11. 2018_Proceeding SEMINAR ATMAJAYA 2018-104-109.pdf

WORD COUNT 3097
TIME SUBMITTED 29-DEC-2020 01:30PM
PAPER ID 67252147

Texture, Colour and The Preference Level for Cooked- Cured Duck Meat with Added Sodium Tripolyphosphate

Sri Hartati Candra Dewi[1*], Chatarina Wariyah[1]

[1] Faculty of Agroindustry, Mercu Buana University of Yogyakarta, Jl. Wates Km 10 Yogyakarta 55753 Indonesia
* Corresponding author: candradewisrihartati@yahoo.co.id

Abstract

Duck meat obtained from unproductive laying duck and old duck has a tough characteristics and dark color. Moreover, the high fat content cause the meat oxidixed easily. The previous study showed that duck meat curing in the curcumin extract could lower the fat oxidation, and the addition of the sodium tripoliphosphate (STTP) could reduce the toughness of the meat. However, meat heating during cooking could decrease the curcumin content and leach the STTP into the water. The objectives of this research was to determined the effect of cooking on the colour, texture and acceptability of the cooked-cured duck meat. The study used Randomized Complete Design, with two factors of: curcumin extract concentrations of 0.3% and 0.4% (w/w) and STPP added with various concentrations of: 0.0; 0.10; 0.15; 0.20 and 0.25% (w/w). The cooked-duck meat texture was tested by using a Texture Analyzer and the colour was tested with a Colour Reader Conica Minolta. The preference level of the cooked-cured duck meat was determined by Hedonic Test. The research showed that the cooked-cured duck meat preference was higher than that of the cooked-fresh duck meat. The duck meat cured in the curcumin extract at concentrations of 0.3% with an addition of 0.10% to 0.25% STPP resulted in the most acceptable product, based on the smell preferred, texture with high deformation and lightness colour.

Key words: cured-meat, cooking, acceptability.

Introduction

Duck (*Anas platyrhynchos*) is a type of poultry farmed for meat and eggs. The quantities of duck meat on the market are still very limited as supply mostly comes from culled females (54%), but as much as 35% can come from male salvage and up to 18% from young females (Hardjosworo, 2001). Duck meat is the meat of culled non-productive female layers and older males. Rejected duck meat has a clay-like texture and a fat content reaching 1.84%, in contrast to chicken meat at only 1.05% fat (Ali et al., 2007). Unsaturated fatty acids (ALTJ) make up more than 60% of the total fatty acids, which results in the duck meat being easily oxidized, thereby degrading flavour, destroying nutrients and leading to a build-up of toxic substances. According to Baggio and Bragagnolo (2006) meat, during processing and storage, can be the subject of oxidation induced by the presence of heat, light, metal and oxygen which will produce ROS (Reactive Oxygen Species) such as aldehydes, peroxide and cholesterol oxides that can lead to degenerative diseases such as cardiovascular disease and early aging.

Attempts to inhibit oxidation of the fat in duck meat were made by Dewi and Astuti (2013) by adding 0.3% turmeric extract as a natural source of antioxidants and then curing for 10 minutes.

Storage was undertaken for 8 weeks in a freezer. Turmeric is known to contain curcumin which can inhibit lipid peroxidation (Jayaprakasha et al., 2006). The results show that extract of turmeric can inhibit an increase in the numbers of peroxides and TBARS of duck meat, and the texture of duck meat after storage becomes more tender. But curcumin is yellow in colour and has a distinctive turmeric flavour, which can affect the acceptability of the product. In addition, the research is still limited to storage only. Yet according to Sampaio et al. (2012), lipid oxidation will continue during cooking. The problem is that the texture of duck meat becomes more tender after storage in a freezer (Dewi and Astuti, 2013), but according to Fernandes et al. (2013) storing lamb and mutton at freezing temperatures (-18 °C) causes low water retention or Water Holding Capacity (WHC), so that the texture of the meat after cooking is hard. Abdel et al. (2011) state that the addition of sodium tripolyphosphate (STPP) to lamb meat which is to be frozen can inhibit the decrease in WHC compared to the control, so the texture of the cooked meat is softer and is preferred by the consumer. And according to Marsha et al. (2013) the use of STPP in turkey meat, in addition to inhibit the oxidation of fat by slowing down the penetration of heat into the material. However, curcumin and STPP could not stable during cooking of duck meat. Hence this objective study to evaluate the effects of cooking of cured- duck meat in curcumin extract, and the addition of STPP on the physical properties and preference level of cooked-duck meat.

