PRESERVATION OF CHICKEN BREAST MEAT BY ROSEMARY (*Rosmarinus officinalis* L.)

Huynh Thi Phuong Loan[1,*], Nguyen Tong Ngoc Nhung[2],
Doan Ngoc Thach Ky[1], Pham Duy Sang[1]

ABSTRACT

The study aims to extend the shelf - life of chicken breast meat by different treatments, including: (i) rosemary extract 14%, 16%, and 18%; (ii) rosemary essential oil 3%, 5%, and 7%; (iii) edible coatings formula (sodium alginate combined with rosemary extract or rosemary essential oil). The study evaluated the effect of these treatments on the physicochemical parameters (pH, color, shear force, drip loss) and microbiological indicators (*Escherichia coli* and aerobic plate count) of chicken breast meat during the cooling storage. The results showed that the physicochemical parameters of chicken breast meat were not be effected by different treatments, these parameters were good maintained during cooling storage (4 ± 1^0C). However, the antibacterial activity of rosemary extract was less effective to the growth of microorganisms, otherwise the rosemary essential oil 5% exhibits impressive antibacterial properties, including the growth of *E. coli* and aerobic plate count during seven days of storage. Moreover, the chicken breast meat was treated with sodium alginate - rosemary essential oil 5% had the *E. coli* and the aerobic microbial plate count within Vietnamese national standards (TCVN 12429-3: 2021) during ten days of cooling storage.

Keywords: *Chicken meat, essential oil, meat quality, rosemary, sodium alginate.*

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1. INTRODUCTION

Poultry meat is regarded as one of the most popular food items in the world, and its consumption expanded substantially during the previous two decades in the several nations [1]. Chicken meat has high content of protein and moisture, with weak acidic pH (5.3 – 6.5), therefore the chicken meat is sensitive to lipid oxidation and microbial development, leading to its shelf - life only 4 - 5 days [2], [3]. In order to prolong the storage time, natural ingredients are used to extend the shelf-life and increase the sensory quality of chicken meat. Rosemary (*Rosmarinus officinalis* L.), a *Lamiaceae* family member, is widely cultivated as an ornamental and aromatic plant worldwide [4]. It is known for its antibacterial and antioxidant properties based on its chemical components. Additionally, rosemary essential oil has been demonstrated to inhibit various foodborne pathogens from growing in vitro [5], [6]. The edible coating film is described as a thin layer of material that may be digested by people. Its function reduces the loss of volatile flavor compounds from food and provides a barrier to microorganisms [7], as well as improves esthetic appearance by minimizing the development of physical damage and improving the surface luster [8], [9]. For these reasons, the study was carried out to investigate the ability to prolong the shelf - life of chicken breast meat by using rosemary based on its antioxidant and antibacterial properties.

2. MATERIALS AND METHODS

2.1. Materials

Chicken breast meat and fresh rosemary were used in the experiment, which were purchased at the markets in Ninh Kieu district, Can Tho city,

[1] Institute of Food and Biotechnology, Can Tho University
[2] Kien Giang University
[*] Email: htploan@ctu.edu.vn

Vietnam. Fresh Rosemary tree was purchased at the shop "Dalat farm", the chicken breast meat was collected in the CP Freshmart (the time for samples collection was in the early morning when the shop received the newest products from the company). The commercial rosemary essential oil used in the study was sourced from India and distributed by Heber Vietnam Co., LTD.

The bacterial cultural mediums used in the study: Nutrient Agar (NA) - India, Tryptone Bile Glucuronic (TBX) Agar - India, Sodium alginate (SRK Entersprise, India).

2.1.1. Rosemary extract (RE) and rosemary essential oil (REO) preparation

Rosemary extract preparation: the branches of Fresh Rosemary tree were cut and cleaned with water and drained for 2 minutes. Rosemary was ground with cleaned water at the content such as: 14%, 16%, and 18% (w/w), then the mixture was filtered and collected clear rosemary extract.

Rosemary essential oil preparation: Emulsifier Tween 80 (Polysorbate 80) (10% mass fraction of mixture) was dissolved in distilled water, heated to 50^0C, stirred continuously for 5 mins to obtain a homogeneous solution and cooled down. Thereafter, the essential oil with different content such as: 3%, 5%, and 7% (v/v), that was slowly added to the solution and stirred for 10 minutes.

