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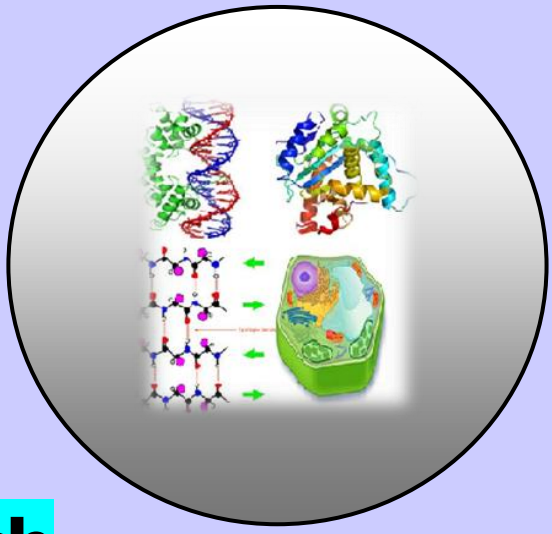
ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

Index Copernicus International Value
IC Value of Journal 46.52 Poland, Europe (2015)
Journal Impact Factor: 4.275
Global Impact factor of Journal: 0.876
Scientific Journals Impact Factor: 3.285
InfoBase Impact Factor: 3.66

J. Biol. Chem. Research
Volume 34 (1) 2017 Pages No. 72-79



Journal of Biological and Chemical Research
An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

Indexed, Abstracted and Cited in various International and National Scientific Databases

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 34, No. 1: 72-79, 2017
(An International Peer Reviewed / Refereed Journal of Life Sciences and Chemistry)
Ms 34/1/76/2017
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ISSN 0970-4973 (Print)
ISSN 2319-3077 (Online/Electronic)

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RESEARCH PAPER

Received: 23/02/2017 **Revised: 06/03/2017** **Accepted: 07/03/2017**

The Effect of Water Extract of Two Leaves (*Moringa oleivera* and *Sauropus androgynus*) on Growth Performance and Meat Cholesterol Levels in Broilers

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ABSTRACT

The present study was conducted to determine the effects of sweet leaf (Sauropus androgynus) and Moringa oleivera leaves water extract on the growth performance and meat cholesterol level of 6-week old broilers. One hundried and sixty 2-wk-old broilers were colony caged in an environmentally controlled house to evaluate the effect of Moringa (Moringa oleivera) and sweet leaf (Katuk, Indonesian) leaves water extract administration on broilers. Sweet leaf and Moringa extract was prepared by macerating sweet leaf and Noni leaves in distilled water (1:1, w/w). Broilers were randomly divided into three equal groups: one served as a control and was administered with drinking water only. Theother two groups were administered 5% water extract of sweet leaf or Moringa leaves, respectively. Moringa and sweet leaf water extract increased growth performance (P<0.05). Moringa or sweet leaf water extract administration results in lower (P<0.05) abdominal fat and meat cholesterol contents. Moringa or sweet leaf water extract increased growth performance, but decreased abdominal fat and meat cholesterol contents of broiler.
Keywords: Moringa, Sweet Leaf (Katuk), Cholesterol and Broiler.

INTRODUCTION

The consumers, nowdays mostly wish yhe low fat and cholesterol animal product becouse high fat and cholesterol levels in such a product can couse the high rist of

