption of cell membrane thus exposing phospholipids, which are more prone to oxidation and dilution of natural antioxidants of cell membrane (Mead,1989) and explained that such processing disruptions were very obvious in conventional processing than in scientific processing.

Increase microbial load under conventional method may be due to various type of cross

contaminations during poultry slaughtering. There are different sources of microbial contamination like water, appliances and air etc and gets contaminations. This results also in agreement with Kandeepan and Biswas, 2007 and Das and Biswas, 2003. Similar observation was also made by Patra *et al*., 2016 and Biswas *et al*., 2017.

From the present study, it can be concluded that in conventional method, slaughtered in unhygienic place, repeated washing in same water, evisceration, appliances and retailing were the major point of contaminations during poultry processing but in scientific method of slaughtering different hazards can be reduced by applying scientific techniques like stunning, proper bleeding, evisceration, washing in chilled water and also found that the scientific method of slaughter was superior to conventional methods in terms of parameters like of ERV, TBA, TPC and PC and keeping quality of meat was better in scientific methods.

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