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THE EFFECT OF FERMENTED FEED SUPPLEMENT ON MEAT pH AND TENDERNESS OF BROILER

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Abstract

The study of the effect of fermented feed supplement on meat pH and tenderness of broiler was aimed to determine the effect of the feed fermented with Aspergillus niger. Meat tenderness may be influenced by changes occurring during muscle conversion to meat and these changes may be controlled, to improve meat quality. The feed supplement is a mixture of solid coconut oil and solid tofu waste, which were fermented by Aspergillus niger. With this feed was fed to 120 Cobb-strain day old chicks for 5 weeks. And then the meat was boiled at 60^{o}C and checked the meat pH and tenderness. This experiment was used Completely Randomized Design (CRD) 6 x 4; consisted of six treatments{(R-0)0% fermented feed supplement, (R-1) 5%; (R-2) 10%; (R-3) 15%; (R-4) 20%; and (R-5) 25%}; and each treatment was repeated four times. Statistical tests performed by analysis of variance and the differences between treatments effect were examined using Duncan's multiple range test. The results indicated that usage up to 25% fermented feed supplement in the ration will increase the meat tenderness and the pH.

Keywords**:** *broiler, fermented feed supplement, meat pH, meat tenderness*

INTRODUCTION

The fermentation process, the controlled action of selected micro-organisms is used to alter the texture of feed. The main advantages of fermentation processing is the use of mild conditions of pH and temperature which maintain and improve the nutritional properties and sensory of the food. The separation of enzymes from microbial cells, for use in vitro in the processing is a more recent development (Fellows, 1990). The mild conditions used in fermentation produce few of the deleterious changes to nutritional and sensory quality. Microbial growth causes complex changes to the nutritive value of fermented products by changing the composition of proteins, fats and carbohydrates. Many of fungi are beneficial, and nearly all species of molds are harmless. Yeast a by-product in the manufacture of various items, furnish an excellent protein and vitamin supplement. The species of Aspergillus, vary somewhat in color, some are black. The *Aspergillus niger* is used in commercial citric acid production (Gebhardt, 1970). One of the advantages in fermentations, the controlled action of selected microorganism is used to alter the texture, which increase the quality and value of raw materials. *Aspergillus niger* is a type of mold that is used commercially unimproving the quality of agricultural processing wastes, because of the easy handling, its ability to grow quickly and it is not harmful because it does not produce mycotoxins. This fungus can produce enzymes such as a-amylase, amylase, cellulase, gluco-amylase, catalase, pectinase, lipase, and galactosidase (Ratledge, 1994).

The pH of IVRIN (the plant proteolytic enzyme, was isolated from unripe fresh fruits of *Cucumis pubescens W)* treated meat was decreased significantly ($p<0.01$) and the effect was more pronounced in breast than thigh muscle (Sinku et al, 2002). The pH of meat plays important role in maintaining the quality of meat. The pH of broiler meat around 5.95 – 6.00. The toughness of meat occurs even at low pH.

It was observed that the fall in pH of breast muscle was more rapid as compared to thigh muscle in treatment group. An ultimate pH near 5.7 is desirable for maintaining quality of poultry breast meat (Khan et al., 1970).

