DOI https://doi.org/10.18551/rjoas.2017-10.32

EFFECT OF NUTMEG (MYRISTICA FRANGRANS HOUTT) LEAVES AND CLOVE (SYZYGIUM AROMATICUM L.) LEAVES TREATMENT TO PHYSICAL AND CHEMICAL CHARACTERISTICS OF KACANG GOAT (CAPRA HIRCUS)

Yusri S.*, **Salim M.A.**, **Ryadin A.R.**
Faculty of Agriculture, University of Khairun, Ternate, Indonesia
*E-mail: yus_ara01@yahoo.co.id

ABSTRACT
Nutmeg (*Myristica frangrans* Houtt) and clove (*Syzygium aromaticum* L) is an herb plants that contain essential oils. The research objective was to determine the physical quality (pH, shrinkage cooking, and water holding capacity) and chemical quality (moisture content, protein content and fat content) of Kacang goat (*Capra hircus*) by rationing of nutmeg and clove leaves treatment. There are four treatments that consisted of the percentage of R0 = ration basal (without the addition of nutmeg and clove leaves), R1 = basal diet + 5% of nutmeg leaves, R2 = basal diet + 5% of clove leaves, R3 = basal diet + 5% of nutmeg leaves +5 % of clove leaves, while each treatment was replicated four times. The results showed that the use of nutmeg and cloves leaves in a ration of 5% does not affect the physical and chemical quality of the Kacang goat in terms of pH, cooking shrinkage, water holding capacity, moisture content, protein content and fat content.

KEY WORDS
Nutmeg leaves, clove leaves, goat, physical quality, chemical quality.

In Indonesia, Kacang goat has an important economic value, favorable by the people and is widespread in the land of farmers. This fact shows the crucial role of goats to the farmers. Contributions from goats of total farm income for small ruminants is very substantial, where its production also plays an important role to foster the income activity of many small farmers in addition to being a source of animal protein that support national food security.

Goat meat consumption in Indonesia increased along with population growth and development, as well as increasing public awareness of eating meat. One commodity meat that contribute substantially to public nutrition is mutton.

Goat meat is one favored by the public. The most important thing in the choice of meat is the meat quality, meat quality circulating in the community is often not secured properly. The quality of the meat can be viewed from two factors, namely physical and chemical qualities of meat.

The physical quality of the meat include pH, water holding capacity, cooking losses and texture, while the chemical quality of the meat can be determined based on changes in its chemical components such as moisture, protein, fat and ash. Physical and chemical qualities of goat meat affected by the process before and after cutting. Factors before cutting that can affect the quality of the meat is genetic, species, race, type of animal, sex, age, including feed additives (hormones, antibiotics, and minerals) and the state of stress. After cutting factors affecting meat quality include among others the pH of the meat, storage methods, types and locations of muscle meat in a meat muscle (Soeparno, 2009).

Nutmeg (*Myristica frangrans* Houtt) and clove (*Syzygium aromaticum* L) is an Indonesian herb plants that are rich in anti-bacterial agents, because they contain essential oils. According to Dorman et al. in Nurdjannah (2007), the main components of essential oils are terpenes, terpene phenolic alcohol and ether. Components monoterpenes hydrocarbons is the main component of essential oil composed of β-pinene (23.9%), α-pinene (17.2%) and limonene (7.5%). While the phenolic components primarily myristicin ether (16.2%), followed by safrole (3.9%) and methyl eugenol (1.8%). Essential oils of nutmeg and clove consists of several components including the active compound and monoterpan myristicin. Myristicin contained in the fruit flesh of nutmeg can be used to soothe the pain (analgesia), improving

blood circulation, sedatives and anti-depressants (Anonymous, 2008). Furthermore, Mancha and Fuentes (2008) stated that recent developments of utilization of oil nutmeg and cloves are as a raw material that is stress relieving aromatherapy for their myristicin component. Critical components such as myristicin contained in nutmeg and cloves are expected to improve physical and chemical properties of Kacang goats.

