

THE UTILIZATION OF FRESH GARLIC, GARLIC POWDER, AND GARLIC ESSENTIAL OIL IN REDUCED NITRITE CHINESE STYLE SAUSAGE.

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ABSTRACT

Fresh garlic, garlic powder, and garlic essential oil were added to nitrite reduced Chinese style sausage and evaluated for antimicrobial and antioxidant effects of different forms of garlic. TBA numbers of all treatments were not found significantly different between all treatments and during all storage times except on storage day 28. The pH values and total plate counts of all treatments and after storage for 28 days indicated no significant difference. There were some differences found in sensory evaluations except in the case of color (cooked). However, there were some differences found in uncooked color (reflectance).

INTRODUCTION

Spices are added into Chinese style sausages, one of the most common and popular processed meat products in Taiwan, for obtaining more variety of products. The flavor of garlic and paprika are two of the most popular and acceptable flavors used in Chinese style sausage. Fresh garlic, garlic powder, and garlic essential oil were added separately into Chinese style sausages with 150 ppm and 75 ppm (reduced) nitrite treatments. Their antimicrobial and antioxidant effects were evaluated by testing total plate count and TBA numbers. Sensory panel evaluation was also obtained.

MATERIAL & METHODS

Sample preparation:

Boneless pork shoulders were bought and separated into lean and fat portions. Lean and fat were weighed to a 4:1 ratio and seasoned with 0.5% MSG, 1.7% salt, 8% sugar, 2% rice wine, 0.2% sodium poly phosphate, and 150ppm or 75 ppm nitrite. Three different forms of garlic were added by their strength ratio (Farrell, 1990). If 5% of fresh garlic was used, then the equal flavor strength of garlic powder should be 1.2% and 100% garlic essential oil should be 0.006%.

Seasoned meats of all treatments were cured for 18 hours and stuffed into collagen casings (1 cm diameter in size), then vacuum packaged and stored at 4° C after drying at 50 to 55° C for 18 hours.

Chemical analysis:

Basic analysis of sausage composition (moisture, protein, fat and pH value) were conducted by the Ockerman's method (1985). The TBA value for fat oxidation (Pensel, 1990) and total plate counts (Speck, 1984) were used to evaluate the antioxidant and antimicrobial effects of garlic added sausages. Hunter Lab colorimeter was used to determine the color difference of all treatments. Panel tests were also used to evaluate the acceptability of different garlic added treatments.

Statistical analysis:

The data obtained in this study were analyzed by ANOVA (the analysis of variance) and the Duncan procedure (SAS, 1985).

RESULT & DISCUSSION

There were no significant difference for pH values or total plate count (TPC) numbers between any treatments during all of the storage times. There was also no difference found for color (cooked) values by sensory evaluation.

The TBA analysis:

The TBA values were found not to be significantly different of all treatments during 21 days of storage. However, there was a significant difference between treatments on the day 28 observation with no garlic (control) having a lower TBA value than fresh garlic.

The color values:

Color values were expressed by L, a and b values, which accounts for white, red and yellow colors. The higher the L, a, and b values, the whiter, redder, and more yellow the color. There were no significant difference for L values for all four 150 ppm nitrite added treatments during storage, but there were significant differences for all four 75 ppm nitrite added treatments during storages and the samples got lighter over time. For a values, there were no significant difference at day 0, 4, 7, 14 and 21 of any treatments. There were significant differences of all treatments during storages except for control and garlic powder of 150 ppm nitrite added and in general the a values decreased with time. There were also some differences between all treatments for the b values and in general the 75 ppm nitrite treatments decreased in b values over time.

Sensory evaluation:

There was no significant difference in color (cooked), and no significant difference in oxidation of any treatments except treatment of 75 ppm nitrite with fresh garlic added at 28 day of storage had an increase in oxidation. There were some difference in texture and juiciness of all treatments, but more differences on garlic flavor strength with fresh being the strongest and overall acceptability which decreased on fresh and powder treatments with time.

CONCLUSION

From all the data obtained in this study, there were not much difference found between all the treatments except for garlic flavors. It seemed that garlic does not drastically affect the antimicrobial and antioxidant prospects of Chinese style sausages in

both 150 ppm and 75 ppm nitrite added groups. Nitrite reduced Chinese style sausage did not perform much worse than the non-nitrite reduced sausage in color. The color values expressed by L, a, b varies quite a bit, but this may due to the large fat particles in the sausages. Fresh garlic treatments seemed to have stronger flavor than garlic powder and garlic essential oil treatments in this product.

