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Effect of Turmeric (*Curcuma longa*) Treatment on Quality of Chicken Meat

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A B S T R A C T

A study was conducted to determine the effect of immersing chicken breast meat in four different concentration and contact time combinations of turmeric powder added water on its quality characteristics. The effect of turmeric treatment on inherent microbial flora and sensory characteristics were evaluated immediately after treatment as well as during refrigerated storage (4±1°C) at regular intervals and compared with that of tap water and distilled water dipped control(s) chicken meat samples. The results revealed that there were no significant reductions in inherent microbial flora for all the treatment combinations studied. The colour, odour and overall acceptability scores of different treatments were significantly higher ($p<0.01$) from that of tap water and distilled water dipped control samples. Similarly, 30% turmeric powder added water treated samples had significantly higher ($p<0.01$) colour, odour and overall acceptability scores compared to rest of the treatments.

Introduction

The consumption of safe and nutritious food is critical to our health and well-being. Various chemical and biological hazards may appear in our food and contamination could occur at any stage during the production, processing, storage and at consumer kitchen while preparing the food. So, occurrence of food-borne diseases remains a real and formidable problem in both developed and developing countries, causing great human suffering and significant economic losses. As nutrient rich milieu, foods of animal origin *viz.*, meat, fish and poultry provide conditions suitable for proliferation of spoilage microorganisms including food-borne pathogens which leads to quality control issues and food poisoning outbreaks.

The wet market system adopted for processing and retailing of poultry meat to cater the domestic needs are often lacking infrastructure facilities, skilled manpower as well as

hygienic practices and thus, the meat is frequently subjected to contamination. Raw chicken have been a significant sources of the bacterial pathogens like *Salmonella* and *Campylobacter* spp. (Deming *et al.,* 1987; Madden *et al.,* 2011; Drinceanu *et al.,* 2013).

Vast majority of the intervention technologies that include trimming (Prasai *et al.,* 1995a,b), water washing (Hardin *et al.,* 1995; Reagan *et al.,* 1996), hot water spraying (Smith and Graham, 1978), steam pasteurizing (Phebus *et al.,* 1997), as well as sanitizing by chemicals such as organic acids (Hardin *et al.,* 1995; Dorsa *et al.,* 1997), chlorine compounds (Kotula *et al.,* 1974) and polyphosphates (Dickson *et al.,* 1994) etc., for decontamination of red meat and poultry carcasses have been developed and some were patented by the research institutions in developed countries. However, these technologies could be integrated as a unit operation in 'on the rail dressing' performed by large and medium scale modern abattoir to reduce the likelihood of pathogenic microorganisms being present on the carcasses and meat. In developing countries like India, scattered meat production system and lack of modern slaughter facilities restrict the application of such intervention technologies at the meat processing environment.

Hence, in addition to the implementation of hygienic principles of meat processing, developing and adopting a decontamination technology that could be applied by the consumer at household level would definitely validate the safe consumption of meat by the consumers to a greater extent.

Turmeric powder is being used as an ingredient in almost all the Indian meat preparations. Several researchers have documented the antimicrobial and antioxidant properties of turmeric (Goel, 2007; Lourenco *et al.,* 2013; Deshmukh 2014; Pandey *et al.,* 2014; Rachana and Venugopalan 2014; Gupta *et al.,* 2015; Mohammed and Habil 2015). It is noteworthy to mention that immersing/washing meat in/with turmeric powder added water prior to cooking is a household practice in India. However, very scarce studies have been conducted to evaluate the effect of such practice on microbial quality of meat. Keeping above facts in consideration, this study was proposed to determine the effect of immersing chicken meat in turmeric powder added water on its quality characteristics.

Materials and Methods

Collection of chicken meat samples

The chicken breast meat samples were collected within 3 to 4h of slaughter, packed individually in clean, sterile polyethylene bags and transported to the Food and Industrial Microbiology Laboratory at College of Food and Dairy Technology, Koduvalli, Chennai, in an insulated container maintained at 4±1°C under hygienic condition and utilized for decontamination study.

