Indonesian Journal of Veterinary Sciences
Vol. 2. No. 1 March 2021, Page. 15-19
DOI:10.22146/ijvs.v2i1.58959, ISSN 2722-421X (Online)
Available online at https://jurnal.ugm.ac.id/ijvs

Effects of Moringa Extract (*Moringa Oleifera* L.)) on Performance and Intestinal Morphology of Broiler

Pretty Riyandari [1], Febryana Saputri [1], Gizaldharatu Bunga Nirwana [1], Agustina Dwi Wijayanti[3], Yuli Purwandari K[2], Ida Fitriana[3]*

[1]Undergraduate Program Faculty of Veterinary Medicine, Gadjah Mada University, Yogyakarta
[2]Departmen of Pathology, Faculty of Veterinary Medicine, Gadjah Mada University, Yogyakarta
[3]Departmen of Pharmacology, Faculty of Veterinary Medicine, Gadjah Mada University, Yogyakarta
*Corresponding author, Email: ida.fitriana@ugm.ac.id

Received: August 22, 2020, Accepted: September 21, 2020, Published: March 1, 2021

Abstract

Chicken meat needs in Indonesia increase every year, farmers use feed supplements to improve broiler performance. The purpose of this study was to evaluate moringa leaf extract on the performance and morphology of broiler gut. Fifty Day Old Chickens (DOC) were divided into 5 treatment groups. The treatment groups were: groups with the addition of vitachick (V), treated 10% Moringa extract of drinking water (M1), 15 % Moringa extract of drinking water (M2), 30 % Moringa extract of drinking water (M3), and control of drinking water without drugs (C). Weight and feed data are taken daily to calculate Feed Conversion Ratio (FCR) and Average Daily Gain values (ADG). The treatment was carried out for 12 days. On the 13th day, the chicken is discharged and then the intestine is taken for Hematoxylin-eosin staining. Data on body weight, feed consumption and drinking water were analyzed by Anova. The FCR value of group treated with 30 % Moringa extract of drinking water has a more efficient value than the control group and other treatments. Based on statistical analysis, body weight of the group treated with of 10 %, 30 % Moringa extract and Vitachick® which were compared with controls differed significantly ($P < 0.05$). The best performance index of group with treated of 30 % Moringa extract of drinking water was 346.28. Moringa extract improves the morphology of chicken intestine. Based on these data it can be concluded that the addition of Moringa extract in drinking water for 12 days can be used as an alternative feed supplement by improving intestinal performance and morphology.

Keywords: Broiler; Intestinal Morphology; Moringa; Performance

Introduction

Chiken meat is a favorite source of animal protein. Farmers try to increase an average body weight of broilers, to get a big advantage. Farmers usually use a feed additives or feed supplement to increase an average body weight of broilers. Feed additives and feed supplement are a material that are mixed in feed that can affect healthy, productivity, and nutritional conditions of livestock, even though the material is not to meet nutritional requirements (Adams, 2000). Feed additives and feed supplement can be added through drinking water.

Feed additives are commonly used in the poultry industry, as well as for growth promotion [2]. Poultry flocks are often raised under intensive conditions using large amounts of antibiotics to prevent and to treat disease. Antimicrobial resistant poultry pathogens may result in treatment failure, leading to economic losses, but also be a source of resistant bacteria/genes (including zoonotic bacteria) that may represent a risk to human health (Nhung *et al*., 2017). Antibiotic residues in meat can cause allergies to consumers, disrupt the balance of microorganisms in the digestive tract and trigger antibiotic resistance (Sola *et al*., 2015). From that impact, government has been banned the use of antibiotic growth promotors (AGP) in Indonesia.

By the banning of use for AGP in broilers cause farmers fretful. It caused by the decrease

of average body weight in broilers while the market demand is increasing. Farmers are using feed additives derived from nutritious plants or herbs to increase the productivity of broilers, as well as replacing AGP. *Moringa oleifera* leaves is commonly known as drumstick and has many active compounds such as alkaloids, flavonoids, saponins, tannins, and triterpenoids (Wansi *et al*., 2013; Dzotam *et al*., 2016) with potent anthelmintic activity (Hegazi *et al*., 2018) and antibacterial effect (El-Kholy *et al*., 2018; Fouad *et al*., 2019).

Herbal ingredients as an alternative to feed additives is expected to replace the function of antibiotics in increasing poultry productivity and feed efficiency. Improved quality chicken products and consumer health is expected to be better by reducing the use of antibiotics. This study aims to evaluate moringa leaf extract in drinking water on the performance and morphology of broiler intestines.

Materials and Methods

This research was supported by ethical clearance declared by ethical clearance commite of the Faculty of Veterinary Medicine of Universitas Gadjah Mada, Indonesia (No. 0050/EC-FKH/ Int./2019).