METHODS OF RESEARCH

Research Sites. This research was conducted in the Cage Ranch IbIKK Khairun University Studies Program. Test physical and chemical qualities of meat carried out in the Laboratory of Animal Husbandry Animal Husbandry University Studies Program Khairun.

Research Materials. Animals used in this study were Kacang male goat as much as 16 tails, about 1 year old with an average initial weight of 11.02 ± 0.53 kg.

Cage and feeding the goats bean research carried out in an individual cage, measuring 100x200 cm in front is equipped with the feeding and drinking places.

Feed used in research are nutmeg leaves, clove leaves, grass field, jackfruit leaves and lamtoro leaves. Nutmeg and clove leaves obtainable around the study site, the site of the garden of nutmeg and clove. Grass, jackfruit leaves and lamtoro leaves obtained from the land surrounding the research site.

Research Method. Goats as many as 12 heads randomly placed in individual cages. Maintenance time for 12 weeks. Goats were divided into 4 groups, each group consisting of three goats as replication. The division of the group are:

R0 (control) = 10% leaf lamtoro + 15% + 75% jackfruit leaves natural grass;

R1 = 5% nutmeg leaves, leaf lamtoro 5% + 15% + 75% jackfruit leaves natural grass;

R2 = 5% leaf clovers, leaf lamtoro 5% + 15% + 75% jackfruit leaves natural grass;

R3 = 5% leaves nutmeg, clove leaves 5%, 5% leaves lamtoro + 10% + 75% jackfruit leaves natural grass.

Feeding both leaf nutmeg, clove, jackfruit and natural grass is given in the form of fresh and administration based on the calculation of 3.5% of body weight in the form of dry ingredients.

Frequency of feeding twice a day morning and evening ad libitum, provision separately done between nutmeg leaves, clove leaves and grass. Drinking water provided ad libitum. After 12 weeks of carried out the slaughter of the experimental material.

Variables observed. Variables observed and measured in this study are the physical and chemical qualities of meat. The physical quality include pH value of meat (ultimate), the value of the meat cooking shrinkage and water holding capacity of meat. The pH of fresh meat, determined by using a pH meter. Cooking shrinkage (SM) or loss is determined by a modified cooking method Bouton et al, (1971) which is cited by Soeparno (2009). Water holding capacity (DIA) is determined by the method of Hamm (1972), quoted from Soeparno (2009).

Variables observed for chemical quality are the water content of the meat, the protein content of meat and fat content of the meat. Cutting or sampling was done at the end of 12 week after the study, carried out on cattle slaughter experiment as much as 3 heads each treatment. Once the cuts was made, separation parts of carcass and non carcass was required to taken samples to test the quality of the meat on the longissumus dorsi (LD). Future collection intended for the weighing of carcasses, but it also carried out the sample analysis to determine the chemical quality of meat which include water content, protein content and fat content.

Data analysis. Data obtained from observations were analyzed using analysis of variance models completely randomized design (CRD) unidirectional pattern. When the results of the analysis showed significantly different treatment responses, then continued with Duncan's multiple range test (Steel and Torrie, 1993).

RESULTS AND DISCUSSION

The physical quality of meal of Kacang goat. The average pH value of Kacang goats with the use of leaf nutmeg and cloves are R0 of 5.69, 5.67 R1, R2 and R3 5.63 5.64 (Table 1) had no significant (P> 0.05). This means giving 5% 5% leaves nutmeg and clove, and combinations thereof in the feed does not give a real impact on the pH value og Kacang goats. The pH value is relatively the same in every treatment (R0 - R3) showed that muscle glycogen reserves at relatively the same each treatment causes deposits of lactic acid are relatively the same. The final pH value of meat anatar study ranged from 5.63 to 5.69 while the ultimate meat pH range ranges (5.4 to 5.8). This fact shows that the use of leaves nutmeg and cloves in the feed they are in ultimate pH range.

