

## QUALITY CHARACTERISTICS OF BA-TSUNG FRESH PORK SAUSAGE AS AFFECTED BY ACID-INDUCED GELLED EGG WHITE POWDER AND SODIUM LACTATE

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**Key Words:** Ba-Tsung fresh sausage, Acid-induced gelled egg white powder, Sodium lactate, Antioxidant ability, Bacteriostatic ability

### Introduction

Chen *et al.* (2004) reported that non-fermented acid Chinese-style semi-dry sausage formulated with acid-induced gelled egg white powder had the antioxidant ability and appetizing acidic traits. Sodium lactate was a natural salt of lactic acid to be extensively used in meat industry, which possessed the characteristics of increasing shelf-life and enhancing meat flavor, water-holding ability, antioxidant function, cooking yields on the meat products without affecting pH value of meat products. And it also had the function of reducing water activity and inhibiting the growth of aerobic, facultative and anaerobic microorganisms. The Chinese mixed herbs-Ba-Tsung powder had the antioxidant and appetizing effects on meat products due to containing the polyphenol functional groups.

The ground fresh pork sausage was an uncured and nitrite-non-added meat products which quality was easily affected by unsuitable raw meat handling processing procedures and storage time, and subsequently to cause the results of lipid oxidative rancidity flavor, color discoloration and microbial growth of products, and further, to reduce the economic value of products.

### Objectives

The objective of this study was to investigate the characteristics of pH values, antioxidant ability, color stability and bacteriostatic ability of non-fermented and acidic fresh pork sausage formulated with Ba-Tsung powder as affected by differing ratios acid-induced gelled egg white powder and sodium lactate during 21 days refrigerated storage.

### Methodology

#### *Materials*

1. The acid-induced gelled egg white powder were made as described by Chen *et al.* (2004).
2. The experimental design of non-fermented and acidic Ba-Tsung fresh pork sausage formulated with 1,2.5% of differing lactic acid concentration (6,7,8,9 and

10%) induced gelled egg white powder and 0,3% of sodium lactate(SL) was shown in table 1.

## Methods

1. **Measurement of pH value, 2-thiobarbituric acid (TBA) value and metmyoglobin (MetMb) content** : a. The pH value was measured as described by Ockerman (1974). b. The TBA value was measured as described by Taladgis *et al.* (1960) and modified Zipser and Watts (1962) and Ockerman (1974). c. The MetMb was analyzed as described by Warriss (1979), Trout (1989) and calculated as described by Krzywicki (1982).
2. **Measurements of color difference and water-holding capacity (WHC)** : a. The color difference of Hunter *L, a, b* value was measured by color difference meter (Model TC-1, Nippon Denshoku Co., LTD, Tokyo, Japan). b. The WHC was measured as described by the methods of McCaw *et al.* (1994).
3. **Total plate counts (TPC) measurement** : The Total plate counts was obtained as described by FDA. (1996).
4. **Statistical analysis** : Triplicate measurements were conducted for each sample. The statistical analysis of the data was carried out by applying Duncan's new multiple range test using the statistical analysis system (SAS, 1996) by the General Linear Model.

## Results & Discussion

The pH value, water-holding capacity, color difference(Hunter *L, a, b*), metmyoglobin content and total plate counts of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and sodium lactate across all storage days at 4 are shown in table 2, 3, 4, 5, 6, 7 and 8. Table 2 indicated that the pH value of treatment groups A1 and A2 were between 5.5~5.8, D1 and D2 to be lower than 5.4. Table 3 showed that the water holding capacity of all treatment groups were very stable, and A1 and A2 groups had significantly difference ( $p < 0.05$ ) than the others. Table 4 and 5 indicated that the Hunter *L* and *a* value of all treatment groups were very stable, and contrasted with metmyoglobin content as shown in table 7, the A1, A2 and B2 had the high acceptability than the others. Table 6 showed that the TBA value of all treatment groups were increased with increasing storage days, and A1, A2, B1 and B2 groups had lower value than the others, and to be significantly difference ( $p < 0.05$ ). It could be explained that the antioxidant ability of our experimental non-fermented and acidic Ba-Tseng pork sausage were stabilized by Chinese mixed herbs-Ba-Tseng powder. Table 8. indicated that the TPC of all treatment groups were very stable across storage days at 4 , and 2.5% of differing lactic acid concentration (6, 7, 8, 9 and 10%) induced gelled egg white powder and sodium lactate had significantly difference ( $p < 0.05$ ) than the others. As we expected that the different ratio lactic acid induced egg white powder and sodium lactate had the synergistic effects on Ba-Tseng fresh pork sausage. Additionally, our experiments have indicated that the sensory evaluation group can not accept the pH value of non-fermented and acidic Ba-Tseng fresh pork sausage to be lower than 5.50.

## Conclusions

According to the data of experimental items of pH value, antioxidant ability, color stability and bacteriostatic ability across all storage days at 4 °C, the Ba-Tseng pork sausage formulated with 1% of 6% lactic acid-induced gelled egg white powder and 3% sodium lactate had possessed the non-fermented and acidic appetizing traits.

## References

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## Tables

**Table 1. Experimental design of non-fermented and acidic Ba-Tseng fresh pork sausage formulated with 1%, 2.5% of differing lactic acid concentration (6%,7%,8%,9% and 10%) induced gelled egg white powder and 0%,3% of sodium lactate**

<b>A1 :</b>	<b>1% of 6% lactic acid-induced gelled egg white powder+0%SL</b>
<b>A2 :</b>	<b>1% of 6% lactic acid-induced gelled egg white powder+3%SL</b>
<b>A3 :</b>	<b>2.5% of 6% lactic acid-induced gelled egg white powder+0%SL</b>
<b>A4 :</b>	<b>2.5% of 6% lactic acid-induced gelled egg white powder+3%SL</b>
<b>B1 :</b>	<b>1% of 7% lactic acid-induced gelled egg white powder+0%SL</b>
<b>B2 :</b>	<b>1% of 7% lactic acid-induced gelled egg white powder+3%SL</b>
<b>B3 :</b>	<b>2.5% of 7% lactic acid-induced gelled egg white powder+0%SL</b>
<b>B4 :</b>	<b>2.5% of 7% lactic acid-induced gelled egg white powder+3%SL</b>
<b>C1 :</b>	<b>1% of 8% lactic acid-induced gelled egg white powder+0%SL</b>
<b>C2 :</b>	<b>1% of 8% lactic acid-induced gelled egg white powder+3%SL</b>
<b>C3 :</b>	<b>2.5% of 8% lactic acid-induced gelled egg white powder+0%SL</b>
<b>C4 :</b>	<b>2.5% of 8% lactic acid-induced gelled egg white powder+3%SL</b>
<b>D1 :</b>	<b>1% of 9% lactic acid-induced gelled egg white powder+0%SL</b>
<b>D2 :</b>	<b>1% of 9% lactic acid-induced gelled egg white powder+3%SL</b>
<b>D3 :</b>	<b>2.5% of 9% lactic acid-induced gelled egg white powder+0%SL</b>
<b>D4 :</b>	<b>2.5% of 9% lactic acid-induced gelled egg white powder+3%SL</b>
<b>E1 :</b>	<b>1% of 10% lactic acid-induced gelled egg white powder+0%SL</b>
<b>E2 :</b>	<b>1% of 10% lactic acid-induced gelled egg white powder+3%SL</b>
<b>E3 :</b>	<b>2.5% of 10% lactic acid-induced gelled egg white powder+0%SL</b>
<b>E4 :</b>	<b>2.5% of 10% lactic acid-induced gelled egg white powder+3%SL</b>

