EFFECT OF CERTAIN ADDITIVES ON THE QUALITY CHARACTERISTICS OF IMMERSION CHILLED BROILER CUT UP PARTS

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ABSTRACT
Broiler leg and breast cuts were treated with 5% tetrasodium pyrophosphate + 2.5% sodium chloride (T1) and (2%) lactic acid + (2%) potassium sorbate (T2) or without any additive (control) during immersion chilling. The per cent moisture uptake and drip loss were significantly lower (P<0.05) and per cent cooking yield was higher in T1 group followed by T2 and control groups. Organoleptic scores in relation to appearance, tenderness, flavour, juiciness and overall acceptability of the cooked samples of both the cuts were also superior in T1 followed by T2 and control samples.

INTRODUCTION
There is a steady growth of poultry industry in the country. The processed food market is growing at a phenomenal rate. It offers fantastic opportunities to overseas entrepreneurs, who wish to expand their foreign markets by using India as a sourcing centre for regional exports, transfer technology or sign joint ventures. There is a definite need to utilize poultry cut up parts in the development of processed poultry products. Parallel with it, the consumers are becoming quality conscious. Cut up parts held in free state lose more moisture than whole carcasses. Moisture loss and weeping of cut up poultry have been major drawbacks to a widespread practice of cutting in the processing plant, which can be solved by phosphate treatment (May et al., 1963). Use of polyphosphates in poultry meat improves flavour, tenderness and juiciness scores and increases water uptake (Panda and Khanna, 1992; Panda, 1994; Panda, 1996) and of sodium chloride in increasing meat swelling (Hamm, 1960; Shults and Wierbicki, 1972) and of lactic acid and potassium sorbate in increasing acceptability and flavour scores of dressed chicken were reported (Panda, 1994; Ellenbroek et al., 1997). Since the raw meat quality influence the quality of finished poultry products, it is worth exploring the effect of immersion chilling with selected additives on certain qualitative characteristics of broiler meat cut of parts. Therefore, an investigation was conducted to determine the effect of polyphosphate, sodium chloride, lactic acid and potassium sorbate as additives during immersion chilling on the quality of broiler cut up parts.

MATERIAL AND METHODS
Thirty broilers of same age group maintained under similar conditions of feeding and management schedule were slaughtered as per the standard procedure (Mountney, 1976). The dressed carcasses were washed with tap water, drained and then divided into three groups of ten each. Leg and breast cuts were made from each carcass as per the procedure outlined by Panda (1982). Each group contained both leg and breast cuts. The control (C) group was immersed in the plain ice water (1:1) whereas those of T1, T2 and control groups were dipped in the ice water containing tetrasodium pyrophosphate (5%) + sodium chloride (2.5%) and lactic acid (2%) + potassium sorbate (2%), respectively. The immersion chilling of broiler cut up parts was done for 4 hours at a temp.
of 4±0.5°C. After 4 hours of chilling, both control and experimental samples were drained for 10 minutes and weighed to determine the percent moisture uptake. The percent moisture absorption during chilling (Kobyla et al., 1962; Sahoo and Panda, 1983), percent driploss (Klosee et al., 1963) after freezing at -10°C for 3 days and thawing at 4±0.5°C overnight, percent cooking yield (Panda, 1981) were estimated. Sensory evaluation of the product was conducted using a 9-point hedonic scale (1= Extremely undesirable, 9= Extremely desirable) by a semi-trained taste panel comprising six judges. About 100 gram of meat chunks from each sample of leg and breast cuts was taken from control, T1 and T2 groups, 1.5% of sodium chloride (w/w) was added and cooked in pressure cooker for 20 minutes and served warm to panel members for organoleptic evaluation. The experiment was replicated thrice and the results were analyzed. Analysis of variance followed by Duncan’s Multiple Range Test were used to find significant difference (Snedecor and Cochran, 1980) between the mean values.

RESULTS AND DISCUSSION

Effect of use of tetrasodium pyrophosphate and lactic acid during immersion chilling on the moisture uptake, drip loss and percent cooking yield of leg and breast cuts has been shown in Table 1. The values revealed that the percent moisture uptake in both the cuts was lowest in T2 group (P<0.05). The reasons behind this can be explained based on the findings of Mountney and Arganosa (1962), Panda (1981) and Pandey (1982,) who found less moisture uptake in polyphosphate treated birds. The water uptake of phosphate treated poultry carcasses depends upon the concentration of polyphosphate used in chilled water. There was also found to be a significant lower moisture uptake in T1 group in both the cuts as compared to the control. Perhaps this might be due to the effect of lactic acid which resulted into hard, leathery and glistening surface of the muscle as a result of protein denaturation (Mountney and O’Malley, 1965). When comparison was made between both the cut up parts regarding moisture uptake, it was observed that leg cut absorbed less water than the breast cut. Since breast muscle contained less amount of fat, more water is absorbed and retained (Pandey and Mahadevan, 1979).

The percent drip loss was significantly lower in T1 group as compared to T2 and control groups. The possible reason for this may be increasing water holding capacity due to the effect of polyphosphates in T1 group. Hamm (1960) stated that water holding capacity of meat can be improved by the use of various polyphosphates which perhaps exert their influence due to sequestering of heavy metals and calcium ions in meat, increasing pH and splitting of actomyosin into components having properties of greater water holding capacity. The beneficial effect of polyphosphate in the chilling medium to reduce drip loss in poultry meat was also reported (Panda, 1980; Panda, 1994). The drip loss between both the cuts was also significant, breast cut lost more moisture than the leg cut.