The achievement of the ultimate pH of meat due to lactic acid heap during post mortem glycolysis, depending on the amount of muscle glycogen reserves during cutting. Lactic acid accumulation will stop after muscle glycogen reserves depleted, or after the condition is achieved ie pH low enough to stop the glycolytic enzymes in the process of anaerobic glycolysis (Judge et al., 1989).

The degree of muscle activity before the cuts will affect the amount of time livestock glycogen cut (Swatland, 1994). In cattle too many moves before it is cut, for example the cuts that are not stunned beforehand or not rested before cutting the supply of glycogen will be much reduced. Most of glycogen is used for activity, this would result in higher fixed pH or pH niali meat ultimate pH above. In general, ways to overcome the low muscle glycogen reserves are to be rested, rest periods ranged from 12 to 24 hours. Feeding taste with good characteristics and adequate rest can improve muscle glycogen reserves in order to obtain meat with a normal pH end. Cattle are stunned before slaughter is also able to overcome the loss of glycogen reserves as a result of stress stress. The pH value of the meat has close links with flesh color, aroma, taste and water holding capacity of meat.

Research Budiyanto and Usmiati (2009) obtained a pH value of 5.81 mutton. According to the Twelve (2008) the diversity of the pH value on the bacon can be caused by two factors: intrinsic and extrinsic. Intrinsic factors such as age, type of muscle, muscle glycogen and stress levels of livestock before slaughter.

Table 1 – Average values of pH, water holding capacity (WHC) and cook shrinkage of goat by nutmeg and clove leaves treatments

Variables	Feed treatments			
	R0 (Control)	R1 (nl 5%)	R2 (cl 5%)	R3 (nl and cl 5%)
pH	5,69	5,67	5,63	5,64
WHC (%)	31,64	31,47	31,21	31,23
Cook Shrinkage (%)	40,83	40,47	40,26	40,35

Note: nl = nutmeg leaves, cl = clove leaves.

Whereas, extrinsic factors include ambient temperature and treatment additives before cutting. The effect of stress before slaughter, such as climate, aggressive behavior among livestock or excessive movements have a major influence on the reduction or exhaustion of muscle glycogen can cause accumulation of lactic acid to produce meat with a high pH (> 5.9).

Water holding capacity is the ability of meat to bind water or water is added during no influence from outside forces, such as meat cutting, heating, grinding and pressure. In this study, the value of water holding capacity of meat R0 31.64, 31.47 R1, R2 and R3 31.21 31.23 (Table 1) had no significant (P> 0.05). This means giving 5% 5% leaves nutmeg and clove, and combinations thereof in the feed does not give a real impact on the water holding capacity of Kacang goats. The value of water holding capacity of meat is influenced by the pH value of the meat. Water holding capacity decreased from a high pH to the isoelectric pH / pH ultimate. In accordance with the opinion of Wismer-Pedersen (1971) in Suparman (1996) suggest that the accumulation of lactic acid during the process of postmortem glycolysis (immediately post) will lower water holding capacity.

The pH value is decreased resulting in low water holding capacity (Sunarlim and Usmiati, 2009). This is due to the low pH value of meat resulting in open flesh structure so that the lower water holding capacity and high pH meat meat resulting structure is closed so that a high water holding capacity. In this study, the pH of the meat produced is still in the range of ultimate meat pH means that the pH effect of meat on the water holding capacity of meat still in the stage of normal. Besides the factors pH value of the water holding capacity of meat is also affected by differences in the species, age and muscle function, feed, transport prior to cutting, health ernak, temperature, sex cattle, treatment before cutting and intra muscular fat content (Soeparno, 2009).