Table 2. The pH value of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C

Treatment groups	Storage time (days)						
	0	3	5	7	10	14	21
Control	5.83±0.01 <sup>a</sup>	6.24±0.11 <sup>a</sup>	6.05±0.03 <sup>a</sup>	6.23±0.06 <sup>a</sup>	6.36±0.03 <sup>a</sup>	6.25±0.03 <sup>a</sup>	6.15±0.04 <sup>a</sup>
A1	5.64±0.06 <sup>abc</sup>	5.78±0.07 <sup>bc</sup>	5.80±0.10 <sup>b</sup>	5.64±0.05 <sup>b</sup>	5.59±0.02 <sup>bc</sup>	5.78±0.07 <sup>bc</sup>	5.58±0.10 <sup>bcd</sup>
A2	5.57±0.05 <sup>ab</sup>	5.88±0.03 <sup>b</sup>	5.84±0.08 <sup>ab</sup>	5.64±0.06 <sup>b</sup>	5.64±0.02 <sup>b</sup>	5.90±0.05 <sup>b</sup>	5.65±0.02 <sup>bc</sup>
A3	4.76±0.03 <sup>hi</sup>	4.94±0.02 <sup>ghi</sup>	4.85±0.12 <sup>de</sup>	4.89±0.04 <sup>fgh</sup>	5.02±0.05 <sup>f</sup>	4.79±0.00 <sup>hij</sup>	4.85±0.05 <sup>ef</sup>
A4	5.02±0.005 <sup>g</sup>	5.04±0.03 <sup>g</sup>	4.94±0.16 <sup>d</sup>	5.12±0.04 <sup>e</sup>	5.04±0.03 <sup>f</sup>	5.00±0.00 <sup>fg</sup>	5.04±0.04 <sup>e</sup>
B1	5.63±0.10 <sup>abcd</sup>	5.76±0.09 <sup>bc</sup>	5.47±0.16 <sup>c</sup>	5.45±0.05 <sup>c</sup>	5.65±0.01 <sup>b</sup>	5.11±0.02 <sup>f</sup>	4.92±0.05 <sup>ef</sup>
B2	5.40±0.14 <sup>def</sup>	5.63±0.03 <sup>cde</sup>	5.43±0.02 <sup>c</sup>	5.44±0.02 <sup>c</sup>	5.54±0.04 <sup>bcd</sup>	5.50±0.00 <sup>d</sup>	5.62±0.04 <sup>bc</sup>
B3	4.75±0.01 <sup>hi</sup>	4.81±0.05 <sup>ijk</sup>	4.88±0.11 <sup>de</sup>	4.89±0.01 <sup>hi</sup>	4.78±0.01 <sup>gh</sup>	4.65±0.08 <sup>lk</sup>	4.86±0.07 <sup>ef</sup>
B4	4.92±0.02 <sup>hgi</sup>	4.97±0.03 <sup>ghi</sup>	4.83±0.08 <sup>de</sup>	5.07±0.00 <sup>ef</sup>	5.01±0.04 <sup>f</sup>	4.92±0.03 <sup>gh</sup>	4.95±0.01 <sup>ef</sup>
C1	5.30±0.24 <sup>f</sup>	5.52±0.05 <sup>def</sup>	5.44±0.03 <sup>c</sup>	5.46±0.02 <sup>b</sup>	5.33±0.03 <sup>e</sup>	5.50±0.00 <sup>d</sup>	5.55±0.02 <sup>bcd</sup>
C2	5.46±0.01 <sup>cdef</sup>	5.58±0.02 <sup>de</sup>	5.50±0.02 <sup>c</sup>	5.58±0.03 <sup>b</sup>	5.40±0.00 <sup>de</sup>	5.50±0.03 <sup>d</sup>	5.68±0.00 <sup>bc</sup>
C3	4.69±0.03 <sup>i</sup>	4.77±0.03 <sup>kl</sup>	4.69±0.02 <sup>e</sup>	4.91±0.00 <sup>hi</sup>	4.74±0.00 <sup>h</sup>	4.70±0.03 <sup>jk</sup>	4.75±0.03 <sup>f</sup>
C4	4.91±0.01 <sup>hgi</sup>	4.95±0.02 <sup>ghi</sup>	4.90±0.05 <sup>de</sup>	5.05±0.03 <sup>efg</sup>	5.02±0.03 <sup>f</sup>	4.90±0.02 <sup>gh</sup>	4.85±0.05 <sup>ef</sup>
D1	5.41±0.02 <sup>cdef</sup>	5.59±0.02 <sup>de</sup>	5.46±0.03 <sup>c</sup>	5.52±0.08 <sup>bc</sup>	5.35±0.05 <sup>e</sup>	5.69±0.11 <sup>c</sup>	5.41±0.06 <sup>d</sup>
D2	5.56±0.03 <sup>bcd</sup>	5.65±0.05 <sup>cd</sup>	5.53±0.01 <sup>c</sup>	5.53±0.01 <sup>bc</sup>	5.44±0.02 <sup>cde</sup>	5.75±0.01 <sup>c</sup>	5.51±0.02 <sup>cd</sup>
D3	4.72±0.00 <sup>i</sup>	4.76±0.01 <sup>kl</sup>	4.75±0.03 <sup>de</sup>	4.92±0.02 <sup>gh</sup>	4.77±0.01 <sup>gh</sup>	4.66±0.00 <sup>k</sup>	4.76±0.03 <sup>f</sup>
D4	4.96±0.02 <sup>gh</sup>	5.01±0.04 <sup>gh</sup>	4.91±0.00 <sup>de</sup>	5.06±0.01 <sup>ef</sup>	4.98±0.03 <sup>f</sup>	4.89±0.01 <sup>ghi</sup>	4.97±0.00 <sup>e</sup>
E1	5.39±0.08 <sup>ef</sup>	5.41±0.07 <sup>f</sup>	5.43±0.04 <sup>c</sup>	5.31±0.06 <sup>d</sup>	5.56±0.01 <sup>bcd</sup>	5.36±0.02 <sup>e</sup>	5.58±0.22 <sup>bcd</sup>
E2	5.56±0.07 <sup>bcd</sup>	5.48±0.04 <sup>ef</sup>	5.53±0.03 <sup>c</sup>	5.45±0.01 <sup>c</sup>	5.61±0.21 <sup>b</sup>	5.41±0.01 <sup>de</sup>	5.73±0.02 <sup>b</sup>
E3	4.76±0.04 <sup>hi</sup>	4.65±0.05 <sup>k</sup>	4.69±0.01 <sup>e</sup>	4.53±0.01 <sup>j</sup>	4.70±0.01 <sup>h</sup>	4.52±0.02 <sup>l</sup>	4.53±0.02 <sup>g</sup>
E4	4.98±0.02 <sup>gh</sup>	4.84±0.02 <sup>hij</sup>	4.91±0.01 <sup>de</sup>	4.78±0.03 <sup>i</sup>	4.92±0.01 <sup>fg</sup>	4.76±0.03 <sup>ijk</sup>	4.76±0.00 <sup>f</sup>

<sup>a-j</sup> Mean within the same column with different superscripts are significantly different (p<0.05).



