Journal for the Agriculture, Biotechnology and Education, 2(2), 57-62, August 2022
e-ISSN: 2754-7825
http://ywacademia.com/index.php/jabedu

youngwisepub.com

Research Article

Quality improvement and acceptability of meat loaf with water melon juice, papaya juice and tomato juice as a natural source of color is the element

Bhutharit Vittayaphattananurak Raksasiri [1*] and Saowapar Khianngam[2]

Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Cha-am, Petchaburi, 76120 Thailand

Article Info

Received: 6 July 2022
Accepted: 13 August 2022
Available online: 30 August 2022

Keywords:
Consumer acceptance
Meat loaf
Papaya juice
Tomato juice
Watermelon juice

2754-7825 © 2022 The JABEdu.
Published by Young Wise Pub. Ltd.

Abstract

A study of the quality and acceptant consumer of meat loaf containing natural pigments compounds. Three types of natural pigments were composed of watermelon juice, papaya juice and tomato juice. The experimental design was completely randomized design (CRD). The experiment was divided into 4 group; group 1 was original meat loaf, group 2 original with watermelon juice, group 3 original with papaya juice and group 4 original with tomato juice. The data was evaluated by the sensory panel method, composed appearance, aroma, flavor, color, tenderness and total acceptant. The products were well accepted by consumer panel. The percentage cooking loss found that group 1 had higher than the other group ($p<0.05$) at 1.57 0.67 0.58 and 0.62 percent of group 1, 2, 3 and 4 respectively. The percentage of drip loss at 1 and 7 day found that group 2 was higher than group 1, 3 and 4, ($p<0.05$) at 0.82 1.81 1.22 and 0.61; 0.80 1.73 1.04 and 0.64 percent of group 1, 2, 3 and 4 respectively. At 2, 5 and 6 day found that group 2 and 4 higher than group 1 and 3 ($p<0.05$) at 0.66 1.51 0.58 and 1.71; 0.71 1.67 0.56 and 1.82; 0.80 1.66 0.66 and 1.74 percent of group 1, 2, 3 and 4 respectively. Isolation of spoilage microorganism by using aerobic plate count at 35 °C, 24 and 48 hours, found that group 2 had higher than the other group ($p<0.05$). They were 4.18 14.52 3.88 and 5.30; 6.43 14.96 7.91 and 1.64 (104 CFU/g) of group 1, 2, 3 and 4 respectively. The color L* (lightness) found that group 1 showed highest value ($p<0.01$) at 58.92. The color a* (redness) and color b* (yellowness) found that group 4 higher than the other group at 16.45 and 17.12 respectively. The highest and lowest score in shear force were 12.81 (group 2) and 5.37 (group 3) respectively.

To cite this article

Raksasiri, B.V. & Khianngam, S. (2022). Quality improvement and acceptability of meat loaf with watermelon juice, papaya juice and tomato juice as a natural source of color is the element. *Journal for the Agriculture, Biotechnology and Education, 2*(2), 57-62.

Introduction

Meat loaf is an emulsified food that typically uses pork, fat and ice. Other ingredients added include spices, phosphates, nitrites, salt. which these substances this will affect the quality of the sausage in terms of texture, flavor and color to meet the needs of consumers. The characteristics that consumers can perceive through the senses are appearance, color, smell, taste, texture and overall acceptance. The meat loaf in the general market has these different characteristics. In this experiment, it was developed by using natural pigments instead of plain water, the natural pigments used are okra, papaya, tomatoes. Marniyom et. al. (2004), have studied the making of sausages that contain natural dyes for sensory testing, found, Tomato-based sausages are the most popular, followed by sausages with dyes from papaya and watermelon respectively. However, sausage consumption can have health effects and pose a risk of disease (Mendoza et al., 2001), namely, colon cancer, high blood pressure and heart disease (Garcia et al., 2002). Therefore, reducing the

[1] Corresponding Author: Assistant Professor, Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Cha-am, Petchaburi, 76120 Thailand
E-mail: Raksasiri_b@silpakorn.edu Phone: +66887904744 ORCID No: 0000-0002-3737-9902
[2] Assit. Prof.Dr., Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Cha-am, Petchaburi, 76120 Thailand. .