Cooking shrinkage is a function of temperature and duration of cooking. The results of this study showed no real difference among the four treatments. This means giving 5% 5% leaves nutmeg and clove leaves and kompinasinya not give a real impact on the value of shrinkage cook of Kacang goats. In general, meat susutmasak value varies between 1.5 to 54.5%. Value shrinkage. cooking is influenced by pH, sarcomere length of muscle fibers, long pieces of muscle fibers, myofibrils contraction status, size and weight of a cross-sectional sample of meat and meat (Bouton et al., in Soeparno, 2009). Other factors that influence the cooking shrinkage is water-holding capacity by the network's own flesh and fat content in the muscle or the surface of the meat, and the meat fat translocation. Muscles that have a high intramuscular fat has a high water holding capacity so small cooking shrinkage when cooked. Cooking meat with a lower shrinkage has a relatively better quality of meat by cooking shrinkage values larger, because the loss of nutrients during cooking would be less. The results showed that the use of nutmeg and clove leaves 5% and their combinations in feed perpengaruh not significantly affect the characteristics (pH, DIA and cooking shrinkage) og Kacang goats.

The average value of water content of Kacang goats with the use of leaf nutmeg and cloves are R0 72, 15 ± 0.97%, R1 71, 75 ± 0.82%, R2 71, 67 ± 0.73% and 72 R3, 01 ± 0.69% (Table 1) had no significant (P> 0.05). This means giving 5% 5% leaves nutmeg and clove, and combinations thereof in the feed does not give a real impact on the value of water content of Kacang goats. The average water content in this study masi in the normal range 60-80% (Lawrie and Ledward, 2006).

Table 2 – Average water content, protein content and fat content of goat meat by nutmeg and clove leaves treatment

Variable	Feed treatments			
	R0 (Control)	R1 (nl 5%)	R2 (cl 5%)	R3 (nl dan cl 5%)
Water content (%)	72, 15 ± 0,97	71, 75 ± 0,82	71, 67 ± 0,73	72, 01 ± 0,69
Protein content (%)	19, 34 ± 0,18	19, 54 ± 0,23	19, 32 ± 0,25	19, 83 ± 0,46
Fat content (%)	6.54 ± 0,87	6.35 ± 0,90	6.79 ± 0,93	6.82 ± 0,89

Note: nl = nutmeg leaves, cl = clove leaves.

The water content of the meat can be influenced by the fat content of meat, this is due to the levels of accumulation of high fat content can melunggarkan bond network structure of the meat so much water that is free. In this study, it appears that the fat content of meat is also not significant between the treatment so that the levels airpun not significant between treatments. Browning et al (1990) is on meat containing high levels of fat tended to have a low water content. The water content of the meat has a positive correlation with the pH of the meat, because meat ultimate pH effect on actin filament spacing density and mimosin (Huff-Lonergan and Lonergan, 2005).

Meat with high moisture content will look pale, watery and mushy texture because more water is bound to come out of the meat. The high water content in meat protein lead to slightly soluble in water so that the water holding capacity of meat proteins will decline. According Soeparno (2009) the water content of the meat is affected by the type of animal, age, sex, feed and the locations and functions of the parts of muscle in the body. High water levels caused by the age of the young cattle, due to the formation of protein and fat meat is not perfect (Rosyidi, Ardhana and Santoso, 2000).

CONCLUSION

Based on this research can be concluded that provision of nutmeg and clove leaves 5% 5% as well as combinations in the feed does not give a significant effect on the physical and chemical quality of the Kacang goats.