Chemicals, Media, Buffers and Reagents

All the chemicals used in the study were of analytical grade purchased from reputed national firms. Media, supplements and laboratory aids used in the study were procured from HiMedia, Mumbai.

Turmeric Powder

The dried turmeric rhizomes purchased from the market were adjusted to the moisture content of less than 12% using solar drier and ground into fine powder in a spice pulverizer. The turmeric powder obtained was employed for preparation of different concentrations of turmeric powder added water and the later were used in this study as decontaminant.

Determining effect of turmeric (*Curcuma longa*) powder added water treatment on quality of chicken breast meat

Selection of contact times for different concentrations of turmeric powder added water (Preliminary Trials)

In this trial, the contact times for chicken breast meat samples in four different concentrations of turmeric powder added water were separately standardized by sensory evaluation. For this purpose, turmeric powder were individually dissolved at a rate of 15g, 25g, 35g and 45g for every 150 ml of sterile distilled water in order to prepare four different concentrations (10%, 16.67%, 23.33% and 30%) of turmeric powder added water.

To standardize the contact time for each concentration, about 150g of chicken breast meat samples were individually immersed in 600ml of each concentration of turmeric powder added water, at 1:4 (W/V) ratio, for three different contact times *viz.*, 5, 10 and 15 min. After specified period of immersion, the chicken breast meat samples were removed, drained and kept in clean plates. 45min after the treatment, the samples were cooked to the internal temperature of 72°C and the intensity of effect of immersion in different concentration of turmeric powder added water on colour, odour, taste and overall acceptability of the chicken breast meat samples were subjectively evaluated against a nine point hedonic scale (Meilgaard *et al.*, 2006) by a sensory evaluation panel comprising students and staff of College of Food and Dairy Technology, Koduvalli, Chennai. The maximum contact time at which each concentration of turmeric powder added water had minimal or no effect on sensory attributes was chosen. Accordingly, one contact time was selected for each concentration of turmeric powder. By the end of this preliminary trial, four different concentration-contact time combinations were obtained and utilized in this decontamination study.

Effect of turmeric powder added water on inherent microbial flora and sensory quality of chicken breast meat samples

Dipping chicken breast meat samples in turmeric powder added water

Each chicken breast meat samples was hygienically portioned into pieces of 50g and were divided into six groups each containing 3 pieces. Breast meat pieces from four groups were separately immersed in a glass beaker containing 200ml of 10%, 16.67%, 23.33% and 30% of turmeric powder added water for 15min, 15min, 5min and 5min, respectively. The fifth and sixth groups were separately dipped in 200ml of sterile distilled and tap water, each for 15min respectively and maintained as controls. The breast meat pieces belonging to control and different treatment groups were individually drained, packed in sterile polyethylene bags, labeled and stored under refrigerated condition (4±1°C) for five days. The control and treated breast meat pieces were analyzed 45min after the treatments as well as on 3rd and 5th day of refrigerated storage for various microbial (Total Viable, *E. coli* and Staphylococcal counts) and sensory parameters (odour, colour and overall acceptability). On each such occasion of analysis, one chicken breast meat sample was drawn from each of the control and treatment groups.

Microbial analysis

Effect of different concentration and contact time combinations of turmeric powder added water on inherent microbial flora of chicken breast meat samples was evaluated by assessing their effect on total viable,

Escherichia coli and Staphylococcal counts. All the microbial groups were determined by pour plate method following the procedures of American Public Health Association (APHA, 1984). Five grams of sub-sample from one of the chicken breast meat pieces drawn from each group was weighed near flame in sterile stomacher bags separately. 45ml of sterile peptone water (Hi Media) was added and homogenized in a stomacher circulator (Seward, UK) for 2min at 230rpm to get uniform homogenate.

Decimal dilutions of the homogenate were prepared in sterile peptone water and appropriate serial dilutions were plated in duplicate. Different media and incubation time and temperature were used for counting different type of bacteria. All the work was carried out in a clean UV sterilized laminar flow.