2.1.2. Process of treating chicken breast with rosemary extract, rosemary essential oil.

The chicken breast meat was bought at the market and brought to the lab to be pretreated with cleaned water and drained. Chicken breast will be immersed in rosemary extract or rosemary essential oil (prepared) for 60 seconds for each sample. The samples were placed in PA packages, vacuumed and sealed. The sample kept at 4±1^{0}C for seven days, tested for microorganism and physicochemical properties on days 0, 2, 4, and 7.

2.1.3. Coating solution preparation

Sodium alginate solution of 2% (w/v) fixed, proceed to weigh 20 g of sodium alginate completely dissolved in 1 L of water (mixed in a temperature bath of 70^0C and stirred), cooling down to ambient temperature. Rosemary extract and rosemary essential oil (with concentrations selected from experiments 1 and 2) were added to the solution, then the mixture was homogenized to obtain a homogeneous coating solution. There were 3 types of coating solutions, including: sodium alginate (SA), sodium alginate and rosmary extract (SA-RE), sodium alginate and rosmary essential oil (SA-REO).

2.1.4. Process of treating chicken breast with sodium alginate edible coating

The chicken breast meat was bought at the market and brought to the lab to be pretreated with water and drained. Then immerse each sample in a coating mixture solution for 60 seconds. The samples storaged in PA packages, vacuumed and sealed, and kept at 4±1^{0}C for ten days tested for microorganism and physicochemical properties on days 0, 3, 6, and 10.

2.2. Methods

2.2.1. Color assessment

The colors were measured using a colorimeter Fru (WR10, China). Determine the values of L*, a*, b*. The color deviation (ΔE) of meat after n days is calculated according to the formula:

$$\Delta E = [(L^*_0 - L^*_n)^2 + (a^*_0 - a^*_n)^2 + (b^*_0 - b^*_n)^2]^{1/2}$$

2.2.2. pH assessment

Using the Sinotester pH meter (pH - 618, China) to determine the pH value at different intervals. Mince 5 g chicken breast meat finely to ensure that both the inside and the outside are sampled, placed in a beaker and pour 50 ml of distilled water. Then measure the pH and record the value.

2.2.3. Shear force assessment: According to Young's Modulus formula: $E = \frac{P}{\Delta L/L}$ (Pa)

2.2.4. Drip loss assessment

Determination of drip loss rate (%) by weighing samples before and after the period of storage. Weigh meat samples and PA packaging before storage (m_1). After storage, pour out all the water, then reweigh the meat sample and PA

package (m_2). According to the formula: drip loss = $\frac{m_1 - m_2}{m_1} \times 100\ (\%)$

2.2.5. Aerobic plate count assessment: according to TCVN 4884-1: 2015 (ISO 4833-1: 2013) [10].

2.2.6. E. coli plate count assessment: according to TCVN 7924-2: 2008 (ISO 16649-2: 2001) [11].

3. RESUTLS AND DISCUSSION

3.1. Effect of rosemary extract on the physicochemical parameters of chicken breast meat during storage

During the preservation process, it is important and necessary to monitor the changes in the physicochemical parameters of chicken breast meat. Indicators such as color, pH, texture (shear force), and drip loss directly affect the quality. Tables 1 and 2 showed that all treated samples with the rosemary extract that had significantly lower L* values (lightness value) than the control sample ($p<0.05$), leading to these samples became darker. The decrease in L* value is due to the oxidation of meat, due to the myoglobin was oxidated to metmyoglobin (brown) during the storage [12]. When the content of rosemary extract treatment on the chicken breast was increased, as well as the prolonged storage time, the L* decreased, the b* value (yellowness) increased, ortherwise the a* values (redness) and ΔE value (color deviation) remained stable during 7 days of storage ($p<0.05$). Several research studies have indicated that rosemary extract has a possible antioxidant activity, leading to the stability of meat color [13 - 15].

