

# Qualities of pork patties added with *Origanum majorana* during refrigerated storage

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## Introduction

Due to health concern, consumers prefer natural food additives. Seeking natural food additives become very important. In addition to flavor enhancement, herbs are often with some functions, such as antimicrobial and antioxidant properties. Majoram (*Origanum majorana*) which is originally grown in Mediterranean areas, has been planted in Taiwan recently. Because its leaves smell well, people often add majoram leaves when flavoring or cooking. In addition, majoram has been reported to have some antioxidant and antimicrobial properties (Karpińska *et al.*, 2001; Koşar, *et al.*, 2005; Vági *et al.*, 2005). This research was to evaluate the qualities of pork patties added with various amounts of majoram when the products were stored under refrigeration.

## Materials and Methods

Fresh majoram leaves, obtained from a local market in Taiwan, were cut into pieces with length of 3-5 cm, washed, dried in an oven at 60°C for 4 hr, ground into powder, packed with an aluminum foil, and refrigerated stored prior to use. Pork loin and backfat were ground first. The formula included 80% fresh legs, 20% pork backfat, 3.0% sugar, 1.5% salt, 0.2% monosodium glutamate, 0.1% white pepper powder. Dried majoram powders at the levels of 0, 0.1, 0.2, 0.3, or 0.4% were added accordingly and mixed with the meat mixture. Then, the mixtures were manually formed into patties that had approximate thickness of 1.5 cm and a diameter of 8 cm and a weight of approximately 95g. Pork patties were packaged in polyethylene film, and stored at 4°C and analyzed. The L\*, a\*, and b\* values of the samples were measured. Thiobarbituric acid (TBA) values of the samples were determined according to the methods described by Salih *et al.* (1987). Volatile basic nitrogen (VBN) was determined by the Conway micropipette diffusion method. The sensory evaluation conducted using a 1 to 7 scale, with 1 representing the lowest intensity and the lightest color. The data were analyzed using the SAS software.

## Results and Discussion

Adding more dried marjoram leaf powder tended to decrease the L\* and a\* values and increase the b\* values of the samples (Table 1). This change in colors is probably due to the addition of marjoram. Samples added with 0.2 or 0.3% of marjoram tended to have lower TBA values, especially after refrigerated stored for four and more days when comparing with the controls (Table 2). The VBN values increased significantly during storage as expected. Comparing with the controls, samples that added with marjoram had significantly ( $P < 0.05$ ) lower VBN values after refrigerated stored for more than 6 days. Adding majoram increased the sensory aroma, color, and flavor scores of the samples. In addition, the samples added with 0.2 to 0.3% of majoram had the highest overall acceptability.

## Conclusions

Adding majoram (*Origanum majorana*) into pork patties formula decreased products L\* and a\* values. The treated samples had lower VBN values after refrigerated stored for 6 and 8 days. Samples added with 0.2 to 0.3% of majoram had lower TBA values and the highest sensory overall acceptability.

## References

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**Table 1.** Changes in color of pork patties added with *Origanum majorana* during refrigerated storage

