PREPARATION OF COMPOUND FILMS FROM PROTEIN HYDROLYSATES OF BUFFALO SKIN AND PLANT EXTRACTS AND STUDY ITS PROPERTIES AND THEIR USE IN COAT MEAT CHICKEN

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Abstract

This study included preparation of a protein hydrolysate from buffalo skin in an acidic way, and a study the chemical content of the skin and an acidic protein hydrolysate moisture 67.24%, 9.81%, protein 29.52%, 83.85%, fat 1.86%, 2.82%, and ash 0.85%, 3.12% For both the skin and the acidic protein hydrolysate, respectively. Protein hydrolysate a rate of 4% and 40% of glycerol used in the preparation of a simple films and its detention and mechanical properties were studied. Then, the compound films with extracts of ginger, thyme and cloves were prepared at a concentration of 0.3%. The results showed that their values decrease in permeability, solubility, tensile strength and elongation in compound films with simple films. Simple and compound films prepared were used in coated chicken breast slices and refrigerated at (5 ± 1)C for 10 days during which some specific characteristics of the coated slices were studied and compared with uncoated slats.

Keywords : Plant extracts; buffalo skin; protein hydrolysates.

Introduction

Protein hydrolysates are peptide chains of various lengths and various amino acids resulting from hydrolysis of proteins by acids, bases and enzymes. Protein hydrolysate products have been used in many fields, especially nutrition, as well as some of the decomposition products have vital efficacy as antimicrobial and antioxidant (Harris et al., 2009 and Zhao et al., 2011). Degradation of proteins by acids or enzymes results in a number of products that end with amino acids, starting with the production of protein and then di peptide and ending with free amino acids (Manninen, 2009 and Herpandi et al., 2011), films are defined as the thin layers surrounding the food and can Consuming it with the food material, it works to extend the storage period of the food product by improving the detention properties of water and oxygen vapor or the transfer of the hydrolysis substance, increasing thermodynamic and reducing enzymatic reactions and pregnancy and microbial count (Falguera et al., 2011). The films were classified as oily films, as these films were characterized by their good detection properties of water vapor as a result of their anti-hydrophobic nature and their crystalline structure that acts as a barrier to moisture as well as they gain the appearance and luster of the product, but fish and fragility are accustomed to it, so some other materials must be added to improve its mechanical properties, especially proteins or derivatives. Cellulose (Cutter and Sumner, 2002) and glucose films, as Taylor (2005) indicated that glucose films have characteristics that make them suitable for preserving frozen foods that include meat, poultry, fish, and seafood. protein films, edible protein films have received great attention in recent years due to their nutritional and health benefits, abundance and renewable nature, as they can be used to package small portions of food or as carriers of antioxidants and as well as the possibility of using them in the packaging of multi-layered foodstuffs, as these are films are in direct contact with the foodstuff, followed by the other inedible layers. Many protein substances were used in preparing the edible films that were used in the packaging of food products, especially meat. Collagen is a fibrous protein with great interest in the production of edible films, as it possesses distinct properties that made it the most successful in preparing edible films, including biocompatibility with the biological material, non-toxic, and possessing appropriate physical and chemical properties as well as the ability to extract and purify it in large quantities (Wittaya, 2012), As Quiros–Sauceda et al. (2014) mentioned, the bioactive compounds are added to the films either on the surface layer of the films or the addition of the active substance in the bottom layer of the films or it may be in contact with the food material and the addition may be through two layers or through multiple layers of the films as the layers containing the bioactive compounds are not in contact with the material Food. The aim of this Study was prepared protein hydrolysate from buffalo skin and use it in preparing compound films by adding plant extracts, and study their reservation and mechanical properties, and test the efficiency of these films to maintain the qualitative characteristics of chicken breast slices.