Table 1. Effect of rosemary extract content on physicochemical properties of chicken breast meat

Content of rosemary extract (%)	L*	a*	b*	pH
Control	66.41 ± 0.50^{b}	3.40 ± 0.12^{c}	2.59 ± 0.26^{a}	6.19 ± 0.02^{a}
14	63.88 ± 0.50^{a}	2.86 ± 0.12^{ab}	11.86 ± 0.26^{b}	6.26 ± 0.02^{b}
16	64.85 ± 0.50^{a}	3.17 ± 0.12^{bc}	12.91 ± 0.26^{c}	6.23 ± 0.02^{ab}
18	63.55 ± 0.50^{a}	2.63 ± 0.12^{a}	14.98 ± 0.26^{d}	6.26 ± 0.02^{b}

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Table 2. Effect of rosemary extracts on physicochemical properties of chicken breast meat during storage periods

Days	ΔE	pH	Shear force (kPa)	Drip loss (%)
0	0.00 ± 0.53^{a}	6.23 ± 0.02^{ab}	15.28 ± 0.35^{c}	0 ± 0.56^{a}
2	2.64 ± 0.53^{b}	6.25 ± 0.02^{bc}	13.57 ± 0.35^{b}	5.43 ± 0.56^{b}
4	2.82 ± 0.53^{b}	6.29 ± 0.02^{c}	12.67 ± 0.35^{b}	5.84 ± 0.56^{b}
7	3.69 ± 0.53^{b}	6.18 ± 0.02^{a}	11.43 ± 0.35^{a}	6.44 ± 0.56^{b}

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Normally, the pH of fresh chicken meat ranges from 5.3 to 6.5 after slaughter [3]. Tables 1 and 2 showed that the pH value of treated chicken breast meat was higher than control sample, the difference was statistically significant ($p < 0.05$). But pH values of the treated samples still remained within the standards of TCVN 12429-1: 2018 [16].

The pH value was stable during storage but it decreased slightly on seventh day. Hosseini *et al.*

(2021) [17] reported that the pH decrease might be related to the dominance of lactic acid bacteria over time, which leads to the accumulation of acidic products in the extracellular environment, the primary cause of pH decline in meats.

The results of shear force and drip loss showed that the treatment of rosemary extract effected on the texture of chicken breast meat, and there was statistically significant difference ($p<0.05$) between the treated samples and the control. The shear force values decreased slightly, as well as drip loss increased during the storage period ($p<0.05$), water inside the meat is released, causing chicken breast meat to be softer (Table 2).

3.2. Effect of rosemary extract on the antimicrobial activity in chicken breast meat during storage

After slaughtering, chicken meat is a suitable environment for the growth of microorganisms, table 3 and table 4 show the *E. coli* and the aerobic plate count in the chicken breast meat that was treated at different rosemary extract content during storage period.

Table 3. The effect of content of rosemary extract on the *Escherichia coli* plate count in chicken breast meat

Content of rosemary extract (%)	*Escherichia coli* (10^3 cfu/g) by storage period (days)				
	0	2	4	7	Mean
Control	341.0	342.5	383.5	384.5	362.9^{c}
14	268.4	181.5	283.5	250.0	257.6^{b}
16	225.0	199.0	153.5	127.0	176.1^{a}
18	280.0	175.0	220.0	314.0	264.8^{b}
Mean	278.6^{b}	224.5^{a}	260.1^{b}	268.8^{b}	

Different letters in the same column or row represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

In the table 3 and 4, the results showed the antibacterial activity of rosemary extract, the statistically significant difference among control sample and treated samples was found on the *Escherichia coli* plate count (Table 3), and the aerobic plate count (Table 4). The sample was treated by 16% of rosemary extract that had the best antibacterial activity, the *E. coli* count and aerobic plate count were the lowest. Sienkiewicz *et al.* (2013) [18] revealed rosemary has potential effectiveness against extended-spectrum β-lactamase positive bacteria as well as resistant clinical strains of *Escherichia coli*. Because of the combined effects of rosmarinic acid, rosmaridiphenol, carnosol, epirosmanol, carnosic acid, rosmanol, and isorosmanol, rosemary has an inhibiting impact on microbial. They interact with the cell membrane, changing the creation of fatty acids, the transport of electrons, the leakage of cellular components, the genetic material and nutrients [19]. Also, Govaris *et al.* (2010) [20] discovered rosemary extract inhibited the increase of total viable counts in poultry breast meat during storage, the antibacterial activity of phenolic compounds was associated with the inactivation of cellular enzymes [21], [22]. However, the results in table 3 and 4 showed that, both of the *Escherichia coli* and the aerobic plate count were higher than the standard of TCVN 12429-3: 2021 [23] throughout 7 days of cooling storage, indicating the antibacterial activity of rosemary extract was less effective to the growth of microorganisms. It might due to the content of rosemary extract was not high enough and contained a little amount of the antibacterial components.