consumption of meat products or eating products with plant and fruit ingredients such as fruit juices or portions. of plants and fruits this will reduce the likelihood of risk of developing various diseases. In addition, fruit components are also used to improve the quality of meat products, such as pineapple juice, which is used in combination with a salt solution. This results in the product having a soft texture. It also maintains the quality of reducing contamination of pathogenic bacteria in food products as well (Raksasiri, 2020), This is because bromelain enzyme in pineapple juice is a glycoprotein. (Glycoprotein) can catalyze the molecular digestion reaction. It belongs to the group of enzymes that contain a sulfidyl group. Bromelain enzyme can also catalyze the amine digestion of amino acids and peptides (Nonthaun and Sirichariyawa, 2018; Sullivan and Calkins, 2010). Therefore, in this experiment, the production of processed products containing plant and fruit ingredients was studied is the use of watermelon, papaya and tomatoes as an ingredient in the product and consumer acceptance testing. To help improve product quality including various appearances to meet the needs of consumers.

Material and Methods

Animal and Treatments

Completely randomized design (CRD) experiments were planned, with test groups following The production formulas were different for 4 groups, each experimental group had 12 iterations as follows: The experiment was conducted by mixing meat, fat and water at a ratio of 50:30:20, while water was substituted with watermelon juice (group 2), papaya juice (group 3) and Tomato juice (group 4).

Sample, Data Collection and Analysis

Parameters such as sensory panel method with Affective method (consumer method) were used to test the response of consumers in terms of adoption. There were about 50-100 people whom are not necessarily trained tasters were used as consumers (Raksasiri, 2010). Using the hip muscles of spent laying hens in the study the sample breast meat for examination with pH (45 mn. to 24 hrs.), the percentage of drip loss and cooking loss during storage . (Devine, 1999). Parameters used were in accordance to; Van Oeckel et al . (1999), for shear force and compression force; Saricoban et al. (2010) for, color of meat such as Lightness (L*), redness (a*), and yellowness (b*), chroma and hue angle; Novasiana: TH 200, for water activity (aw), and Kristensen and Purslow, 2001; for water-holding capacity (WHC). The sensory panel method (Affective method) gave a preference score on physical properties, including appearance, color, smell, taste, texture and the overall acceptance of consumers with five preference scores ranged from 5 (very like = 4.21-5.00), 4 (like = 3.41-4.20), 3 (passive = 2.61-3.40), 2 (disliked = 1.81-2.60), and 1 (most disliked = 1.00-1.80), used among 212 tasters (regardless of gender and age).

Statistical Analysis

Data was analyzed statistically Following completely randomized design (CRD.Significant differences between treatments were determined using Duncan's news multiple range test (DMRT) by R program version 4.1.1.

Results

A study on consumer acceptance of meat loaf using natural colorants, by using pigments from watermelon, papaya and tomatoes instead of water in the production formula. The experimental method using the taster (Sensory panel method) was the Affective method. The preference was rated based on physical properties, i.e. appearance, colour, smell, taste, texture of sausages and overall consumer acceptance, there were 5 levels of like-mindedness: 5 = very like, 4 = like, 3 = passive, 2 = disliked and 1 = most disliked. The results of the study were the average liking score of each trait tested. When the aforementioned average liking score was statistically analyzed, it was found that the appearance, color, smell, taste, texture of sausages and overall consumer acceptance were not different.

Table 1. Mean Scores (Mean ± SD) for Each Sensory Characteristic of Frankfurter Sausages Using Natural Dyes as Constituents

Assessed characteristics	Experimental group (N=12)				SEM	P-value
	Group 1	Group 2	Group 3	Group 4		
Appearance	3.25 ± 0.09	3.24 ± 0.72	3.70 ± 0.83	3.93 ± 0.79	1. 081	0.312
Colour	3.08 ± 0.07	3.214 ± 0.50	3.75 ± 0.89	3.94 ± 0.86	0.968	0.255
Smell	3.10 ± 0.04	3.134 ± 0.31	3.58 ± 0.88	3.75 ± 0.79	1.112	0.411
Taste	3.92 ± 0.05	3.434 ± 0.59	3.79 ± 1.01	3.86 ± 0.91	1.845	0.316
Texture	3.25 ± 0.15	3.124 ± 0.72	3.55 ± 0.96	3.67 ± 0.66	1.133	0.431
Overall acceptance	3.27 ± 0.03	3.26 ± 0.51	3.85 ± 0.83	3.90 ± 0.55	1.246	0.212