atherosclerosis. It is proved especially when consuming product having high in cholesterol such as broiler carcasses. This is due to that high cholesterol levels in those products is one cause of the high risk of atherosclerosis when consuming products high in cholesterol such as meat. Meats are a highly delicate food product, which could lose quality rapidly during the period between collection and consumption. Thus, improving and extending meat shelf life were included to the list of selection criteria for breeders and other researchers in the fields of production, management and nutrition. Numerous efforts have been made to lower the cholesterol content of meats. Should the meat cholesterol go down to minimal levels, it would be a win battle not only for poultry industry but also it would be beneficial to public's health (Mahmoud *et al*., 2010). According Santoso *et al.* (2005), that studies on the efficacy of the use of plants to improve the quality of livestock production is very important, because it can increase the diversity of plant resources and is the basis of economic botany or other applied botany. The plant leaves *Moringa* (*Moringa oleivera)* and *Katuk* (*Sauropus androgynus*), besides known as traditional medicinal plants and spices, turned out to have medical properties, antibacterial, and contains beta-carotene as an active ingredient to color skin of carcasses. *Katuk* (*Sauropus androgynus*) leaves contain phytochemical compounds that have remarkable physiological functions. Preliminary observations indicate that the phytochemical compounds contained in *Katuk* leaves are flavonoids, saponins, sterols, quinone, and tannins. According Oka *et al*. (2016), *Katuk* leaves contain 1411.06 mg/l antioxidants, which is much higher than *Moringa* leaves. They contain 8.73 mg/100 mlvitamin C. Results of research conducted by Santoso *et al.* (2005) showed that the 3% *Katuk* leaf meal in chicken feed might reduce the accumulation of fat, lower the fishy smell of meat, and can reduce the number of *Salmonella sp* and *E. coli* in meat. It was further reported also by Santoso *et al*. (2015) showed that administration of 5% *Katuk* leaf meal in could significantly lower the amount of fat and cholesterol in chicken meat. Syahrudin *et al.* (2013) reported that administration of fermented *Katuk* leaves up to 14% has no effect on weight gain and feed efficiency, but can lower cholesterol in broiler meat. According to Wardiny (2006), decreasing cholesterol content is caused by the beta-carotene in the leaves *Katu*k and *Moringa*. *Moringa* trees are found in Indonesia, leaves a lot to have the nutritional content, protein content and high vitamins and does not contain antinutrisi (Nuhu, 2010; Ayssiwede *et al*., 2011; Mutayoba *et al*., 2011). Some research indicates that the use of *Moringa* leaves for poultry and monogastric, highly dependent on the nutrient content of the ration and the level of *Moringa* leaves in the ration (Kaijage *et al*., 2003; Nuhu, 2010; Olugbemi *et al.,* 2010a; 2010b). Khan *et al.* (2014) reported that administration of *Moringa* leaf meal in the diet at the level of 2% can significantly improve weight gain, feed intake and feed efficiency. Ayssiwede *et al.* (2011) reported that administration of Moringa leaves in the ration at the level of 24%, had no effect on feed intake, weight gain and efficiency of feed utilization in chickens.

This study was conducted to evaluate effect of water extract of two leaves (*Sauropus androgynus* and *Moringa oleivera*) on the growth performance and meat cholesterol contents of broilers up to two weeks of age.

MATERIAL AND METHODS

Animals, treatments, and experimental design: This study used 180 broilers, two weeks of age, with a homogeneous body weight of 501.37 ± 6.52 grams obtained from a commercial poultry farm.

All chickens were given commercial feed specific for broiler containing 3.100 kcal/kg of Metabolizable Energy (ME); 21% of CP; 1.0% of Ca; and available phosphor of 0.45%. For the treatments, birds were placed into three groups each containing 10 birds: (1) birds were only given water as a drink, (2) birds were given 5 cc of sweet leaf extract in 100 cc of drinking water, and (3) birds were given 5 cc of *Moringa* leaf extract in 100 cc of drinking water. Each treatment was repeated 6 times for a total of 180 birds. Food and drinking liquid were given *ad libitum*. The individual birds were weighted weekly, and food consumption and drinking water was recorded daily.

Preparation of Moringa (*Moringa oleivera)* **and Sweet leaf (*Sauropus androgynus*) Extract:** Fresh leaves of the sweet leaf and *Moringa* were obtained from the local fresh food market. The leaves of both plants were blended and macerated overnight in distilled water (1:1, w/w), according (Parwata *et al*., 2015). The blended extract was then filtered using a cheese cloth. This extract was used for the treatment.

Performance and laboratory analysis

The individual birds were weighted weekly, and food consumption and drinking water was recorded daily, throughout the experimental period. Meat samples from 54 birds were allowed to clot, and the abdominal fat was harvested to determine the total serum cholesterol content. Cholesterol levels were analyzed following the Liberman-Burchard methods (Lieberman and Burchard, 1980).

Statistical analysis: All data were analyzed with analysis of variance (ANOVA) to determine the differences among treatments. If differences were found, then further analysis was performed with Duncan's multiple range test.

RESULTS

The results study shows that 5.0% *Katuk* leaf extract and 5.0% *Moringa* leaf extract in drinking water significantly increased ($P<0.05$) the average number of feed and drinking water consumption, final body weight, live weight gains, and feed efficiencies. However, were decreased significant differences ($P<0.05$) on abdominal fat and meat cholesterol level rather than control (Table 1). The average value of FCR (feed consumption : live weight gains) over four weeks of observation in the control group was 1.955/head (Table 1). This was significantly different ($P<0.05$) from birds in treatment groups B and C an average of 17.24% and 17.14%, respectively. In addition, the results show that an additional 5.0% (5 cc/100 cc) of *Katuk* and *Moringa* leaves extract in drinking water resulted in a significant ($P<0.05$) decrease in abdominal fat and levels of cholesterol in the meat of birds.

