The impact of sweet basil plant additive on biochemical parameters and organoleptic quality of meat of chicken

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Abstract:
This study aimed to evaluate chicken meat features after frozen when using sweet basil (SB) plant additive to work as an antioxidant. A 120 1-day old broiler unsex chicks were distributed in two groups (60 chicks for each group) and held for 42 days. The first group was control and the second group was feed additive 0.5 % SB. The study investigated some freshness, extend shelf-life and, sensory evaluation (pH, water holding capacity (WHC), thawing losses, total volatile basic nitrogen (TVB-N), Thiobarbituric acid reactive substances (TBARS)) during freezing of broiler meat. There were non-significant differences in TVB-N value of breast and thigh meat in treatment and control groups. The TBARS values for treated and control breast pieces were the same, while in relation to thigh samples the treated values were significantly (P < 0.01) lower than control. The pH values were shown non-significant differences among all groups. The percentage of thaw loss of treated samples (thigh and chest) progressively decreases with a significant (P < 0.01) difference compared to control groups at the same storage time of storage (45 days). The Addition of SB improved WHC.

Keywords: Sweet basil, Broiler, WHC, pH, TVA-N, TBARS

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Introduction:
Although individuals attempt to keep the meat in its very best quality for as long as attainable, it's not really easy to apply the better-known protective technique to make sure its freshness for a randomly long period. Poultry meat is consumed everywhere the planet and maybe an extremely biodegradable food. Lipid oxidation, one in every of the most important causes of quality deterioration, is additionally necessary (Raghavan and Richards 2007) as a result of it will negatively have an effect on sensory attributes like color, texture, odor, and flavor yet because the nutritionally quality of the merchandise (Calik et al. 2017). These problems leave the meat and poultry business in would like of economical and effective natural antioxidants that may replace artificial antioxidants while not negatively poignant the standard of finished merchandise and client perceptions (Babuskin et al. 2014). The natural preservatives obtained from spices and herbs are wealthy in phenol compounds like phenolic acids and flavonoids that have a large variety of biological activity as well as inhibitor and anti-bacterial. Sweet basil (SB) is a very important aromatic spice used as condiments to boost the food's sensory quality. Identification of inchoate spoilage of broiler meat depends on some chemical parameters like pH concentration, total volatile basic nitrogen TVBN (Wojdylo et al. 2007). The organoleptic quality and freshness of meats deteriorate by physical, chemical, and biological changes during storage. The standard is considered pH of 5.5–6.4 and TBARS of 0.9 mg MDA/kg as a maximum acceptable limit for chicken meat Consistent with the Iranian Veterinary Organization concerning the management and supervising of meat, the utmost desired quantity of TVBN in frozen chicken, turkey and ostrich meat is twenty mg one hundred g -1 of meat, however high levels of TVBN (27 mg one hundred g -1) are determined in frozen meat, that is so poisonous for humans, additional stress is placed on contemporary meat quality traits. The WHC refers to the power of meat to retain inherently or further water through process and storage (Moraes et al. 2016). The activity of WHC in contemporary meat is any difficult by the very fact that WHC changes with postmortem storage, processing, and preparation of meat. The biological science, live animal handling, and early postmortem temperature management have the potential to greatly influence the speed and extent of pH concentration...
decline, and so the WHC of the meat. The study aimed to review more light on (SB) as natural antioxidant source used in poultry meat beneath the frozen conditions.

Material and method:
Experimental Design:
This experiment was carried out in the poultry farm of the faculty of veterinary medicine, University of Tehran (Amenoobad), Iran. It was held 42 days start from 15/4/2018 to 26/5/2018. Broilers (Rose) 120 one day oldunsex chicks were raised in ground type housing and were divided randomly into 2 groups of (60) bird: (first basal diet as control (CG) and the second basal diet with added 0.5% SB (TG).

Protective Program:
Chicks were vaccinated in boxes by sprayed with Newcastle (B1) and Infectious Bronchitis (IB) vaccine on the first day of age. All vaccines were dissolved in free chlorine water. Waters were holed for three hours before vaccination. Vitamin C was added at the rate of 1gm/liter and also vitamins AD³E at the ratio of 0.5ml/liter for 3 days after each vaccination (Al-Kelabi and Al-Kassie 2013). They received all vaccines which are listed in (Table 1).

Table 1. Protective vaccines program. (n=120 broiler chicken)

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccines and the way of vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Newcastle (B1)+IB is by spray*</td>
</tr>
<tr>
<td>9</td>
<td>Newcastle (LaSota) with drinking water*</td>
</tr>
<tr>
<td>15</td>
<td>Gamboro IBD2 with drinking water*</td>
</tr>
<tr>
<td>20</td>
<td>Newcastle (LaSota) with drinking water*</td>
</tr>
<tr>
<td>30</td>
<td>Newcastle (LaSota) with drinking water*</td>
</tr>
</tbody>
</table>

*All vaccines were obtained from Intervet Company.

Phase feeding program:
The feeding program consisted of a starter diet used for the first 14 days of age then grower diet from 15th - 28th day of age and a finisher diet till to 42 days of age. The diets for each period were prepared with the same batch of ingredients, and all diets within a period had the same composition. Diets were formulated to meet or exceed requirements by the (Council 1994). Feed and water were provided in ad libitum during the experimental period. SB was added to the basal diet at a rate of 0.5 % for the treated group. The composition of the experimental basal diets is shown in (Table 2).

