

Effect of thawing and coating of broiler carcass cuts on cooking loss and sensory characteristics

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Abstract: The object of this experiment to study the effect of thawing and coating of frozen broiler carcass cuts (Breast, thigh, drumstick) on cooking loss percentage and sensory characteristics (Tenderness, flavor, juiciness). 24 carcasses of broiler were divided to the main cuts (Breast, thigh, drumstick) and frozen for 3 weeks then divided to 4 groups of 6 cuts, half of each cuts were thawed on room temperature and the other half left frozen, then half of the thawed and half of the frozen cuts were coated with a layer of Kentucky mix in a plastic bag, then all carcass cuts were fried in deep oil. The results showed that thawing or coating or interaction between them had no significant effect on cooking loss percentage for the three parts, and thawing did not affect sensory characteristics significantly, while coating had a significant effect on tenderness, juiciness, and flavor at ($P < 0.05$) of the breast and the tenderness of thigh and drumstick ($P < 0.05$). The interaction between thawing and coating had a significant effect on Juiciness and flavor of breast and tenderness of thigh ($P < 0.05$) but not significant on drumstick.

Keywords: broiler, coating, Thawing, Cooking loss, Sensory Characteristics.

تأثير الإذابة والتغطية لقطع ذبائح فروج اللحم المجمدة على نسبة الفقد اثناء الطبخ والصفات الحسية

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المستخلص: هدفت هذه التجربة إلى دراسة تأثير ذوبان وتغطية قطع ذبائح فروج اللحم (الصدر، الفخذ، الدبوس) على نسبة الفقد أثناء الطهي والخصائص الحسية (الطراوة، النكهة، والعصيرية). تم تقسيم 24 ذبيحة من ذبائح فروج اللحم إلى القطع الرئيسية (الصدر، الفخذ، الدبوس) حيث تم تجميدها لمدة 3 أسابيع ثم قسمت إلى 4 مجموعات من 6 قطع، تمت إذابة نصف القطع في درجة حرارة الغرفة والنصف الآخر تركت مجمدة، بعدها تم أخذ 3 من كل من القطع الرئيسية جرى تغطيتها بطبقة من خلطة كنتاكي في كيس بلاستيكي، ثم تم قلبها في الزيت العميق على درجة 180 درجة مئوية. أظهرت النتائج أن الإذابة أو التغطية أو التداخل بينهما لم يكن لها تأثير معنوي على نسبة الفقد أثناء الطهي للأجزاء الثلاثة، كما أن الإذابة لم يكن لها تأثير معنوي على الصفات الحسية لقطع الصدر وأن قطع الصدر غير المغطاة أظهرت انخفاض معنوي في قيم العصيرية والطراوة والنكهة تحت مستوى ($P < 0.05$)، كما وجد انخفاض معنوي

في قيم الطراوة ($P < 0.05$) بالنسبة لقطع الفخذ والدبوس غير المغطاة في حين لم يكن هناك اختلاف معنوي في قيم العصرية والنكهة لهذه القطع.

الكلمات المفتاحية: فروج اللحم، ذبائح، الإذابة، التغطية، الفقد أثناء الطبخ، الصفات الحسية.

Introduction.