Table 4. The effect of content of rosemary extract on the aerobic plate count in chicken breast meat during storage period

Content of rosemary extract (%)	Aerobic plate count (10^6 cfu/g) by storage period (days)				
	0	2	4	7	Mean
Control	23.0	49.0	48.5	57.0	44.8^{c}
14	25.5	29.0	28.5	19.0	25.3^{b}
16	14.5	18.5	17.5	15.0	17.4^{a}
18	15.0	17.5	16.0	23.0	26.8^{b}
Mean	19.5^{a}	28.5^{b}	27.6^{b}	28.5^{b}	

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

3.3. Effect of rosemary essential oil (REO) on the physicochemical parameters of chicken breast meat during storage

The results on the tables 5 and 6 showed that the treated samples with rosemary essential oil had higher L* values than the control sample and tended to increase the brightness throughout storage ($p<0.05$). The sample was treated with 5% REO that had a lower a* value than the other samples. The redness value tends to increase compared to the beginning of storage period, Kahraman *et al.* (2015) [24] also reported that rosemary essential oil treatment significantly increased the a* value of stored poultry fillets. Most of the b* values of the treated samples with REO were higher than the control sample ($p<0.05$). The color deviation remained stable until day 7 ($p<0.05$), because the essential oil had antioxidant properties, therefore the color of chicken breast meat was stable. Moreover, the pH value of chicken breast meat was also affected by REO treatment, there was statistically significant difference pH value of chicken breast meat during storage time.

Table 5. Effect of rosemary essential oil content on physicochemical properties of chicken breast meat

Content of rosemary essential oil (%)	L*	a*	b*	pH
Control	66.41 ± 0.50^{b}	3.40 ± 0.12^{c}	2.59 ± 0.26^{a}	6.19 ± 0.02^{a}
3	63.88 ± 0.50^{a}	2.86 ± 0.12^{ab}	11.86 ± 0.26^{b}	6.26 ± 0.02^{b}
5	64.85 ± 0.50^{a}	3.17 ± 0.12^{bc}	12.91 ± 0.26^{c}	6.23 ± 0.02^{ab}
7	63.55 ± 0.50^{a}	2.63 ± 0.12^{a}	14.98 ± 0.26^{d}	6.26 ± 0.02^{b}

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Table 6. Effect of rosemary essential oil on physicochemical properties of chicken breast meat during storage period

Days	Δ E	pH	Shear force (kPa)	Drip loss (%)
0	0.00 ± 0.53^{a}	6.23 ± 0.02^{ab}	15.28 ± 0.35^{c}	0 ± 0.56^{a}
2	2.64 ± 0.53^{b}	6.25 ± 0.02^{bc}	13.57 ± 0.35^{b}	5.43 ± 0.56^{b}
4	2.82 ± 0.53^{b}	6.29 ± 0.02^{c}	12.67 ± 0.35^{b}	5.84 ± 0.56^{b}
7	3.69 ± 0.53^{b}	6.18 ± 0.02^{a}	11.43 ± 0.35^{a}	6.44 ± 0.56^{b}

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

The table 6 showed the texture of chicken breast meat changed during the storage time, the shear force value decreased when the storage time was extended. Water is tightly bound to proteins in muscle tissue and is also present in the spaces between myofibrils, giving the structure of meat was soft and elastic [25], part of water was lost during storage, causing the meat to degrade its elasticity and become more tender. The drip loss increased until day 7, due to the high content of essential oil was added, lead to the protein structure was broken down and the leakage water increased.

3.4. Effect of rosemary essential oil on the antimicrobial activity in chicken breast meat during storage

The results in table 7 showed that the treated samples with higher content of rosemary essential oil had lower *E. coli* plate count than others ($P<0.05$). Ojeda-Sana *et al.* (2013) [26] proved that rosemary oils include α-pinene, which has a broad antibacterial spectrum against Gram-negative and Gram-positive bacteria, as well as 1,8-cineole, which has antibacterial action against Gram-negative pathogenic bacteria by disrupting cell membranes. Many studies have aimed to clarify the antimicrobial mechanism of essential, including cell wall destruction, cytoplasmic membrane disturbance, disruption of the proton motive force, coagulation of cell contents, ATP hydrolysis, and a decrease in the synthesis process, resulting in a drop in the intracellular pool of ATP [27], [28]. The results of table 7 showed that there was significant statistical difference between storage days, the *E. coli* plate count continuously increased during 7 days of storage.