Table 2. Composition of experimental diets. (n=120 broiler chicken)

<table>
<thead>
<tr>
<th>Ingredient (%)</th>
<th>Starter 1-14 day</th>
<th>Grower 15-28 day</th>
<th>Finisher 28-42 day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Corn</td>
<td>634.8</td>
<td>654</td>
<td>685</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>319.1</td>
<td>293.8</td>
<td>268.2</td>
</tr>
<tr>
<td>Oil(8900kcal/kg)</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Decalcium</td>
<td>13.6</td>
<td>14.4</td>
<td>11.2</td>
</tr>
<tr>
<td>Carbonate</td>
<td>13.4</td>
<td>13.4</td>
<td>12.1</td>
</tr>
<tr>
<td>Salt(NaCl)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>*Premix</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>*Multivitamins</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>
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Results:

TBARS:
The TBARS values for breast pieces were no significant differences, while for thigh meat the CG significantly higher (P < 0.05) than TG. Lower values (0.030) were observed with TG of the breast meat relative to the CG that recorded (0.055). In thigh meat, (0.059) was lower in the TG significantly (P < 0.05) than CG (0.131).

TVB-N:
There were non-significant effects on the TVB-N values between T and C Groups.

Thaw Loss
The thaw loss percentage of breast meat of TG (3.78) was significant (P < 0.05) lower than CG (6.35), while it was recorded in thigh (5.29) for TG significantly (P < 0.05) lower than CG that recorded (7.02).

Muscle pH:
There were non-significant effects on the pH values between T and C Groups.

WHC:
The WHC was dramatically improved by add SB for increased BW, WHC thigh meat, which averaged (40.33) in the CG, was increased to (42.71) in the TG, whereas the WHC breast meat was (44.06) in TG compared to CG (40.43).

Figure 1. Biochemical study of five parameters control and treated (chest and thigh muscles) groups, (the result represented as means and standard errors)

Discussion:
The results concord with the findings of (Filgueras et al. 2010) who reported that the TBARS value of leg muscle of Rhea wasn’t considerably enhanced throughout air packaged storage. The sensory panelists are the most well-liked treated breast meat that had lower TBARS values, typically mentioned as the flavor of this plant. These results could also be because of the feature of SB as an antioxidant, the activity is attributed to numerous phenolic compounds, that are structurally connected however dissent in amount and sort, looking on the precise supply. The foremost phenolic constituents in spices and herbs (SB one amongst them) are phenolic acids, phenolic diterpenes, flavonoids and volatile oils (e.g., eugenol, carvacrol, thymol, menthol) (Kulkarni et al. 2011; Shah et al. 2014). Meat and membrane phospholipids from broilers fed 500 mg/kg rosemary and sage extracts exhibited a significantly lower oxidation rate than those fed 200 mg/kg α-tocopherol and the control after 9 days of refrigerated storage. TBARS values of the products increased significantly (p<0.05) with the period of storage; however, our result agrees with that finding the values of products incorporated with leaf extract were significantly (p<0.05) lower than control on Day 7 and onwards. A comparatively slow increase in
TBARS values of sausages incorporated with leaf extract might be attributed to the range of compounds, including phenolic compounds present in Ocimum sanctum, the same family of SB namely, curvilineal, cirsimaritin, isothymusin, apigenin, rosmarinic acid, eugenol, etc., which possess good antioxidant activity (Bhat et al. 2015) (Mudgil et al. 2014). WHC of the breast meat from broilers was considerably enhanced by the 0.5% SB for TG in comparison with CG (Huff-Lonergan and Lonergan 2005) according to that WHC isn’t solely influenced by the pH however conjointly postmortem chemical change that began with the activation of μ-calpain that will be inactivated by oxidization. Previous studies have indicated that antioxidants in meat will have an effect on proteolysis. Therefore, it will be thought that the dietary SB improved the antioxidative system in broiler breast meat, leading to the development of WHC (Bowker and Zhuang 2015; Zidane et al. 2018).

Recent advances highlighted that the final pH of the breast meat is negatively associated with broiler breast muscle collagen levels decrease as muscle cell diameter and a lot of typically muscle weight and yield increase, these changes resulted in breast meat with larger pH and consequently improved WHC. (Petracci et al. 2015). However, it’s unlikely that a distinction in pHu entirely explains the distinction in WHC, as a result of the magnitude of distinction for pHu was quite little. More investigation is needed to outline the link between WHC and therefore the rate of decrease in pH postmortem. Chemical change throughout postmortem aging ends up enlarging the areas between muscle fibers, and afterward, WHC is enhanced (Lotan et al. 2011). In the current study, pH values of breast and thigh meat are in smart agreement with previous analysis of United Nations agency found 5.74 and 6.14 severally (Mikulski et al. 2011). The thaw loss results parallel to the event of denaturation and aggregation of super molecule. These results were in agreement with (Ali et al. 2015; Ozcan et al. 2004).

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Ethical approval
All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

Disclosure of potential conflicts of interest and current submission
This manuscript has not been previously published and is not under consideration in the same or substantially similar form in any other peer-reviewed media.

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