Using Different Methods to Tenderize Spent Hens Meat

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Abstract: The aim of this study is tenderizing spent hens meat by using cheap local materials such as bitter orange juice, vinegar, salt and sugar for 1, 2, 3 and 4h, distill water is used (T1) in curing to make it as standard. Bitter orange juice (acidity of 1.5) (T2), vinegar (acidity of 7) (T3), table salt (2%) (T4) and sugar (2%) (T5) were used. The processed meat was stored under -18°C ± 2°C for a month to investigate the influence of the type of treatment and the periods of storing and submersion on the sensory properties and chemical qualities through estimating the percentage of moisture, hydrogen number pH, volume of the released extract. A sensory properties evaluation of the qualities of flavor, juiciness, tenderness and overall acceptance was carried out. Results of curing in the different solutions revealed a decreased pH value in (T2) and (T3); while the highest significant differences (p<0.05) was in samples T4. Besides, there were no significant differences concerning the periods of curing. As far as the period of freezing is concerned, a significant increase in pH of the samples was noticed, T1 had the upper degree. There were no significant differences concerning the periods of curing. The percentage of moisture increased significantly (p<0.05) of the treatment groups compared with T1. The highest significant differences (p<0.05) were found in T4. A significant (p<0.05) increase occurred in the percentage of moisture when it was frozen and cured. Besides, there were significant differences (p<0.05) concerning the period of curing. A decrease was noticed of the volume of the released extract. The highest significant (p<0.05) difference was in T1 and the lowest one was in T4. It was also noticed that significant (p<0.05) increase of the frozen sample, the highest significant difference (p<0.05) was in T1 and the lowest one was in T4. Results of sensory evaluation indicated the improvement of the sensory qualities of the samples treated with the different solutions especially of tenderness and juiciness. These results were reflected on the quality of general acceptance by the consumer of the samples. Results of sensory evaluation revealed that T2 and T3 was the best sample. Significant differences (p<0.05) as far as the periods of curing were noticed. Thus we can recommend using 2% salt and bitter orange juice (1.5 acidity) in curing spent hens meat.

Key words: Chicken meat, curing methods, freezing, volume of the released extract sensory evaluation

INTRODUCTION
Curing is an important method for improving tenderness of spent hens meat (Richard, 1980). Acid solution was used in curing to tenderize and improve flavor and texture and thus called marinade, acids, salts, sugar, spices were used in curing. The acids used in the process of tenderizing meat effect the collagen of the connective tissue (Seuss and Martin, 1993). Acids blow up myofibrils (Offer and Trinick, 1983). Genaro et al. (1989) found that acids such as acetic, citric and lactic acid act on collagen and led to dissolved the collagen and decreased the shear value. Vinegar is a weak carboxy acid, it contain 6-10% acetic acid (AL-Jalili et al., 2004). bitter orange juice contain 87.8% water and 10.2% carbohydrate and 68 mg/100 g vitamin C and its pH 2-2.4 (AL-Sakini, 1997). Joslyn (1978) observed that bitter orange juice contain 6.33% citric acid and 0.32% malic acid. The researcher notice that citric acid improved tenderness and its other qualitative characteristics. Salt solution used too in curing, chloride ion increase the electrostatic state between molecular as of protein (Offer and Trinick, 1983).

The use of calcium chloride in solution (0.3 M) and sodium chloride (0.8 M) injection a breast meat led to decrease the shear value. Long time ago in many parts of the civilized world man learned how to preserve meat for future consumption, the most widely used method was by salting and then drying the meat (Al-Ani, 1986). Curing used as a method of preservation. Since then several meat curing methods has been developed to a suitable way to increase getting a homogenize curing components and minmize the presence of any unfavorable ingredient in the curing process such as the unfavorable color or any degradation of the meat cuts (Leverenz, 2001; Kutlas, 2002). The aging of meat in the plant led to increase the coasts because of holding the meat in storage which causes lost of moisture and then decreased the quality of meat (Goll et al., 1962). Further research is needed to study these curing methods to improved the quality of spent hens meats.