Moringa leaves were dried in an oven at 50°C for 24 h, then smoothed/milled with a blender to facilitate the extraction process. The powder was weighed and then macerated with 70% ethanol (Nurmashita *et al*., 2015). The liquid extract was then evaporated until it was free of ethanol solution until the extract was viscous.

The results of the extract obtained were analyzed for its phytochemical content using the UV-Vis spectrophotometry method (UV-1800 Shimadzu) with a slit width of 2nm, using a 10-mm cell at room temperature. The extract was examined under visible and UV light in the wavelength ranging from 190 – 1100 nm for proximate analysis. For UV-VIS spectrophotometer analysis, the extract was centrifuged at 3000 rpm for 10 min and filtered through Whatman No. 1 filter paper. The sample is diluted to 1:10 with the same solvent (Sinurat *et al*., 2015). Fifty broilers used in this research. DOC are weighed, placed in each plot, and given drinking water mixed with sugar so doc can absorb energy directly. Feeds are given twice a day on 07.00 am and 17.00 pm. Drinking water are given ad libitum. Fifty chickens were divided into 5 treatment groups. The treatment groups were: treated with vitachick groups (V), treated with 10% Moringa extract of drinking water (M1), 15% Moringa extract of drinking water (M2), 30% Moringa extract of drinking water (M3), and control of drinking water without drugs (C). Weight and feed data are taken daily to calculate of Feed Conversion Ratio (FCR) and Average Daily Gain (ADG) values. The treatment was carried out for 12 days. On the 13th day, the chicken was discharged and the intestine was taken. Jejunum were collected, fixed Formalin 10%, and processed for paraffin block tissues. Jejunum tissues was stained with hematoxylin-eosin. Measurement of the length and width of the intestinal villi using ImageJ software. 1.49v. Data obtained included average body weight, FCR, mortality, length and width of intestinal villi. Data were analyzed by statistical analysis of variance (ANOVA) method using SPSS.

Results and Discussion

Analysis of the amount of flavonoid, saponin, and tanin in moringa extract can be seen in Table 1. Table 1 showed that the highest content in Moringa leaves used in the study was saponins. Several studies have explained that moringa leaves contain compounds such as saponins, triterpenoids, and tannins which have a mechanism of action by damaging bacterial cell membranes (El-Kholy *et al*., 2018; Othman and Ahmed, 2017). The antibacterial activity of Moringa extracts was evaluated to assess the antibacterial effect and the significant difference of inhibition zones appeared on *P. aeruginosa*, *Enterococcus faecalis*, and *Staphylococcus aureus* (El-Kholy *et al*., 2018; Sinurat *et al*., 2009). Mechanism of *Moringa oleifera* leaves extract which include disruption and disintegration of the cell wall and extrusion of the cytoplasmic content of bacteria (Jain *et al*., 2016).

Table 2 showed that moringa extract increasing in drink water that can increase chicken feed consumption, moringa extract caused digestion process of chicken increase and better in digesting feed because there is the increase of digestion

Tabel 1. Analysis of the amount of chemical substtance in moringa extract.

Test Parameters	Result
Amount of flavonoid (% b.b)	4,77
Saponin (% b.b)	11,78
Tanin (% b.b)	2,37
Amount of Alkaloid (ug/g)	8237,42
Steroid (ug/g)	<1

enzym so that digestion system will increase and caused chicken alimentary canal empty fast and finally chicken feed consumption will increase (Tantalo, 2009). This is probably because the amount of ingredients added to drinking water makes the aroma and taste of moringa not palatable for the chicken. The low consumption of drinking water in the chicken group treated with the addition of herbal extracts can affect the aroma and taste of drinking water.

The analysis result showed that 30% moringa extract of drinking water is influential toward chikcken weight than control group and treated with vitachick group ($P<0.05$). The group of treated with 30% moringa extract of drinking water result the heighest chicken weighy. Chicken feed consumption of the group of treated with 30% moringa extract of drinking water was lower than the control group and treated with vitachick group ($P<0.05$). Drink consumption of the group treated with vitachick was the heighest and not different with the other group (Table 2).

Chicken feed conversion the group of treated with 30% moringa extract of drinking water was lower than the group of control and the group of treated with vitachick. The number of chicken feed conversion of the group of treated with moringa extract in drinking water range of 1.3-1.4. Feed conversion is needed for explain biological efectivity of feed nutrition substances usage. Conversion of broiler strain CP 707 chicken feed that has been take care in comfort temperature in the age of five weeks was 1.62 (Santoso., 2002).

The group of treated with 30% moringa extract of drinking water result higher index perfomence than the control group, was 346.28. Perfomence index criteria shows exellent. Based on Santoso and Sudaryani (2009), perfomence index criteria of broiler is less than <300, 301 up to 325 represent enough, 326 up to 359 represent good, 351 up to 400 represent very well, and >400 represent special. Broiler chickens reared for 4 weeks set a standard performance index of 348 (Santoso and Sudaryani, 2009).

