EVALUATION OF ANTIOXIDATIVE AND ANTIBACTERIAL ACTIVITY OF SOME HERBS (Taiwan basil-*Ocimum basilicum*("nine-levelpagoda"), garlic sprout- *Allium sativum* and ginger-*Zingiber officinale*) IN FRESH CHICKEN SAUSAGE DURING STORAGE AT 2-4℃

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Abstract—Crude fat of fresh chicken sausages with 3% Taiwan basil, garlic sprot and ginger, individually, were lower than the control but no significant differences were found among them (P＞0.05). pH values in all fresh chicken sausages decreased with storage time and at the 14th day fresh chicken sausage with garlic sprout and Taiwan basil were significantly lower than the control and ginger treatment. Before 10days during storage, herbs didn't demonstrate better antioxidative ability but ginger had lower TBA value in comparison with the control, Taiwan basil and garlic sprout at the final day. With storage time, VBN in all fresh chicken sausages were gradually increased and Taiwan basil and garlic sprout showed significantly lower than control and ginger at the final day. During storage, the total plate counts in all samples increased with storage time. Fresh chicken sausages with Taiwan basil and garlic sprout had significant lower counts (P<0.05) when compared with the control and ginger at the end of storage. On sensory panel, except of fresh chicken sausage with ginger, the control, Taiwan basil and garlic sprout had higher score in appearance, flavor and overall acceptance but lower in off-odd before 7 days during storage. However, 3% ginger had the highest off odd score and the lowest overall acceptance score at the end of storage in this study.

Key words: Taiwan basil, garlic sprout, ginger. Fresh chicken sausage

I. INTRODUCTION

Traditionally, basil has been extensively utilized in food as a flavoring agent, and in perfumery and medical industries (Telci *et al*., 2006). The leaves and flowering tops of the plant are perceived as carminative, galactogogue, stomachic and antispasmodic in folk medicine (Sajjadi, 2006). However, recently the potential uses of basil, particularly as antimicrobial and antioxidant agents have also been investigated (Lee *et al*., 2005; Wannissorn *et al*., 2005). Garlic has been known since ancient times as a flavoring agent and for its medicinal properties (Abu-Lafi *et al*., 2004) .The popularity of garlic is known from folk medicine through the centuries for treatment of such varied disorders as respiratory ailments, asthma, pneumonia, diabetes, cardiovascular disorders and rheumatism among others (Fenwick and Hanley, 1985). Garlic sprout also always used in food, especilly, as a flavoring and vegetable with Chinese becaon in Taiwan. Ginger (*Zingiber officinale* (L.) Rosc) has been used as a spice for over 2000 years (Bartley & Jacobs, 2000). Ginger has antioxidant (Lee *et al*., 1986a) and antimicrobial (Salzer, 1982) properties that help extend the shelf life of a product (Kim & Lee, 1995). It also helps enhance the flavor of the food product. Ginger has been also shown to have a powerful proteolytic activity (Choi *et al*., 1999), and this property is especially useful in improving the tenderness quality of otherwise tough meat (Lee *et al*., 1986b).

The aim of this study was to evaluate the herbal antimicrobial and antioxidant ability of Taiwan basil, garlic sprout and ginger in fresh chicken sausage stored at 2-4℃. The pH, thiobarbituric acid (TBA) values, volatile basic nitrogen (VBN), and microbial quality were to determine. On the other hand, the result of sensory evaluation was also to understand hedonic scale of fresh chicken sausage with these herbs in this study.