MATERIALS AND METHODS
This study was conducted at the college of Agriculture/ University of Baghdad. The broilers (48-52 months) were
brought from a local market then slaughtered and cut the
thighs for our research.
Bitter orange juice (acidity of 1.5) as citric acid, vinegar
as acetic acid, table salt (sodium chloride) 2% and
sugar 2% were used. The processed meat was stored
in -18°C ± 2°C for a month. The thighs then washed with
tab water and immersed in the solution, small sample
is taken to investigate the influence of the type of
treatment and the periods of curing and freezing.
The samples of the standard treatment were immersed
in distill water and conducted the same process on it.
The pH was estimated according to Jeacocce (1977),
the percentage of moisture was determined according
A.O.A.C. (1980), Extract release volume was estimated
according to Pearson (1976). The degree of sensory
evaluation of flavor, tenderness, juiciness and overall
acceptance of cooked meat by boiling determined
according to Leive (1970). A 9-point hedonic scale (9-like
tremely, 1-dislike extremely) was used to evaluate the
following attributes. Ten staff members of the college of
agriculture and graduate students most of whom had
participated in previous consumer panels work as
panelists, were given the details about this panel and
we do a primary panel before the essential test which we
adapted in this study. We depending the standard
to control on varieties which may effect the degree
of panel: Time of the test in 11 O’clock (A.M.), degree
of cooking temperature, time between cooking and test,
drinking water in 25°C between the test and other, finally
the size of the pieces which we tested (Lee et al., 1997).

Statistical analysis: The data were analyzed using
Complete Randomized Design and Multiple
Regression. The calculation was preformed by the SAS
package programmers (SAS, 2001). LSD test was used
to determine significant differences.

RESULTS AND DISCUSSION
The effect of curing poultry meat with different methods
and submersion for the periods 1, 2, 3 and 4 h on the
value of hydrogen number (pH) are summarized in Table
1. The data revealed that there were significant
difference (p<0.05) between curing methods (bitter
orange juice, vinegar, salt and sugar) and during curing
periods, while as there where no significant differences
between the periods of curing except when used the
bitter orange juice, it was found no significant
differences between treatment 1 and 2, and between
treatment 3 and 4, while there were significant
differences (p<0.05) among the periods of curing, pH of
chicken meat before treatments was 6.91. A significant
(p<0.05) decrease in pH occurred in the treatment (T1)
and (T3), this decrease depended on the acidity, it was
found that Sample 4 which was treated with salt
maintained significantly (p<0.05) the highest level.

Freezing effect (Table 2) for 30 days notes when the pH
increased for all treatments, because of the natural
hydrolysis of meat protein and the separation of amines
groups (Assaf and Bratzler, 1969).
The data in Table 3 revealed a significant differences
(p<0.05) of the percentage of moisture for all treatments,
which increased as the periods of curing increased,
because of the changes of the protein structure induced
by catabasins which cause the binding of the water.
The bacteria also produced a complex compound
named Amino sugar which causes the increased of
(2008) reported that percentage of moisture of curing
meat has been increased.
Curing in salt T1 (Table 3) increased significantly (p <
0.05) the percentage of moisture while it decreased the
another treatment T2, T3 and T5, no significant
differences among them were observed, the increased
could be because of the diffusion which led the salt to

<table>
<thead>
<tr>
<th>Method of curing</th>
<th>Curing Period (hours)</th>
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<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>T1</td>
<td>6.40&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T2</td>
<td>5.00&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>T3</td>
<td>4.93&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T4</td>
<td>7.13&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T5</td>
<td>6.00&lt;sup&gt;c&lt;/sup&gt;</td>
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Means followed by the same small letter (Row) and means
followed by the same big letter (columns) are not significant.

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<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>T1</td>
<td>6.65&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T2</td>
<td>5.70&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>T3</td>
<td>5.10&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>T4</td>
<td>7.16&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T5</td>
<td>6.23&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
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<tr>
<td>T1</td>
<td>69.73&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T2</td>
<td>72.40&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>T3</td>
<td>72.43&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>T4</td>
<td>74.49&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>T5</td>
<td>72.45&lt;sup&gt;b&lt;/sup&gt;</td>
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*The percentage of moisture before treatment was 65.58.*
penetrate into the tissues of the meat and mixed with the molecular water because of the increased of negative charges of meat protein and the increased of spaces among them which cause some binding of molecular water which consider a polarized molecules (Lawrie, 1974).

As for the effect of freezing (Table 4), no significant differences were noticed among treatments T_1, T_2 and T_3 while there were significant differences (p < 0.05) among treatments T_4 and T_5. There were significant differences (p < 0.05) concerning the periods of curing. The meat in treatment T_1 (salt) increased (p < 0.05) of the percentage of moisture. In conclusion, the percentage of moisture increased (p < 0.05) when submersion and freezing compared with fresh treatment.

Table 5 showed the effect of curing poultry meat with different methods and submersion for the period of 1, 2, 3 and 4h on the percentage of moisture.

