

UTILITY OF TRIMMING METHOD AND ROASTING DURATION FOR INCREASING MEAT QUALITY OF POST-LAYING DUCK

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ABSTRACT

The research was conducted to investigate chemical qualities of post-laying duck meat by using trimming method and roasting duration. 18 local post-laying ducks were used in this investigation. The Islamic method, *dzakah*, was used to slaughter the ducks was used to cut part of the carcasses. Trimming factors were breast meat with skin (A₁), breast meat without skin (A₂) and breast meat without skin and subcutaneous fat that was trimmed as thick as 1 cm longitudinal myofibril (A₃). The meats were roasted at temperature 90°C in 0 minute (B₁), 45 minutes (B₂) and 90 minutes (B₃). The samples analyzed were crude protein, crude fat, cholesterol, and dissolved protein content with breast meat. The crude protein (CP), crude lipid (CL), cholesterol (Chol), and dissolved protein content were analyzed by using Kjeldahl method, Soxhlet extraction, Nolllet method, and Lowry method, respectively. The statistical analysis used was variance of Completely Randomized Design (CRD) with Factorial Pattern 3x3. Factors were the trimmed meat (A) and roasting duration (B) followed by Duncan's Test. The samples were 18 breast meats with two replications. The data were statically analyzed by using Minitab 2000 computer program. The results indicated that there were significant differences (P<0.01) on CP, CL and Chol content in trimmed meat. However, there was not significant difference (P>0.05) on DP. The results indicated that the roasting duration significantly affected (P<0.01) on CP, Chol and DP. However it did significantly affect (P>0.05) on CL. There were interaction between the trimming method and roasting duration on CP, CL and Chol (P<0.01), but it was not significant (P>0.05) on DP. The meat roasted for 90 minutes has highest CP and Chol. The meat without skin and subcutaneous fat has high CP and Chol, but it has low CL. The trimmed meat without skin and subcutaneous fat roasted for 45 minutes has the best chemical quality.

Key Words: Trimming Method, Roasting Duration, Meat Of Post-Laying Duck

INTRODUCTION

Meat of post-laying duck has not been extensively utilized, whereas it has high protein content. It is because the meat has high- fat content and rancid smell than other poultries (Srigandono, 1986). Both harvesting in the late age causes high-fat content and its volatile fatty acid causes rancid smell (Samosir, 1990). The high fatty acid, especially saturated fatty acid and cholesterol can disturb health of human body specifically on blood vessels and hearth disturbance. (Baraas, 1993).

One of methods can be used to reduce fat content are roasting and trimming of the meat (Pearson, 1997). Roasting meat is conducted by using high temperature and

scheduled time. Roasting can reduce fat content by melting both subcutaneous fat and inner fat in the meat (Mountney, 1976). However, roasting method can damage protein, change the color and flavor of the meat. (Soeparno, 1992). The damage can be reduce by using low roasting temperature and long time duration as well as trimming method to open and widen the surface of meat. Wide surface of meat is useful to rapidly reach the internal temperature that appropriate to melting of fat, so the damage of protein can be avoided.

Trimming fat on part of the carcasses before packing is a technique developed to eliminate fat content (Savell et al., 1987 cited by Pearson, 1997). According to Hadiwinoto (1992), removal of fat, abdominal and visceral is conducted along with removal of fleshy part of fowl's tail (*urophigeal*). Subcutaneous fat is separated by lifting part of the skin (Parry, 1989). It is also stated that to make certain meat products, separation of both red meat and white meat from other components including fat is necessary.

The aims of this research are to investigate crude protein content, crude fat, cholesterol, and dissolved protein of post-laying duck meat by trimming method and roasting duration and interaction of the meat roasted at external temperature 90°C.

MATERIALS AND METHODS

The ducks was slaughtered by using the Islamic method, dzakah, (Nuhriawangsa, 1999). Swatland method (1984) was used to cut part of the carcasses. Trimming factors were breast meat with skin (A₁), breast meat without skin (A₂) and breast meat without skin and subcutaneous fat that was trimmed as thick as 1 cm longitudinal myofibril (A₃) according to Smith *et al.* (1987). The meats were roasted at temperature 90°C in 0 minute (B₁), 45 minutes (B₂) and 90 minutes (B₃). The samples analyzed were crude protein, crude fat, cholesterol, and dissolved protein content with breast meat (Cahaner *et al.*, 1986).

The crude protein (CP) content was analyzed by using Kjeldahl method (AOAC, 1975). The crude lipid (CL) was analyzed by using Soxhlet extraction (Atkinson *et al.*, 1972). The cholesterol (Chol) was analyzed by using Nollet method (1996). The dissolved protein (DP) was analyzed by using Lowry method (Mulyadi, 1990)

Statistical analysis used was variance of Completely Randomized Design (CRD) with Factorial Pattern 3x3. There were 18 samples and each sample used 2 replications. Factors were the trimmed meat (A) and roasting duration (B) followed by Duncan's Test (Astuti, 1980). There were 18 samples and each sample used 2 replications

RESULT AND DISCUSSION

Results of the chemical qualities test are showed in table 1.

