EFFECT OF VARIOUS LEVELS OF GLYCEROL ON THE QUALITY OF CHICKEN JERKY WITH ANKA RICE EXTRACT DURING STORAGE AT 25℃

H. J. Chuang [1], D. C. Liu[1*], F. J. Tan[1] and J. H. Liu[1]

[1]Department of Animal Science, National Chung Hsing University, 250 Kao Kung Rd Taichung 40227, Taiwan ROC

[*]Corresponding author (phone: +886-4-22872622; fax: +886-4-22860265; e-mail: dcliu@ dragon.nchu.edu.tw)

Abstract— The results showed that the yield of chicken jerkys with anka rice(*Monascus purpureus*) extract was lower than the control, but addition of glycerol significantly increased in yield and crude fat content. With the storage time increase, pH values in all treatments didn't change significantly, and the pH values were from 6.07 to 6.14. The water activity in all treatments were 0.73~ 0.78 and use of 3% anka rice extract and 3% glycerol (MG3) had significant lower value in all treatments. The total plate counts, mold and yeast counts in all treatments increased with storage time. Non-enzymatic browning of chicken jerky decreased by adding anka rice extract and glycerol. The sample with only anka rice extract had higher shear values than those with glycerol. Shear force decreased with glycerol increase, but increased with storage time. However, the overall acceptance of chicken jerky with anka rice extract and glycerol were higher than the control and MG3 had the highest score in this study. In conclusion, use of 3% anka rice extract and 3% glycerol can improve yield and texture of chicken jerky and also actually kept satisfactory and better quality when chicken jerky stored at 25℃ for 21 days

Key words: glyerol, anka rice, chicken jerky binder, and quality

I. INTRODUCTION

Anka rice is a very traditonal spice and usually used in meat food such as fish, duck and pork to develope shining color, special flavor and texture in Taiwan and Chniese. Many authors also concluded that anka rice can improve the color , flavor and antioxdation for meat products in their research (Fink-Gremmels *et al*., 1991; Fabre *et al*., 1993; Cheng and Ockerman, 1998). Additionally, anka rice also has secondary metabolites to inhibit microorganism and cholesterol synthesis (Juzlová *et al*., 1996). Glycerol is a moisturing agent for food to keep more water in food and improve the hardness of food. Barrett *et al*. (1998) and Okonkwo *et al*. (1992) reported that glycerol can help the mobility of moisture molcular in food to soften the tissue texture. Boyle *et al*. (1993) concluded 20-30% glycerol was added into restructured beef to decrease water activity of meat products but had bitter taste in final products. Besides, added glycerol in semi-dry meat also can increase extract of myosin from meat and inhibit protein denature in meat products(Muguruma *et al.*, 1987). However, few scientific research to study anka rice and glycerol were added into chicken jerkys for improving the quality. The purpose of this study , therefore, to evaluate the effect of different levels (1% -MG1, 2%- MG2 and 3%- MG3) of glycerol on the quality of chicken jerky with anka rice (*Monascus purpureus)* extract during storage at 25℃. The yield, chemical composition and sensory panel of all chicken jerkys were evaluated at the inital time (0 day) in this experiment. The pH values, water activity, colors, TBA values, VBN values, non-enzymatic browning and shear force of the products with aerobic package were also determined at the 0, 3th, 7th, 10th, 14th and 21th day during storage at 25℃.

II. MATERIALS AND METHODS

Frozen chicken breast fillets were purchased from local chicken food company. *Monascus purpureus* CCRC No.31499 was obtained from Food Industry and Reasarch Institute in Taiwan and anka rice was prepared as the description of Wu (2003). 25 gram anka rice was added into 100 mL 50% alcohol and shaked at 100 rpm for 2 hrs then filted with NO1 filter paper and the filterate is anka rice extract. Five treatments and control were designed to constitute with anka rice extract and glycerol and sorted as following (C) : 0% anka rice extract and glycerol (M) 3% anka rice extract (MG1) 3% anka rice extract+1% glycerol (MG2) 3% anka rice extract+2% glycerol and (MG3) 3% anka rice extract+3% glycerol.