Total viable count

23.5g of Plate Count Agar (PCA) was suspended in 1000ml of distilled water, boiled to dissolve completely and sterilized by autoclaving at 121°C (15lbs pressure) for 15min. Final pH was adjusted to 7.0±0.2. Sterilized petridishes in duplicate were inoculated with one ml of aliquots of appropriate dilutions. About 10-15ml of sterile PCA maintained at 44-46°C was poured and inoculums were mixed properly by rotating plates. After solidification plates were incubated at 37°C for 48±1h. The number of colonies was multiplied by reciprocal of the dilution and expressed as $\log_{10}$cfu/g of sample.

Staphylococcus count

63g of Baird Parker Agar (BPA) was suspended in 950ml of sterile distilled water, boiled to dissolve completely and sterilized by autoclaving at 121°C (15lbs pressure) for 15min. Final pH was adjusted to 7.0±0.2. Prior to pouring the medium into the petridishes, 50ml of egg yolk tellurite emulsion was added and mixed well. Sterilized petridishes in duplicate were inoculated with one ml aliquots of appropriate dilutions and about 10-15ml of sterile BPA (egg yolk tellurite emulsion added) maintained at 44-46°C was poured. Inoculums were mixed properly by rotating plates. After solidification, plates were incubated at 37±1°C for 24h. Black shiny and regular shaped colonies were counted and expressed as $\log_{10}$ cfu/g of sample.

Escherichia coli count

55.07g of MacConkey agar (MCA) was suspended in 1000ml of sterile distilled water, boiled to dissolve completely and sterilized by autoclaving at 121°C (15lbs pressure) for 15min. Final pH was adjusted to 7.0±0.2. Sterilized petridishes in duplicate were inoculated with one ml aliquots of appropriate dilutions.

About 10-15ml of sterile MacConkey agar maintained at 44-46°C was poured. Inoculums were mixed properly by rotating plates. After solidification, plates were incubated at 35°C±1°C for 48h. Pink sharp colonies with 0.5mm diameter were counted and expressed as $\log_{10}$ cfu/g of sample.

Effect on sensory quality

Chicken breast meat pieces subjected to dipping treatments described in 2.4.2(a) were utilized for sensory evaluation. The breast meat pieces belonging to control and different treatment groups were subjectively evaluated 45min after the treatment as well as on 3rd and 5th day of refrigerated storage (4±1°C) for the effect on color, odor and overall acceptability by a sensory evaluation panel comprising students and staff of College of Food and Dairy Technology, Koduvalli, Chennai.

Statistical analysis

Data obtained were analyzed using standard statistical procedures described by Snedecor and Cochran, (1994). Analysis of Variance (ANOVA) procedure was used to determine the significant difference ($p \leq 0.05$) among the means obtained for different treatments. The results of storage studies were analyzed by two-way analysis to know the effect of treatments and storage period.

Results and Discussion

Standardization of contact times for different concentration of turmeric powder added water based on sensory evaluation

As discussed in materials and method section, series of preliminary trials were conducted to identify optimum contact time for each of the four different concentrations of turmeric powder added water used in this study. The maximum contact time at which each concentration of turmeric powder added water had minimal / no effect on the odour, colour and overall acceptability scores of chicken breast samples were selected. The contact times chosen are summarized in the Table 1. With respect to chicken breast samples treated with 10% as well as 16.67% turmeric powder added water, mean sensory scores for colour, odour, taste and overall acceptability did not significantly differ ($p>0.05$) between the contact times studied. The mean colour and odour scores of 23.33% turmeric powder added water treated chicken breast samples did not significantly differ ($p>0.05$) between the contact times whereas mean scores for taste and overall acceptability were significantly higher ($p<0.05$) for 5 min than 15min contact times. Similarly, mean colour and odour scores of chicken breast samples treated with 30% turmeric powder added water did not significantly differ ($p>0.05$) between contact times but the mean scores for taste and also overall acceptability were significantly higher ($p<0.05$) for 5min than 15min contact times.

Based on the statistical inferences, the contact time for dipping chicken breast samples in 10%, 16.67%, 23.33% and 30% turmeric powder added water were determined as 15min, 15min, 5min and 5min, respectively.