<table>
<thead>
<tr>
<th>Method of curing</th>
<th>Curing Period (hours)</th>
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<tbody>
<tr>
<td>T_1</td>
<td>75.25^{60} 76.13^{60} 76.94^{60} 77.30^{60}</td>
</tr>
<tr>
<td>T_2</td>
<td>75.19^{60} 75.67^{60} 76.56^{60} 77.21^{60}</td>
</tr>
<tr>
<td>T_3</td>
<td>73.95^{60} 75.09^{60} 76.25^{60} 77.12^{60}</td>
</tr>
<tr>
<td>T_4</td>
<td>77.67^{60} 78.41^{60} 78.48^{60} 79.22^{60}</td>
</tr>
<tr>
<td>T_5</td>
<td>75.67^{60} 76.12^{60} 76.53^{60} 76.89^{60}</td>
</tr>
</tbody>
</table>

Means followed by the same small letter (Row) and means followed by the same big latter (columns) are not significant.

Table 5: The effect of curing meat with different methods and submersion for the period of 1, 2, 3 and 4h on the volume of the released extract.

<table>
<thead>
<tr>
<th>Method of curing</th>
<th>Curing Period (hours)</th>
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<tbody>
<tr>
<td>T_1</td>
<td>24.86^{60} 24.12^{60} 23.85^{60} 23.12^{60}</td>
</tr>
<tr>
<td>T_2</td>
<td>15.78^{60} 15.41^{60} 15.10^{60} 15.10^{60}</td>
</tr>
<tr>
<td>T_3</td>
<td>16.73^{60} 16.10^{60} 15.93^{60} 15.89^{60}</td>
</tr>
<tr>
<td>T_4</td>
<td>12.83^{60} 12.63^{60} 12.46^{60} 11.90^{60}</td>
</tr>
<tr>
<td>T_5</td>
<td>14.70^{60} 14.83^{60} 14.83^{60} 15.07^{60}</td>
</tr>
</tbody>
</table>

Means followed by the same small letter (Row) and means followed by the same big latter (columns) are not significant.

Table 6: Effect of freezing curing meat with different methods and submersion for the period of 1, 2, 3 and 4h on the volume of the released extract.

<table>
<thead>
<tr>
<th>Method of curing</th>
<th>Curing Period (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T_1</td>
<td>30.34^{60} 23.34^{60} 23.11^{60} 32.09^{60}</td>
</tr>
<tr>
<td>T_2</td>
<td>16.93^{60} 18.40^{60} 12.82^{60} 18.82^{60}</td>
</tr>
<tr>
<td>T_3</td>
<td>16.93^{60} 18.10^{60} 15.90^{60} 15.53^{60}</td>
</tr>
<tr>
<td>T_4</td>
<td>13.16^{60} 13.05^{60} 12.80^{60} 12.43^{60}</td>
</tr>
<tr>
<td>T_5</td>
<td>13.69^{60} 13.63^{60} 13.76^{60} 13.93^{60}</td>
</tr>
</tbody>
</table>

Means followed by the same small letter (Row) and means followed by the same big latter (columns) are not significant.

The effect of curing meat with different methods and submersion for the period of 1, 2, 3 and 4h on flavor of boiled meat presented in Fig. 1, which indicated that T_1 decreased in sensory score while another treatment increased, T_2 and T_4 have upper degree compared with T_3 and T_5. Significant differences (p < 0.05) were noticed among the periods of submersion.

Tenderness (Fig. 2) improved the curing treatment compared with T_1, but T_2 and T_4 have upper degree compared with T_3 and T_5. There were significant differences (p < 0.05) of the period of curing.

Figure 3 showed the effect of curing meat with different methods and submersion for the periods of 1, 2, 3 and 4 hours on juiciness treatment had a significant differences (p < 0.05) in juiciness compared with T_1, but T_2 and T_4 have upper degree compared with T_3 and T_5. There were no significant differences for the periods of curing.

Overall acceptance (Fig. 4), the results showed improved (p < 0.05) in the sensory evaluation, thus led to improved acceptance of curing meat compared with T_1, T_2 and T_4 have a higher score for overall acceptance, there were a significant differences (p < 0.05) for the periods of submersion.

Fig. 1: Effect of curing meat with different methods and submersion for a period of 1, 2, 3 and 4h on flavor.


**Conclusion:** In conclusion, we can recommend using salt and bitter orange juice in curing on large scale basis and the best of periods of submersion was 1 h.

**REFERENCES**