Frozen chicken breast fillets were thawed at 4 ℃ refrigerator for 24 hrs and mixed with 25% sugar, 2% maltose, 1.2 % salt, 1% soy sauce, 0.3 % MSG, 0.1 % polyphosphates and 0.05% isoascorbic acid then cured at 4℃ for 72 hrs. The cured chicken fillets were pressured to flat and dried at 55-60℃ for 4.5 hrs . The final produts were roasted at 220℃ for 2-3 mins. Chemical content and pH of restructured pork steaks were determined according to AOAC (1990)'s method. Rheological properties of roasted chicken jerkys also were performed by Sun Rheo Meter (Model Compac-100, Sun

Rheo Meter, Japan). Water activity was determined by a fast instrument (AQUA-Lab CX-2 , U. S. A.). Non-enzymatic browning of the products were tested by the method of Resnik and Chirife (1979). Sensory panel of all chicken jerkys were evaluated by seven-point scale hedonic scale test at the inital time (0 day). The microbial quality (total plate count , mold and yeast count) was performed according to the method of Bacteriological Analytical Manual for Foods (BAM, FDA) (1996). SAS (2003) 's GLM program was used to analysis all data in this study.

III. RESULTS AND DISCUSSION

The chemical composition and yield of chicken jerkys were showed as table 1, crude fat of chicken jerky with 3% glycerol was significantly higher than the control ($P<0.05$) and had the highest value in all products. Moisture, crude protein, and ash were not significantly different among four treatments and control. The yield of chicken jerky with ony 3% anka rice extract was the lowest (54.64%) and lower than the control. With level of glycerol, the yield significantly increased and MG3 had the highest yield (60.74%). The results also indicated that use of glycerol can improve yield in semi-dry meat products. pH values in all treatments didn't change significantly and were from 6.07 to 6.14 and this condition also kept stable during 21 days storage at 25℃(figure1). The water activity of chicken jerkys was decreased with glycerol level and MG3 had significant lower value than the control. During storage, Aw of all chicken jerkys maintained stable except of MG3 at the 14th day (figure2). The total plate counts, mold and yeast 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 all chicken jerky with glycerol had lower counts when compared with the control at the end of storage(figure 3 and 4). Non-enzymatic browning of chicken jerky decreased by adding anka rice extract and glycerol. The control sample and sample with only 3% anka rice extract had higher shear force than the other treatments with glycerol. Shear force decreased with level of glycerol in chicken jerky, but increased with storage time (figure 5). The overall acceptance of chicken jerky with anka rice extract and glycerol were higher than the control (table2). However, MG3 had the highest overall acceptance score in this study.

IV. CONCLUSION

In conclusion, use of 3% anka rice extract and 3% glycerol can improve yield and texture of chicken jerky and also actually kept satisfactory and better quality when chicken jerky stored at 25℃for 21 days

REFERENCES

A.O.A.C. 1990. Official Methods of analysis. 15th ed. Assoc. Offic. Anal. Chem., Arlington, VA.

Barrett, A. H., J. Briggs, M. Richardson and T. Reed. 1998. Texture and storage stability of processed beefsticks as affected by glycerol and moisture levels. J. Food Sci. 63:84-87.

Boyle, E. A. E., J. N. Sofos and G. R. Schmidt. 1993. Depression of aw by soluble and insoluble solids in alginate restructured beef heart meat. J. Food Sci. 58:959-967.

Cheng, J. H. and H. W. Ockerman. 1998. Effects of anka rice, nitrite, and phosphate on warmed-over flavor and palatability characteristics in roast beef. Meat Sci. 49:65-78.

F. D. A. 1996. Bacteriological analytical manual for foods. U. S. Government Printing Office Washington. U. S. A.

Fabre, C. E., A. L. Santerre, M. O. Loret, R. Baberian, A. Pareilleux, G. Goma, and P. J. Blanc. 1993. Production and food applications of the red pigments of Monascus rubber. J. Food Sci. 58:1099-1102(1110).

Fink-Gremmels, J., J. Dresel and L. Leistner. 1991. Use of Monascus extracts as an alternative to nitrite in meat products. Fleisch. 71(10):1184-1186.