Determination of the percentage of weight loss after cooking (cooking loss) of meat loaf using watermelon, papaya and tomato pigments as constituents, revealed that traditional production formula group the pre-cooked weight loss was the highest, followed by the experimental group that used papaya, watermelon and tomatoes instead of water in the traditional production formula. Weight loss after cooking were 1.57, 0.67, 1.54 and 0.62%. There was a statistically significant difference ($p< 0.05$) compared to the watermelon and tomato experimental group. The results of the study to determine the percentage of weight loss after storage (Drip loss) of meat loaf using natural colorants found that at 24 and 168 hours, the second experimental group had a percentage of weight loss. There was no statistically significant difference at 72 and 96 hours, while at 48, 120 and 144 hours, the percentage weight loss was significantly higher than the other groups ($p<0.05$). During the preservation of groups 2 and 4, it was statistically significantly higher than that of experimental groups 1 and 3 ($p<0.05$). The quantitative study of microorganisms in frankfurter sausages using pigments from watermelon juice, papaya juice and tomato juice showed that when frankfurter sausage samples were incubated at 35 °C for 24 and 48 hours, the experimental group using watermelon juice instead of water. The number of microorganisms was significantly higher than the other experimental groups ($p<0.05$). When the frankfurter sausage juice mixed with all 4 types of natural colorants was measured for color values, it was found that the experimental group with the same formula The original group gave the highest brightness (L*), followed by the experimental group using papaya, watermelon and tomatoes, which were 59.41, 57.14, 49.07 and 47.15, respectively. will give the high est red value followed by the original formula papaya and watermelon, respectively. From the measurement of the yellow value (b*), it was found that adding tomato juice gave the yellow value significantly higher than the other experimental groups ($p<0.05$). To test the softness of the product, it was found that the addition of papaya juice and tomato juice will give the meat value. different cross-sectional force However, the values obtained were lower than the experimental group that added watermelon juice and the same formula. significantly ($p<0.05$).

Table 2. Mean Scores (Mean ± SD) for Each Sensory Characteristic of Frankfurter Sausages Using Natural Dyes as Constituents

Assessed characteristics	Experimental group (N=12)				SEM	P-value
	Group 1	Group 2	Group 3	Group 4		
Cooking loss	1.57±0.23[a]	0.67±0.19[b]	1.54±0.16[a]	0.62±0.26[b]	0.173	0.026
Drip loss						
24 hours	0.72±0.19[b]	1.81±0.28[a]	1.22±0.27[b]	0.61±0.15[b]	0.123	0.041
48 hours	0.66±0.27[b]	1.51±0.25[a]	0.58±0.24[b]	1.71±0.14[a]	0.121	0.038
72 hours	0.88±0.09	1.51±0.21	1.41±0.27	0.58±0.13	0.071	0.587
96 hours	0.87±0.86	1.45±0.22	0.81±0.20	1.54±0.14	0.112	0.701
120 hours	0.71±0.19[b]	1.67±0.18[a]	0.56±0.14[b]	1.82±0.12[a]	0.136	0.043
144 hours	0.80±0.15[b]	1.66±0.17[a]	0.66±0.16[b]	1.74±0.14[a]	0.121	0.027
168 hours	0.80±0.14[b]	1.73±0.43[a]	1.04±0.14[b]	0.64±0.17[a]	0.117	0.046
Total bacteria (104CFU/g) 24 hr.	4.18±1.02[b]	14.52±1.86[a]	3.88±1.34[b]	5.30±1.58[b]	0.602	0.037
Total bacteria (104CFU/g) 48 hr.	6.43±1.81[b]	14.96±1.27[a]	7.91±1.25[b]	1.64±0.96[b]	0.182	0.018
L* (lightness)	59.41±2.83[a]	57.14±2.79[b]	47.15±3.11[b]	49.07±2.86[b]	4.841	0.037
a* (redness)	6.44±1.18[b]	5.50±1.51[b]	12.49±1.48[b]	17.84±1.79[a]	1.121	0.024
b* (yellowness)	14.76±1.28[b]	14.17±1.19[b]	15.62±1.82[ab]	17.00±1.46[a]	2.008	0.031
Shear force	19.53±1.19[a]	22.73±1.89[a]	4.77±2.79[b]	4.96±1.89[b]	0.875	0.012
Water activity: aw	0.81±0.092	0.81±0.191	0.82±0.089	0.81±0.109	0.012	0.451

