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## A Comparative Study Between Some of the Local Iraqi Method for Curing Chicken Meat and Typical Methods and Their Effect on Chemical Composition, Sensory Evaluation of Fresh and Storage Meat

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**Abstract:** This research work was carried out to study some of local Iraqi method of chicken meat curing in comparison with the typical method and its effect on chemical composition and sensory evaluation of fresh and storage meat compared with uncured meat (T<sub>1</sub>). Citric acid and salt (T<sub>2</sub>) were used in curing meat of the local Iraqi method (T<sub>3</sub>). Vineger and garlic (T<sub>3</sub>), While, brine solution was used with the typical method (T<sub>4</sub>). Curing was conducted under 4°C for 24 h. The samples storage for 0, 15 and 30 day under -18°C. The data revealed a significant increase (p<0.05) in moisture of the cured treatment compared with the control. T<sub>2</sub> have a higher percentage of moisture. The data indicated no significant differences in moisture content of all treatments as the period of storage increased. The data further, reveal the percentage of protein was decreased significantly (p<0.05) in cured treatment compared with the control. No significant differences between treatments as the period of storage increased. Fat content of cured treatment compared with the control did not differ significantly for all periods of storage. While ash content increased significantly (p<0.05) during curing, T<sub>4</sub> have a high percent, there were no significant differences between treatment during the storage period increased compared with all treatment. No significant differences in pH value, T<sub>3</sub> have a low percent (p<0.05) in pH. There were significant differences (p<0.05) between T<sub>1</sub>, T<sub>3</sub> and T<sub>2</sub>, T<sub>4</sub> were notice with regard to the percentage of cooking loss. The organoleptic assessment for color score was notice to decreased significantly (p<0.05) for treatment T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> while increased significantly (p<0.05) for T<sub>4</sub>. Flavor, tenderness and overall acceptability increased of curing treatment. The over all acceptability increased for the Iraqi method (T<sub>3</sub>) incomparisom with typical method and the control. There were a decrease (p<0.05) in sensory score when the period storage increased. This study revealed no significant differences between the Iraqi method curing and the typical method, Thus we can recommend using the Iraqi method of curing on large scale basis.

**Key words:** Chicken meat, curing, freezing, chemical composition, sensory evaluation

### INTRODUCTION

The production of poultry for meat has become by far, the largest facet of the poultry industry where as, 50 years ago in many parts of the world, most of the poultry meat marketed was a by product of egg production.

The phenomenal successes of broiler, turkey and fish industries during the last 50 years has led to marked changes in food preferences among consumers. The development of further, process products from poultry meat has been a major factor in the expansion of the markets for the chickens and turkey during the last three decades, Long time ago in many parts of the civilized world man learned how to preserve meat for future consumption, the most wildly used method was by salting and then drying the meat (Al-Ani, 1986). Many decades latter it was found that the shiny red color of the salted meat was due to the presence of traces of sodium and potassium nitrate and nitrite with the salt used for salting the meat (Gillespie, 1960). This led to used curing as a method of preservation. Thus became essential the use of nitrate and nitrite in meat preservation (Parks *et al.*, 2000). Since then several

meat curing methods has been developed to a suitable way to increase getting a homogenize curing components and minimize the presence of any unfavorable ingredient in the curing process such as the unfavorable color or any degradation of the meat cuts (Leverent, 2001; Katus, 2002).

In the meantime several methods have been adapted in applying curing components, such as in the case of dry curing where, the curing components squeezed on the surface of the meat. The disadvantage of using such a method is uneven distribution of the curing components, thus the meat will be hard and salty (Acbroat, 2001). Wet curing is preferred in which the whole curing components were dissolved in water to obtain the "Curing Brine" which will be added to the meat (Parks *et al.*, 2000), or by emersion the meat into the Curing Brine.

Many local ways of curing poultry meat without the use of nitrate or nitrite have been used with the curing components and preferred by the consumers for their good taste and flavor. Further research is needed to study these new products.