Materials and Methods

Materials

The materials used for the study of duck meat were derived from duck breeders in the village of Argomulyo, Sedayu, Bantul, Yogyakarta. Turmeric, as a natural source of antioxidants, was purchased from a local market in the Yogyakarta area. Analysis of the base material (duck meat) included water content (AOAC, 1990). Texture of the cooked duck meat was tested using a Texture Analyzer and colour was tested using a Colour Reader Cinica Minolta. Chemicals used in all the pro qualifying analyses were obtained from Merck.

Methods

The research method consists of five steps. These are: 1) Preparation of turmeric curcumin extract by sorting tubers, then peeling and washing. Curcumin extraction using maceration method (Marsono et al., 2005). 2) Curing fresh duck meat with turmeric curcumin extract (with a variation of 0.3% and 0.4%) and variation of the addition of STPP at 0.00; 0.10; 0.15; 0.20; and 0.25%. 3) Storage of duck meat (phase 2) at freezing temperatures (-10 °C) for 8 weeks. 4) Cooking at 100 °C during 15 minutes. 6) Testing the physical properties (texture, color), and determining the organoleptic acceptability of cooked duck meat by hedonic test.

Statistical analysis

The experimental design used was completely randomized design, factorial pattern with factors such as variation of the amount of curcumin extract and STPP, to determine the differences between treatments used by the F test, then the real difference between the samples was determined by Duncan's Multiple Range Test (DMRT) (Gacula and Singh, 1984)

Result and discussion

Texture of cooked-duck meat

The results showed that there was no interaction effect from each curcumin and STPP treatment on the hardness of the cooked-cured duck meat (Table 1). As for the texture of boiled or roasted cured duck meat, it was found to be more influenced by the addition of curcumin (Table 1). The deformation shown the toughness of cooked-duck meat. The higher the STPP the higher the deformation. It mean that the moer tender than without STPP. Soeparno (2009) states that muscle difference affects the texture and tenderness of meat, while the texture of cured duck meat which has been boiled or roasted is not affected by the addition of STPP. According to Abdel et al. (2011) STPP is generally used in cured meats to retain water during cooking, so that the palatability of the meat after cooking remains high and there is no decrease in tenderness. Therefore, in this study the texture of boiled or roasted cured duck meat is not significant (Table 1).

Table 1. Texture of cooked cured duck meat (g)

Curcumin (%)	STPP (%)					Average
	0	0.1	0.15	0.2	0.25	
0.3	532.38	624.00	698.38	500.88	600.13	591.15[a]
0.4	772.63	812.67	706.13	752.17	838.33	776.38[b]
Average (ns)	652.51	718.34	702.26	626.53	719.23	

Deformation

Deformation is a change in the meat texture caused by cutting the meat to measure texture. If the cured duck meat was overcooked, the deformation was affected by the addition of STPP. Deformation of cured cooked duck meat was greatest with the addition of STPP by 0.1%. Higher additions of STPP showed no more significant deformation. This is because in meat products, STPP is generally used to maintain texture or tenderness after cooking. In the table 2. it appears that the addition of 0.1% STPP (43.05%) was significantly different from that without STPP (37.88%).

Table 2. Deformation of cooked cured duck meat (%)

Curcumin (%)	STPP (%)					Average (ns)
	0	0.1	0.15	0.2	0.25	
0.3	38.36	42.12	41.07	35.41	38,58	39.19
0.4	37.40	43.98	37.29	42.55	40.28	40.30
Average	37.88[a]	43.05[b]	39.18[ab]	38.98[ab]	39.43[ab]	

Brightness (L)

The brightness of cooked-cured duck meat was influenced not significantly by the addition of STPP, but there was significant effect from the addition of curcumin as well as its interaction (Table 3).

Table 3. Lightness of cooked cured duck meat

Curcumin (%)	STPP (%) 0	0.1	0.15	0.2	0.25	Average
0.3	35.17	34.47	34.74	35.42	33.05	34.57[a]
0.4	37.13	31.44	32.22	33.65	34.60	37.85[b]
Average (ns)	34.90	32.96	33.48	34.54	33.83	

The addition of 0.4% curcumin gave the same relative brightness as the addition of 0.3%. Curcumin only serves to add antioxidants, which are substances that can inhibit an oxidation reaction in materials susceptible to oxidation (Fennema, 1996). It is likely that it has no real effect on the brightness of the flesh.