Crude Protein

Result of statistical analyses indicated that there were significant differences (P<0.01) on crude protein of the meat among trimming methods. The data shows that there was an increasing trend on crude protein. The differences were caused by decreasing of crude fat content. In accordance with Soeparno (1992) and Nuhriawangsa (1994) that fat content influences other chemicals content including protein. Fat content

positively relates to protein content, in which decreasing of fat content will be followed by increasing of protein content (Uzu, 1981).

Table 1. Mean of the chemical qualities of post-laying ducks with different both trimming method and roasting duration at temperature 90°C

Trimming methods	Roasting duration			Mean
	B ₁	B ₂	B ₃	
Crude protein (%))**
A ₁	17.780 ^x	26.925	31.050 ⁿ	25.252 ^d
A ₂	20.035	32.040	42.985	31.687 ^e
A ₃	20.535 ^m	37.805 ^y	53.235	37.192 ^f
Mean**	19.450 ^a	32.257 ^b	42.423 ^c	
Crude fat (%))**
A ₁	18.055	18.860 ^x	15.955 ^o	17.623 ^d
A ₂	7.200	5.655	5.650	6.168 ^d
A ₃	4.585 ^m	4.225 ⁿ	6.635 ^y	5.148 ^e
Mean ^{ns}	9.947	9.580	9.413	
Cholesterols (mg %))**
A ₁	86.695	98.972 ^x	86.327 ^o	90.664 ^d
A ₂	94.120 ^m	102.142 ⁿ	152.469 ^y	116.244 ^e
A ₃	112.222	107.987	143.379	121.196 ^e
Mean**	97.679 ^a	103.034 ^a	127.391 ^b	
Dissolved protein (mg/100 mg)) ^{ns}
A ₁	9.430	6.655	6.505	7.530
A ₂	11.175	6.500	6.195	7.957
A ₃	10.765	6.350	6.025	7.713
Mean**	10.457 ^a	6.502 ^a	6.242 ^b	

**P<0.01

^{ns} Not significant differences (P>0.05)

^{a-c} Mean on the same row with different superscripts indicated significant differences (P<0.01)

^x Mean with different superscripts indicated significant differences (P<0.01)

^{m-} Mean with different superscripts indicated significant differences (P<0.01)

^d Mean on the same column with different superscripts indicated significant differences (P<0.01)

Result of the statistical analyses indicated that there were significant differences (P<0.01) on crude protein of the meat among roasting durations. It was a trend of increasing protein content by adding up roasting duration. Roasting duration influenced water content resulting the decrease of its weight (Desrozier, 1988) because of decreasing of that content (Nuhriawangsa, 2004a). Water content is the most compiler factor of the meat (Lawrie, 1989). Decreasing of the water content has increased protein content in equal meat weight (Nuhriawangsa and Sudiyono, 2004).

There were interactions between trimming method and roasting duration (P<0.01) on the crude protein. Trimming method by removing skin and subcutaneous fat trimmed as thick as 1 cm on opposite direction to meat fiber (A₃) has caused the opening of meat protection system. Consequently, it would accelerate the excretion of water than other treatments (A₁ dan A₂) by increasing of roasting duration. According to Nuhriawangsa (2004a), roasted meat has less water-holding capacity; consequently, the evaporation of water would be faster. It would cause the increase of protein content in meat by increasing the roasting duration (Nuhriawangsa, 2004b).

Crude Fat

Result of statistical analyses indicated that there were significant differences ($P < 0.01$) on crude fat of the meat among trimming methods. Trimming method by removing skin and subcutaneous fat trimmed as thick as 1 cm on opposite direction to meat fiber (A_3) was different from A_1 and A_2 with lowest protein content. It was caused by removing skin and subcutaneous fat. Soeparno (1992) reported that fat content in meat of aged livestock was influenced by subcutaneous fat.

Result of statistical analyses indicated that there were no significant differences ($P < 0.01$) on crude fat among roasting durations. It was inappropriate to Mountney (1976) and Hadiwinoto (1992) stating that roasting could release fat, therefore, it would decrease fat content of meat. It was possible by roasting meat at temperature 90°C for 45 to 90 minutes had not enough to excrete meat fat significantly.

There was interaction between the trimming method and the roasting duration ($P < 0.01$) on crude fat content. Trimming method by removing skin and subcutaneous fat trimmed as thick as 1 cm on opposite direction to meat fiber (A_3) caused the opening on meat protection system, hence by increasing the roasting duration it would influence the emission level of fat in the meat.