**MATERIALS AND METHODS**

We conducted this work at the college of Agricultural/ University of Baghdad. The carcasses were brought from a local market with an average weight of 1300 kg. The first local method of Brine Solution (T<sub>2</sub>) contained citric acid (1 spoon), spices, salt. Three hundred and forty gram ketchup and mixed with the liter of water, the curing process lasted one hour. The second local curing way (T<sub>3</sub>) consisted of vinegar, garlic and salt and weak acetic acid which contain acetic acid. The standard method (T<sub>4</sub>) use in curing poultry meat consisted of 5 gallons of water, 5 pound salt, 3 pound sugar, 1½ pound Brine solution which contained (6.25% sodium nitrate), 28 g black paper, 1.3 pound sodium tripolyphosphate, 0.21 pound sodium ascorbate, cup of crumpled pay levels the curing process lasted 24 h in refrigerator. The curing solution was prepared 24 h before being used, the samples were frozen for 0, 15 and 30 days. Chemical analysis (moisture protein, fat and ash) was determined according AOAC (1980). pH estimated according to Jeacocke (1977), cooking loss was estimate according to Rasmussein and Mast (1989). The degree of sensory evaluation of flavor, tenderness, juiciness and overall acceptance of cooked meat by roasting determined according to Bouine (1978). A 9-point hedonic scale (9-like extremely, 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 panaleats, We give them the details about this panel and we do a primary panel before the essential test which we depend on this study. We depending the standard point to control on varieties which may effect the degree of panel: Time of the test in 11 am, 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 programmes (SAS, 2001). LSD test was used to determine significant differences.

**RESULTS AND DISCUSSION**

The effect of curing methods on chemical composition of frozen poultry meat for the periods (0, 15 and 30) days are summarized in Table 1. The data revealed that the percentage of moisture increased significantly (p<0.05) after curing compared to control treatment T<sub>3</sub> showed the highest percentage, because of diffusion which led the salt to penetrate into the tissues of meat and mixed with the molecular water because of the increased of negative charges of meat protein and the increase of spaces among them which cause some binding of

Table 1: Effect of curing method and storage period on chemical composition of poultry meat

Characteristics	Treatment	Storage period (day)		
		0	15	30
Moisture	T <sub>1</sub>	72.313 <sup>Ca</sup>	71.060 <sup>Ba</sup>	70.116 <sup>Ba</sup>
	T <sub>2</sub>	74.096 <sup>Ba</sup>	74.236 <sup>Aa</sup>	73.953 <sup>Aa</sup>
	T <sub>3</sub>	76.436 <sup>Aa</sup>	75.860 <sup>Aa</sup>	74.533 <sup>Aa</sup>
	T <sub>4</sub>	74.883 <sup>Ba</sup>	74.173 <sup>Aa</sup>	73.060 <sup>A Ba</sup>
Protein	T <sub>1</sub>	17.500 <sup>Aa</sup>	17.450 <sup>Aa</sup>	17.093 <sup>Aa</sup>
	T <sub>2</sub>	13.990 <sup>Ca</sup>	13.713 <sup>Ba</sup>	13.016 <sup>Ca</sup>
	T <sub>3</sub>	15.340 <sup>Ba</sup>	15.220 <sup>Aa</sup>	15.000 <sup>Ba</sup>
	T <sub>4</sub>	13.716 <sup>Ca</sup>	13.050 <sup>Ba</sup>	12.886 <sup>Ca</sup>
Fat	T <sub>1</sub>	10.026 <sup>Aa</sup>	9.700 <sup>Aa</sup>	10.020 <sup>Aa</sup>
	T <sub>2</sub>	8.840 <sup>Aa</sup>	8.650 <sup>Aa</sup>	9.402 <sup>Aa</sup>
	T <sub>3</sub>	9.036 <sup>Aa</sup>	8.620 <sup>Aa</sup>	8.226 <sup>Aa</sup>
	T <sub>4</sub>	8.000 <sup>Aa</sup>	8.500 <sup>Aa</sup>	9.000 <sup>Aa</sup>
Ash	T <sub>1</sub>	0.213 <sup>Cb</sup>	1.093 <sup>Cb</sup>	1.766 <sup>Ca</sup>
	T <sub>2</sub>	1.050 <sup>Ba</sup>	1.176 <sup>Ba</sup>	2.231 <sup>Ca</sup>
	T <sub>3</sub>	1.250 <sup>Ba</sup>	1.756 <sup>Ba</sup>	2.013 <sup>Ba</sup>
	T <sub>4</sub>	3.326 <sup>Aa</sup>	4.153 <sup>Aa</sup>	4.833 <sup>Aa</sup>