<i>Origanum majorana</i> level	Storage time (day)				
	0	2	4	6	8
	L*				
0.0%	69.45 <sup>ax</sup>	71.48 <sup>avw</sup>	72.07 <sup>av</sup>	70.77 <sup>aw</sup>	71.11 <sup>aw</sup>
0.1%	67.73 <sup>abv</sup>	69.03 <sup>bv</sup>	69.55 <sup>bv</sup>	69.55 <sup>abv</sup>	69.47 <sup>bv</sup>
0.2%	65.71 <sup>bcdx</sup>	67.84 <sup>cw</sup>	67.97 <sup>cw</sup>	69.10 <sup>bv</sup>	69.63 <sup>bv</sup>
0.3%	65.81 <sup>bcdx</sup>	67.13 <sup>dw</sup>	66.76 <sup>dw</sup>	67.07 <sup>cw</sup>	68.52 <sup>cv</sup>
0.4%	63.71 <sup>cy</sup>	66.57 <sup>ew</sup>	65.16 <sup>ex</sup>	66.60 <sup>cw</sup>	67.92 <sup>cv</sup>
	a*				
0.0%	7.18 <sup>ax</sup>	8.25 <sup>av</sup>	7.19 <sup>ax</sup>	7.87 <sup>aw</sup>	7.10 <sup>ax</sup>
0.1%	5.97 <sup>bw</sup>	6.37 <sup>bv</sup>	5.96 <sup>bw</sup>	5.03 <sup>by</sup>	5.22 <sup>bx</sup>
0.2%	4.11 <sup>cw</sup>	4.89 <sup>cv</sup>	4.80 <sup>cv</sup>	4.07 <sup>cw</sup>	3.93 <sup>cx</sup>
0.3%	2.91 <sup>dy</sup>	3.95 <sup>dv</sup>	3.46 <sup>dw</sup>	3.27 <sup>dx</sup>	2.37 <sup>dz</sup>
0.4%	2.29 <sup>ew</sup>	2.64 <sup>ev</sup>	2.72 <sup>ev</sup>	2.68 <sup>ev</sup>	2.15 <sup>ex</sup>
	b*				
0.0%	13.91 <sup>cx</sup>	14.95 <sup>dv</sup>	14.30 <sup>dw</sup>	14.84 <sup>dv</sup>	14.32 <sup>cw</sup>
0.1%	14.22 <sup>ay</sup>	15.63 <sup>cv</sup>	15.18 <sup>cw</sup>	14.89 <sup>dx</sup>	15.26 <sup>bw</sup>
0.2%	14.17 <sup>abz</sup>	15.95 <sup>bv</sup>	15.60 <sup>bw</sup>	15.42 <sup>cx</sup>	15.16 <sup>by</sup>
0.3%	14.01 <sup>bcdx</sup>	16.30 <sup>av</sup>	15.92 <sup>bw</sup>	15.90 <sup>bw</sup>	15.69 <sup>aw</sup>
0.4%	14.23 <sup>ay</sup>	16.37 <sup>aw</sup>	16.82 <sup>av</sup>	16.12 <sup>aw</sup>	15.80 <sup>ax</sup>

<sup>v-z</sup> Means within a row in the same test that have different superscripts are significantly different ( $P < 0.05$ ).

<sup>a-e</sup> Means within a column in the same test that have different superscripts are significantly different ( $P < 0.05$ ).

**Table 2.** Changes in TBA and VBN values of pork patties added with *Origanum majorana* during refrigerated storage

<i>Origanum majorana</i> level	Storage time (day)				
	0	2	4	6	8
	TBA				
0.0%	0.774 <sup>by</sup>	0.691 <sup>abz</sup>	1.241 <sup>aw</sup>	1.124 <sup>ax</sup>	1.322 <sup>av</sup>
0.1%	0.882 <sup>ax</sup>	0.628 <sup>cz</sup>	1.106 <sup>bv</sup>	0.798 <sup>by</sup>	1.063 <sup>bw</sup>
0.2%	0.840 <sup>abx</sup>	0.676 <sup>aby</sup>	0.917 <sup>dv</sup>	0.739 <sup>bcz</sup>	0.840 <sup>dw</sup>
0.3%	0.804 <sup>abw</sup>	0.648 <sup>bcy</sup>	0.910 <sup>dv</sup>	0.776 <sup>bx</sup>	0.889 <sup>cv</sup>
0.4%	0.882 <sup>ax</sup>	0.707 <sup>ay</sup>	1.040 <sup>cv</sup>	0.691 <sup>cy</sup>	0.909 <sup>cw</sup>
	VBN				
0.0%	4.158 <sup>ay</sup>	6.930 <sup>ax</sup>	9.148 <sup>aw</sup>	10.534 <sup>av</sup>	11.088 <sup>av</sup>
0.1%	4.158 <sup>ay</sup>	6.930 <sup>ax</sup>	8.870 <sup>aw</sup>	8.870 <sup>bw</sup>	9.702 <sup>bv</sup>
0.2%	4.158 <sup>ay</sup>	6.653 <sup>ax</sup>	8.316 <sup>aw</sup>	8.316 <sup>bw</sup>	9.702 <sup>bv</sup>
0.3%	4.158 <sup>ay</sup>	6.653 <sup>ax</sup>	8.039 <sup>aw</sup>	8.316 <sup>bv</sup>	8.870 <sup>cv</sup>
0.4%	3.881 <sup>ax</sup>	6.376 <sup>aw</sup>	7.762 <sup>av</sup>	8.316 <sup>bv</sup>	8.593 <sup>cv</sup>