[ab]Mean in the same row with different superscript differ ($P<0.05$), Group 1= control, Group 2 = watermelon juice, Group 3 = papaya juice and Group 4 = Tomato juice

Discussion

A study on consumer acceptance of meat loaf using natural colorants, by using pigments from watermelon, papaya and tomatoes instead of water in the production formula. The experimental method using the sensory panel method, affective method, was evaluated based on physical properties such as appearance, color, smell, taste, texture of meat loaf and overall consumer acceptance. The results of the study were the average liking score of each trait tested. When the aforementioned average liking scores were analyzed statistically, found, consumer acceptance in terms of appearance, color, smell, taste, texture, and overall acceptance of meat loaf products that use natural colorants in all 4 groups, give different results. It shows that consumers are acceptable for meat loaf products that use pigments from watermelon juice, papaya juice and tomato juice instead of water in the traditional formulation. This will add another value to the meat loaf products, because this emulsion product it is still popular with consumers because it is easy to buy, convenient to eat suitable for a fast paced life and because at present consumers are increasingly paying attention to their health. Therefore, the addition of natural ingredients that have good health benefits will make this product even more attractive. The study was to determine the percentage of weight loss after cooking (cooking loss) of Frankfurter sausages using pigments from watermelon juice, papaya juice and tomato juice as constituents. It was found that the experimental group using natural pigments had less weight loss than the control group using tomato substitutes in traditional production formulations. The former had the least weight loss. followed by the experimental group using watermelon juice and papaya juice as shown in Table 2. Wilson et al. (1981) stated that meat products with good cooked quality should have a percentage of water loss. not more than 10 percent of weight loss during cooking. From the experiment, it was found that the total weight loss of all 4 groups after cooking was less than 10%. Therefore, it can be considered that all four meat loaf were of good cooked quality. The results of a study to determine the percentage of drip loss after storage of meat loaf using natural pigments for a total of 7 days showed that the second experimental group had a percentage of loss of weight loss after storage of meat loaf using natural colorants. Weight loss during storage was higher than the other experimental groups. statistically significant ($p<0.05$), which showed solubility and outflow of water when stored at low

temperatures. and the experimental group using tomato as a component with the least weight loss during storage. Which this result this was consistent with the percentage of weight loss after cooking, which was also the lowest weight loss group for tomatoes. From the study of the quantification of Microorganisms in frankfurter sausages using pigments from watermelon juice, papaya juice and tomato juice by aerobic plate count method, reported as CFU (Colony Forming Unit) per 1 gram. It was found that when frankfurter sausage samples were incubated at 35 °C for 24 and 48 hours, the experimental group using watermelon juice had the highest number of bacteria. more microorganisms than other experimental groups ($P<0.05$), bacteria found in meat loaf is the cause of the deterioration, *Leuconostoc viridescens* is found in meat loaf and the standard value of the amount of the microorganisms in meat loaf are 130×10^6, which the standard values obtained here it is the number of bacteria cells that challenge the surface of the sausage as mucus. (Fiazier, 1967). And from the experiment, it was found that the 4 experimental groups, when incubated at 24 hours and 48 hours it was found that the value was less than the specified standard value, shows that even if the infection is detected microorganisms in the product these microorganisms It does not affect meat loaf products and consumers. When meat loaf mixed with 4 types of natural pigments were measured for color, it was found that the experimental group with the formula the original group gave the highest brightness (L*), followed by the experimental group using papaya juice, watermelon juice and tomato juice, respectively. As for the red value (a*), it was found that adding tomato juice would give the highest red value, followed by the original recipe papaya and watermelon, respectively, and from the measurement of the yellow value (b*), it was found that the addition of tomato juice yielded the highest yellow value, followed by papaya and watermelon, respectively ($p<0.05$). However, the darker colors are naturally caused by plant pigments. While, increasing the color of the product is another factor that affects the decision to buy the product as well (Raksasiri, 2010). In addition, when meat loaf was taken to measure the cutting force, it was found that papaya juice filling and tomatoes will give the same texture value. However, the values obtained were lower than the experimental group that added watermelon juice and the same formula. Significantly ($P<0.01$). That means the wages it takes to crack the sausages apart for the first time in the papaya filling group, and tomatoes will use less force than those who use watermelon juice and traditional recipes.