II. MATERIALS AND METHODS

Three different fresh herbs (Taiwan basil-*Ocimum basilicum*("nine-levelpagoda"), garlic sprout- *Allium sativum* and ginger-*Zingiber officinale*) were obtained from local markets, and then blended with a blender for 1.5 min. Those herbs were stored at 4℃. The frozen chicken meat (breasts and legs), chicken skin, pork backfat and pork casing obtained from local markets. Chicken meat was ground by 9 mm plate, chicken skin and pork backfat by 6mm plate. First, ground chicken meat was mixed 1.6% NaCl and 0.1% polyphosphates for 5 min, and then mixed with spices and seasoning, including 1% sugar, 0.4% MSG, 0.15% white pepper powder, 0.1% onion powder, 0.085% cardamom powder for 3 min. Finally the meat paste was mixed with 9% chicken skin, 6% pork backfat and 15% ice for 8 min. The meat pastes were divided int four groups as control = non herb, basil=3% Taiwan basil, garlic sprout=3% garlic

sprout and ginger=3% ginger, individually. The four meat paste mixtures were cured at 4℃ for 24 hours, and then stuffed (Stuffer, Dick D-73779, Germany) into pork casing and sectioned as 10-12cm length then packed in a tray with PVC film and stored at 2- 4℃.

The samples were taken at days 1, 4, 7, 10 and 14 during storage. Chemical content and pH of fresh chicken sausages were determined according to AOAC (1990)'s method. TBA values of the samples were determined according the methods described by Faustman *et al*.(1992). Total plate count was performed according to the method of Bacteriological Analytical Manual for Foods (BAM, FDA) (1996). Volatile basic nitrogen was determined by the Conway micropipette diffusion method (CNS, 1982). Sensory attributes, including appearance, off-odour, flavor and overall acceptance were determined using 1–7 point hedonic scale, with 1, 4 and 7 representing extremely dislike, neither like nor dislike and extremely like, respectively. SAS (2003) 's GLM program was used to analyses all data in this study.

III. RESULTS AND DISCUSSION

The chemical composition of fresh chicken sausages with Taiwan basil, garlic sprot and ginger were showed as table 1, Crude fat of fresh chicken sausages with 3% basil, garlic sprot and ginger, individually, were lower than the control but no significant differences amnog them ($P > 0.05$). Moisture in the control was lower value than with herbs due to a high moisutre in herbs. Crude protein, and ash were not significantly different among three treatments and control. pH values in all fresh chicken sausages decreased with storage time and at 14th day fresh chicken sausage with garlic sprout and Taiwan basil were significantly lower than the control and ginger treatment (figure1). This result also indicated that herbs didn't significantly inhibit the decline of pH during storage in this study. During the whole storage, herbs didn't demonstrate better antioxiative ability and the result showed as the TBA of fresh chicken sausages in figure 2. Neverthless, ginger had lower TBA value in comparsion with the control, Taiwan basil and garlic sprout at the final day. With storage time, VBN in all fresh chciken sausages were gradually increased and Taiwan basil and garlic sprout showed sigificantly lower than control and ginger at the final day. Ginger had the highest VBN value during the whole storage period and this result may be caused by it's stronger proteolytic ability (figure3). The total plate counts in all samples increased with storage time. At the initial, the microbial count were not significantly different among all treatments and the contol but fresh chciken sausages with Taiwan basil and garlic sprout had significant lower counts ($P<0.05$) when compared with the control and ginger at the end of storage(figure 4). The reults also displayed Taiwan basil had better antimicrobial ability than the others two herbs. On sensory panel, except of fresh chicken sausage with ginger, the control, Taiwan basil and garlic sprout had higher score in appearnace, flavor and overall acceptance but lower in off-odd at the middle period of storage. However, 3% ginger had the highest off odd score and the lowest overall acceptance score at the end of storage in this study.

IV. CONCLUSION

In conclusion, use of 3% Taiwan basil could help to control VBN and bacterial quality in fresh chicken sausages and also actually kept better sensory quality when the products stored at 2-4℃ for 14 days.

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Table1 Effects of Taiwan basil, garlic sprout and ginger on chemical content of fresh chicken sauage

		Treatment		
Items	Control	Taiwan Basil	Garlic sprout	Ginger
Moisture%	66.56±0.71[a]	67.30±0.38[a]	66.61±0.48[a]	67.25±0.54[a]
Crude protein%	15.22±0.20[b]	16.34±0.54[a]	16.51±0.73[a]	15.76±0.18[a,b]
Crude fat %	12.84±0.09[a]	10.59±0.38[c]	11.45±0.73[b]	10.89±0.16[b,c]
Ash%	2.37±0.07[a]	2.44±0.10[a]	2.35±0.10[a]	2.39±0.03[a]

mean±S.D., n=6.