Poultry meats are an important source of animal protein in human diet. (Augustyńska-Prejsnar et al, 2018) indicated that global broiler production had grown by 80.5% between 2000 and 2016 comparing to pork and beef which increased by 35%, 20.7% respectively. One of the common practices used in storage of meat are freezing. Frozen meat should be thawed before used and thawing time should be minimum to reduce microbial growth, chemical alteration, water loss, because the quality of frozen meat depend upon the freezing and thawing procedures (Akhtar et al 2013). (Zhuang and Savage, 2020) indicated that thaw loss % is calculated by the difference in weight between before and after thawing of meat. (Zhuang et al, 2013) found that there is a significant difference in cooking loss% between frozen (21.2%) and thawed (19.0%) breast cuts, and frozen cuts show significantly ($P < 0.05$) higher Cohesiveness, Hardness, Rate of breakdown, Chewiness, while there were insignificant differences in flavor between frozen and thawed cuts. (Benly 2016) stated that of the 319 families that thawed the frozen chicken at home, 31.66 percent thawed at the ambient temperature, 26.64 percent in the refrigerator, 14.42 percent in the hot water, 13.17 percent in the microwave, 7.21 percent under tap water, 5.33 percent cooking without thawing, and 1.57 percent of options were other methods, including the combination of two or more methods. (Robbins et al 2003) indicated that flavor, tenderness, and juiciness, were the main factors of consumer eating satisfaction. (Augustyńska-prejsnar 2019) found that drip loss and cooking loss increased significantly ($p < 0.05$) with freeze storage duration (1-8 months) and thawing method where it is higher when thawed in atmospheric air comparing to microwave method. (Aidani et al, 2014) indicated that the balance between thawing time, appearance and the bacteriological state of the product, manufacturing problems such as expenditure and operational costs of wastewater treatment and the related systems must be taken when choosing a thawing technique for industrial use, and the thawing time relies on product-related variables and environmental factors. (Wang et al, 2003) studied the effect of different freeze thawing cycles of rabbit meat on meat quality where he found that thawing and cooking loss increased significantly ($P < 0.05$) by increasing freezing thawing cycles (1, 2, 3, 4, 5), while hardness (g) decreased significantly. (soyer et al, 2010) indicated that there are a range of physical and biochemical changes during frozen storage, such as water loss, color shift, lipid and protein oxidation, that can affect the quality of frozen chicken meat. (Akhtar et al, 2013) had mentioned that Appropriate precautions must be taken during the thawing of meat to avoid microbial deterioration, including the temperature being lower than the hazardous area and reducing the thawing time. Incorrect thawing technology will result in activation and reproduction of dormant microflora that already exist on the surface of the meat.

(Cunningham and Lee, 1975) found that the weight loss of thawed meat before cooking is significantly greater than that from the frozen state, and the bones of the parts cooked from the frozen state are less black than the cooked of the thawed part, and members of the taste panel do not differentiate broilers Cooked from the frozen state, and the broiler thawed before cooking.

Materials and methods.

The research was carried out on broiler chickens bought from a commercial broiler producer on the day of slaughter. The birds were slaughtered and divided into the main cuts, (breast, thigh, and drumstick). 24 carcasses of broiler were divided to the main cuts (Breast, thigh, drumstick) then frozen at a temperature of -20 C° for 3 weeks. Half of each cuts were got out of freezer and thawed at room temperature for 4 hours and the other half kept in freezer. Then half of the thawed and half of frozen cuts were coated with a layer of Kentucky mix (wheat flour and Kentucky spices) in a plastic bag. All cuts were weighed before frying then fried in a deep corn oil for 10 minute until it become with a brown color, then all cuts were left on pieces of wire clamp to get rid of the remnants of oil and weighed after frying to calculate cooking loss percentage,

according to the formula:

$$\text{Cooking loss\%} = \frac{Wb - W a}{Wb} \times 100$$

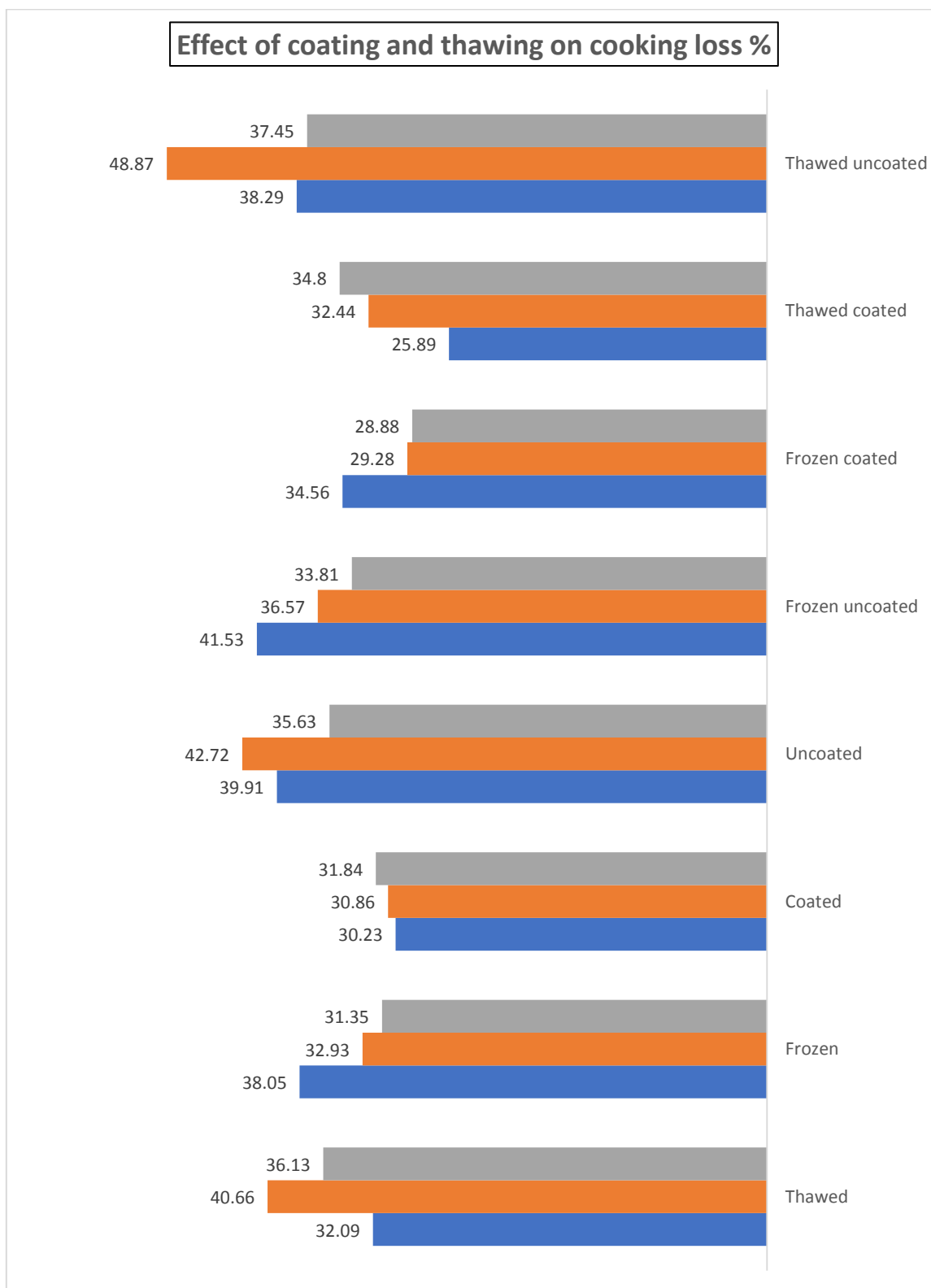
where Wb is the weight of meat before cooking, and Wa is the weight of meat after cooking. The carcasses cuts were examined for their suitability for human consumption before being presented to sensory auditors.

The sensory evaluation was carried out by 15 faculty members at the College of Agriculture, where each of them was provided with a form to record their evaluation of each piece in terms of tenderness, flavor and juiciness according to (Al-Fayadh et al, 2011) With a scale of 9 degrees ranging from very soft to very dry for tenderness, very good to unacceptable for flavor and very juicy to Unacceptable for juiciness, and the data were analyzed by the CRD using the SAS 2012 program, the means were compared Via the Duncan multiple test. and the percentages of weight loss during cooking were converted to the corresponding values of the sine.

Results and discussion.

Figure (1) shows the effect of thawing, coating, or interaction between them on the percentage of loss during cooking in deep frying with oil for the three cuts (breast, thigh, drumstick), and it was shown that thawing or coating or the interaction between them had insignificant effect on losses over the course of the cooking of the three cuts. However, it was noticed that the coated cuts showed a mathematical decrease in cooking loss comparing to uncoated, and the interaction between thawing and coating did not have a significant effect on cooking loss, it appeared that the uncoated frozen breast showed the highest

percentage of loss 41.53% and the thawed coated was the lowest 25.89%, while for the thigh ranged between 29.28% for frozen coated and 48.87% for thawed uncoated, and between 28.88% for frozen coated, 37.45% for thawed uncoated for drumstick. This results did not agreed with (Zhuang et al, 2013) who found a significant difference in cooking loss% between frozen and thawed breast cuts. (Wei et al, 2017) indicated that the increased of cooking loss in frozen meat may be due to the denaturation of protein tissues, and the damage of cell structure by ice crystals. (Akhtar 2013) indicated that thawing method at room temperature (counter top) is not favorable due it increased cooking loss and increased loss of many nutrients of meat. (Ballin and Lametsch, 2008) indicated that there was an increase in drip loss of thawed comparing to fresh meat. (Cunningham and Lee, 1975) found that deep frying of broiler halves increased cooking loss comparing to other methods of cooking.



DRUMSTICK

THIGH

BREAST

Table (1) shows that there were a significant difference between treatments in Juiciness, tenderness and flavor at ($P<0.05$) for breast cuts, there were a significant decrease in uncoated cuts comparing to other treatments in the sensory characteristics of breast for juiciness, flavor, tenderness, this result disagreed with (Zhuang et al, 2013) who found insignificant difference in flavor of breast cuts.