Table 7. The effect of content of rosemary essential oil on the *Escherichia coli* plate count in chicken breast meat

Content of rosemary essential oil (%)	*Escherichia coli* (10^3 cfu/g) by storage time (days)				
	0	2	4	7	Mean
Control	126.6	191.8	197.2	236.8	184.85^{d}
3	47.2	111.6	113.4	143.4	107.15^{c}
5	16.1	5.0	3.0	0.6	6.18^{a}
7	12	12.2	14.7	17.1	14.28^{b}
Mean	50.83^{a}	80.65^{b}	82.44^{b}	99.54^{c}	

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Increasing the content of rosemary essential oil treatment, the aerobic microbial count tended to decrease (Table 8). This is analogous to the study of Hać-Szymańczuk *et al.* (2017) [29], who reported that the total bacterial count was significantly lower in samples with added rosemary essential oil and ethanol extract (70% v/v) compared to the control sample. The table 8 showed a large microbial count of the control sample had proliferated grown on day 7 but the samples treated with REO at content of 5%, and 7% still inhibited the growth of aerobic microbial. All of samples were treated by REO, which had aerobic plate count within the standard of TCVN 12429-3: 2021 throughout storage. The results of table 8 showed that there was significant statistical difference between storage days, the aerobic plate count continuously increased during 7 days of storage. In particularly, the sample was treated by REO 5% that inhibited the growth of microorganisms, which had the *E. coli* and the aerobic plate count within the standard of TCVN 12429-3: 2021 [23] throughout seven days of cooling storage.

Table 8. The effect of content of rosemary essential oil on the aerobic plate count in chicken breast meat during storage period

Content of rosemary essential oil (%)	Aerobic plate count (10^5 cfu/g) by storage time (days)				
	0	2	4	7	Mean
Control	154.5	194.0	195.0	950.0	373.3^{c}
3	11.0	47.5	55.0	19.0	33.1^{b}
5	23.5	8.5	6.5	0.4	9.6^{a}
7	22.5	9.5	6.0	5.0	10.7^{a}
Mean	52.7^{a}	64.8^{b}	65.8^{b}	243.5^{c}	

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

3.5. Effect of sodium alginate edible coating incorporated with rosemary extract and rosemary essential oil on the physicochemical parameters

The results are indicated on tables 9 and 10, the L* values of edible coating formulas increased from 0 to day 6 and remained stable until day 10 ($p<0.05$). Both of the samples coated with aginate and rosmary (SA-RE and SA-REO) had lower a* values than samples coated with only alginate (SA). The results proved that the alginate coating contributes as an antioxidant barrier on preserving chicken breast meat. Samples treated with sodium alginate-rosemary extract (SA-RE) was the highest b* values, Lefebvre *et al.* (2021) [30] revealed that the rosemary plant contains pigments (i.e. carotenoids, chlorophylls) that may cause a color problem during the use of the extract. Extending the storage time, the color deviation tends to increase, statistically different from beginning. Besides, the pH tends to rise with a statistically significant difference ($p<0.05$), related to the ionized carbonate releasing from the coating [31].

Table 9. Effect of edible coating incorporated with rosemary on physicochemical properties of chicken breast meat during 10 days of cooling storage

Treatment	L*	a*	b*	pH	Shear force (kPa)
SA	63.24 ± 0.29^{b}	3.18 ± 0.11^{c}	3.43 ± 0.18^{a}	6.39 ± 0.02^{c}	15.02 ± 0.27^{b}
SA - RE	61.31 ± 0.29^{a}	2.33 ± 0.11^{a}	8.45 ± 0.18^{c}	6.26 ± 0.02^{b}	13.68 ± 0.27^{a}
SA - REO	63.44 ± 0.29^{b}	2.68 ± 0.11^{b}	3.84 ± 0.18^{b}	6.11 ± 0.02^{a}	14.04 ± 0.27^{a}

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Table 10. Effect of edible coating incorporated with rosemary on physicochemical properties of chicken breast meat during cooling storage period