Redness

The colour of cooked cured duck meat was influenced significantly by the addition of curcumin and STPP, but the interaction was not significant (Table 4). Cooked duck meat became significantly redder with a higher addition of curcumin (0.4%) compared to a 0.3% addition. This is because adding curcumin to cooked meat gives a yellower colour, and this yellowing makes cooked meat appear redder . Ali et al. (2007) stated that the colour of the duck meat has a very high redness value, but it has a low brightness value.

Table 4. Redness of cooked cured duck meat

Curcumin (%)	STPP (%) 0	0.1	0.15	0.2	0.25	Average
0.3	5.54	6.73	5.99	6.04	6.54	6.17[a]
0.4	7.80	7.67	7.37	6.22	7.30	7.28[b]
Average	6.67[ab]	7.20[b]	6.68[ab]	6.13[a]	6.92[ab]	

Yellowness

Ali et al. (2007) stated that the color of the duck meat has a very high redness value, but it has a low brightness value. Dewi and Astuti (2014) stated that the addition of curcumin gave an improved flesh color.

Table 5. Yellowness of cooked cured duck meat

Curcumin (%)	STPP (%) 0	0.1	0.15	0.2	0.25	Rerata (ns)
0.3	20.02	24.88	23.45	20.25	21.50	22.02
0.4	22.80	20.50	20.33	23.30	23.85	22.16
Rerata (ns)	21.41	22.69	21.89	21.78	22.68	

It is further mentioned that there is a relationship between the amount of curcumin and the length of time curing the duck meat on the colour. i.e. if lower levels of curcumin are used to get the desired yellow color, then curing time has to be longer. From these results, cured cooked duck

meat is not influenced by the addition of curcumin, STPP and interaction (Table 5). This is presumably because the ripening color of curcumin will be reduced, so that the meat after cooking has the same yellow color.

Sensory Test

The sensory test of cured cooked duck meat the smell was not affected by treatment with curcumin and STPP. While colour, texture and taste were on the whole affected by treatment with curcumin and STPP, the addition of curcumin made no significant difference to the smell of the cooked meat, possibly because 0.3% and 0.4% additions of curcumin after cooking had a relatively similar smell. While the most preferred colour of cooked cured meat was achieved by adding STPP at 0.2% and curcumin at 0.3% to 0.4%. Preferred texture of the cooked cured meat is achieved by addition of curcumin 0.3% and STPP at 0.1 to 0.2%, and curcumin at 0.4% with STPP at 0.2% to 0.25%.

Table 6. Sensory Test of Cooked Cured Duck Meat

		Smell (ns)	Color	Texture	Taste	Flavor
	Normal cooked duck meat	3.67	4.40^{b}	3.13^{ab}	3.33^{ab}	3.53^{ab}
Curcumin (%)	STPP (%)					
0.30	0.00	3.20	3.80^{ab}	3.80^{ab}	4.33^{bcdef}	4.20^{abc}
	0.10	3.33	3.33^{ab}	3.19^{ab}	3.13^{a}	3.47^{a}
	0.15	3.93	3.60^{ab}	2.73^{a}	3.93^{abcde}	3.73^{ab}
	0.20	3.27	3.13^{a}	2.80^{a}	3.47^{abc}	3.30^{a}
	0.25	3.67	3.44^{ab}	3.47^{ab}	3.80^{abcd}	3.93^{abc}
0.4	0.00	3.13	3.27^{a}	4.20^{ab}	4.67^{def}	4.13^{abc}
	0.10	4.20	3.13^{a}	4.27^{b}	5.00^{ef}	5.00^{c}
	0.15	4.04	3.47^{ab}	4.33^{b}	5.13^{f}	4.67^{bc}
	0.20	4.07	3.07^{a}	3.53^{ab}	4.60^{cdef}	4.40^{abc}
	0.25	4.13	3.40^{ab}	3.20^{ab}	4.60^{cdef}	4.40^{abc}

While the preferred taste of cooked cured meat is with curcumin added at 0.3% and STPP from 0.1% to 0.25%, and curcumin at 0.4% with STPP from 0.2% to 0.25%. On the whole the most preferred cooked cured duck meat is with an addition of curcumin at 0.3% with STPP from 0.1% to 0.2%, and curcumin added at 0.3% with STPP at 0.20% to 0.25%.