<sup>v-z</sup> Means within a row in the same test that have different superscripts are significantly different ( $P < 0.05$ ).

<sup>a-d</sup> Means within a column in the same test that have different superscripts are significantly different ( $P < 0.05$ ).

**Table 3.** Sensory evaluation of pork patties added with *Origanum majorana* during refrigerated storage

<i>Origanum majorana</i> level	Storage time (day)			Storage time (day)		
	0	2	4	0	2	4
	Aroma			Color		
0.0%	2.00 <sup>ev</sup>	2.00 <sup>dv</sup>	2.00 <sup>ev</sup>	1.80 <sup>ev</sup>	2.00 <sup>dv</sup>	1.92 <sup>ev</sup>
0.1%	2.80 <sup>dv</sup>	2.90 <sup>cv</sup>	2.78 <sup>dv</sup>	3.00 <sup>dv</sup>	3.10 <sup>cv</sup>	2.92 <sup>dv</sup>
0.2%	3.70 <sup>cv</sup>	4.00 <sup>bv</sup>	3.67 <sup>cv</sup>	3.60 <sup>cw</sup>	4.20 <sup>bv</sup>	4.17 <sup>cv</sup>
0.3%	4.50 <sup>bv</sup>	5.10 <sup>av</sup>	4.80 <sup>bv</sup>	5.00 <sup>bv</sup>	5.10 <sup>av</sup>	5.25 <sup>bv</sup>
0.4%	5.70 <sup>av</sup>	5.50 <sup>av</sup>	5.78 <sup>av</sup>	5.70 <sup>avw</sup>	5.50 <sup>aw</sup>	6.00 <sup>av</sup>
	Flavor			Overall acceptance		
0.0%	1.89 <sup>dv</sup>	2.30 <sup>cv</sup>	2.09 <sup>ev</sup>	3.60 <sup>bv</sup>	3.30 <sup>bv</sup>	3.58 <sup>cv</sup>
0.1%	3.22 <sup>cv</sup>	2.80 <sup>cv</sup>	3.18 <sup>dv</sup>	4.33 <sup>abv</sup>	4.50 <sup>av</sup>	4.42 <sup>bv</sup>
0.2%	3.44 <sup>cw</sup>	4.20 <sup>bv</sup>	4.27 <sup>cv</sup>	4.40 <sup>abw</sup>	4.50 <sup>aw</sup>	5.25 <sup>av</sup>
0.3%	4.67 <sup>bv</sup>	5.30 <sup>avw</sup>	5.09 <sup>bv</sup>	4.90 <sup>av</sup>	4.40 <sup>av</sup>	4.92 <sup>av</sup>
0.4%	5.44 <sup>avw</sup>	5.67 <sup>aw</sup>	6.09 <sup>av</sup>	4.00 <sup>abv</sup>	4.00 <sup>av</sup>	4.58 <sup>bv</sup>

<sup>v-w</sup> Means within a row in the same test that have different superscripts are significantly different ( $P < 0.05$ ).

<sup>a-e</sup> Means within a column in the same test that have different superscripts are significantly different ( $P < 0.05$ ).