Effect of chosen combination of turmeric powder added water on quality of chicken meat

Optimum concentration and contact time combinations of turmeric powder added water determined through preliminary trails were compared for their effect on quality of chicken meat.

Effect on inherent microbial flora

Effect of dipping chicken breast meat in selected concentration and contact time combinations of turmeric powder added water on Total Viable Count (TVC), *Escherichia coli* count (ECC) and Staphylococcal count (SC) as affected by refrigerated storage (4±1°C) are presented in Table 2.Tap water and distilled water dipped chicken meat samples were used as controls. Overall treatment mean values of TVC (log cfu/g) for controls (distilled water and tap water dipped chicken breast meat samples) as well as 10%, 16.67%, 23.33%, and 30% of turmeric powder added water treated chicken breast meat samples were 5.80±0.22, 5.85±0.23, 5.65± 0.23, 5.59±0.23, 5.56±0.23 and 5.53±0.23, respectively (Fig.1). Analysis of variance (ANOVA) revealed that there is no statistical significance between treatment groups ($p>0.05$) but showed a significantly higher difference between the storage days ($p<0.01$). However, the interaction between treatments and storage days were not statistically significant.

Table.1 Standardization of contact times for immersing chicken breast meat in different concentrations of turmeric powder added water based on Sensory attributes (Mean±SE)[#]

Standardization of contact time for 10% turmeric powder added water			
Sensory attributes	**Contact times**		
	5 min	10 min	**15 min**
Colour	6.77±0.20	6.91±0.21	6.91±0.19
Odour	6.83±0.24	7.00±0.20	6.93±0.18
Taste	7.06±0.18	7.22±0.17	6.83±0.18
Overall acceptability	7.04±0.18	7.10±0.18	6.83±0.16
Standardization of contact time for 16.67% turmeric powder added water			
Sensory attributes	**Contact times**		
	5 min	10 min	**15 min**
Colour	7.25±0.18	7.41±0.14	7.06±0.18
Odour	7.14±0.17	7.41±0.15	7.18±0.15
Taste	7.20±0.13	7.29±0.16	6.81±0.19
Overall acceptability	7.29±0.12	7.41±0.13	7.06±0.15
Standardization of contact time for 23.33% turmeric powder added water			
Sensory attributes	**Contact times**		
	5 min	10 min	15 min
Colour	6.91±0.14	6.93±0.15	6.81±0.20
Odour	7.18±0.16	7.12±0.16	6.85±0.17
Taste	6.77±0.16 [a]	6.22±0.21[ab]	5.77±0.23[b]
Overall acceptability	7.00±0.17 [a]	6.77±0.20[ab]	6.35±0.21[b]
Standardization of contact time for 30% turmeric powder added water			
Sensory attributes	**Contact times**		
	5 min	10 min	15 min
Colour	6.37±0.22	6.18±0.24	6.12±0.25
Odour	6.72±0.16	6.58±0.21	6.37±0.19
Taste	5.75±0.26[a]	5.06±0.28[ab]	4.87±0.31[b]
Overall acceptability	6.20±0.27[a]	5.77±0.28[ab]	5.33±0.29[b]

- Average of six trials.

The mean scores in a row with similar superscripts or no superscript represents that there is no significant difference.

The mean scores in a row with different superscripts represents that there is significant difference.

Table.2 Effect of immersion of chicken meat in turmeric powder added water on inherent microbial flora (at different storage periods) (Mean±SE)[#]