Means followed by the same small latter (Raw) and means followed by the same big latter (Columns) are not significant

Table 2: The effect of curing methods and storage period on pH and cooking loss

Characteristics	Treatment	Storage period (day)		
		0	15	30
pH	T <sub>1</sub>	5.80 <sup>Aa</sup>	5.53 <sup>Aa</sup>	5.33 <sup>Aa</sup>
	T <sub>2</sub>	5.41 <sup>Aa</sup>	5.23 <sup>Aa</sup>	5.06 <sup>Aa</sup>
	T <sub>3</sub>	4.72 <sup>Ba</sup>	4.52 <sup>Ba</sup>	4.4 <sup>Ba</sup>
	T <sub>4</sub>	5.60 <sup>Aa</sup>	5.36 <sup>Aa</sup>	5.06 <sup>Aa</sup>
Cooking loss	T <sub>1</sub>	21.15 <sup>Ba</sup>	21.61 <sup>Aa</sup>	22.56 <sup>Aa</sup>
	T <sub>2</sub>	22.13 <sup>Aa</sup>	21.43 <sup>Aa</sup>	23.06 <sup>Aa</sup>
	T <sub>3</sub>	20.32 <sup>Ba</sup>	19.80 <sup>Ba</sup>	20.00 <sup>Ba</sup>
	T <sub>4</sub>	23.06 <sup>Aa</sup>	21.15 <sup>Aa</sup>	24.36 <sup>Aa</sup>

Means followed by the same small latter (Raw) and means followed by the same big latter (Columns) are not significant

molecular water which consider apolized molecule (Lawrie, 1974). Busboon (2002) reported that percentage of moisture of cured meat has been increased. No significant differences were noticed of the percentage of moisture during frozen period.

The data in Table 1 showed significant decreased (p<0.05) in the percentage of protein between treatment T<sub>2</sub> and T<sub>4</sub> which maintained the lowest percent, no significant differences were notice among treatments, because of the extraction of sarcoplasmic protein dissolved in water and myofibril protein dissolved in salt-water and drained with curing solution, instead of that curing method led to the increase of moisture percentage compared to protein percentage. No significant differences were noticed with frozen meat comparable with the control because of slow and little analyses of meat protein during frozen storage (Al-Aswad, 2000). These results agree with that of Lyon (1984) when freezing curing meat in -34°C, percentage protein decreased from 19.7-18.3%. The storage period, did not show any differences between treatments. There

Table 3: The effect of curing methods and storage period on sensory evaluation, color, flavor, tenderness and overall acceptance

Treatment	Storage period	Color	Flavor	Tenderness	Acceptance
T <sub>1</sub>	0	7.70 <sup>Aa</sup>	7.65 <sup>Ba</sup>	7.65 <sup>Ba</sup>	6.72 <sup>Ca</sup>
	15	7.25 <sup>Ab</sup>	7.33 <sup>Ba</sup>	7.40 <sup>Ba</sup>	6.47 <sup>Ca</sup>
	30	6.70 <sup>Bc</sup>	7.14 <sup>Bb</sup>	7.07 <sup>Ba</sup>	6.07 <sup>Ca</sup>
T <sub>2</sub>	0	7.69 <sup>Aa</sup>	8.61 <sup>Aa</sup>	8.85 <sup>Aa</sup>	8.81 <sup>Aa</sup>
	15	7.30 <sup>Ab</sup>	8.60 <sup>Ab</sup>	8.76 <sup>Aa</sup>	8.56 <sup>Aa</sup>
	30	6.70 <sup>Bc</sup>	8.35 <sup>Ab</sup>	8.25 <sup>Ab</sup>	8.72 <sup>Aa</sup>
T <sub>3</sub>	0	7.78 <sup>Aa</sup>	8.73 <sup>Aa</sup>	8.83 <sup>Aa</sup>	8.83 <sup>Aa</sup>
	15	7.20 <sup>Ab</sup>	8.50 <sup>Ab</sup>	8.73 <sup>Aa</sup>	8.61 <sup>Aa</sup>
	30	6.60 <sup>Bc</sup>	8.25 <sup>Ab</sup>	8.25 <sup>Ab</sup>	8.77 <sup>Aa</sup>
T <sub>4</sub>	0	8.85 <sup>Aa</sup>	8.76 <sup>Aa</sup>	8.79 <sup>Aa</sup>	8.07 <sup>Ba</sup>
	15	8.73 <sup>Aa</sup>	8.50 <sup>Ab</sup>	8.50 <sup>Ab</sup>	8.42 <sup>Ba</sup>
	30	8.61 <sup>Aa</sup>	8.25 <sup>Ab</sup>	8.25 <sup>Aa</sup>	7.85 <sup>Ba</sup>