Cholesterol

Result of the statistical analyses indicated that there were significant differences ($P < 0.01$) on cholesterol of the meat among trimming methods. The treatments indicated increasing of cholesterol than the control. It was possibly caused by subcutaneous fat that functioned as reserve energy in the role of fatty acid and glycerol (Soeparno, 1994). Moreover, ducks used were the layer, so inside their bodies possibly stored reproduction hormones containing cholesterol. According to Nelson and Cox (2000), cholesterol was the particular compiler of membranes and sexual hormones, including in ducks body as well. The decrease of fatty acid contents by removing skin and subcutaneous fat would influence the proportion of other kinds of fat; therefore it could increase the cholesterol content.

Result of the statistical analyses indicated that there were significant differences ($P < 0.01$) on cholesterol of the meat among the roasting duration. It indicated the increase of cholesterol content by increasing the roasting duration. Cholesterol has both polar clusters and non-polar clusters (Lehninger, 1990). The characteristic possibly made cholesterol more resistant to heat than the other did; therefore at temperature 90°C it was still stable. Meanwhile, the roasting would decrease the water content (Desrozier, 1988), it was proved by decreasing of the cooking loss (Nuhriawangsa, 2002), and so it would increase the cholesterol content in the same weight condition by increasing the roasting duration.

There were interactions between the trimming method and the roasting duration ($P < 0.01$) on cholesterol of the meat. The significant interaction was in the meat roasted for 90 minutes than the trimming method. It was possible in 90 minutes the internal temperature of the meat could melt the cholesterol, consequently would exit cholesterol from the meat. According to Soeparno (1992), fat would melt when the meat was roasted then it would go into meat holes and formed emulsion with protein becoming gelatin held out in subcutaneous fat tissue. The trimming and the roasting could open the protector membranes of meat, so the held out fat could exit from the meat.

Dissolved Protein

Result of the statistical analyses indicated that there were significant differences ($P < 0.01$) on dissolved protein of the meat among the trimming methods. It indicated that there were not significant differences on the dissolved protein. Removing skin and fat was a technique to reduce fat content of the meat. (Smith, 1997). Consequently, it was not significantly influence on the dissolved protein of the meat. It caused the dissolved fat content in the meat was not different.

Result of the statistical analyses indicated that there were significant differences ($P < 0.01$) on dissolved protein of the meat among the roasting durations. It indicated that the increase of the roasting duration would decrease the dissolved protein. It was significantly seen in 90 minutes. According to Nuhriawangsa (2004b) and Pertiwiningrum (1993) reported that the increase of the roasting duration would decrease the dissolved protein. Protein joined the water that would exit when it was roasted (Sudarmadji *et al.*, 1989). The protein would be disposition because heating would form gelatin and be stored in the meat holes (Swatland, 1984), that would be melted and exit from the meat. The increase of the roasting duration would influence the meat oxidative liquid (Soeparno, 1994). It caused the decrease of the dissolved protein content.

There were not interactions between the trimming method and the roasting duration ($P < 0.01$) on the dissolved protein of the meat. It was caused by the free water would exit when the heat occurred in the meat (Judge *et al.*, 1989), so it was not influenced by the trimming methods.

CONCLUSION

Increasing of the roasting duration would increase the crude protein content and the cholesterol of the meat. The meat roasted for 90 minutes has the highest both crude protein content and cholesterol.

Removing skin and subcutaneous fat and the trimming method could increase both cholesterol and crude protein content. However it would decrease the fat content of the meat. Trimming method by removing skin and subcutaneous fat trimmed as thick as 1 cm on opposite direction to meat fiber (A_3) has the highest cholesterol and protein content. However it has the lowest crude fat.

The Roasting duration for 45 minutes at temperature 90°C , which the skin was removed and trimmed as thick as 1 cm has the best chemical quality.

REFERENCES

- Astuti, M., 1980. *Rancangan Percobaan dan Analisis Statistik*. Bagian ke-1. Bagian Pemuliaan Ternak, Fakultas Peternakan, Universitas Gadjah Mada, Yogyakarta.
- AOAC, 1975. *Official Methods of Analysis*. 12th ed. Association of Official Analytical Chemist, Washington D.C.
- Atkinson, T., V. R. Fowler, G. A. Garton dan A. Lough, 1972. A rapid methode for determination on lipid in animal tissues. *Analist*, London. 97:563-568.
- Baraas, F., 1993. *Upaya Menuju Jantung Sehat: Tentang Kholesterol*. Penerbit Data Jantung Indonesia, Jakarta.