Figure 1 showed the results of the Hematoxylin-eosin staining in the intestinal organs of the group 30% moringa extract of

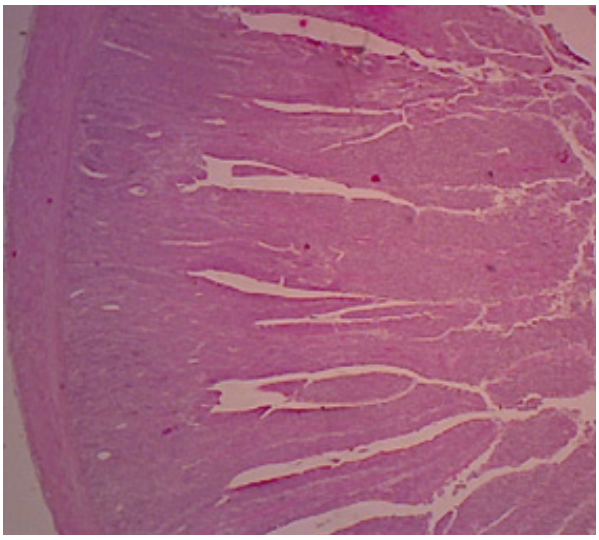

Figure 1. Result of intestines histology inspection the groups of treated with 30% moringa extract of drinking water

Table 2. Chicken perfomance

Variable	Group of Treatment				
	V	M1	M2	M3	C
Feed Consumption (g tail^{-1})	1821,04 ± 78,02^{a}	1828,4 ± 70,14^{b}	1803,9 ± 74,98^{b}	1755,65 ± 75,84^{b}	1835,5 ± 72,40^{c}
Drink Consumption (mL tail^{-1})	4598 ± 64,37^{a}	4438 ± 54,40^{a}	4529 ± 34,89^{a}	4398 ± 36,45^{a}	4431 ± 39,18^{a}
Weight (g tail^{-1})	1214 ± 50,10^{a}	1306 ± 24,76^{c}	1288,5 ± 24,65^{b}	1350,50 ± 30,45^{c}	1223 ± 43,251^{b}
Feed Conversion	1,5	1,4	1,4	1,3	1,5
Mortality	0	0	0	0	0
Perfomance index	269,78	310,95	306,78	346,28	271,78

Note: The groups of treated with vitachick (V), treated with 10% moringa extract of drinking water (M1), 15% moringa extract of drinking water (M2), 30% moringa extract of drinking water (M3), and control of drinking water without drugs (C)

Table 3. Extract moringa effect in drink water towards intestinal broiler morfology

Variable	MV	M1	M2	M3	C
length of villi (nm)	71.944	80.154	84.757	63.872	53.478
Width of villi (nm)	7.466	6.107	13.939	6.974	5.498

drinking water, the intestine seems normal, there are no pathological changes. Histologically, the epithelial surface of the small intestine was good, the intestinal villi appear complete, there is no epithelial erosion, and there is an increased activity or number of globet cells (Fig. 1). This means that treatment with moringa extract for 12 days does not affect or damage the intestines of chickens.

Treated with 10, 20, or 30% extract moringa of drinking water shows an improvement intestinal morphology (Table 3). Morphological repairment was indicated by the presence of better vili's length and width compared to the control group, with values that were almost the same as the group treated with vitachick.

In general, feed addictive functions to reduce the number of pathogenic microbes in the digestive tract of chickens, so that it can increase chicken growth by around 3.9% and increase feed usage efficiency around 2.9% [12]. Moringa leaves contain antibacterial substances such as saponins, triterpenoids, and tannins that damage the mechanism of bacterial cell membranes. One way to determine whether antibiotics compounds have a good influence on livestock growth is by examining the morphology of the small intestine [17]. Antibiotics can increase the thickness of the gastrointestinal tract and increase the number of mucous glands, which improve nutrient absorption of feed. Antibiotics in natural feed supplements can increase the area of the villi and the depth of the crypts in the small intestine and increase nutrient absorption from the feed [18]. The use of Moringa leaves as a feed additives are expected to replace the function of antibiotics in increasing the productivity of broilers and the efficiency of feed use. Improving the quality of livestock products and consumer healths are better by reducing antibiotic use.

Conclusion

The 30% Moringa extract of drink water showed higher body weight and feed consumption, lower consumption of drink water, lowest feed conversion and the best performance index compared to other groups. Moringa extract also improves intestinal morphology.

Competing Interests

The authors declare that they have no competing interests.