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

where no significant differences among treatments with regard to the percentage of fat storage (AL-Ani, 1999). Table 1 shows a significant increase in ash was notice ( $p < 0.05$ ) in curing treatment, T<sub>4</sub> have upper degree, were no significant differences between T<sub>2</sub> and T<sub>3</sub>. There were no significant differences among all treatments during storage except T<sub>1</sub> which increased significantly ( $p < 0.05$ ) as the period of storage advanced and thus related to the increased in salt content as the moisture evaporated during freezing (Mohammed *et al.*, 1988). It was notice that the increase in ash percentage was due to the content of brine solution of nitrite, ascorbate, salt, sugar and paper which were diffuse in the meat (Lyon, 1984). Table 2 showed the effect of curing and frozen storage on pH and cooking loss, there were no significant differences in pH among treatments and during storage except T<sub>3</sub> which had the lowest degree because it was cured with vinegar. No significant differences in pH during Frozen storage, because of the non significant decrease of fermented glycogen stored in muscles due to endogenous enzymes in meat and to the accumulated lactic acids in muscle (AL-Aswaid, 2000). The data in Table 2 revealed a significant differences ( $p < 0.05$ ) between T<sub>1</sub> and T<sub>3</sub> in comparison with T<sub>2</sub> and T<sub>4</sub> which maintained the highest percentage of cooking loss, this might be the result of the absorption of large quantity of water by these 2 treatments which resulted in higher percentages of cooking loss (AL-Fayadh and Naji, 1989). No significant differences among treatment, during storage period were noticed. The effect of curing methods follow by freezing on the sensory characters, indicated in Table 3 revealed that T<sub>4</sub> (The conventional method) accomplish the highest sensory score, in color which was a highly accepted comparable with other treatments which have no significant differences among them in color, due to nitrite which causes the desirable pink color (Lee and Cassens, 1980).

As for storage period a significant differences ( $p < 0.05$ ) was noticed of the score grades as the storage period increased for treatment T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> and a decrease in the score of treatment T<sub>4</sub> due to nitrosomyoglobin

pigment formed during cooking when nitrate was used. This pigment is stable under storage condition at the time same it will be sensitive to oxygen which may cause some minor change as the storage period advanced ( Mitsumoto *et al.*, 1991).

The data in Table 3 concerning the flavor showed that the cured treatments (T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>) maintained significantly ( $p < 0.05$ ) the highest score compared to treatment T<sub>1</sub> (control) because T<sub>2</sub> have citric acid and T<sub>3</sub> have vinegar and garlic and T<sub>4</sub> have ascorbate and nitrate which cause the acceptable flavor. The score decrease as the storage period increase.

Tenderness have a better score (very tender) for cured treatments compared to the control mainly because of the acids in the curing solution which causes meat tenderness.

The acids hydrolyze the meat protein specially the myofibril protein which cause the meat to be tender (Tahir, 1983). No significant difference in tenderness as the period of storage advanced for T<sub>1</sub>, while curing treatments decrease significantly ( $p < 0.05$ ) with 30 day storage.

The Iraqi method of curing (T<sub>2</sub>, T<sub>3</sub>) have a higher score for overall acceptance (Table 3), then T<sub>4</sub> and finely T<sub>1</sub> the control which have the lowest score. The score decrease for all treatments when the period of storage increased. The characteristics of all over acceptance was a conclusion of color, flavor and tenderness and the curing treatments have a highest score for this character, therefore, it have a higher overall acceptance, the Iraqi method of curing maintained has the highest score regardless of the color.

**Conclusion:** In conclusion, we can recommend using the Iraqi method of curing on large scale basis instead of the standard method which depend on using nitrite as curing material.

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