- Cahaner, A., Z. Nitsan dan I. Nir, 1986. Weight and fat content of adipose and non-adipose tissues in broilers selected for or against abdominal adipose tissue. *Poultry Sci.* 65:212-222.
- Desrosier, N.W., 1988. *The Technology of Food Preservation*. 3rd ed. Penterjemah: M Muljohardjo. UI-Press, Jakarta.
- Hadiwiyoto, S., 1992. *Kimia dan Teknologi Daging Unggas*. Buku Monograf. PAU Pangan dan Gizi, Universitas Gadjah Mada, Yogyakarta.
- Lawrie, R.A., 1995. *Meat Science*. Pent. A. Parakkasi. Penerbit Universitas Indonesia Press, Jakarta.
- Lehninger, A. L., 1990. *Principles of Biochemistry*. Penterjemah: Maggy Thenawidjaja. Penerbit Erlangga, Jakarta.
- Mountney, G.J., 1976. *Poultry Product Technology*. 2nd ed. The Avi Pub., Co., Inc., Westport, Connecticut.
- Mulyadi, 1990. *Analisis Makromolekul*. PAU Bioteknologi, Universitas Gadjah Mada, Yogyakarta.
- Nelson, D. L. dan M. M. Cox, 2000. *Lehninger Principles of Biochemistry*. 3rd ed. Worth Pub., New York.
- Nollet, L.M.L., 1996. *Handbook of Food Analysis*. Volume 1. Marcel Deccker, Inc., New York-Basel-Hong Kong.
- Nuhriawangsa, A. M. P., 1994. Komposisi Kimia Daging Dada dan Non Dada pada Karkas Ayam Broiler Jantan dan Betina Umur Enam Minggu. *Skripsi Sarjana Peternakan*. Fakultas Peternakan UGM, Yogyakarta.
- Nuhriawangsa, A.M.P., 1999. *Pengantar Ilmu Ternak Dalam Pandangan Islam: Suatu Tinjauan Tentang Fiqih Ternak*. Program Studi Produksi Ternak, Fakultas Pertanian, Universitas Sebelas Maret, Surakarta.
- Nuhriawangsa, A. M. P., 2002. Kegunaan Enzim Papain dan Pemanggangan untuk Meningkatkan Kualitas Daging Itik Afkir. *Penelitian Dosen Muda*. Fakultas Pertanian, Universitas Sebelas Maret, Surakarta.
- Nuhriawangsa, A. M. P., 2004a. Pengaruh Presentase Daging Buah Pepaya dan Pemanggangan terhadap Kualitas Daging itik Afkir. Vol. 1 No. 1, Maret 2004. *Sains Peternakan*. Jurusan/Program Studi Produksi Ternak FP-UNS.
- Nuhriawangsa, A. M. P., 2004b. Pengaruh Waktu dan Lama Pemanggangan terhadap Kualitas Daging Itik Afkir. *Jurnal Pengembangan Peternakan Tropis UNDIP*. Edisi Khusus Nopember. Hal: 122-127.
- Nuhriawangsa, A. M. P. dan Sudiono, 2004. Pengaruh Waktu dan Lama Pemanggangan terhadap Kualitas Organoleptik Daging Itik Afkir. Vol. 1 No. 2, September 2004. *Sains Peternakan*. Jurusan/Program Studi Produksi Ternak FP-UNS. Hal: 90-98.
- Pertiwiningrum, A., 1993. Pengaruh level dan Lama Perebusan terhadap Kandungan Albumin Telur Ayam Rebus yang Disimpan Selama Dua Minggu. *Buletin Peternakan UGM*, Yogyakarta. Desember, 17:93-97.
- Samosir, D. J., 1990. *Ilmu Beternak Itik*. P. T. Gramedia, Jakarta.
- Smith, G.C, G.T. King dan Z.L. Carpenter, 1978. *Laboratory Manual for Meat Science*. 2nd ed. American Press, Boston, Massachusetts.
- Smith, D.M., 1997. Low Fat and Low Salt Poultry Products. Dalam: *Advances in Meat Research: Production and Processing of Healthy Meat, Poultry and Fish*

- Product*. A.M. Pearson and T.R. Dutson, Eds. Vol. 11. Blackie Academic & Professional, London-Weinheim-New York-Tokyo-Melbourne-Madras.
- Soeparno, 1994. *Ilmu dan Teknologi Daging*. Gadjah Mada University-Press, Yogyakarta.
- Srigandono, B., 1986. *Ilmu Unggas Air*. Gadjah Mada University Press, Yogyakarta.
- Sudarmadji, S., B. Haryono dan Suhardi, 1989. *Analisa Bahan Makanan dan Pertanian*. Cet. Ke-1. Liberty, Yogyakarta.
- Swatland, H.J., 1984. *Structure and Development of Meat Science*. Prentice-Hall Inc., Englewood Cliffs, New Jersey.
- Uzu, G., 1981. Pengaruh Pengurangan Kadar Protein terhadap Performan dan Perlemakan Broiler Selama Periode Finishing. *Proceeding Seminar*. Dalam: Seminar AEC tentang New Development and Poultry Nutrition, Jakarta.