



# SENSORY AND PH CHANGES OF MANUFACTURED BASTRAMI FROM OLD DUCK (*ANAS PLATYRHYNCHOS*) MEAT

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## Abstract

The current study aimed at the possibility of using old duck meat to replace beef in the manufacture bastrami and for different storage periods (15, 30, 45, 60, 75 and 90 days) and their effect on the sensory and pH characteristics of the manufacture bastrami, this experiment was conducted in the laboratory of nutrition and poultry in the Faculty of Agriculture - Al-Muthanna University at 15/2/2016, used in this study old Iraqi ducks (*Anas platyrhynchos*), was brought from the scientific research station in the Faculty of Agriculture Al-Muthanna University, the treatments of the experiment were as follows, T<sub>1</sub>: Beef 100% (control), T<sub>2</sub>: beef 75% + old duck meat 25%, T<sub>3</sub>: Beef 50% + old duck meat 50%, T<sub>4</sub>: beef 25% + old duck meat 75% and T<sub>5</sub>: 100% old duck meat. The results indicated that partial replacement (75% beef + 25% old duck meat) and (50% beef + 50% old duck meat) did not give a significant differences compared to the control treatment (100% beef) for all studied sensory traits, and the pH value for storage period of up to 60 days, (25% beef + 75% old duck meat) and 100% beef meat (P=0.05) showed significant decrease in all sensory and pH characteristics and for all storage periods.

**Key words:** Sensory, pH, manufactured bastrami, old duck meat

## Introduction

Duck farming projects are spread throughout the world, which are a food source and one of the finest types of meat, all of the domesticated ducks *Anas platyrhynchos*, except for wild-type Muscovite ducks called Mallard (Al-Sabeel and Al-Badri, 2010), ducks were believed to have been sown more than 2,000 years ago and commercial duck production has long been started in China before other parts of the world (Ismail *et al.*, 2010). Recent studies on the possibility of using older waterfowl meat for human consumption through the use of one of the techniques of evolution or introduction in the manufacturing (Mazanowski *et al.*, 2003), according to statistics of the International Food and Agriculture Organization in 2004 that the number of ducks breached exceeds 500 million, making it exceed 4% of the total percentage of poultry meat (Naji, 2009). One of the methods of manufacturing is the use of bastrami, a word of Turkish origin, which means dried beef and highly salted and spiced meat, derived from the Turkish word Basterma

et (Al-Marzani, 2007), Bastrami is traditionally made from sheep meat and mechanical fat with the addition of salt, spices and garlic without the addition of chemical substances, as meat is mixed with the fat of the machine, mixed manually, wrapped in natural wrappers and dried in normal conditions (Gokalp *et al.*, 1999), the commercial is made from a combination of beef with the fat of the machine and add anti-microbiological and anti-oxidant chemicals such as nitrite, nitrite and ascorbic acid (Bozkurt and Erkmen, 2002), the flavor characteristic of this product can come from a number of factors that can affect the taste, where microbial changes occur in the product and the development of physiological, especially in the stage of drying as well as carbohydrate fermentation with a change in color and lipid breakdown and oxidation and protein degradation (Al-Douri, 2009). The current study aims at the possibility of using older duck meat to replace beef in the manufacture of pastrami and for different storage periods on pH and sensory properties.

## Material and methods

This experiment was conducted at the Nutrition and Poultry Laboratory at the Faculty of Agriculture, Al-Muthanna University, at 15/2/2016, the old local Iraqi ducks were brought from the scientific research station at the Faculty of Agriculture, Al-Muthanna University, The birds were slaughtered manually, the carcasses were scaled with water of  $60 \pm 2^\circ\text{C}$  for 45 seconds, the feathers and internal viscera were removed, The carcasses were kept in the refrigerator at  $4^\circ\text{C}$  for 24 hours, separated the meat from the bone, calculated the required quantities of meat and materials in the manufacture of bastrami, was grinded using an electric grinder machine, added 1% (garlic, mustard, coriander, pepper, cinnamon, thyme and salt) to the grinded mixture, put the mix on cleaned cow small intestine, stored for different periods of 15, 30, 45, 60, 75 and 90 days. The treatment were follow:

1. The first treatment ( $T_1$ ): (control) 100% beef.
2. The second treatment ( $T_2$ ): beef 75% + old duck meat 25%.

3. Third treatment ( $T_3$ ): beef 50% + old duck meat 50%.
4. The fourth treatment ( $T_4$ ): beef 25% + old duck meat 75%.
5. Fifth treatment ( $T_5$ ): 100% old duck meat.