Storage period	Control [log(cfu/g)]		Treatment [log(cfu/g)]				Overall Mean
	DW	TW	T1	T2	T3	T4	
Effect on Total Viable Count							
Day 0	4.80±0.19	4.86±0.21	4.62±0.20	4.58±0.20	4.55±0.19	4.52±0.19	**4.65±0.08^{A}**
Day 3	5.80±0.20	5.85±0.22	5.65±0.21	5.59±0.22	5.55±0.21	5.53±0.21	**5.66±0.08^{B}**
Day 5	6.80±0.19	6.85±0.22	6.67±0.20	6.60±0.22	6.57±0.21	6.54±0.21	**6.67±0.08^{C}**
Overall Mean	**5.80±0.22^{a}**	**5.85±0.23^{a}**	**5.65±0.23^{a}**	**5.59±0.23^{a}**	**5.56±0.23^{a}**	**5.53±0.23^{a}**	**5.66±0.09**
Effect on *Staphyloccocal* count							
Storage period	**Control [log(cfu/g)]**		**Treatment [log(cfu/g)]**				**Overall Mean**
	DW	**TW**	**T1**	**T2**	**T3**	**T4**	
Day 0	2.97±0.18	3.00±0.18	2.94±0.19	2.90±0.19	2.88±0.19	2.85±0.19	**2.92±0.07^{A}**
Day 3	3.01±0.17	3.05±0.17	2.99±0.18	2.94±0.17	2.92±0.18	2.89±0.18	**2.97±0.07^{A}**
Day 5	3.05±0.18	3.10±0.17	3.03±0.17	2.99±0.17	2.96±0.18	2.93±0.17	**3.01±0.07^{A}**
Overall Mean	**3.01±0.10^{a}**	**3.05±0.10^{a}**	**2.98±0.10^{a}**	**2.95±0.10^{a}**	**2.92±0.10^{a}**	**2.89±0.10^{a}**	**2.96±0.04**
Effect on *E. coli* count							
Storage period	**Control [log(cfu/g)]**		**Treatment [log(cfu/g)]**				**Overall Mean**
	DW	**TW**	**T1**	**T2**	**T3**	**T4**	
Day 0	3.13±0.18	3.14±0.17	3.08±0.18	3.04±0.19	2.99±0.19	2.92±0.19	**3.05±0.07^{A}**
Day 3	3.19±0.18	3.22±0.17	3.14±0.18	3.10±0.18	3.06±0.19	3.01±0.18	**3.12±0.07^{A}**
Day 5	3.25±0.17	3.29±0.17	3.20±0.17	3.16±0.18	3.12±0.18	3.07±0.19	**3.18±0.07^{A}**
Overall Mean	**3.19±0.10^{a}**	**3.22±0.09^{a}**	**3.14±0.10^{a}**	**3.10±0.10^{a}**	**3.06±0.10^{a}**	**3.00±0.10^{a}**	**3.12±0.04**

- Average of six trials

The mean scores in a row with similar superscripts or no superscript represents that there is no significant difference.

The mean scores in a row with different superscripts represents that there is significant difference.

Note: DW-Distilled water, TW-Tap water, T1-10% Turmeric Powder added water, T2-16.67% Turmeric Powder added water, T3-23.33% Turmeric Powder added water, T4-30% Turmeric Powder added water.

Fig.1 Petri dishes showing Total Viable Count of turmeric powder added water treated chicken breast meat samples

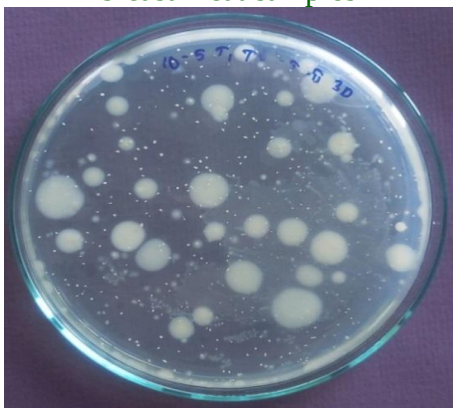


Table.3 Effect of immersion of chicken meat in turmeric powder added water on sensory characteristics (at different storage period) (Mean±SE)[#]