Table 3. The water holding capacity of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C

Treatment groups	Storage time (days)						
	0	3	5	7	10	14	21
Control	70.66±1.14 <sup>bcd</sup>	74.22±1.02 <sup>a</sup>	74.23±0.79 <sup>a</sup>	72.13±1.51 <sup>ab</sup>	74.23±1.61 <sup>a</sup>	73.41±1.02 <sup>a</sup>	73.98±1.03 <sup>a</sup>
A1	68.11±1.86 <sup>efgh</sup>	70.16±1.31 <sup>abcd</sup>	70.69±1.28 <sup>abcd</sup>	71.16±0.35 <sup>abcd</sup>	69.15±0.10 <sup>bcdef</sup>	68.94±0.78 <sup>cd</sup>	70.85±0.32 <sup>bc</sup>
A2	67.95±0.62 <sup>efgh</sup>	69.46±0.30 <sup>bcdef</sup>	70.41±2.46 <sup>abdef</sup>	70.86±0.48 <sup>abdef</sup>	70.77±0.42 <sup>bcde</sup>	67.62±1.56 <sup>de</sup>	70.85±1.08 <sup>bc</sup>
A3	66.16±0.31 <sup>gh</sup>	66.84±0.52 <sup>fghi</sup>	67.52±0.53 <sup>def</sup>	67.68±0.46 <sup>fghi</sup>	67.89±0.58 <sup>ef</sup>	66.97±0.38 <sup>de</sup>	67.06±0.35 <sup>e</sup>
A4	67.57±0.29 <sup>efgh</sup>	65.89±0.59 <sup>hij</sup>	67.16±0.28 <sup>ef</sup>	67.24±0.34 <sup>ghi</sup>	68.23±0.83 <sup>def</sup>	66.75±0.47 <sup>de</sup>	66.43±0.83 <sup>e</sup>
B1	73.72±1.18 <sup>a</sup>	72.15±0.92 <sup>ab</sup>	72.05±1.02 <sup>abc</sup>	72.85±0.37 <sup>a</sup>	72.34±0.75 <sup>ab</sup>	70.39±1.11 <sup>bc</sup>	68.22±1.21 <sup>cde</sup>
B2	72.55±1.12 <sup>ab</sup>	70.00±1.18 <sup>bcde</sup>	72.90±0.72 <sup>ab</sup>	71.89±0.68 <sup>ab</sup>	72.16±3.77 <sup>abc</sup>	72.75±0.04 <sup>ab</sup>	72.55±0.91 <sup>ab</sup>
B3	66.81±0.49 <sup>fgh</sup>	65.60±0.61 <sup>ij</sup>	67.18±0.72 <sup>ef</sup>	66.56±0.58 <sup>hi</sup>	67.76±0.16 <sup>ef</sup>	67.07±0.33 <sup>de</sup>	66.49±0.51 <sup>e</sup>
B4	66.63±0.54 <sup>fgh</sup>	66.16±0.45 <sup>hij</sup>	67.60±1.12 <sup>edf</sup>	66.17±0.15 <sup>f</sup>	67.30±0.46 <sup>f</sup>	67.30±0.71 <sup>de</sup>	66.42±0.97 <sup>e</sup>
C1	69.29±0.56 <sup>cde</sup>	71.47±1.29 <sup>abc</sup>	71.60±0.87 <sup>abcd</sup>	71.31±0.59 <sup>abc</sup>	67.17±1.76 <sup>f</sup>	68.32±0.92 <sup>cde</sup>	68.19±1.22 <sup>cde</sup>
C2	71.01±0.50 <sup>bc</sup>	69.83±0.78 <sup>bcde</sup>	69.62±0.84 <sup>bcdef</sup>	70.59±0.60 <sup>bcde</sup>	68.85±0.46 <sup>cdef</sup>	68.56±0.47 <sup>cde</sup>	70.13±2.12 <sup>bcd</sup>
C3	67.18±0.48 <sup>efgh</sup>	67.38±0.35 <sup>defghi</sup>	66.64±0.43 <sup>ef</sup>	68.03±0.10 <sup>fghi</sup>	68.52±0.33 <sup>def</sup>	67.24±0.51 <sup>de</sup>	66.81±0.39 <sup>e</sup>
C4	67.74±0.44 <sup>efgh</sup>	66.83±0.39 <sup>fghij</sup>	66.21±1.61 <sup>f</sup>	68.23±0.67 <sup>fghi</sup>	68.01±0.71 <sup>def</sup>	67.00±0.83 <sup>de</sup>	66.14±0.51 <sup>e</sup>
D1	68.83±0.89 <sup>cdef</sup>	68.05±0.57 <sup>defghi</sup>	68.20±1.93 <sup>cdef</sup>	68.98±0.91 <sup>defg</sup>	69.41±1.20 <sup>bcdef</sup>	68.64±1.90 <sup>cde</sup>	69.09±1.00 <sup>cde</sup>
D2	68.45±0.52 <sup>defg</sup>	69.57±1.14 <sup>bcdef</sup>	69.07±1.09 <sup>bcdef</sup>	68.00±0.67 <sup>fghi</sup>	71.35±0.41 <sup>abcd</sup>	68.27±1.06 <sup>cde</sup>	70.11±0.61 <sup>bcd</sup>
D3	67.88±0.24 <sup>efgh</sup>	66±510.40 <sup>ghij</sup>	66.72±0.97 <sup>ef</sup>	69.67±0.92 <sup>cdef</sup>	68.56±0.34 <sup>def</sup>	66.84±0.33 <sup>de</sup>	67.28±1.15 <sup>de</sup>
D4	68.17±0.54 <sup>efgh</sup>	65.76±0.29 <sup>ij</sup>	67.73±0.97 <sup>edf</sup>	68.38±0.25 <sup>fgh</sup>	68.98±0.18 <sup>bcdef</sup>	66.98±0.11 <sup>de</sup>	66.69±0.55 <sup>e</sup>
E1	68.49±0.75 <sup>defg</sup>	69.00±0.95 <sup>cdefg</sup>	68.41±0.47 <sup>bcdef</sup>	68.67±1.33 <sup>efgh</sup>	68.78±0.60 <sup>bcdef</sup>	68.19±0.53 <sup>cde</sup>	67.45±0.12 <sup>de</sup>
E2	68.57±0.35 <sup>cdefg</sup>	68.59±1.18 <sup>defghi</sup>	69.73±0.30 <sup>bcdef</sup>	68.04±0.62 <sup>efg</sup>	69.16±0.69 <sup>bcdef</sup>	68.94±0.79 <sup>cd</sup>	68.06±0.77 <sup>cde</sup>
E3	67.74±1.02 <sup>efgh</sup>	67.33±0.66 <sup>efghi</sup>	66.57±0.57 <sup>ef</sup>	67.29±0.73 <sup>ghi</sup>	67.09±0.29 <sup>f</sup>	66.21±0.31 <sup>e</sup>	66.31±0.43 <sup>e</sup>
E4	65.87±0.60 <sup>h</sup>	64.65±0.94 <sup>j</sup>	68.84±3.95 <sup>bcdef</sup>	66.13±0.62 <sup>i</sup>	67.55±0.01 <sup>ef</sup>	66.45±0.40 <sup>de</sup>	66.73±0.57 <sup>e</sup>