Notes:

1. A: drinking water without *Katuk* or *Moringa* leaves extract as control; (B): drinking water with 5 cc/100 cc *Katuk* water extract; and (C): drinking water with 5 cc/100 cc *Moringa* water extract, respectively.
2. SEM:Standard Error of Treatment Means
3. Means with different superscripts within raw values are significantly different ($P<0.05$)

The average value of abdominal fat over four weeks of observation in the control group was 2.55 % body weight (Table 1).

This was significantly different (P<0.05) decreased from birds in treatment groups B and C an average of 25.1% and 19.61% lowered, respectively. In addition, the results show that an additional 5.0% (5 cc/100 cc) of *Katuk* and *Moringa* leaves extract in drinking water resulted in a significant (P<0.05) decrease in levels of cholesterol in the meat, were: 13.00% and 13.62%, respectively than control.

Table 1. The effect of sweet leaf or *Katuk* (*Sauropus androgynus*) and *Moringa (Moringa oleivera)* leaf water extract added in drinking water and administered to 2-6 weeks aged of broilers to the growth performance and meat cholesterol level.

Variables	Treatments[1)]			SEM[2)]
	Group A (control)	Group B *(Katuk)*	Group C *(Moringa)*	
Feed Consumption (g/head/4 weeks)	3035.61b[3)]	3097.06a	3090.39a	10.64
Water consumption (ml/head/4 weeks)	7589.04b	7742.64a	7725.98a	26.61
Final body weight (g/head)	2067.45a	2428.88b	2422.43b	11.100
Live weight gains (g/head/4 weeks)	1553.83b	1914.84a	1908.45b	11.130
Feed conversion ratio (feed consumption **:** body weight gains)	1.955a	1.618b	1.620b	0.010
Abdominal fat (% body weight)	2.55a	1.91b	2.05b	0.070
Meat cholesterol (mg/dl)	74.13a	64.49b	64.03b	0.320

DISCUSSION

The addition of 5% *Katuk* or *Moringa* water extract into the drinking water can increase of feed intake and drinking water. This shows that the content of phytochemical compounds in the *Katuk* or *Moringa* leaves able to increase feed intake and drinking water. Result of research by Khan *et al.* (2014) that administration of *Moringa* leaf meal in the diet at the level of 2% can significantly improve weight gain, feed intake, and feed efficiency. But, Ayssiwede *et al.* (2011) reported that administration of *Moringa* leaves in the diet at the level of 24%, had no effect on feed intake, weight gain, and efficiency of feed utilization in chickens.

We measured the effects of oral administration of *Katuk* or *Moringa* leaf extract on final body weight and live weight gains in broilers. The extract increased live weight gains and feed efficiencies, but there was significant decreased on abdominal fat and meat cholesterol level in broilers. Syahruddin *et al.* (2013) reported that feed consumption and feed conversion ratio were not affected by the levels of fermented *Katuk* leaf in the diet. However, the cholesterol content in broiler carcass was significantly affected by the dietary treatments. We found that *Katuk* or *Moringa* significantly increased the efficiency of feed (feed consumption : live weight gains). This could be the a result of phytochemical contained in *Katuk* leaves and *Moringa*.

Adibmoradi *et al.* (2006) reported that administration of phytochemical contained in *Garlic* can markedly increase villus height and crypt depth. Nusairat (2007) showed that the thickness of the epithelium and the number of goblet cells in the duodenum, jejunum and ileum poultry decreased. These features can increase nutrient absorption. They concluded that the morphological changes in the intestines of birds increases digestive capacity.

According Hernandes *et al.* (2004), that plant extract supplementation improved apparent whole tract digestibility of the nutrients. Phytochemical contained in garlic administration enhanced villus height and crypt depth and decreased epithelial thickness and goblet cell numbers in duodenum, jejunum and ileum of birds (Adibmoradi *et al.,* 2006); similar results were have been shown elsewhere Nusairat (2007). Ramakrishna *et al.* (2003) reported that phytochemical contained in garlic supplementation probably enhanced the activities of the pancreatic enzymes and provided micro-environment for better nutrient utilization in rats.