Materials and Methods

Raw Materials

The buffalo skin was obtained from the massacre of Maysan Governorate, it was cleaned, washed and cut into small pieces ranging from 2-3 cm and kept freezing until use. Plants used in the Study

Samples of plants were purchased from the local markets in Basra and included thyme, ginger, and cloves. It was ground with softly by electric grinder and sieved well, then placed in polyethylene bags and kept in the refrigerator (5 ± 1) c until use (Table 1).

<table>
<thead>
<tr>
<th>Part used</th>
<th>Scientific name</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rayesomate</td>
<td>Zingiber officinale</td>
<td>Ginger</td>
</tr>
<tr>
<td>Seeds</td>
<td>Thyme vulgaris</td>
<td>Thyme</td>
</tr>
<tr>
<td>Fruits</td>
<td>Eugenia caryophyllata</td>
<td>Clove</td>
</tr>
</tbody>
</table>

Chicken Breast Meat : The meat was cut into strips with a thickness of 2 cm and a length of 4 cm. It was wrapped with prepared films and stored in refrigeration for 10 days, during which it studied some of its quality characteristics, which included peroxide number, thiobarbituric acid, and of free

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fatty acids, the percentage of lost moisture and the percentage of fat after frying and the cooking yield.

**Chemical content**

The chemical content of buffalo skin and the hydrolysate prepared in an acidic method was studied which included moisture, fat and ash according to the AOAC (1995). Protein according to the Egan et al. (1988).

**Preparation of Protein Hydrolysate**

Acidic hydrolysate was prepared by using citric acid according to the method of Niu et al. (2013) and Ktari et al. (2014).

**Detention and mechanical characteristics**

**Measurement of Films thickness:**

The thickness of the prepared films was measured in different proportions of the protein hydrolysate and plasticizer using a manual measuring tool with a sensitivity of closer to 0.01 mm. The measurements were taken by testing five random locations for each film from the circumference to the films center and then calculating the five films average readings (Bourtoom, 2008).

**Estimation permeability of films of water vapor**

The films permeability of water vapor (WVP) was estimated according to the method Oh (2012).

**Tensile strength and elongation till the cutting edge**

Tensile strength and Elongation percentage were measured According to the method described by Kaya and Kaya (2000) and Tanaka et al. (2001).

**Estimation of the solubility of films in water**

The solubility of films in water was estimated according to the method used by Zahedi et al. (2011).

**Light transmittance**

The light transmittance was estimated by dissolving the films in 0.5 M of acetic acid at a concentration of 2 mg / ml. Absorbance was measured by the ultraviolet device of the Polymer Research Center - University of Basra at a wavelength of 200-500 nm at a scan rate of 210 nm, according to the method described by Yan et al. (2008).

**Peroxide Number Value (P.V.)**

Peroxide number was estimated before and during storage periods according to Egan et al. (1988).

**Estimating of Fat Percentage**

The percentage of fat in chicken pieces and pieces of wrapped and uncoated fish after frying was estimated according to the method.

**Percentage of cooking yield**

The yield was calculated by weighing the wrapped and uncoated chicken and fish pieces after frying, and the yield was determined according to the Mukprasirt et al. (2000) method.

**Results and Discussion**

**Chemical content of buffalo skin and acidic protein hydrolysate**

The results in Table (1) show the chemical content of buffalo skin and acid decomposing that included moisture, protein, fat and ash, as they reached 67.24%, 29.52%, 1.86%, and 0.85%, respectively. These results converged with what Mulyani et al. (2017) found. When they studied the chemical content of buffalo skin, as the moisture content was 68.62%, protein content was 30.22%, and ash content was 0.72%, based on the wet weight. As for the chemical content of the acid protease decomposition, it amounted to 9.81%, 83.85%, 2.82% and 3.12% for moisture, protein, fat and ash, respectively.