After storing the pH was estimated, according to Xiong *et al.* (1993), 1 g of meat with 10 ml distilled water, pH was estimated using the pH-meter (Ghawca) Chinese-made, cut into circular rings thickness of approximately 1 cm and then salted with the addition of table salt 0.5% to be ready to eat, for the purpose of sensory evaluation according to the sensory assessment form prepared and to give scores for each attribute to rank the results (Table 1), the assessment was carried out at 10 am, leaving a period of time and drinking water between the assessment and the last (Al-Aswad, 2000).

## Statistical analysis

Completely Randomized Design (CRD) were used, significant differ between means were comparative by Duncan multiple range (1955), all data were analyzed by

**Table 1:** Card used for judgment of subjective meat quality attributes.

		<b>Tenderness</b>	<b>Flavour</b>	<b>Colour</b>	<b>Juiciness</b>
		8. Extremely tender	8. Extremely intense	8. Extremely desirable	8. Extremely juicy
		7. Very tender	7. Very intense	7. Very desirable	7. Very juicy
		6. Moderately tender	6. Moderately intense	6. Moderately desirable	6. Moderately juicy
		5. Slightly tender	5. Slightly intense	5. Slightly desirable	5. Slightly juicy
		4. Slightly tough	4. Slightly bland	4. Slightly undesirable	4. Slightly dry
		3. Moderately tough	3. Moderately bland	3. Moderately undesirable	3. Moderately dry
		2. Very tough	2. Very bland	2. Very undesirable	2. Very dry
		1. Extremely tough	1. Extremely bland	1. Extremely undesirable	1. Extremely dry
Serial	Sample code				Comments
1					
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SPSS program (2009).

## Results and discussion

### Sensory Traits

#### Tenderness

Table 2 shows the effect of partial or total replacement of old duck meat substituted for beef on the bastrami tenderness and stored for different periods, the results showed a significant decrease ( $P=0.05$ ) on bastrami tenderness in  $T_4$  (25% beef + 75% old duck meat) and  $T_5$  (100% old duck meat) compared to control treatments  $T_1$  (100% beef) and  $T_2$  (75% beef + 25% old duck meat), as well as significant differences between  $T_3$ ,  $T_4$  and  $T_5$ , and treatments  $T_1$ ,  $T_2$ ,  $T_3$  on the other, during a 30-day storage period, the same table shows a significant decrease ( $P=0.05$ ) on the bastrami tenderness in the same direction with the increase in the storage period and the replacement ratio of the old duck meat substitutes of beef, tenderness in  $T_3$  (50% beef + 50% adult duck meat) and 30-day storage period was a better than other experimental treatments, the lowest degree of tenderness obtained from  $T_5$  (100% old duck meat) and during all different storage periods compared to the rest of the treatments. This may be due to lower  $T_5$  relative

humidity compared with other treatments.

This results was agree with Stafle (2006), which did not detect significant differences between processed beef bastrami and cooked chicken legumes and storage periods of less than 60 days, while this result did not agree with Licensee (2009), which indicated that the use of beef in the manufacture of bastrami has been given a better tenderness compared to the bastrami made from chicken meat. This was attributed to the high susceptibility of cow meat to ripening, especially when storing for long periods exceeding 50 days.

#### Juiciness

Table 3. shows the effect of the partial or total replacement of the old duck meat substitutes for beef on juiciness of the different periods stored of manufactured bastrami, the table indicates that there are no significant differences between the  $T_1$ ,  $T_2$  and  $T_3$  treatments during storage periods of 30, 45, 60 days by hand and a significantly higher ( $P=0.05$ ) on  $T_4$  and  $T_5$  treatments in the same storage periods on the other hand, the same table shows a significant decrease ( $P=0.05$ ) in juiciness in all treatments at storage periods 75 and 90 days compared to control treatment.

**Table 2:** The Effect of old duck meat on tenderness of the different periods stored of manufactured bastrami±Standard error.