<sup>a-j</sup> Mean within the same column with different superscripts are significantly different (p<0.05).

Table 4. The lightness (*L* value) of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C

Treatment groups	Storage time (days)						
	0	3	5	7	10	14	21
Control	38.93±0.96 <sup>ab</sup>	43.35±1.87 <sup>a</sup>	42.64±0.44 <sup>a</sup>	40.33±0.36 <sup>a</sup>	38.64±1.05 <sup>ab</sup>	39.60±1.88 <sup>ab</sup>	41.10±1.46 <sup>ab</sup>
A1	33.83±1.07 <sup>defg</sup>	34.77±1.34 <sup>def</sup>	34.64±0.88 <sup>defg</sup>	33.66±1.65 <sup>efgh</sup>	35.56±0.44 <sup>cde</sup>	33.90±0.22 <sup>efg</sup>	34.75±1.11 <sup>gh</sup>
A2	33.16±0.89 <sup>efg</sup>	34.19±0.88 <sup>def</sup>	33.74±0.36 <sup>efgh</sup>	32.65±1.12 <sup>efij</sup>	33.86±0.32 <sup>ef</sup>	34.59±0.85 <sup>def</sup>	34.48±0.60 <sup>gh</sup>
A3	36.83±0.33 <sup>bcd</sup>	36.33±1.00 <sup>cdef</sup>	35.44±0.65 <sup>def</sup>	37.40±1.37 <sup>bcddef</sup>	35.82±0.58 <sup>cde</sup>	39.57±0.47 <sup>ab</sup>	37.28±0.14 <sup>cdefg</sup>
A4	34.29±0.84 <sup>defg</sup>	35.79±1.02 <sup>def</sup>	34.16±0.14 <sup>defgh</sup>	35.78±0.73 <sup>defg</sup>	36.90±0.59 <sup>bc</sup>	33.90±1.00 <sup>efg</sup>	34.86±0.92 <sup>efgh</sup>
B1	31.88±1.49 <sup>g</sup>	31.43±0.57 <sup>gh</sup>	30.79±0.84 <sup>i</sup>	29.89±0.51 <sup>ij</sup>	30.68±0.25 <sup>h</sup>	31.87±1.22 <sup>fg</sup>	35.82±1.09 <sup>efgh</sup>
B2	31.52±0.68 <sup>g</sup>	30.45±0.20 <sup>h</sup>	30.95±0.21 <sup>i</sup>	29.60±0.34 <sup>j</sup>	30.94±0.53 <sup>gh</sup>	31.55±0.49 <sup>g</sup>	34.27±1.66 <sup>gh</sup>
B3	36.20±0.44 <sup>bcd</sup>	37.32±0.84 <sup>bcd</sup>	38.13±0.41 <sup>bc</sup>	38.11±1.33 <sup>abcd</sup>	37.48±1.32 <sup>abc</sup>	40.15±1.70 <sup>ab</sup>	39.40±1.75 <sup>abcd</sup>
B4	34.30±0.79 <sup>cdef</sup>	35.82±1.05 <sup>def</sup>	36.23±0.71 <sup>bcd</sup>	36.22±0.16 <sup>cdef</sup>	35.85±0.96 <sup>cd</sup>	38.14±0.57 <sup>abc</sup>	38.03±0.72 <sup>bcd</sup>
C1	32.58±0.97 <sup>fg</sup>	33.46±0.24 <sup>efgh</sup>	31.93±0.55 <sup>i</sup>	32.93±0.23 <sup>ghi</sup>	33.38±0.54 <sup>f</sup>	33.28±0.50 <sup>efg</sup>	33.38±0.55 <sup>h</sup>
C2	31.99±1.18 <sup>g</sup>	33.10±0.49 <sup>efgh</sup>	32.55±0.25 <sup>ghi</sup>	33.25±0.84 <sup>efgh</sup>	33.57±0.61 <sup>f</sup>	32.95±0.74 <sup>efg</sup>	33.69±0.55 <sup>h</sup>
C3	38.79±1.40 <sup>abc</sup>	39.15±0.57 <sup>bc</sup>	38.16±0.44 <sup>bc</sup>	38.32±0.71 <sup>abcd</sup>	39.08±0.27 <sup>a</sup>	39.50±1.49 <sup>ab</sup>	39.97±0.60 <sup>abc</sup>
C4	37.55±0.92 <sup>abc</sup>	37.00±0.39 <sup>bcd</sup>	34.71±0.69 <sup>defg</sup>	37.07±0.10 <sup>bcd</sup>	35.66±0.62 <sup>cde</sup>	39.76±1.28 <sup>ab</sup>	38.20±1.70 <sup>abcde</sup>
D1	33.34±0.40 <sup>efg</sup>	34.71±1.00 <sup>def</sup>	35.47±0.06 <sup>def</sup>	35.25±0.96 <sup>defg</sup>	34.39±0.59 <sup>def</sup>	34.69±0.10 <sup>def</sup>	35.34±0.23 <sup>efgh</sup>
D2	33.47±1.39 <sup>efg</sup>	33.67±0.86 <sup>efgh</sup>	33.79±1.10 <sup>efgh</sup>	32.97±0.80 <sup>ghi</sup>	33.12±0.06 <sup>f</sup>	32.79±0.27 <sup>efg</sup>	35.34±0.88 <sup>efgh</sup>
D3	40.14±0.46 <sup>a</sup>	40.02±0.60 <sup>b</sup>	38.68±1.11 <sup>b</sup>	39.19±1.00 <sup>abc</sup>	39.25±1.01 <sup>a</sup>	40.87±1.18 <sup>a</sup>	40.83±1.33 <sup>ab</sup>
D4	35.67±0.59 <sup>cdef</sup>	36.28±1.99 <sup>cdef</sup>	36.17±0.69 <sup>bcd</sup>	34.92±1.16 <sup>efgh</sup>	36.30±0.73 <sup>cd</sup>	35.22±1.06 <sup>cde</sup>	38.06±0.87 <sup>abcde</sup>
E1	32.23±10.6 <sup>g</sup>	33.95±0.28 <sup>efg</sup>	33.52±0.53 <sup>efgh</sup>	33.97±0.79 <sup>efgh</sup>	32.81±0.38 <sup>fg</sup>	33.50±0.88 <sup>efg</sup>	34.50±0.80 <sup>gh</sup>
E2	31.25±1.52 <sup>g</sup>	33.32±1.56 <sup>efgh</sup>	32.46±0.90 <sup>ghi</sup>	32.48±0.49 <sup>hij</sup>	31.10±0.11 <sup>gh</sup>	33.90±0.53 <sup>efg</sup>	34.65±0.22 <sup>gh</sup>
E3	36.83±0.86 <sup>bcd</sup>	39.33±0.97 <sup>bc</sup>	36.64±0.59 <sup>bcd</sup>	39.59±1.51 <sup>ab</sup>	38.95±0.18 <sup>a</sup>	39.34±0.21 <sup>ab</sup>	41.28±1.43 <sup>a</sup>
E4	33.20±1.76 <sup>efg</sup>	36.96±1.12 <sup>bcd</sup>	35.99±2.34 <sup>cdef</sup>	36.39±0.78 <sup>cdef</sup>	36.81±0.17 <sup>bc</sup>	37.21±1.04 <sup>bcd</sup>	36.28±0.85 <sup>bcd</sup>