The meat tenderness may be influenced by changes occurring during muscle conversion to meat. These changes may be controlled, to improve the meat quality. The influence of diet on meat properties is minor importance if there are non nutritional deficiencies. Any feeding practice which alters the quantity of glycogen stored in muscles can influence the ultimate meat properties. Some of the physical properties of fresh meat are difficult to measure objectively. Many factor within muscles, such as intra muscular fat content, can contribute to these physical properties. The tenderness is one of palatability factor that has received more research study (Abrele, 2001). The tenderness of meat is distinctly important to the consumer, having much to do with the pleasure derived from eating meat. Many factors influence tenderness. Certain feeding programs are known to increase the proportion of connective tissue in meat. Feeding may, therefore, have relative direct influence on tenderness, in addition to the fattening effect (Acker et al., 1991). According to the laboratory and consumer studies, it has shown that tenderness is the most important sensory attribute of meat. The tenderness and juiciness are closely related, the more tender the meat, the more quickly the juices are released by chewing it. The deposits of fat in muscle, add to the juiciness and flavor of meat, when it was cooked. The tenderness of meat is measured as the force required to cleave a standard cross sectional area of cooked meat across the muscle fibres (Davey et al., 1988). The heating of meat is accompanied by changes in appearance, flavor, texture and nutritive value. The most drastic changes in meat during heating, such as shrinkage and hardening of tissue, release of juice and discoloration are caused by changes in the muscle proteins. The heating of muscle tissue as well as of myofibrils results in an increase of pH which depends on the initial pH and starts at about 30^0C, the maximum pH increase was observed to be between 40 and 60^0C. Simultaneously, the pH of minimum water holding capacity of the myofibrilar proteins is shifted from 5.0 – 6.0 after heating at 80^0C. The most drastic changes of the myofibrillar and sarcoplasmic proteins occur between 30 and 50^0C, reaching almost completion at 60^0C (Schmidt , 1988).

MATERIALS AND METHODS

Materials: 120 chickens were used for 24 experimental units, each unit were 5 chickens. After slaughter, the meat was put in the polyethylene bag and boiled at 60^oC for 10 minutes and then was check the tenderness using Universal penetrometer 1/10 TH MM DV and pH meter Jenway 3310.

Methods: This research used Completely Randomized Design (CRD) 6x4; consisted of six treatments: (R-0) diet + 0% fermented feed supplement, (R-1) diet + 5% fermented feed supplement; (R-2) diet + 10% fermented feed supplement; (R-3) diet + 15% fermented feed supplement; (R-4) diet + 20% fermented feed supplement; and (R-5) diet + 25% fermented feed supplement; and each treatment was repeated four times. Statistical tests performed by analysis of variance and the differences between treatments effect were examined using Duncan's multiple range test.

RESULTS AND DISCUSSIONS

The effect of treatment on meat pH

In Table 1, there are the results of treatment on meat pH.

Table 1. The effect of treatment on meat pH

Replication	R-0	R-1	R-2	R-3	R-4	R-5
I	6.36	6.36	6.54	6.25	6.70	6.64
II	6.40	6.40	6.63	6.50	6.58	6.73
III	6.26	6.24	6.51	6.64	6.64	6.67
IV	6.30	6.56	6.20	6.73	6.60	6.76
Total	25.32	25.56	25.98	26.12	26.52	26.80
Average	6.34	6.39	6.495	6.53	6.63	6.70

Notes : (R-0) diet + 0% fermented feed supplement,
(R-1) diet + 5% fermented feed supplement
(R-2) diet + 10% fermented feed supplement
(R-3) diet + 15% fermented feed supplement
(R-4) diet + 20% fermented feed supplement and
(R-5) diet + 25% fermented feed supplement.

The means on pH of meat broiler has not significance, even the more fermented feed supplement, gave more pH and this results indicated that there is insignificantly, because the carcass has the same treatments and the pH was measured after the meat was boiled in 60^{o}C. The pH of meat plays important role in maintaining the meat quality. The thoughness of the meat occurs at low pH. In this treatment, the pH of the meat are between 6.34 – 6.70. The meat pH level rise as the fermented feed supplement percentage in the ration was higher. It means that the fermented feed supplement has effect on pH level. So there is an activity of fermented feed supplement towards the meat pH, even there is insignificantly on this treatment. In R-0 (diet without fermented feed supplement), the pH is 6.34, and the meat pH will increase when the level of fermented feed supplement more higher; in R-1(diet + 5% fermented feed supplement), the pH 6.39; and in R-2 (diet + 10% fermented feed supplement) the meat pH is 6.495; the R-3 (diet + 15% fermented feed supplement; meat pH is 6.53); R-4 (diet + 20% fermented feed supplement; the meat pH 6.63); and in R-5 has the highest meat pH is 6.70 (diet + 25% fermented feed supplement). This results are more better compared to the pH meat of culled layers are 5.63 (Sinku et al., 2002), and an ultimate pH near 5.7 as desirable for maintaining quality of poultry breast meat (Khan et al., 1970). The broilers that given fermented feed supplement which consists of solid coconut oil and tofu waste fermented with *Aspergillus niger* have more meat pH, compared to the broiler give no fermented feed supplement. The influence of diet on meat properties is minor importance if there are no nutritional deficiencies. The influence of diet on the physical properties of muscle, as long as no serious nutritional deficiencies, the feeding practice in ante mortem period which alters the quantity of glycogen stored in muscles can influence the ultimate physical properties of meat (Aberle et al., 2001).