Abdominal fat and cholesterol levels in meat declined markedly by administration of 5.0% *Katuk* leaves and leaves of *Moringa* extract in drinking water. According to a previous report Issa *et al.* (2012), the decrease in plasma cholesterol via phytochemical contained in garlic powder supplementation might be due to the reduction of synthetic enzymes. Significant decreases in hepatic 3-hydroxy-3-methylglutaryl-CoA reductase, cholesterol 7α-hydroxylase, fatty acid synthetase, and pentosephosphate pathway activities were seen in various fractions of garlic (petroleum ether-, methanol- and water-soluble fractions). *Katuk* leaf can lower cholesterol levels because of the content of beta-carotene (Wardiny, 2006). Reported by Wang and Keasling (2002), beta-carotene can decrease the cholesterol associated with hydroxy methyl glutaril enzyme-CoA (HMG). This enzyme plays a role in the formation of mevalonic in the biosynthesis of cholesterol. Cholesterol synthesis and synthesis of beta-carotene are derived from acetyl CoA along with mevalonic. If the consumption of beta-carotene is greater than that of saturated fatty acid, then it makes the biosynthesis process by enzyme HMG Co-A directed at beta-carotene. Thus, the saturated fatty acids are not converted into cholesterol (McGilvery and Goldstein, 1996). The lowest cholesterol level was obtained by feeding the chickens with diets containing 14% fermented *Katuk* leaf (Syahruddinn *et al*., 2013)

According Syahruddinn *et al*. (2013), more beta-carotene in diets lowers cholesterol in the carcass because beta-carotene can inhibit enzyme HMG-CoA reductase (hydroxyl metyl glutaryl-CoA). This plays a role in the formation of mevalonic acid. Mevalonic is required for cholesterol synthesis by inhibition of the enzyme that blocks formation of cholesterol (Kohlmeier and Hastings, 1995). Oka *et al.* (2016) reported that the antioxidant content in *Katuk* leaf extract is 1411.06 mg/l, which is much higher than the antioxidant content of *Moringa* leaves. However, its vitamin C content is 8.73 mg/100 ml, which is still lower than the *Moringa* leaf extract (19.13 mg/100 ml). Fermented *Sauropus androgynus* leaves offered the best broiler meat quality as indicated by lower fat and cholesterol with higher vitamin A, beta-carotene, protein, iron contents with better amino acid and fatty acid content (Santoso *et al.,* 2015). *Sauropus androgynus* leaves also reduced cholesterol in broiler meat (Santoso and Sartini, 2001) and eggs (Santoso *et al*., 2005).

According some researches, compounds that lower cholesterol and abdominal fat in broilers include drinking water with 5 cc/100 cc *Moringa* water extract and drinking water with 5 cc/100 cc *Katuk* extract, respectively, these might contain alkaloids and non-alkaloids (Santoso *et al.,* 2010), saponins (Son *et al.,* 2007), flavonoid (Shrime *et al*., 2011), and polyphenol (Ngamukote *et al*., 2011).

The reduction of cholesterol by alkaloids is due to reduction of lipogenic enzyme activities and increased bile acid excretion in the feces (Patil *et al.,* 2010). *Katuk* (*Sauropus androgynus*) leaves contain phytochemical compounds that have remarkable physiological functions. The ability of beta-carotene lowering cholesterol is closely related to the activity of the enzyme glutaril hydroxy methyl-CoA (HMG) is decreasing due to the presence of compounds phytochemical in both the leaf extract (Wang and Keasling, 2002). Preliminary observations indicate that the phytochemical compounds contained in *Katuk* leaves are flavonoids, saponins, sterols, quinone, and tannins (Santoso *et al*., 2005). According to Wardiny (2006), decreasing cholesterol content is caused by the beta-carotene in the leaves *Katuk* or *Moringa*.

CONCLUSION

We conclude that 5.0% sweet leaf or Katuk (*Sauropus androgynus*) and *Moringa (Moringa oleivera)* leaf water extract added in drinking water and administered to 2-6 weeks aged of broilers improved growth performance and may decrease both abdominal fat and meat cholesterol level in broilers up to two weeks of age.

ACKNOWLEDGEMENTS

The authors would like to thank to staff of laboratory attendants at the Nutrition Laboratory, Udayana University for their assistance in chemical analysis of the samples. We also would like to thank the Head of Magister Program of Animal Science and Rector of Udayana University for their support during this study.

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