Juzlová, P., L. Martinková and V. Kren. 1996. Secondary metabolites of the fungus Monascus: A review. J. Ind. Microbiol. 16:163-170

Muguruma, M., T. Nishimura, R. Umetsu, I. Goto and M. Yamaguchi. 1987. Humectants improve myosin extractability and water activity of raw, cured intermediate moisture meats. Meat Sci. 20:179-194.

Okonkwo, T. M., Z. A. Obanu and D. A. Ledward. 1992. Characteristics of some intermediate moisture smoked meats. Meat Sci. 31:135-145.

Resnik S. and J. Chirife. 1979. Effect of moisture content and temperature on some aspects of nonezymatic browning in dehydrated apple. J. Food Sci. 44:601-605.

SAS. 2002. "SAS/GRAPH user's guide". SAS Institute Inc., Cary, NC.

Table1 Effects of anka rice extract and glycerol on chemical content and yield of chicken jerky

	Treatment				
Items	Control	M	MG1	MG2	MG3
Moisture%	24.82±1.98	24.83±1.25	25.24±2.41	24.96±2.06	24.42±1.04
Crude Fat%	2.32±0.54c	3.07±0.91bc	2.82±0.58bc	3.20±0.66b	4.07±1.06a
Crude Protein%	35.70±2.30	34.04±2.19	35.01±2.13	36.10±2.10	34.34±3.63
Ash%	5.11±1.33	5.93±1.66	5.86±1.47	5.48±1.67	5.74±1.86
yield %	56.63± 1.42^{ab}	54.64± 2.98^{b}	59.49± 1.92^{ab}	57.77± 2.11^{ab}	60.74± 3.49^{a}

mean±S.D., n=9.

*C=control (no anka rice extract), M=3% anka rice extract, MG1=3% anka rice extract+1% glycerol, MG2=3% anka rice extract+2% glycerol, MG3=3% anka rice extract+3% glycerol.

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

Table 2 Effects of anka rice extract and glycerol on sensory panel items of chicken jerky

		Treatment			
Items	Control	M	MG1	MG2	MG3
Appearance	3.33±0.49^{e}	4.53±0.52^{d}	5.13±0.35^{bc}	5.07±0.26$^{c\,d}$	5.47±0.51^{ab}
color	2.67±0.49^{d}	4.33±0.49^{c}	5.00±0.65^{b}	4.93±0.26^{b}	5.67±0.49^{a}
Flavor	3.67±0.48^{d}	3.80±0.68^{cd}	4.13±0.52^{bcd}	4.27±0.70^{bc}	4.80±0.68^{a}
Chewiness	2.73±0.46^{d}	3.13±0.35^{cd}	3.40±0.73^{bc}	3.07±0.46^{cd}	4.13±0.74^{a}
Overall acceptance	3.20±0.41^{e}	3.87±0.74^{d}	4.27±0.46^{c}	4.07±0.59^{cd}	4.93±0.80^{a}

The same as table 1.

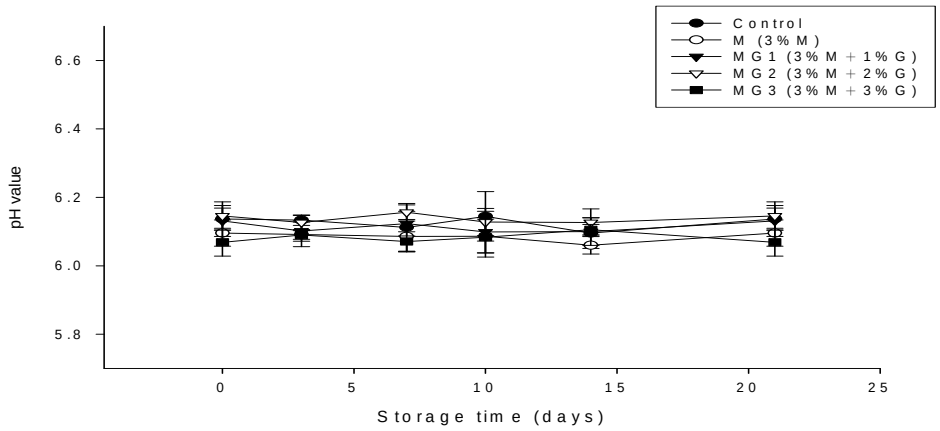

Figure 1 Effect of various levels of glycerol on pH value of chicken jerky with anka rice extract during storage at 25℃.