Conclusion

The results of this study concluded that the cooked cured duck meat acceptability was higher than just cooked duck meat. The research showed that the duck meat cured with curcumin extract at 0.3% and 0.4% concentrations and added with 0:10 to 0:20% STPP resulted in the most acceptable product, based on texture, color and water holding capacity, especially the brighter color and softer texture after cooking.

Acknowledgement

We gratefully acknowledge the Directorate of Research and Community Service, Directorate

General of Reinforcement and Development, Ministry of Research, Technology and Higher Education of the Republic of Indonesia for providing financial support from the Communities Service Program in 2017.

References

Abdel-Ad Aal, H.A. and H.M.A. Mohamed. 2011. Change in the ultrastructure of lamb muscles as influenced by freezing and sodium tripolyphosphate (STPP). Department of Food Science, Faculty of Agriculture, Minia University, El-Minia, Egypt. Lucrari stiitifice.. Seria Zootehnie. 2011 Vol.56 : 286-293

Ali. M.S., G.H. Kang, H.S.Yang, J.Y. Jeong, Y.H. Hwang, G.B. Park dan S.T. Joo. 2007. A comparison of meat characteristics between duck and chicken breast. Asian-Aust. J. Anim. Sci. 20: 1002-1006.

AOAC, 1990. Officials Methods of Analysis Association Official Agricultural Chemistry (Water Content Analysis). Washington D.C.

Baggio.S.R. dan N. Bragagnolo, 2006. Cholesterol oxide, cholesterol, total lipid and fatty acid content in processed meat products during storage. LWT. 39: 513-520.

Dewanti, T. 2009. STPP Pengganti Boraks (Bleng) pada Krupuk Puli dan Bakso, http://terminalcurhat.blogspot.com/2009/03/stpppengganti-boraks-bleng-pada-krupuk.html diakses 6 Januari 2016

Dewi, S.H.C. 2010. Sifat Fisik Daging Sapi pada Lama Penyimpanan yang Berbeda. Laporan Penelitian. Universitas Mercu Buana. Yogyakarta.

Dewi, S.H.C. 2011. Populasi Mikroba dan Sifat Fisik Daging Sapi Beku pada Lama Penyimpanan yang Berbeda. Laporan Penelitian. Universitas Mercu Buana. Yogyakarta.

Dewi, S.H.C. dan Astuti,N. 2013. Ekstrak Kurkumin Kunyit Untuk Menghambat *Off-Flavor* Daging Itik Selama Pangolahan. Laporan Penelitian. LPPM. Universitas Mercu Buana Yogyakarta.

Dewi, S.H.C. dan Astuti, N. 2014. Akseptabilitas dan Sifat Daging Itik Afkir yang Dilakukan Curing Menggunakan Ekstrak Kurkumin Kunyit untuk Menghambat Oksidasi lemak Selama Penyimpanan. Jurnal Agritech. Fakultas Teknologi Pertanian. Universitas Gadjah Mada. Yogyakarta. Vo. 34 (4) : 415-421.

Fennema, O.R., 1996. Principles of Food Science. Marcell Dekker Inc. New York. Fujiwara,H., M. Hosokawa, X. Zhou, S. Fujimoto, K. Fukuda, K. Toyoda, Y. Nishi, Y. Fujito, K. Yamada, Y. Yamada., Y. Seino and N. Inagaki. 2008. Curcumin Inhibits Glucose Production in Isolated Mice Hepatocytes. Diabetes Research and Clinical Practice. 80 : 188-191.

Gacula, M.C. dan J. Singh, 1984. Statistical Methods in Food and Consumer Research. Academic Press, Inc. Orlando. San Diego. New York. London.

Hardjosworo. 2001. Ternak Itik. Penebar Swadaya. Jakarta.

Jayaprakasha, G.K, L. Jaganmohan Rao , K.K. Sakariah. 2006. Antioxidant activities of curcumin, demethoxycurcumin and bisdemethoxycurcumin. Food Chemistry 98 : 720–724.