REFERENCES

1. 2008. Herbal Indonesia Efficacious Scientific Evidence and How to make formula: Nutmeg. p. 387-388. Trubus. Vol. 08. Jakarta.
2. Babiker SA, El Khider IA, Shafie SA. 1990. Chemical composition and quality attributes of goat meat and lamb. Meat Sci. 28: 273-277.
3. Browning, M.A., D. Lhuffman, W.R. Egbert and S.B. Jungs.1990. Physical and compositional characteristic of beef carcass selected for leanness. J. Food Sci. 55: 9-14.
4. Budiyanto, A and S. Usmiati. 2009. Effect of Enzyme Papain Against Goat Meat Quality During Storage. Indonesian Center for Agricultural Postharvest Research and Development. Bogor.
5. Fernandez, D. M, Duenas, A. J. Myers, S. M. Scramlin, C. W. Parks, S. N. Carr, J. Killefer and F. K. Mc. Keithonline. 2008. Carcass, Meat Quality and Sensory Characteristics of Heavy Body Weight Pigs Fed. J.Anim.Sci. 86: 3544-3550.
6. Huff-Lonergan, E. and S. M. Lonergan. 2005. Mechanisms of water holding capacity and meat: the role of postmortem biochemical and structural changes. Meat Sci. 71: 194-204
7. Jugde, M.D., E.D. Aberle, J.C. Forrest, H.B. Hendrick, and R.A. Merkel. 1989. Principles of Meat Science. 2nd ed. Kendall Hunt Publishing Co., Dubuque, Iowa.
8. Lawrie, R. A. 2003. Meat Science. Fifth Edition. Translation Aminudin Parakasi. UI Press. Jakarta.
9. Lawrie, R. A. and D. A. Ledward. 2006. Lawrie's Meat Science 7th ed. Woodheat Publishing Limited. Abington Combridge, England.
10. Mancha A. and J. Fuentes. 2008. Evaluation of the health beneficial properties of the aromatic ether Myristicin - Nov9 - 330PM. Ppt-USA.
11. Murphy TA, Loerch SC, Mc Clure KE, Solomon MB. 1994. Effects of restricted feeding on growth performance and carcass composition of lambs subjected to different nutritional treatments. J Anim Sci. 72: 3131-3137.
12. Nurdjannah, N. 2007. Processing Technology of Nutmeg. Agency for Agricultural Research and Development. Great Hall Postharvest Research and Development of Agriculture.
13. Rosyidi, D., Ardhana, M and Santoso, R.D. 2000. Quality Meat Fat Tailed Sheep (DEG) Wean off Period Females with Docking and Treatment Concentrate Giving Levels in terms of Moisture, fat content and protein content. Journal of Animal Husbandry Sciences. Vol.11 No. 3: 39-44.
14. Soeparno. 2009. Meat Science and Technology. Fifth printing. Gadjah Mada University Press. Yogyakarta.
15. Steel, R. G. D. and J. H. Torrie. 1993. Principles and Procedures of Statistics. An Approach Biometrics. Translators: Sumantri, B. General Gramedia Pustaka, Jakarta.
16. Sunarlim, R and Usmiati, S. 2009. Characteristics of Goat Meat with Soaking Enzyme Papain (The Characteristic of Goat Meat Soaked In Papain). National Seminar on Animal Husbandry and Veterinary Technology, 2009. Research and Development of Agricultural Postharvest. Bogor.
17. Suparman, P. 1996. Effects of Long Fattening And Fasting Before Cut Production Of Carcass and Physical Characteristics Beef Brahman Cross. Thesis. Faculty of Animal Husbandry Universitas Gadjah Mada.
18. Swatland, H.J. 1994. Structure and Development of Animals and Poultry Meat. Technomic Publishing Company, Inc., Lanchaster Pennsylvania.
19. Twelve, C. 2008. Sheep and Goat Meat Characteristics and Quality. Ethiopia Sheep and Goat Productivity Improvement Program. USA.

20. USDA (United State Department of Agriculture). 2001. Nutrient data base for standard reference, release 14. Agricultural Research Service United States Department of Agriculture. Maryland.
21. Uyun, N. 2008. Quality Chemicals Goat Meat Peranakan Etawah (PE) Males And Boer Goats Peranakan (PB) Castration. Journal of Animal Science and Technology Results. Poor. Vol. 4 No. 2: 9-16.
22. Van Niekerk WA, Casey NH. 1988. The Boer goat. II. Growth, nutrient requirements, carcass and meat quality. Res Small Rumin. 1: 355-368.
23. Williams PG. 2007. Nutritional composition of red meat. Nutr Dietetics. 64: S113-S119.