There was a significant difference in percent cooking yield between the control and treated groups. Both the cuts were also significantly different from each other, leg cut being superior to breast cut. The percent-cooking yield obtained in T1 group was consistently better in both the cut up parts indicating a significant (P>0.05) improvement over T2 and control groups. Farr and May (1970) and Panda (1981), were also of the view that polyphosphates improve the moisture retention and reduce cooking losses in broiler chicken.

Organoleptic characteristics of leg and breast samples belonging to different experimental groups have been presented in
Table 1. Effect of different additives on the per cent moisture uptake, drip loss and cooking yield of broiler leg and breast cuts (n=6)

<table>
<thead>
<tr>
<th>Quality parameters</th>
<th>Leg</th>
<th></th>
<th></th>
<th>Breast</th>
<th></th>
<th></th>
<th>CD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>T1</td>
<td>T2</td>
<td>C</td>
<td>T1</td>
<td>T2</td>
<td></td>
</tr>
<tr>
<td>% Moisture uptake</td>
<td>6.78±0.17</td>
<td>5.61±0.21</td>
<td>6.02±0.06</td>
<td>7.64±0.11</td>
<td>6.68±0.17</td>
<td>7.15±0.23</td>
<td>0.53</td>
</tr>
<tr>
<td>% Drip loss</td>
<td>2.38±0.06</td>
<td>1.52±0.02</td>
<td>1.90±0.03</td>
<td>3.14±0.04</td>
<td>2.15±0.06</td>
<td>2.75±0.06</td>
<td>0.14</td>
</tr>
<tr>
<td>% Cooking yield</td>
<td>69.02±1.50</td>
<td>80.40±1.70</td>
<td>71.93±0.61</td>
<td>64.09±1.20</td>
<td>75.77±1.77</td>
<td>65.45±0.52</td>
<td>4.15</td>
</tr>
</tbody>
</table>

Means±SE with different superscripts in a row are significantly different (P<0.05).

Table 2. Effect of different additives on the organoleptic scores of broiler leg and breast cuts (n=6)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cut up parts</th>
<th>Appearance</th>
<th>Flavour</th>
<th>Tenderness</th>
<th>Juiciness</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Leg</td>
<td>7.60±0.08</td>
<td>6.88±0.13</td>
<td>7.72±0.10</td>
<td>7.38±0.13</td>
<td>7.49±0.07</td>
</tr>
<tr>
<td></td>
<td>Breast</td>
<td>6.62±0.08</td>
<td>5.86±0.10</td>
<td>6.84±0.08</td>
<td>6.77±0.11</td>
<td>6.94±0.04</td>
</tr>
<tr>
<td>T1</td>
<td>Leg</td>
<td>7.88±0.03</td>
<td>7.58±0.09</td>
<td>8.07±0.08</td>
<td>8.00±0.05</td>
<td>7.89±0.04</td>
</tr>
<tr>
<td></td>
<td>Breast</td>
<td>7.55±0.02</td>
<td>7.15±0.12</td>
<td>7.82±0.10</td>
<td>7.65±0.10</td>
<td>7.54±0.06</td>
</tr>
<tr>
<td>T2</td>
<td>Leg</td>
<td>7.20±0.11</td>
<td>7.27±0.06</td>
<td>7.43±0.08</td>
<td>6.72±0.14</td>
<td>7.06±0.08</td>
</tr>
<tr>
<td></td>
<td>Breast</td>
<td>6.87±0.07</td>
<td>6.78±0.06</td>
<td>7.13±0.03</td>
<td>6.22±0.06</td>
<td>6.65±0.02</td>
</tr>
<tr>
<td>CD</td>
<td></td>
<td>0.22</td>
<td>0.28</td>
<td>0.26</td>
<td>0.33</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Means±SE with different superscripts in a column are significantly different (P<0.05).

Table 2. The findings indicated that there was a significant improvement in the sensory scores of appearance, flavour, tenderness, juiciness and overall acceptability of both leg and breast cuts in T1 group, when compared to control as well T2 groups. The results are in line with the findings of Panda (1970, 1981) who observed that incorporation of phosphate in immersion chilling improved the sensory attributes of dressed poultry. Though the organoleptic scores of the broiler cut up parts for all the characters except flavour were significantly lower (P<0.05) in T2 group as compared to the control yet they were found to be acceptable. This might be due to the fact that organic acids and potassium sorbate treatment imparted darker colour and appearance to the broiler carcasses (Ristic and Osthold, 1984). In the present study, the flavour score was better in T2 group when compared with the control group. Similar result was obtained by Ellerbroek et al. (1997) who reported that the flavour score of the poultry meat samples dipped or sprayed with lactic acid was better as compared to the control ones.

It could be concluded that the addition of tetrasodium pyrophosphate (5%) + sodium chloride (2.5%) during immersion chilling is helpful in reducing the percent drip loss and moisture uptake and increasing cooking yield of poultry and sensory scores as compared to those belonging to both lactic acid (2%) + potassium sorbate (2%) and control samples.

REFERENCES
August, 25-27, CCS Haryana Agricultural University, Hisar.