**Table 1 : Chemical content of buffalo skin and acid decomposing**

<table>
<thead>
<tr>
<th>Chemical content%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
</tr>
<tr>
<td>0.85</td>
</tr>
<tr>
<td>3.12</td>
</tr>
</tbody>
</table>

**The thickness of films**

Table (2) indicates the thickness of the films prepared from protein hydrolysate by 4% and plasticized by 40% with the addition of plant extracts. It was noted that the thickness of the compound films increased to 0.25, 0.21 and 0.26 mm for the compound films prepared by adding ginger, thyme and clove extracts, respectively, compared which simple films (0.037), and the reason for this may be attributed to the concentration of the added extract, as the increase in concentration and solid materials leads to an increase in the thickness of the films (Dashipour et al., 2014).

**Table 2 : Thickness of compound films with added plant extracts**

<table>
<thead>
<tr>
<th>Thickness of compound films</th>
<th>Glycerol %</th>
<th>Hydrolysate %</th>
<th>Films type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>40</td>
<td>4</td>
<td>Compound with ginger</td>
</tr>
<tr>
<td>0.21</td>
<td>40</td>
<td>4</td>
<td>Compound with thyme</td>
</tr>
<tr>
<td>0.26</td>
<td>40</td>
<td>4</td>
<td>Compound with clove</td>
</tr>
<tr>
<td>0.037</td>
<td>40</td>
<td>4</td>
<td>Simple film</td>
</tr>
</tbody>
</table>

**Solubility Properties of Films**

**Solubility of films**

The results in Figure 1, showed that the solubility of the compound films decreased compared to the simple films (38.14%), as the ratio of the melting of the compound films by adding ginger extract decreased to 30.72%, the prepared
films by adding clove extract to 27.6%, and the films prepared by adding thyme extract, solubility reached 29.2%. The reason for the decrease in the solubility of the films may be attributed to the increase in the density of the hydrolysis in the films, and consequently the movement of the molecules, leading to a decrease in the solubility of the films.

**Films Permeability of Water Vapor**

Figure (2) showed a decrease in the permeability values of the compound films of water vapor, as it reached 8.15%, 7.2% and 5.4% g. Mn/m². Hour. KPa for films with extracts of ginger, thyme and clove, respectively, compared to the simple films (9.15) and The results of the statistical analysis showed the presence of significant differences for the permeability of the compound films for which plant extracts were added at the probability level P <0.05). The reason for the decrease may be attributed to the interaction between the extract and films components, which led to an increase in the hydrophobic nature of the films, thus decreasing the hydroxyl (OH) groups that interact with water molecules and thereby reducing the susceptibility of water-soluble films (Shojae-Aliabadi et al., 2013).

**Mechanical Properties**

**Tensile strength**

Figure 3 showed the tensile strength of compound films compared to simple ones (28.8) MPa. The highest tensile strength value when adding an extract of ginger was 26.8 MPa and the lowest tensile value was at the extract of thyme and clove, reaching 26.1 MPa and 26.5 MPa, respectively. The tension when adding the cholesterol to the prepared gelatin films decreases due to the decrease in the hydrogen bonds and the transverse bonds between the gelatin molecules, as the interaction of the beta-gelatin peptides occurs and the OH group in the glycerol that leads to a weak network structure of the gelatin films.
Thiobarbituric Acid (TBA)

The results in Figure (7) showed the values of TBA for chicken breast uncoated and coated with simple protein films and compound films stored in refrigeration for 10 days, as the results of the statistical analysis showed a significant decrease of P <0.05) in the TBA values for samples coated with simple films and compound films compared to the control treatment TBA values decreased in simple films and compound films for which plant extracts were added, and this decrease was in all coated samples compared to the control, but this decrease varies according to the type of added extract, as the lowest TBA values were in samples covered with added films. It has ginger extract, thyme, and finally clove. The reason for this difference in acid values when adding plant extracts to films is the difference in their content of phenolic compounds with antioxidant effectiveness. The results of the statistical analysis also showed a significant effect during the storage period at the level (P <0.05) on the TBA values and for all samples in chicken pieces coated with simple and compound films also increased and for all extracts.

Free Fatty Acids (FFA)

The results in Figure (8) indicate the ratio of free fatty acids of uncoated and coated with simple and compound films in meat during the storage period.