<sup>a-j</sup> Mean within the same column with different superscripts are significantly different ( $p < 0.05$ ).

Table 5. The redness (*a* value) of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C

Treatment groups	Storage time (days)						
	0	3	5	7	10	14	21
Control	10.95±0.75 <sup>bcdef</sup>	7.35±0.26 <sup>bcdef</sup>	7.45±0.56 <sup>c</sup>	7.84±0.24 <sup>bcd</sup>	7.18±0.33 <sup>bcd</sup>	7.50±0.34 <sup>abc</sup>	6.63±0.51 <sup>cde</sup>
A1	10.83±0.38 <sup>abc</sup>	9.19±0.30 <sup>ab</sup>	9.00±0.56 <sup>ab</sup>	9.08±0.16 <sup>ab</sup>	7.74±0.36 <sup>bcd</sup>	7.61±1.21 <sup>ab</sup>	6.64±0.31 <sup>cde</sup>
A2	10.79±0.40 <sup>abc</sup>	9.90±0.52 <sup>a</sup>	9.10±0.37 <sup>ab</sup>	10.34±0.54 <sup>a</sup>	8.22±0.47 <sup>bc</sup>	7.89±0.63 <sup>ab</sup>	8.20±0.32 <sup>ab</sup>
A3	8.14±0.05 <sup>efgh</sup>	5.96±0.27 <sup>defghi</sup>	5.65±0.87 <sup>ef</sup>	4.64±0.29 <sup>fg</sup>	4.32±0.25 <sup>gh</sup>	5.84±0.59 <sup>cdefg</sup>	4.35±0.03 <sup>hi</sup>
A4	9.22±0.46 <sup>bcd</sup>	6.94±0.30 <sup>cdefg</sup>	5.89±0.05 <sup>de</sup>	5.40±0.48 <sup>ef</sup>	5.46±0.72 <sup>fg</sup>	5.36±0.01 <sup>defghi</sup>	6.95±0.58 <sup>bcd</sup>
B1	8.89±0.62 <sup>cdefg</sup>	8.18±0.36 <sup>abc</sup>	7.61±0.20 <sup>c</sup>	7.61±0.45 <sup>cd</sup>	10.00±0.46 <sup>a</sup>	9.10±0.64 <sup>a</sup>	7.51±0.19 <sup>abc</sup>
B2	9.49±0.70 <sup>bcd</sup>	8.38±0.54 <sup>abc</sup>	7.62±0.30 <sup>c</sup>	6.94±0.25 <sup>d</sup>	8.49±1.06 <sup>b</sup>	8.72±0.51 <sup>a</sup>	8.62±0.53 <sup>a</sup>
B3	8.45±0.61 <sup>defgh</sup>	5.85±0.74 <sup>efghi</sup>	4.16±0.26 <sup>gh</sup>	3.82±0.11 <sup>g</sup>	4.16±0.41 <sup>gh</sup>	4.22±0.17 <sup>ghij</sup>	4.92±0.32 <sup>efghi</sup>
B4	9.44±1.03 <sup>bcd</sup>	7.57±1.24 <sup>bcd</sup>	4.79±0.73 <sup>efgh</sup>	4.60±0.49 <sup>fg</sup>	4.56±0.40 <sup>gh</sup>	5.41±0.50 <sup>defghi</sup>	6.84±0.25 <sup>bcd</sup>
C1	10.30±0.10 <sup>abcd</sup>	8.28±0.71 <sup>abc</sup>	7.24±0.53 <sup>c</sup>	7.11±0.43 <sup>d</sup>	6.67±0.78 <sup>def</sup>	5.63±0.25 <sup>defgh</sup>	5.20±0.07 <sup>efghi</sup>
C2	10.10±1.21 <sup>abcde</sup>	8.62±1.15 <sup>abc</sup>	6.93±0.55 <sup>cd</sup>	7.52±1.11 <sup>cd</sup>	6.72±0.39 <sup>cdef</sup>	6.24±0.75 <sup>bcd</sup>	5.52±0.17 <sup>efghi</sup>
C3	7.18±0.59 <sup>gh</sup>	4.82±0.43 <sup>hi</sup>	3.87±0.19 <sup>fgh</sup>	3.94±0.36 <sup>g</sup>	4.11±0.59 <sup>gh</sup>	4.28±0.22 <sup>ghij</sup>	4.63±0.12 <sup>ghi</sup>
C4	8.31±0.26 <sup>defgh</sup>	6.25±0.64 <sup>defg</sup>	4.45±0.07 <sup>gh</sup>	4.13±0.11 <sup>fg</sup>	4.32±0.10 <sup>gh</sup>	4.59±0.13 <sup>ghij</sup>	5.67±0.34 <sup>defgh</sup>
D1	10.95±0.24 <sup>ab</sup>	9.80±0.24 <sup>a</sup>	8.98±0.24 <sup>ab</sup>	8.94±.78 <sup>abc</sup>	8.33±0.21 <sup>b</sup>	6.94±0.47 <sup>bcd</sup>	5.61±0.17 <sup>defgh</sup>
D2	11.75±0.62 <sup>a</sup>	9.69±0.07 <sup>a</sup>	9.58±0.15 <sup>a</sup>	8.78±0.45 <sup>bc</sup>	8.05±0.34 <sup>bcd</sup>	6.98±0.28 <sup>bcd</sup>	6.03±0.33 <sup>defg</sup>
D3	7.02±0.29 <sup>h</sup>	5.05±0.42 <sup>hi</sup>	3.87±0.36 <sup>h</sup>	3.79±0.46 <sup>g</sup>	4.17±0.07 <sup>gh</sup>	3.84±0.33 <sup>ij</sup>	4.98±0.20 <sup>efghi</sup>
D4	9.50±0.31 <sup>bcd</sup>	5.69±0.66 <sup>hi</sup>	5.01±0.20 <sup>efgh</sup>	4.36±0.41 <sup>fg</sup>	4.40±0.53 <sup>gh</sup>	5.20±0.10 <sup>efghi</sup>	6.04±0.23 <sup>def</sup>
E1	10.50±1.09 <sup>abc</sup>	7.73±0.36 <sup>bcd</sup>	6.90±0.21 <sup>cd</sup>	6.72±0.62 <sup>de</sup>	6.42±0.72 <sup>ef</sup>	6.57±1.08 <sup>bcd</sup>	5.01±0.13 <sup>defgh</sup>
E2	11.72±1.30 <sup>a</sup>	8.74±1.02 <sup>abc</sup>	7.91±0.09 <sup>bc</sup>	7.17±0.10 <sup>d</sup>	6.56±0.01 <sup>def</sup>	7.48±0.58 <sup>abc</sup>	6.28±0.07 <sup>cdef</sup>
E3	7.95±0.28 <sup>efgh</sup>	4.36±0.27 <sup>j</sup>	5.08±0.15 <sup>efgh</sup>	3.80±0.40 <sup>g</sup>	3.30±0.20 <sup>h</sup>	3.37±0.57 <sup>i</sup>	4.11±0.18 <sup>j</sup>
E4	9.08±0.19 <sup>bcd</sup>	5.11±0.13 <sup>hi</sup>	5.39±0.28 <sup>efg</sup>	4.09±0.07 <sup>fg</sup>	3.61±0.10 <sup>h</sup>	4.00±0.51 <sup>hij</sup>	5.07±0.42 <sup>efghi</sup>