There were insignificant difference between treatments in juiciness and flavor of thigh, while there was a significant decrease in tenderness of uncoated thigh comparing to other treatments. The drumstick shows a similar results were there was a significant difference only in tenderness, a significant decrease in tenderness in undressed cuts comparing to other treatments at ($P<0.01$). (Rahman et al, 2014) did not found a significant effect of first cycle thawing on juiciness and tenderness while there are significant decrease in cooking loss when thawed at 40 C ambient temperature. (Al Ani, 2013) did not found a significant effect of adding different types of spices, anise, thyme, curry, black pepper to crispy chicken on flavor, tenderness, and Juiciness. (Akhtar et al, 2013) indicated to lower tenderness of freeze-thawed meat compared to chilled meat and this may have attributed to loss of fluids during thawing. (Cunningham and Lee, 1975) indicated that members of the taste panel do not differentiate broilers Cooked from the frozen state, and the broiler thawed before cooking.

Table (1) Effect of thawing and coating on sensory evaluation of broiler carcass cuts

Cuts	Treatments	Juiciness	Flavor	Tenderness
Breast	Frozen	5.150 a	5.700 a	5.475 a
	Thawed	5.500 a *	5.800 a **	5.600 a *
	Coated	5.525 a	6.075 a	5.750 a
	Uncoated	5.125 b	5.425 b	5.325 b
Thigh	Frozen	5.200 a	5.600 a	5.400 a
	Thawed	5.275 a	5.825 a	5.525 a *
	Coated	5.350 a	5.750 a	5.850 a
	Uncoated	5.125 a	5.675 a	5.075 b
Drumstick	Frozen	4.975 a	5.425 a	5.275 a
	Thawed	5.125 a	5.475 a	5.250 a *
	Coated	5.075 a	5.600 a	5.525 a
	Uncoated	5.025 a	5.300 a	5.000 b

(*) Means with different superscripts in same column within each cut differs Significantly, at ($P<0.05$).

Table (2) shows the interaction between thawing and coating of broiler cuts on sensory characteristics. The uncoated breast cuts whether frozen or thawed reflects less significant degrees of flavor compared to coated ones, also the frozen uncoated shows a significant decrease in juiciness comparing to other treatments, and there were insignificant difference in tenderness between all

treatments. There were insignificant difference in Juiciness and flavor between treatments, while the uncoated whether frozen or thawed thigh cuts shows less tenderness comparing to coated thigh cuts. The treatments shows insignificant effect on juiciness, flavor, and tenderness of drumstick cuts.

(zhang et al, 2020) indicate that Cooking directly from frozen state caused harder thigh meat (5.7) than the other thawing treatments ($P<0.05$); however, there were no difference in cooked breast fillets between thawing methods (fresh/never freezing/thawing, directly from frozen state, and thawing for 2 or 24 h before cooking)

(2) The interaction effect between thawing and coating on sensory characteristics.

Cuts	Treatments	Juiciness	Flavor	Tenderness
Breast	Frozen coated	5.500 a	6.050 a	5.650 a
	Frozen uncoated	4.800 b	5.350 b	5.300 a
	Thawed coated	5.550 a	6.170 a	5.850 a
	Thawed uncoated	5.450 a	5.500 b	5.350 a
Thigh	Frozen coated	5.300 a	5.650 a	5.750 a
	Frozen uncoated	5.100 a	5.550 a	5.050 b
	Thawed coated	5.400 a	5.850 a	5.950 a
	Thawed uncoated	5.150 a	5.800 a	5.100 b
Drumstick	Frozen coated	5.050 a	5.550 a	5.550 a
	Frozen uncoated	4.900 a	5.300 a	5.000 a
	Thawed coated	5.100 a	5.650 a	5.000 a
	Thawed uncoated	5.150 a	5.300 a	5.000 a

* Means with different superscripts in the same column within each cut differs significantly ($P<0.05$)

Conclusion

It is clear under the circumstance of our research that thawing had insignificant effect on cooking loss or sensory characteristics of carcass cuts and that coating had a significant effect on tenderness, juiciness, and flavor at ($P< 0.05$) of the breast and the tenderness of thigh and drumstick ($P< 0.05$). The interaction between thawing and coating had a significant effect on Juiciness and flavor of breast and tenderness of thigh ($P< 0.05$) but not significant on drumstick, so the coating of broiler cuts improve the sensory characteristics, I recommend studying the effect of different methods of thawing and the possibility of contamination with microorganisms during thawing to keep it healthy.

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