Treatments	Stored periods (Days)				
	30	45	60	75	90
$T_1$	5.56a±0.001	5.17a±0.003	4.33a±0.002	4.12a±0.001	3.86a±0.002
$T_2$	5.50a±0.002	5.10ab±0.002	4.25b±0.003	3.99b±0.001	3.73b±0.001
$T_3$	5.47ab±0.001	5.02b±0.002	4.17c±0.002	3.90c±0.002	3.66c±0.003
$T_4$	5.43b±0.001	4.96c±0.001	4.13d±0.002	3.81d±0.002	3.52d±0.002
$T_5$	5.39b±0.002	4.88d±0.003	4.02e±0.003	3.70e±0.003	3.44e±0.001
<b>Sig.</b>	*	*	*	*	*

$T_1$ : (control) 100% beef.  $T_2$ : beef 75% + old duck meat 25%.  $T_3$ : beef 50% + old duck meat 50%.  $T_4$ : beef 25% + old duck meat 75%.  $T_5$ : 100% old duck meat. \*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

**Table 3:** The Effect of old duck meat on juiciness of the different periods stored of manufactured bastrami±Standard error.

Treatments	Stored periods (Days)				
	30	45	60	75	90
$T_1$	4.71a±0.003	4.10a±0.002	3.66a±0.001	3.30a±0.002	3.20a±0.003
$T_2$	4.68a±0.001	4.07a±0.002	3.62a±0.002	3.22b±0.002	3.13b±0.004
$T_3$	4.67ab±0.003	4.05a±0.001	3.60a±0.002	3.18bc±0.001	3.37c±0.002
$T_4$	4.55bc±0.003	3.92b±0.001	3.47b±0.001	3.14cd±0.002	2.98d±0.002
$T_5$	4.48c±0.002	3.82c±0.002	3.33c±0.002	109d±0.002	2.90e±0.003
<b>Sig.</b>	*	*	*	*	*

$T_1$ : (control) 100% beef.  $T_2$ : beef 75% + old duck meat 25%.  $T_3$ : beef 50% + old duck meat 50%.  $T_4$ : beef 25% + old duck meat 75%.  $T_5$ : 100% old duck meat. \*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

The significant improvement in treatments of  $T_2$  and  $T_3$  during storage periods 30, 45 and 60 days compared to  $T_4$  and  $T_5$ , which did not differ significantly between them, may be due to the fact that storage time is more suitable for ripening than other treatments, this result was not agree with Pearson (2001), which showed that the mixing of different meat, whether chicken, beef or sheep, significantly reduced the juiciness of the processed product.

#### Flavor

Table T4. (50% beef + 50% adult duck meat) did not differ significantly from the control treatment  $T_1$  (100% beef),  $T_2$  (75% beef+25% duck meat) and  $T_3$  during storage periods 30, 45, 60 days, indicating that the storage period during these periods and these treatments were suitable for ripening and thus led to an improvement in the flavor characteristics, as shown in the same table, the significant

**Table 4:** The Effect of old duck meat on flavor of the different periods stored of manufactured bastrami±Standard error.

Treatments	Stored periods (Days)				
	30	45	60	75	90
T <sub>1</sub>	5.01a±0.001	4.75a±0.003	4.51a±0.003	4.27a±0.003	3.96a±0.004
T <sub>2</sub>	4.97a±0.002	4.71a±0.003	4.43a±0.004	4.17b±0.003	3.71b±0.002
T <sub>3</sub>	4.95a±0.001	4.68a±0.002	4.45a±0.002	4.16b±0.002	3.67b±0.003
T <sub>4</sub>	4.77b±0.002	4.52b±0.002	4.22b±0.003	3.95c±0.002	3.54c±0.002
T <sub>5</sub>	4.65c±0.002	4.40c±0.001	4.10c±0.001	3.83d±0.002	3.41d±0.001
<b>Sig.</b>	*	*	*	*	*

T<sub>1</sub>: (control) 100% beef. T<sub>2</sub>: beef 75% + old duck meat 25%. T<sub>3</sub>: beef 50% + old duck meat 50%. T<sub>4</sub>: beef 25% + old duck meat 75%. T<sub>5</sub>: 100% old duck meat. \*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

**Table 5:** The Effect of old duck meat on taste of the different periods stored of manufactured bastrami±Standard error.