Effect on Colour							
Storage period	**Control**		**Treatment**				**Overall Mean**
	DW	**TW**	**T1**	**T2**	**T3**	**T4**	
Day 0	4.08±0.22	3.96±0.23	5.85±0.21	7.10±0.16	7.48±0.12	8.27±0.12	**6.13±0.12^{A}**
Day 3	3.48±0.19	3.33±0.19	5.08±0.18	6.17±0.15	6.96±0.13	7.94±0.14	**5.49±0.12^{B}**
Day 5	3.40±0.20	3.40±0.20	4.48±0.18	5.71±0.15	6.56±0.14	7.54±0.18	**5.18±0.12^{C}**
Overall Mean	**3.65±0.12^{a}**	**3.56±0.12^{a}**	**5.14±0.12^{b}**	**6.33±0.10^{c}**	**7.00±0.08^{d}**	**7.92±0.09^{e}**	**5.60±0.07**
Effect on Odour							
Storage period	**Control**		**Treatment**				**Overall Mean**
	DW	**TW**	**T1**	**T2**	**T3**	**T4**	
Day 0	2.58±0.17	2.48±0.17	5.79±0.12	6.92±0.17	7.52±0.12	8.29±0.11	**5.60±0.15^{A}**
Day 3	2.38±0.16	2.19±0.15	4.69±0.18	5.85±0.12	6.85±0.12	7.52±0.12	**4.19±0.13^{B}**
Day 5	2.19±0.15	1.98±0.16	4.21±0.18	5.44±0.15	6.15±0.14	7.15±0.16	**4.52±0.13^{C}**
Overall Mean	**2.38±0.09^{a}**	**2.22±0.09^{a}**	**4.90±0.12^{b}**	**6.07±0.10^{c}**	**6.84±0.09^{d}**	**7.65±0.09^{e}**	**5.01±0.08**
Effect on Overall acceptability							
Storage period	**Control**		**Treatment**				**Overall Mean**
	DW	**TW**	**T1**	**T2**	**T3**	**T4**	
Day 0	3.83±0.17	3.79±0.18	5.83±0.18	6.85±0.17	7.65±0.11	7.79±0.19	**5.96±0.12^{A}**
Day 3	3.46±0.15	3.44±0.15	5.25±0.16	5.92±0.13	6.98±0.13	7.42±0.17	**5.41±0.11^{B}**
Day 5	3.33±0.15	3.29±0.15	4.75±0.18	5.56±0.14	6.44±0.16	7.06±0.20	**5.07±0.11^{C}**
Overall Mean	**3.54±0.09^{a}**	**3.51±0.09^{a}**	**5.28±0.11^{b}**	**6.11±0.10^{c}**	**7.02±0.09^{d}**	**7.42±0.11^{e}**	**5.48±0.07**

- Average of six trials.
The mean scores in a row with similar superscripts or no superscript represents that there is no significant difference.
The mean scores in a row with different superscripts represents that there is significant difference.

Fig.2 Petri dishes showing *Staphylococcus* Count of turmeric powder added water treated chicken breast meat samples

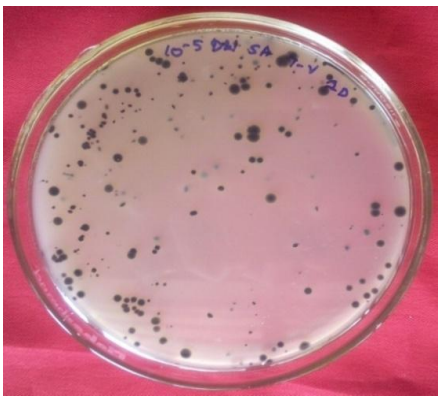
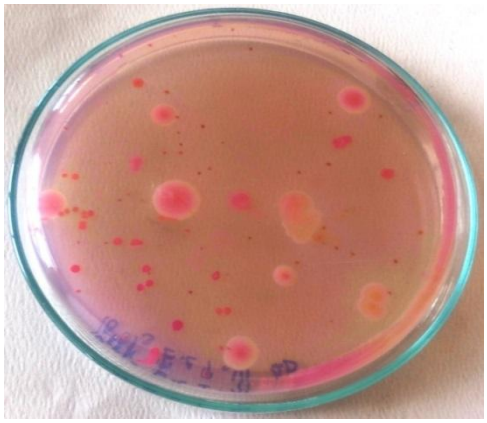