Marsha, L.S., J.R. Clause, N.G. Marriots, W.N. Eigel, H. Wang. 2013. Reduction in lipid oxidation by incoporation of encapsulated sodium tripolyphosphate in ground turkey. Meat Science. 95: 376-380.

Marsono, Y., Safitri, R. dan Noor, Z., 2005. Antioksidan dalam Kacang-kacangan : Aktivitas dan Potensi serta Kemampuannya Menginduksi Pertahanan Antioksidan pada Model Hewan percobaan. Laporan Penelitian Hibah Bersaing XII.

Petracci,M., M. Bianchi, S. Mudalal, C. Cavani. 2013. Functional ingredients for poultry meat products. Trends in Food Science and Technology. 33 : 27-39.

Pratiwi, Y.D. 2016. Pengaruh kadar *sodium tripolyphosphate food grade* (STPP FG) terhadap kualitas daging broiler. Skripsi. Universitas Mercu Buana Yogyakarta. Yogyakarta.

Sampaio, G.r., T. Saldanna, R.a.M. Soares, E.A.F.S. Torres. 2012. Effect of natural antioxidant combinations on lipid oxidation in cooked chicken meat during refrigerated storage. Food Chemistry. 135: 1383-1390.

Soeparno. 2009. *Ilmu dan Teknologi Daging*. 4th edition. Gadjah Mada University Press. Yogyakarta.

Yuanita L., Surodjo S., dan Wikandari P. 1997. *Pengaruh Penggunaan Alkali Fosfat Sebagai Pengganti Boraks Terhadap Kualitas Daging Olahan*. Laporan Penelitian. Lembaga Penelitian IKIP Surabaya.

Yuanita, L. 2008. Penentuan Kadar STPP *Food Grade* Untuk Meningkatkan Masa Simpan Ikan Nila Tilapia (*Oreochromis niloticus L.*). *Jurnal Berkala Penelitian Hayati*. 13: 179-186.

11. 2018_Proceeding SEMINAR ATMAJAYA 2018-104-109.pdf

ORIGINALITY REPORT

8%

SIMILARITY INDEX

PRIMARY SOURCES

1	fst.unair.ac.id Internet	50 words — 2%
2	Tresta Nurina Ciptaningayu, Arie Dipareza Syafei, Muhayatun Santoso, Joni Hermana, Rachmat Boedisantoso, Abdu Fadli Assomadi. "Identification of Metal Pollutants in Ambient Air (Case Study: West Surabaya, East Java, Indonesia)", Research Square, 2020 Crossref Posted Content	25 words — 1%
3	www.repository.wima.ac.id Internet	24 words — 1%
4	es.scribd.com Internet	20 words — 1%
5	J.H. Choi, Y.S. Choi, H.W. Kim, D.H. Song, C.J. Kim. "Effects of postmortem temperature on the physicochemical characteristics of prerigor Pekin duck breast muscles", Poultry Science, 2016 Crossref	18 words — 1%
6	baadalsg.inflibnet.ac.in Internet	13 words — 1%
7	Z. Naveen, B. R. Naik, B. V. Subramanyam, P. M. Reddy. "Studies on the quality of duck meat sausages during refrigeration", SpringerPlus, 2016 Crossref	12 words — < 1%
8	www.hindawi.com Internet	11 words — < 1%

9	Figueirêdo, Bruno Chacon, Isabela Jorge Trad, Lilian Regina Barros Mariutti, and Neura Bragagnolo. "Effect of annatto powder and sodium erythorbate on lipid oxidation in pork loin during frozen storage", Food Research International, 2014. Crossref	9 words — < 1%
10	eprints.upnjatim.ac.id Internet	8 words — < 1%
11	id.scribd.com Internet	8 words — < 1%
12	K.E. Hwang, H.W. Kim, Y.S. Choi, S.Y. Lee, E.J. Yeo, Y.K. Ham, S.M. Choi, M.A. Lee, C.J. Kim. "Evaluation of the antioxidant effect of ganghwayakssuk (Artemisia princeps Pamp.) extract alone and in combination with ascorbic acid in raw chicken patties", Poultry Science, 2013 Crossref	8 words — < 1%

EXCLUDE QUOTES	OFF	EXCLUDE MATCHES	OFF
EXCLUDE BIBLIOGRAPHY	ON		