The effect of treatment on meat tenderness

In Table 2, there are the results of fermented feed supplement in ration, to the broiler carcass tenderness.

Table 2. The effect of treatment in ration on meat carcass tenderness (mm/g/10 sec)

Replication	R-0	R-1	R-2	R-3	R-4	R-5
I	12.60	12.10	12.80	13.20	15.90	19.50
II	12.40	14.50	14.20	13.40	16.80	17.10
III	13.60	15.20	15.50	15.40	16.00	16.60
IV	14.50	14.70	17.20	19.30	18.90	21.10
Total	53.10	56.50	59.70	61.30	67.60	74.30
Average	13.275	14.125	14.925	15.325	16.90	18.575

Notes : (R-0) diet + 0% fermented feed supplement,
(R-1) diet + 5% fermented feed supplement
(R-2) diet + 10% fermented feed supplement
(R-3) diet + 15% fermented feed supplement
(R-4) diet + 20% fermented feed supplement and
(R-5) diet + 25% fermented feed supplement.

The meat tenderness values were between 13.275 mm/g/10 sec to 18.575 mm/g/10 sec. The highest meat tenderness (18.575 mm/g/10 sec) was get from the broiler that fed R-5 (diet + 25% fermented feed supplement) and the lowest (13.275 mm/g/10 sec) was get from the broiler that fed R-0 (diet + 0% fermented feed supplement). The meat tenderness was significantly better in the groups which consumed fermented feed supplement. The tenderness will increase when the fermented feed supplement in the ratio level percentage are higher. It means that the meat from broilers that given only ration without feed fermented supplement has the lowest tenderness. The more fermented feed supplement in the ration will results the more tenderness of the meat. In R-0 (diet without fermented feed supplement), the tenderness are 13.275 mm/g/10 sec, and the meat tenderness will increase when the level of fermented feed supplement more higher; in R-1 (5% fermented feed supplement), 14.125 mm/g/10 sec; and in R-2 (10% fermented feed supplement) the tenderness is 14.925 mm/g/10 sec; the R-3 (15% fermented feed supplement; meat tenderness 15.325 mm/g/10 sec); R-4 (20% fermented feed supplement; the tenderness 16.90 mm/g/10 sec); and in R-5 has

the highest tenderness (18.575 mm/g/10 sec, 25% fermented feed supplement). It means that the fermented feed supplement has influenced the meat tenderness. The influence of diet on meat properties is minor importance, if there are no nutritional deficiencies. The influence of diet on the physical properties of muscle, as long as no serious nutritional deficiencies, the feeding practice in ante mortem period which alters the quantity of glycogen stored in muscles can influence the ultimate physical properties of meat (Aberle et al., 2001).The broilers that given fermented feed supplement which consists of solid coconut oil and tofu waste fermented with *Aspergillus niger* have more tenderness meat, than the broilers only consumed normal diets. It means that the *Aspergillus niger* has an effect to the tenderness in the meat that feed fermented supplement (Lengkey et al., 2013).

CONCLUSIONS

The broilers that given fermented feed supplement which consists of solid coconut oil and tofu waste fermented with *Aspergillus niger* have more higher meat pH and more tenderness meat, than the broilers only consumed normal diets. It means that the *Aspergillus niger* fermented feed supplement has an effect to the pH and tenderness in the meat broiler that fed with fermented feed supplement. And using up to 25% of fermented feed supplement in the ration will increase the meat tenderness and the pH.

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