Treatments	Stored periods (Days)				
	30	45	60	75	90
T <sub>1</sub>	5.40a±0.003	5.16a±0.02	4.95a±0.002	4.69a±0.002	4.43a±0.003
T <sub>2</sub>	5.36a±0.002	5.13a±0.002	4.93a±0.002	4.56b±0.003	4.31b±0.002
T <sub>3</sub>	5.33a±0.002	5.10a±0.002	4.87a±0.002	4.53b±0.004	4.29b±0.002
T <sub>4</sub>	5.18b±0.002	4.90b±0.004	4.66b±0.002	4.41c±0.003	4.15c±0.002
T <sub>5</sub>	5.08c±0.003	4.83c±0.004	4.53c±0.003	4.30d±0.004	4.02d±0.003
<b>Sig.</b>	*	*	*	*	*

T<sub>1</sub>: (control) 100% beef. T<sub>2</sub>: beef 75% + old duck meat 25%. T<sub>3</sub>: beef 50% + old duck meat 50%. T<sub>4</sub>: beef 25% + old duck meat 75%. T<sub>5</sub>: 100% old duck meat. \*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

**Table 6:** The Effect of old duck meat on pH of the different periods stored of manufactured bastrami±Standard error.

Treatments	Stored periods (Days)				
	30	45	60	75	90
T <sub>1</sub>	6.24±0.005	6.20±0.005	6.14±0.006	6.02a±0.004	5.89a±0.005
T <sub>2</sub>	6.25±0.006	6.21±0.005	6.15±0.005	6.00±0.005	5.88±0.004
T <sub>3</sub>	6.23±0.005	6.22±0.005	6.15±0.006	6.01±0.004	5.90±0.005
T <sub>4</sub>	6.22±0.004	6.19±0.004	6.14±0.005	6.00±0.006	5.90±0.005
T <sub>5</sub>	6.24±0.005	6.22±0.006	6.15±0.004	6.00±0.006	5.88±0.004
<b>Sig.</b>	*	*	*	*	*

T<sub>1</sub>: (control) 100% beef. T<sub>2</sub>: beef 75% + old duck meat 25%. T<sub>3</sub>: beef 50% + old duck meat 50%. T<sub>4</sub>: beef 25% + old duck meat 75%. T<sub>5</sub>: 100% old duck meat. \*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

decrease (P=0.05) was observed in T<sub>4</sub> partial replacement (25% beef+75% old duck meat) and 100% (old duck meat) compared with the rest of the experimental treatments in all different storage periods, it may be due to the high fiber content and low fat content of the manufactured bastrami on the one hand and no change in the value of the pH, which causes a decrease in the flavor of the manufactured pastrami, did not agree with Pearson (2001) that mixing different meat, whether chicken, beef or sheep, significantly reduced the flavor of the processed product.

## Taste

Table 5 shows the partial or total replacement of the old duck meat substitutes for beef on taste of the different periods stored of manufactured bastrami, the table shows no significant differences between the T<sub>2</sub> and T<sub>3</sub> partial substitution treatments compared to the control treatment T<sub>1</sub> during storage periods of 30, 45 and 60 days in the manufactured bastrami, a significant decrease (P=0.05) in T<sub>4</sub> and T<sub>5</sub> partial substitution compared to other experimental treatments and during all storage periods, T<sub>2</sub> and T<sub>3</sub> were significantly higher (P=0.05) than T<sub>4</sub> and T<sub>5</sub>.

A significantly decreased in T<sub>4</sub> and T<sub>5</sub> may be due to low fat, moisture and high fiber content, to use the older ducks meat is replaced by beef meat on the one hand, and to the storage period during the first two months reach bastrami to the stage of maturation better than long storage periods, thus reflecting the taste of pasteurized processed old ducks meat with a substitution rate of not more than 50% replaced by beef in manufactured bastrami, It was agreed with Wiley (2007) that the use of mixed meat, whether beef, sheep or chicken, resulted in no significant differences with the taste of pastrami made from one type of meat.

## pH

Table 6 shows the partial or total replacement of old duck meat substitutes for beef on pH of the different periods stored of manufactured bastrami, the results indicated that there were no significant differences between all the different treatments on the one hand and the effect of different storage periods on the value of pH, This may be due to the absence of significant differences due to similar storage conditions, as well as the lack of exposure to acid-producing bacteria such as lactic acid, which leads to low level of pH, this result was agreed with Laleye *et al.* (1984), which indicated a significant decrease in manufactured bastrami from different meat.

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