Fig.3 Petri dishes showing *Escherichia coli* of turmeric powder added water treated chicken breast meat samples



Overall treatment mean values of SC (log cfu/g) for controls (distilled water and tap water dipped chicken breast meat samples) as well as 10%, 16.67%, 23.33% and 30% of turmeric powder added water treated chicken breast meat samples(Fig.2) were 3.01±0.10, 3.05±0.10, 2.98±0.10, 2.95±0.10, 2.92±0.10 and 2.89±0.10, respectively. Analysis of variance (ANOVA) revealed no statistically significant effect ($p>0.05$) of both treatments and storage days on SC. Similarly, interaction between treatments and storage days was also not significant ($p>0.05$).

Overall treatment mean values of ECC (log cfu/g) for controls (distilled water and tap water dipped chicken breast meat samples) as well as 10%, 16.67%, 23.33% and 30% of turmeric powder added water treated chicken breast meat samples (Fig.3) were 3.19±0.10, 3.22±0.09, 3.14±0.10, 3.10±0.10, 3.06±0.10 and 3.00±0.10, respectively. Analysis of variance (ANOVA) revealed no statistically significant effect ($p>0.05$) of both treatments and storage days on ECC. Similarly, interaction between treatments and storage days was also not significant ($p>0.05$).

In general, though the different concentration-contact time combinations of turmeric powder added water used in the present experiment had reduced the microorganisms studied to limited extent there were no significant level of reduction in all the microbial groups studied.

Effect on sensory quality

The mean colour, odour and overall acceptability scores of chicken breast meat samples dipped in different concentration of turmeric powder added water as affected by refrigeration storage (4±1°C) are presented in Table 3. The overall treatment mean values for colour, odour and overall acceptability scores of 10%, 16.67%, 23.33%, and 30% of turmeric powder added water treated chicken breast meat samples were significantly higher ($p<0.01$) from that of tap water and distilled water dipped control samples and also among each other ($p<0.01$). Such statistical difference ($p<0.01$) in mean values were also observed between storage periods for all the sensory parameters studied.

Effect on Inherent Microbial Flora

The antimicrobial effect of immersing chicken meat in different concentration and contact time combinations of turmeric powder added water was evaluated. When the overall means are compared between different treatment

groups there is no significant reduction in Total Viable, *Staphylococcal* and *E. coli* counts.

The results obtained in this study is in concordance with that of Lourenço *et al.,* (2013) who observed similar findings in their study to assess the antimicrobial effect of 1% turmeric (*Curcuma longa*) on chicken breast meat contamination. Conversely, Gul and Bakht (2015) tested the antimicrobial activities of different turmeric extracts against *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi* and *Candida albicans* by disc diffusion method and reported that water extracted samples of turmeric stored at room temperature inhibited the growth of *Escherichia coli* and *Salmonella* Typhi.

The variation in the preparation of turmeric extract would have inhibited the microorganisms in their study. In the present experiment, the turmeric powder was added to the water just before the act of immersing chicken meat whereas Gul and Bakht, (2015) placed the dried turmeric powder in water for about seven days and intermittently agitated the flask. Further, FAO (2004) reported that Curcumin is an oil-soluble pigment, practically insoluble in water at acidic and neutral pH. Water insolubility of Curcumin/ curcuminoids might be the reason for non-significant reduction in microorganisms studied.

Effect on sensory quality

The overall treatments mean values for colour, odour and overall acceptability were significantly higher than that of controls. Similarly, higher concentration lower contact time combinations of turmeric added water treatment resulted in significantly higher mean scores followed by comparatively lower concentration longer contact time combinations for all the sensory parameters studied. The results obtained in the present study is in accordance with that of Gul and Bakht (2015) who found that increase in the concentration of turmeric extracts resulted in increase in mean colour and odour scores of meal prepared. Similarly, Abdeldaiem (2014) could not find any significant difference in mean flavor, colour and appearance scores while conducting sensory evaluation of chicken breast fillets samples blended with water-soluble yellow pigment (0, 1, 3 and 5% w/w) extracted from turmeric powder.

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