<sup>a-j</sup> Mean within the same column with different superscripts are significantly different ( $p < 0.05$ ).



**Table 6. The TBA value ( mg MDA/g ) of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C**

Treatment groups	Storage time (days)				
	0	3	5	7	10
Control	0.181±0.10 <sup>cdef</sup>	0.174±0.02 <sup>e</sup>	0.221±0.05 <sup>l</sup>	0.185±0.00 <sup>e</sup>	0.175±0.01 <sup>h</sup>
A1	0.188±0.16 <sup>cdef</sup>	0.200±0.04 <sup>e</sup>	0.319±0.11 <sup>f</sup>	0.759±0.09 <sup>e</sup>	2.882±0.83 <sup>gh</sup>
A2	0.078±0.01 <sup>f</sup>	0.235±0.05 <sup>e</sup>	0.234±0.05 <sup>f</sup>	0.530±0.03 <sup>e</sup>	0.933±0.08 <sup>h</sup>
A3	0.522±0.23 <sup>ab</sup>	1.887±0.84 <sup>ab</sup>	4.269±0.26 <sup>bc</sup>	6.701±1.70 <sup>bc</sup>	8.412±0.85 <sup>bcde</sup>
A4	0.468±0.09 <sup>abcd</sup>	1.53±0.20 <sup>abc</sup>	3.8714±0.50 <sup>c</sup>	9.259±0.61 <sup>ab</sup>	9.521±1.15 <sup>abcd</sup>
B1	0.157±0.01 <sup>def</sup>	0.232±0.02 <sup>f</sup>	0.276±0.04 <sup>f</sup>	1.316±0.44 <sup>de</sup>	0.751±0.17 <sup>h</sup>
B2	0.169±0.01 <sup>cdef</sup>	0.237±0.06 <sup>e</sup>	0.663±0.13 <sup>f</sup>	0.755±0.04 <sup>e</sup>	1.517±0.85 <sup>gh</sup>
B3	0.477±0.12 <sup>abc</sup>	1.574±0.43 <sup>abc</sup>	4.678±0.57 <sup>bc</sup>	8.084±1.52 <sup>ab</sup>	7.485±0.99 <sup>cde</sup>
B4	0.403±0.05 <sup>bcde</sup>	1.298±0.16 <sup>bcd</sup>	6.033±0.92 <sup>a</sup>	10.302±1.03 <sup>a</sup>	9.614±0.82 <sup>abcd</sup>
C1	0.224±0.02 <sup>bcdef</sup>	0.276±0.07 <sup>e</sup>	0.443±0.08 <sup>f</sup>	1.424±0.72 <sup>de</sup>	4.420±1.20 <sup>fg</sup>
C2	0.141±0.02 <sup>ef</sup>	0.235±0.01 <sup>e</sup>	0.496±0.08 <sup>f</sup>	1.288±0.57 <sup>de</sup>	6.13±1.29 <sup>fe</sup>
C3	0.726±0.193 <sup>a</sup>	2.130±0.23 <sup>a</sup>	4.066±0.71 <sup>bc</sup>	8.455±1.85 <sup>ab</sup>	7.714±0.29 <sup>cde</sup>
C4	0.743±0.18 <sup>a</sup>	1.550±0.28 <sup>abc</sup>	4.878±0.56 <sup>abc</sup>	9.92±0.33 <sup>a</sup>	11.074±1.60 <sup>ab</sup>
D1	0.161±0.08 <sup>cdef</sup>	0.296±0.00 <sup>e</sup>	0.686±0.13 <sup>f</sup>	1.610±0.20 <sup>e</sup>	1.610±0.202 <sup>gh</sup>
D2	0.141±0.00 <sup>ef</sup>	0.257±0.03 <sup>e</sup>	0.427±0.02 <sup>f</sup>	1.842±0.35 <sup>de</sup>	1.842±0.35 <sup>gh</sup>
D3	0.341±0.02 <sup>bcdef</sup>	1.476±0.17 <sup>abc</sup>	5.293±0.52 <sup>ab</sup>	9.179±1.44 <sup>ab</sup>	9.179±1.44 <sup>abcd</sup>
D4	0.296±0.02 <sup>bcdef</sup>	0.824±0.15 <sup>cde</sup>	4.466±0.36 <sup>bc</sup>	10.281±1.04 <sup>a</sup>	10.28±1.04 <sup>abc</sup>
E1	0.275±0.04 <sup>bcdef</sup>	0.295±0.04 <sup>e</sup>	0.747±0.21 <sup>ef</sup>	1.103±0.27 <sup>de</sup>	6.970±1.48 <sup>bcde</sup>
E2	0.280±0.06 <sup>bcdef</sup>	0.293±0.05 <sup>e</sup>	0.568±0.15 <sup>f</sup>	1.700±0.24 <sup>de</sup>	8.106±0.94 <sup>bcde</sup>
E3	0.340±0.07 <sup>bcdef</sup>	0.672±0.10 <sup>de</sup>	2.337±0.13 <sup>d</sup>	3.907±0.97 <sup>cd</sup>	9.926±0.45 <sup>abcd</sup>
E4	0.317±0.00 <sup>bcdef</sup>	0.452±0.09 <sup>e</sup>	1.981±0.83 <sup>de</sup>	3.872±0.35 <sup>cd</sup>	12.056±1.38 <sup>a</sup>