Conclusion

Acceptance study using sensory panel method, consumer acceptance of appearance, color, odor, taste and texture properties of meat loaf products was good. The study on the effect of post-cook weight loss found that the group that used the least tomato color substitute in the traditional production recipe, but the post-cook weight loss of the four experimental groups The value is still lower than the standard value, which is 10%. Therefore, it can be considered that the addition of natural colorants to the products of meat loaf has no effect on the weight loss after cooking. A study to determine the percentage of weight loss after storage, by refrigeration method, it was found that the tomato-based experimental group had the least weight loss during storage. The quantification of microorganisms in Frankfurter sausages found that, microorganisms in tomato based meat loaf were less than control and watermelon. Color measurements revealed that the addition of natural pigments resulted in darker values in all samples. cutting force found that adding papaya juice and tomatoes are very low. Indicates whether the product is soft or bouncy.

References

Chou, H.E. and Breene, W.M. 1972. Oxidative decoloration of ß -carotene in low moisture model systems. *Journal of Food Science,* 37, 66-68.

Devine, C.E. (1999). Effect of rigor temperature on muscle shortening and tenderization of restrained and unrestrained beef m. longissimus thoracicus et lumborum, *Meat Science, 51*, 61-72.

Garcia M.L., R. Dominguez, M.D. Galvez, C. Casas and M.D. Selgas. 2002. Utilization of cereal and fruit fibres in low fat dry fermented sausages, *Meat Science, 60,* 227-236.

Giovannucci, E., Ascherio, A., Rimm, E.B., Stampfer, M.J., Colditz, G.A. and Willett, W.C. 1995. Carotenoids and retinol in relation to risk of prostate cancer. *J. National Cancer Inst. 87,* 1767 -1776.

Marniyom S., P. Patanakul and W. Temeiya. 2004. Quality Development of Vegetable Oil Defined Pork Sausage Using Natural Colorants and Tapioca Starch. *Khon Kaen Agriculture Journal*, *32*(1), 35-42.

Mendoza E., M.L. Garcia, C. Casas and M.D. Selgas. 2001. In as fat substitute in low fat, dry fermented sausages. *Meat Science, 57, 3*87-393.

Nonthaun K. and A. Sirichariyawat. 2018. Effect of enzyme type and intensity on milk softness of meat. *Khon Kaen Agriculture Journal, 46* (Special1), 101-105.

Raksasiri B.V. 2017. *Teaching Documents. Animal Products* (Revised Edition). Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Phetchaburi Information Campus. Phetchaburi. 163.

Raksaksiri, P., Sunsa, J., Duangchinda, P., Srisuksawat, P., Sitthiya, C., and M. Nopparatmaitree. 2020. Study of the efficacy of pineapple juice with salt solution on dietary properties of retired laying hens. *Khon Kaen Agriculture Journal, 48,* (Special 1): 215-220.

Sullivan G. A. and C. R. Calkins. 2010. Application of exogenous enzymes to beef muscle of high and low-connective tissue. *Meat Science, 85*(4), 730-734.

Wilson, N.R.P. (1981). *Meat and Meat Product: Factor Effecting Quality Control*. Applied Science Publishers. London.