Days	Δ E	pH	Shear force (kPa)	Drip loss (%)
0	0.00 ± 0.45^{a}	6.11 ± 0.03^{a}	16.23 ± 0.32^{d}	0.00 ± 0.47^{a}
3	2.84 ± 0.45^{b}	6.34 ± 0.03^{c}	15.19 ± 0.32^{c}	4.71 ± 0.47^{b}
6	4.57 ± 0.45^{c}	6.38 ± 0.03^{c}	13.43 ± 0.32^{b}	7.15 ± 0.47^{c}
10	3.97 ± 0.45^{bc}	6.20 ± 0.03^{b}	12.13 ± 0.32^{a}	7.14 ± 0.47^{c}

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Tables 9 and 10 show the differences between samples treated with different membrane formulations. Meat samples had a firm texture, and samples coated with only alginate (SA) that had greater shear force value than samples coated with alginate and rosmary (SA-RE and SA-REO). It is probably due to the effect of rosemary extract and rosemary essential oil to make the meat texture softer. Based on the ability of the alginate coating can reduce water loss from the cells, the drip loss values are relatively stable.

3.6. Effect of sodium alginate edible coating incorporated with rosemary extract and rosemary essential oil on the antimicrobial activity in chicken breast meat during cooling storage

The results from table 11 showed that samples were treated by SA-REO and SA coatings showed a very positive effect, the *E. coli* plate count was low, and the microbial resistance of these samples was better than the sample treated with SA-RE coating. Antimicrobial films improved the microbiological quality characteristics of coated chicken breast fillets during storage, extending their shelf life in cooling conditions [32]. The number of *E. coli* in the table 11 showed a downward trend compared to the first day ($p<0.05$).

The coating formulation combining sodium alginate with rosemary essential oil showed outstanding antimicrobial resistance in this experiment. The functionality of edible coatings can be enhanced by incorporating antimicrobial agents to protect food products from microbial pathogens and deteriorations, extend shelf life, and improve food safety [33], [34]. Coated treatment method showed optimal effectiveness, improving the disadvantage of uncoated treatment in preventing the growth of total aerobic microorganisms. Table 12 showed that samples treated with SA-REO had the lowest aerobic plate count ($p<0.05$) during ten days of storage. Its aerobic bacterial plate count remained relatively constant throughout the storage time and still belongs to the standard of TCVN 12429-3: 2021 [23].

Table 11. Effect of edible coating formulas on the *Escherichia coli* plate count

Treatment	*Escherichia coli* (10^3 cfu/g) by storage time (days)				
	0	3	6	10	Mean
SA	141.2	11.4	34.1	12.8	49.8^{b}
SA - RE	218.4	102.0	71.0	34.3	106.4^{c}
SA - REO	38.4	11.8	9.6	2.7	15.5^{a}
Mean	132.6^{a}	41.3^{b}	38.1^{b}	16.6^{c}	

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

Table 12. Effect of edible coating formulas on the aerobic plate count

Treatment	Aerobic plate count (10^5 cfu/g) by storage time (days)				
	0	3	6	10	Mean
SA	11.7	15.0	29.4	81.0	34.26^{b}
SA - RE	43.6	57.7	62.0	64.4	56.41^{c}
SA - REO	4.8	2.8	2.6	2.5	3.26^{a}
Mean	20.13^{a}	25.37^{b}	31.45^{c}	49.3^{d}	

Different letters in the same column represent significant differences between the investigated treatments at the 95% confidence level according to the LSD test

4. CONCLUSION

Rosemary extract, rosemary essential oil, and the combination between rosmary and edible coatings effectively stabilize physicochemical parameters of chicken breast meat, such as color, pH, texture, and drip loss throughout the cooling storage. In the antimicrobial aspect, the chicken breast meat was treated by 16% rosemary extract, or 5% rosemary essential oil, or alginate-rosemary essential oil that effectively reduced the density of microorganism than other treatments. In particular, chicken breast meat was treated with 5% rosemary essential oil had *E. coli* and the aerobic plate count within the standard of TCVN 12429-3: 2021 until seven days of cooling storage, while the chicken breast meat was treated with sodium alginate-rosemary essential oil had the *E. coli* and the aerobic plate count within Vietnamese national standards of TCVN 12429-3: 2021 until ten days of cooling storage.

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