<sup>a-h</sup> Mean within the same column with different superscripts are significantly different (p<0.05)

**Table 7. The MetMb content (%) of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C**

Treatment groups	Storage time (days)						
	0	3	5	7	10	14	21
Control	34.87±3.04 <sup>cd</sup>	38.63±2.40 <sup>h</sup>	43.52±3.35 <sup>h</sup>	40.80±0.59 <sup>l</sup>	44.45±2.08 <sup>fg</sup>	48.68±1.41 <sup>h</sup>	30.28±2.96 <sup>e</sup>
A1	47.48±5.49 <sup>ab</sup>	48.19±2.69 <sup>defg</sup>	49.15±2.58 <sup>gh</sup>	52.83±6.00 <sup>hg</sup>	61.23±3.94 <sup>cdh</sup>	59.05±4.33 <sup>fgh</sup>	84.29±1.79 <sup>a</sup>
A2	46.79±0.03 <sup>abc</sup>	52.32±3.18 <sup>bcdef</sup>	55.68±2.13 <sup>defgh</sup>	54.13±2.08 <sup>fgh</sup>	56.23±0.76 <sup>ef</sup>	60.93±0.96 <sup>efg</sup>	66.48±1.66 <sup>cd</sup>
A3	37.80±4.92 <sup>abcd</sup>	58.81±1.93 <sup>bcde</sup>	65.99±6.72 <sup>abcdef</sup>	68.25±0.26 <sup>abcd</sup>	77.25±2.32 <sup>ab</sup>	72.89±1.26 <sup>abcd</sup>	79.15±2.43 <sup>abc</sup>
A4	37.36±0.80 <sup>abcd</sup>	61.24±3.81 <sup>br</sup>	67.00±3.53 <sup>abcdef</sup>	72.02±2.21 <sup>abcd</sup>	73.62±2.02 <sup>abcd</sup>	71.57±0.10 <sup>abcd</sup>	75.48±1.20 <sup>abc</sup>
B1	33.16±2.23 <sup>cd</sup>	27.77±3.62 <sup>h</sup>	57.47±4.17 <sup>defgh</sup>	60.24±0.07 <sup>efg</sup>	39.22±10.02 <sup>e</sup>	77.42±3.32 <sup>ab</sup>	73.44±2.04 <sup>abcd</sup>
B2	43.93±1.17 <sup>abcd</sup>	48.76±0.66 <sup>cdef</sup>	53.23±9.79 <sup>fgh</sup>	63.36±4.41 <sup>cdefg</sup>	39.70±6.51 <sup>e</sup>	55.46±1.91 <sup>fgh</sup>	58.47±11.58 <sup>d</sup>
B3	32.19±3.26 <sup>d</sup>	59.61±3.48 <sup>bcde</sup>	69.35±1.28 <sup>abcde</sup>	74.92±0.40 <sup>ab</sup>	75.41±0.28 <sup>abc</sup>	76.43±0.80 <sup>ab</sup>	78.49±0.40 <sup>abc</sup>
B4	33.66±3.53 <sup>cd</sup>	61.59±1.15 <sup>abc</sup>	73.13±0.42 <sup>ab</sup>	73.96±1.57 <sup>abc</sup>	74.31±1.42 <sup>abcd</sup>	75.01±0.43 <sup>abc</sup>	72.11±2.08 <sup>abcd</sup>
C1	32.66±1.73 <sup>cd</sup>	46.20±5.66 <sup>fg</sup>	50.97±1.60 <sup>gh</sup>	55.55±3.31 <sup>fgh</sup>	58.55±0.16 <sup>def</sup>	64.08±1.14 <sup>cdefg</sup>	73.76±0.10 <sup>abc</sup>
C2	35.52±2.87 <sup>abcd</sup>	49.75±0.79 <sup>cdefg</sup>	54.38±2.51 <sup>fgh</sup>	56.13±0.81 <sup>fgh</sup>	63.33±0.87 <sup>bcde</sup>	66.09±3.66 <sup>bcdef</sup>	74.25±8.02 <sup>abc</sup>
C3	43.54±3.50 <sup>abcd</sup>	58.77±2.51 <sup>bcde</sup>	71.01±1.05 <sup>abc</sup>	73.96±2.69 <sup>abc</sup>	73.85±0.37 <sup>abcd</sup>	77.37±2.14 <sup>ab</sup>	82.00±3.53 <sup>ab</sup>
C4	39.40±2.38 <sup>abcd</sup>	73.50±2.12 <sup>a</sup>	75.12±1.04 <sup>ab</sup>	73.94±0.62 <sup>abc</sup>	75.46±0.57 <sup>abcd</sup>	72.98±3.15 <sup>abcd</sup>	74.50±2.33 <sup>abc</sup>
D1	42.59±5.49 <sup>abcd</sup>	46.99±4.16 <sup>efg</sup>	45.00±5.84 <sup>h</sup>	46.86±4.27 <sup>hi</sup>	54.34±3.95 <sup>efg</sup>	54.34±3.95 <sup>gh</sup>	81.73±0.18 <sup>ab</sup>
D2	42.97±1.34 <sup>abcd</sup>	49.02±0.07 <sup>defg</sup>	47.40±0.97 <sup>gh</sup>	56.46±4.54 <sup>fgh</sup>	54.81±0.31 <sup>efg</sup>	54.81±0.31 <sup>fgh</sup>	67.89±3.37 <sup>bcd</sup>
D3	38.15±5.53 <sup>abcd</sup>	57.19±3.26 <sup>bcdef</sup>	67.00±4.32 <sup>abcdef</sup>	74.90±1.78 <sup>ab</sup>	76.58±0.58 <sup>abc</sup>	76.58±0.58 <sup>ab</sup>	80.28±2.93 <sup>ab</sup>
D4	37.80±2.39 <sup>abcd</sup>	62.06±5.60 <sup>ab</sup>	69.09±1.44 <sup>abcde</sup>	71.96±0.37 <sup>abcd</sup>	73.55±1.02 <sup>abcd</sup>	75.33±1.02 <sup>abcd</sup>	74.08±0.77 <sup>abc</sup>
E1	47.86±6.77 <sup>ab</sup>	48.56±2.07 <sup>defg</sup>	54.59±1.90 <sup>defgh</sup>	64.32±0.71 <sup>bcdef</sup>	80.33±0.25 <sup>a</sup>	76.41±1.43 <sup>ab</sup>	73.98±0.08 <sup>abc</sup>
E2	49.51±2.48 <sup>a</sup>	55.26±0.32 <sup>bcdef</sup>	60.48±0.74 <sup>bcdef</sup>	62.05±3.95 <sup>defg</sup>	69.66±11.21 <sup>abcde</sup>	77.50±0.46 <sup>ab</sup>	67.89±3.37 <sup>bcd</sup>
E3	49.23±3.90 <sup>a</sup>	64.12±1.54 <sup>ab</sup>	74.64±3.94 <sup>ab</sup>	75.69±0.67 <sup>a</sup>	76.25±0.55 <sup>abc</sup>	80.62±2.44 <sup>a</sup>	80.18±0.08 <sup>ab</sup>
E4	49.65±3.31 <sup>a</sup>	63.98±3.58 <sup>ab</sup>	75.77±0.79 <sup>a</sup>	75.64±1.92 <sup>a</sup>	78.17±0.30 <sup>ab</sup>	79.00±1.98 <sup>a</sup>	76.37±2.23 <sup>abc</sup>