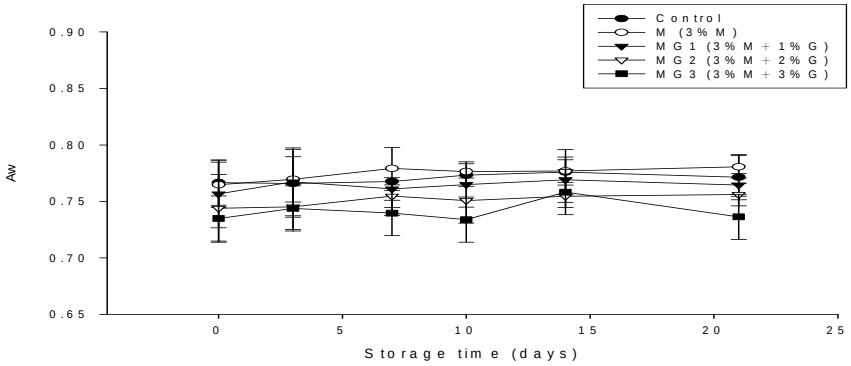

Figure 2. Effect of various levels of glycerol on water activity of chicken jerky with anka rice extract during storage at 25℃.

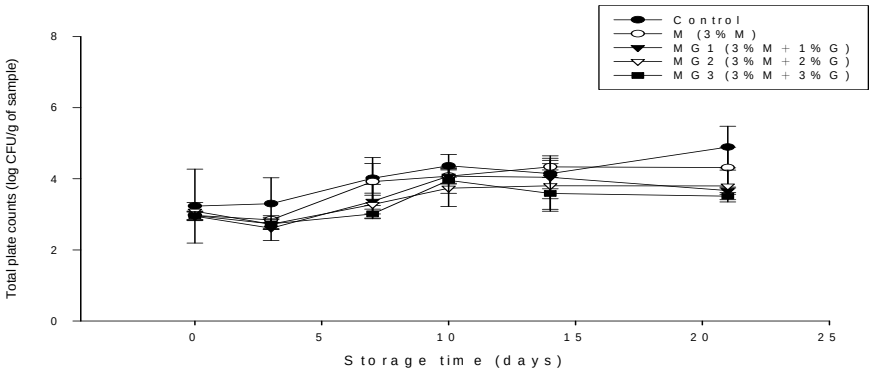

Figure 3. Effect of various levels of glycerol on total plate counts of chicken jerky with anka rice extract during storage at 25℃.

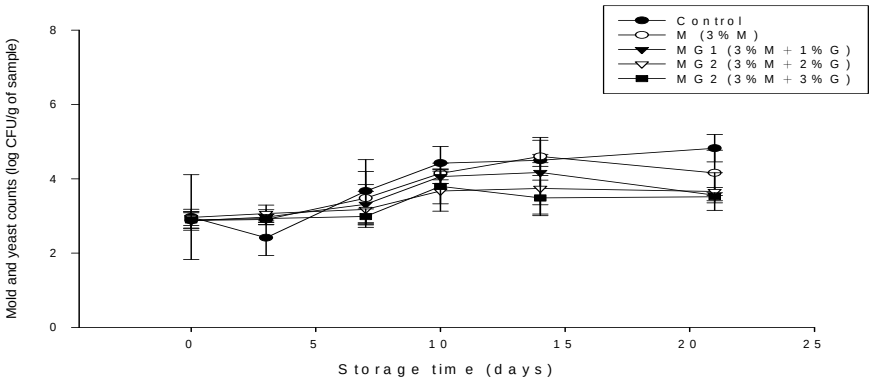

Figure 4. Effect of various levels of glycerol on mold and yeast counts of chicken jerky with anka rice extract during storage at 25℃.