The reason for this may be due to the chicken meat content of the fat and the type of fatty acids in it. As for the reason for the rise in the peroxide values due to the advancement of the storage period in all coated and uncoated samples, it is due to the oxidation of fats and thus peroxide is formed that increases during the storage period but the covers with which the extracts were added have lower values in Peroxide, as it contains compounds that have inhibitory activity to form peroxides, and results also agreed with Al-Ghazzi (2019) who observed high peroxide values in meat during the storage period.
extract of ginger and thyme, which has a clear impact on reducing the FFA ratio through its effect on limiting the growth of bacteria that secrete lipase enzyme that works to cause analytic rancidity.

It also increased with the advance of the period of storing fish amounted to non-coated samples, from 38.78% before storage to 44.7% at the end of the storage period. As for the samples coated with simple films, it continued to rise sample 25.6% to 27.2% after 3 days and reached 28.8% and 30.7% after the passage of 7. And 10 days in a row and in samples coated with films added to them ginger increased from 19.2% to 25.21% after the passing of 10 days. As for the increase in samples coated with films added with clove extract, it increased from 22.8 before storage to 28.1% at the end of the storage period.

**The percentage of fat after frying**

The results in Figure (10) indicate the percentage of fat after frying in pieces of coated and uncoated fried chicken breast with simple and compound protein films and stored in refrigeration for 10 days, as the results of the statistical analysis showed that the percentage of fat after frying decreased significantly (P <0.05) in pieces chicken breast coated with compound films compared to simple films and control treatment. The lowest fat percentage for chicken parts coated with compound films which added to ginger extract, as it reached 3.51%, followed by samples coated with thyme extract as it reached 3.55% and then clove extract reached 3.62% either in together A control ratio of fat after frying high was reached 7.1%. The reason for this may be due to the presence of the films, which reduces the absorption of fat in fried food and the formation of a solid shell that imposes a loss of nutrients. The results of the statistical analysis showed that the storage period had a significant effect (P <0.05) on the percentage of fat after frying in all coated and uncoated samples. High percentage of fat percentage after frying with the advance of the Storage period.

**Cooking Yield**

The results in Figure (11) indicate the percentage of the cooking yield for the uncoated chicken breast pieces coated with simple protein films and compound films stored in refrigeration for 10 days, as the results of the statistical analysis showed a significant increase (P <0.05) for the percentage of the cooking yield for the chicken breast cut with compound films compared to simple films and control treatment, the percentage of cooking yield in chicken pieces decreased significantly (P <0.05) during storage period. In the control treatment, it decreased from 59.6% before storage and continued to decrease, reaching 51.8% after 10 days, as it decreased in models The envelope with simple films, from 66.2% to 64.1%, then to 61.5%, and finally, it reached 58.3% after the passage of 3, 7 and 10 days after storage, while for coated films, the decrease was less than 78.6% before storage to 69.1% after 10 days in The films added to it with ginger extract. As for thyme extract, the decrease was from 77.2%
to 67.7%. In the clove extract, it decreased from 75.8% before storage and continued to 64.3% at the end of the storage period. The decrease in the percentage of the cooking quotient with the advance of the storage period may be attributed to the increase in the loss of moisture and fat during cooking that causes only weight, which is reflected in the percentage of the cooking yield.

**Fig. 11:** The percentage of cooking yield of chicken breast pieces coated with simple and compound films.

These results were in agreement with Al-Athary (2017), as they observed that the percentage of cooking yield decreased significantly in meat patties treated with extracts compared to the control treatment. These results were also consistent with what Ibrahim et al. (2018) found when studying the addition of lemon and orange peel extracts to meat pies, as they observed a gradual decrease in the cooking quotient with the advance of the storage period and the control treatment was more lower compared to the samples treated with the extracts.

**Reference**


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Preparation of compound films from protein hydrolysates of buffalo skin and plant extracts and study its properties and their use in coat meat chicken