<sup>a-i</sup> Mean within the same column with different superscripts are significantly different (p<0.05).



Table 8. The TPC (log CFU/g) of Ba-Tseng fresh pork sausage as affected by different ratio lactic acid-induced gelled egg white powder and SL across all storage days at 4°C

Treatment groups	Storage time (days)						
	0	3	5	7	10	14	21
Control	3.96 <sup>bc</sup>	4.09 <sup>a</sup>	4.37 <sup>b</sup>	4.39 <sup>b</sup>	3.87 <sup>ab</sup>	3.4 <sup>i</sup>	5.06 <sup>e</sup>
A1	3.84 <sup>cd</sup>	3.60 <sup>f</sup>	3.38 <sup>l</sup>	3.94 <sup>c</sup>	5.15 <sup>ab</sup>	4.08 <sup>d</sup>	4.42 <sup>k</sup>
A2	3.49 <sup>ef</sup>	3.92 <sup>c</sup>	3.95 <sup>c</sup>	3.72 <sup>g</sup>	4.11 <sup>ab</sup>	3.5 <sup>g</sup> <sup>hi</sup>	3.83 <sup>p</sup>
A3	3.87 <sup>cd</sup>	3.79 <sup>d</sup>	4.32 <sup>c</sup>	3.00 <sup>o</sup>	2.82 <sup>ab</sup>	4.06 <sup>d</sup>	4.83 <sup>f</sup>
A4	3.35 <sup>fg</sup>	3.54 <sup>f</sup>	3.31 <sup>j</sup>	3.33 <sup>l</sup>	4.26 <sup>ab</sup>	3.83 <sup>e</sup>	4.71 <sup>gh</sup>
B1	4.04 <sup>abc</sup>	4.06 <sup>ab</sup>	4.43 <sup>a</sup>	4.56 <sup>a</sup>	5.22 <sup>ab</sup>	5.39 <sup>a</sup>	3.76 <sup>q</sup>
B2	4.24 <sup>a</sup>	3.72 <sup>de</sup>	4.17 <sup>d</sup>	4.27 <sup>c</sup>	4.27 <sup>ab</sup>	4.95 <sup>b</sup>	4.52 <sup>i</sup>
B3	3.11 <sup>h</sup>	2.83 <sup>k</sup>	3.22 <sup>l</sup>	3.19 <sup>m</sup>	3.01 <sup>ab</sup>	3.56 <sup>ghi</sup>	4.74 <sup>g</sup>
B4	3.12 <sup>h</sup>	3.20 <sup>h</sup>	2.95 <sup>n</sup>	3.45 <sup>kc</sup>	3.30 <sup>ab</sup>	3.99 <sup>d</sup>	5.21 <sup>c</sup>
C1	4.16 <sup>a</sup>	4.01 <sup>b</sup>	3.48 <sup>g</sup>	3.88 <sup>e</sup>	4.05 <sup>ab</sup>	4.08 <sup>d</sup>	4.02 <sup>n</sup>
C2	4.20 <sup>ab</sup>	3.73 <sup>ed</sup>	3.97 <sup>e</sup>	3.82 <sup>f</sup>	6.65 <sup>a</sup>	3.61 <sup>gh</sup>	4.11 <sup>m</sup>
C3	3.13 <sup>h</sup>	3.08 <sup>ij</sup>	2.80 <sup>p</sup>	2.90 <sup>p</sup>	2.99 <sup>ab</sup>	3.79 <sup>ef</sup>	4.69 <sup>zh</sup>
C4	3.68 <sup>de</sup>	3.00 <sup>j</sup>	2.66 <sup>p</sup>	3.08 <sup>n</sup>	3.59 <sup>ab</sup>	2.96 <sup>k</sup>	4.10 <sup>m</sup>
D1	3.18 <sup>gh</sup>	3.40 <sup>g</sup>	3.74 <sup>f</sup>	3.61 <sup>i</sup>	3.61 <sup>ab</sup>	3.23 <sup>j</sup>	5.15 <sup>d</sup>
D2	3.86 <sup>cd</sup>	3.01 <sup>j</sup>	3.25 <sup>k</sup>	3.69 <sup>h</sup>	3.99 <sup>ab</sup>	3.67 <sup>fg</sup>	3.88 <sup>o</sup>
D3	2.89 <sup>i</sup>	3.08 <sup>ij</sup>	2.66 <sup>p</sup>	3.19 <sup>m</sup>	3.16 <sup>ab</sup>	3.63 <sup>gh</sup>	4.86 <sup>f</sup>
D4	3.74 <sup>d</sup>	3.12 <sup>hi</sup>	2.47 <sup>q</sup>	2.81 <sup>r</sup>	2.72 <sup>b</sup>	3.54 <sup>hi</sup>	4.38 <sup>k</sup>
E1	3.47 <sup>ef</sup>	3.91 <sup>c</sup>	2.93 <sup>n</sup>	3.19 <sup>m</sup>	3.40 <sup>ab</sup>	4.46 <sup>c</sup>	5.43 <sup>a</sup>
E2	3.35 <sup>fg</sup>	3.70 <sup>e</sup>	3.39 <sup>j</sup>	2.84 <sup>q</sup>	3.14 <sup>ab</sup>	4.46 <sup>c</sup>	5.33 <sup>b</sup>
E3	3.01 <sup>hi</sup>	3.69 <sup>e</sup>	2.98 <sup>m</sup>	3.07 <sup>n</sup>	3.10 <sup>ab</sup>	3.04 <sup>k</sup>	4.46 <sup>j</sup>
E4	3.02 <sup>hi</sup>	3.43 <sup>g</sup>	3.43 <sup>h</sup>	3.51 <sup>j</sup>	3.09 <sup>ab</sup>	3.17 <sup>j</sup>	4.17 <sup>l</sup>

<sup>a-r</sup> Mean within the same column with different superscripts are significantly different (p<0.05)