[a, b, c] Means within the same row with different superscripts are significantly different (P < 0.05).

Table 2 Effects of Taiwan basil, garlic sprout and ginger on sensory panel items of chicken sausage during storage at 2-4℃

		Treatment		
Items	Control	Taiwan Basil	Garlic sprout	Ginger
1st day				
Appearance	5.40±0.99[a]	4.60±1.12[a]	5.20±0.94[a]	5.00±1.07[a]
Flavor	5.47±1.19[a,b]	5.73±1.16[a]	5.60±1.18[a]	4.67±1.23[b]
Off odor	1.20±0.56[a]	1.67±0.98[a]	1.47±0.83[a]	1.60±0.91[a]
Overall acceptance	5.87±1.06[a]	5.60±1.12[a,b]	5.60±0.99[a,b]	4.87±0.99[d]
7th day				
Appearance	5.27±0.79[a]	3.73±1.19[b]	4.82±0.75[a]	5.27±0.90[a]
Flavor	4.82±1.25[a]	5.45±0.82[a]	5.00±1.10[a]	4.55±1.21[a]
Off odor	1.82±0.75[a]	1.55±0.69[a]	1.55±0.93[a]	2.27±1.27[a]
Overall acceptance	5.18±0.98[a]	5.00±0.77[a]	5.27±1.01[a]	4.82±1.40[a]
14th day				
Appearance	4.90±0.99[a]	3.30±0.82[b]	4.30±0.95[a]	4.80±1.32[a]
Flavor	-	-	-	-
Off odor	3.10±1.91[b]	2.60±1.51[b]	2.90±1.20[b]	3.40±1.35[a]
Overall acceptance	4.10±1.66[a]	3.90±0.99[a]	4.00±1.56[a]	3.60±1.51[a]

mean±S.D., n=9.

[a, b, c] Means within the same row with different superscripts are significantly different (P < 0.05).

-: no test

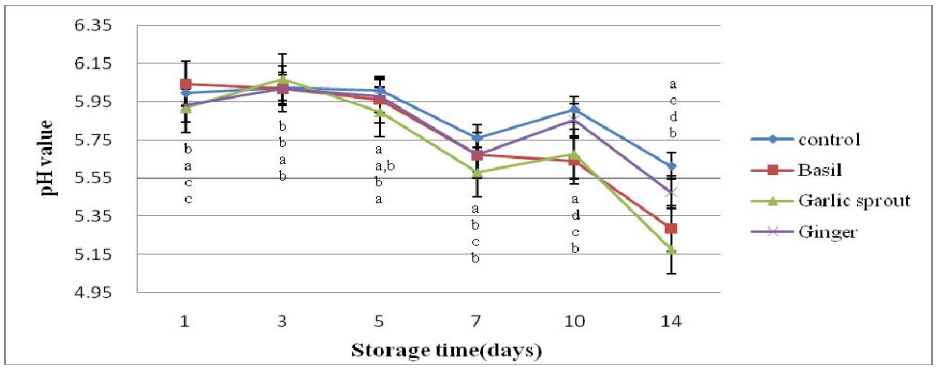

Figure 1 Effects of Taiwan basil, garlic sprout and ginger on pH value of fresh chicken sausages during storage at 2-4℃. mean±S.D., n=6.

[a, b, c] Means within the same row with different superscripts are significantly different (P < 0.05).