Table 1. TBA values of 150 ppm and 75 ppm of nitrite caused by different garlic treatments during 28 days of storage.

Treatment Day	150 ppm nitrite				75 ppm nitrite			
	control	fresh	powder	oil	control	fresh	powder	oil
0	0.15 ^{Aa}	0.13 ^{Aa}	0.18 ^{Aa}	0.12 ^{Aa}	0.13 ^{Aa}	0.12 ^{Aa}	0.13 ^{Aa}	0.12 ^{Aa}
2	0.13 ^{Aa}	0.14 ^{Aa}	0.13 ^{Aa}	0.14 ^{Aa}	0.13 ^{Aa}	0.15 ^{Aa}	0.12 ^{Aa}	0.10 ^{Aa}
4	0.12 ^{Aa}	0.12 ^{Aa}	0.15 ^{Aa}	0.09 ^{Aa}	0.11 ^{Aa}	0.13 ^{Aa}	0.12 ^{Aa}	0.11 ^{Aa}
7	0.10 ^{Aa}	0.09 ^{Aa}	0.11 ^{Aa}	0.11 ^{Aa}	0.09 ^{Aa}	0.11 ^{Aa}	0.11 ^{Aa}	0.09 ^{Aa}
14	0.11 ^{Aa}	0.11 ^{Aa}	0.13 ^{Aa}	0.13 ^{Aa}	0.13 ^{Aa}	0.12 ^{Aa}	0.13 ^{Aa}	0.21 ^{Aa}
21	0.10 ^{Aa}	0.11 ^{Aa}	0.11 ^{Aa}	0.10 ^{Aa}	0.07 ^{Aa}	0.11 ^{Aa}	0.11 ^{Aa}	0.09 ^{Aa}
28	0.10 ^{Ba}	0.18 ^{Aa}	0.12 ^{ABa}	0.12 ^{ABa}	0.12 ^{ABa}	0.14 ^{ABa}	0.14 ^{ABa}	0.12 ^{ABa}

Control = no garlic added, fresh = 5% fresh garlic added, powder = 1.2% garlic powder added, oil = 0.006% garlic essential oil added. ^a the means with same superscript lower case letter in the same column are not significantly different (p,0.05). ^{A,B} the means with different superscript letters in the same row are significantly different (p,0.05).

Table 2. Garlic flavor determined by sensory evaluation of 150 ppm and 75 ppm nitrite and forms of garlic treatments during 28 day storage.

Treatment Day	150 ppm nitrite				75 ppm nitrite			
	control	fresh	powder	oil	control	fresh	powder	oil
0	3.7 ^{Ca}	7.3 ^{Aa}	5.4 ^{Ba}	4.9 ^{BCa}	3.6 ^{Ca}	7.4 ^{Aa}	5.2 ^{Ba}	4.6 ^{BCa}
7	3.2 ^{Ca}	6.9 ^{Aa}	4.3 ^{BCabc}	4.8 ^{Ba}	3.3 ^{Ca}	6.6 ^{Aa}	4.7 ^{Ba}	4.0 ^{BCa}
14	3.8 ^{Ba}	6.9 ^{Aa}	3.5 ^{Bbc}	4.0 ^{Ba}	3.2 ^{Ba}	6.5 ^{Aa}	4.1 ^{Ba}	4.3 ^{Ba}
21	2.9 ^{Ba}	6.5 ^{Aa}	3.3 ^{Bc}	3.5 ^{Ba}	2.9 ^{Ba}	6.4 ^{Aa}	4.1 ^{Ba}	3.3 ^{Ba}
28	4.8 ^{Ba}	6.6 ^{Aa}	5.1 ^{Aab}	4.5 ^{Ba}	3.5 ^{Ba}	6.8 ^{Aa}	4.7 ^{Ba}	4.0 ^{Ba}

Control = no garlic added, fresh = 5% fresh garlic added, powder = 1.2% garlic powder added, oil = 0.006% garlic essential oil added. ^{a,b,c} the means with same superscript lower case letter in the same column are not significantly different (p,0.05). ^{A,B,C} the means with different superscript letters in the same row are significantly different (p,0.05).

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