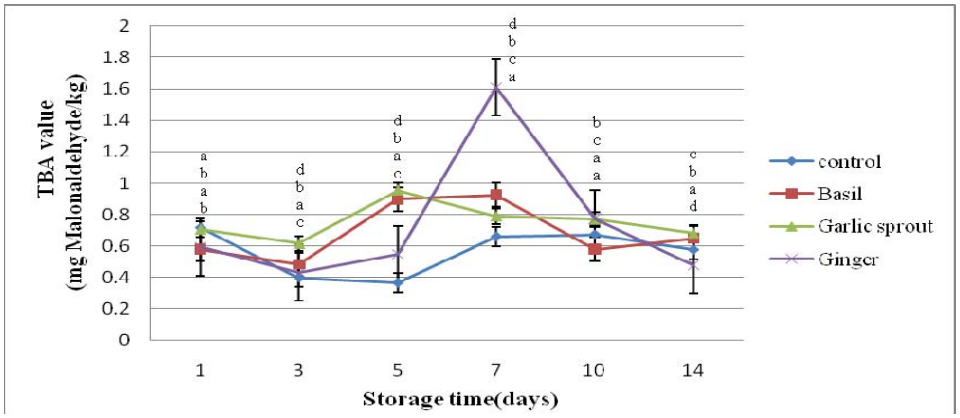

Figure 2. Effect of Taiwan basil, garlic sprout and ginger on TBA value of fresh chicken sausages during storage at 2-4℃. mean±S.D., n=6.

[a, b, c] Means within the same row with different superscripts are significantly different ($P < 0.05$)

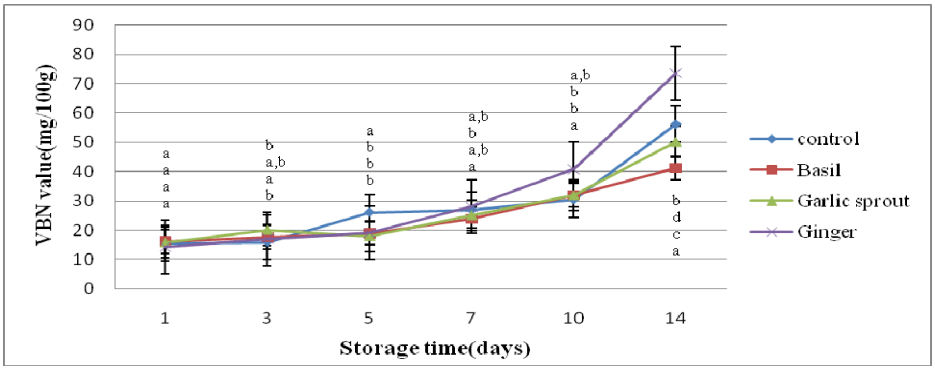

Figure 3. Effect of Taiwan basil, garlic sprout and ginger on VBN value of fresh chicken sausages during storage at 2-4℃. mean±S.D., n=6.

[a, b, c] Means within the same row with different superscripts are significantly different ($P < 0.05$)

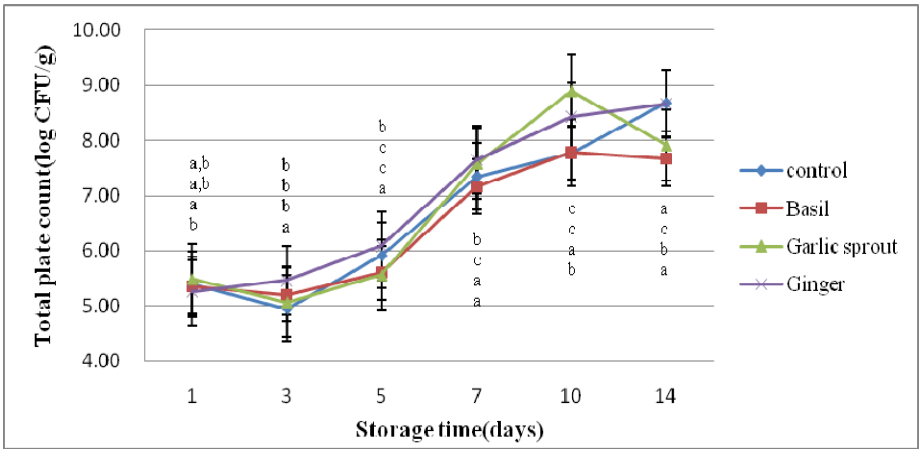

Figure 4. Effect of Taiwan basil, garlic sprout and ginger on total plate count of fresh chicken sausages during storage at 2-4℃. mean±S.D., n=6.

[a, b, c] Means within the same row with different superscripts are significantly different ($P < 0.05$)