References

1. Adams, C.A. (2000) The role of nutricines in health and total nutrition. Proc. Aust. Poult. Sci. Sym., 12: 17-24.
2. Costa, M.C., Bessegatto, J.A., Alfieri, A.A., Weese, J.S., Filho, J.A.B., et al. (2017) Different antibiotic growth promoters induce specific changes in the cecal microbiota membership of broiler chicken. PLOS ONE, 12 (2): e0171642. https://doi.org/10.1371/journal.pone.0171642
3. Nhung, N.T., Chansiripornchai, N, and Carrique-Mas, J.J. (2017) Antimicrobial Resistance in Bacterial Poultry Pathogens: A Review. Front. Vet. Sci., 4:126. doi: 10.3389/fvets.2017.00126
4. Solà-Ginés, M., Cameron-Veas, K., Badiola, I., Dolz, R., Majó, N., Dahbi, G., Viso, S., Mora, A., Blanco, J., Piedra-Carrasco, N., González-López, J.J. and Migura-Garcia, L. (2015) Diversity of multi-drug resistant avian pathogenic Escherichia coli (APEC) causing outbreaks of colibacillosis in broilers during 2012 in Spain. PLoS One, 10(11): e0143191. https://doi.org/10.1371/journal.pone.0143191.
5. Wansi, J.D., Devkota, K.P., Tshikalange, E. and Kuete, V. (2013) 14-alkaloids from the medicinal plants of Africa. In: Kuete V, editor. Medicinal Plant Research in Africa. Elsevier, Oxford. p 557-605.
6. Dzotam, J.K., Touani, F.K. and Kuete, V. (2016) Antibacterial and antibiotic-modifying

activities of three food plants (*Xanthosoma mafaffa Lam*., *Moringa oleifera* (L.) Schott and Passiflora edulis Sims) against multidrug-resistant (MDR) Gram-negative bacteria. BMC Complement. Altern. Med., 16(9): 1-8.

7. Hegazi, A.G., Megeed, K.N.A., Hassan, S.E., Abdelaziz, M.M., Toaleb, N.I., El Shanawany, E.E. and Aboelsoued, D. (2018) Comparative ovicidal activity of *Moringa oleifera* leaf extracts on *Fasciola gigantica* eggs. Vet. World, 11(2): 215-220.
8. El-Kholy, K.H., Barakat, S.A., Morsy, W.A., Abdel- Maboud, K., Seif-Elnaser, M.I. and Ghazal, M.N. (2018) Effect of aqueous extract of *Moringa oleifera* leaves on some production performance and microbial ecology of the gastrointestinal tract in growing rabbits. Pak. J. Nutr., 17(1): 1-7.
9. Fouad, E.A., Abu-Elnaga, A.S.M. and Kandil, M.M. (2019) Antibacterial efficacy of *Moringa oleifera* leaf extract against pyogenic bacteria isolated from a dromedary camel (*Camelus dromedarius*) abscess, Vet. World, 12(6): 802-808.
10. Othman, A.S. and Ahmed, N.A. (2017) Antibacterial Effect of the Ethanol Leaves Extract of *Moringa oleifera* and *Camellia sinensis* against Multi Drug Resistant Bacteria. Int. J. Pharmacol., 13: 156-165.
11. Nurmashita, D., Rijai, L., dan Sulistiarini, R. (2015). Pengaruh Penambahan Ekstrak Daun Kemangi (Ocimum basilicum L.) terhadap Aktivitas Antibakteri Basis Pasti Gigi. Jurnal Sains dan Kesehatan.1(4): 159-167.
12. Sinurat, A.P. Purwandaria, T., Bintang, L.A.K., Ketaren, P.P., Bermawie, N., Rahardjo, M., Rizal, M. (2009). Pemanfaatan kunyit dan temulawak sebagai imbuhan pakan untuk ayam broiler. JITV. 14 (2): 90-96
13. Jain, P.K., Soni, A., Jain, P. and Bhawsar, J. (2016) Phytochemical analysis of Mentha spicata plant extract using UV-VIS, FTIR and GC/MS technique. J. Chem. Pharm. Res., 8(2):1-6
14. Tantalo S. (2009). Perbandingan performans dua *strain* broiler yang mengkonsumsi air kunyit. *Jurnal Ilmiah Ilmu-ilmu Peternakan* 12(3): 146-152.
15. Santoso, U. 2002. Pengaruh tipe kandang dan pembatasan pakan di awal pertumbuhan terhadap performans dan penimbunan lemak pada ayam pedanging unsexed. JITV 7(2): 84-89
16. Santoso H, Sudaryani T. (2009). Pembesaran Ayam Pedaging di Kandang Panggung Terbuka. Jakarta (ID): Penebar Swadaya.
17. Sinurat, A.P. (2017). Kebijakan Pengendalian Penggunaan Antibiotic Growth Promoters dan Ractopamine dalam Mendukung Keamanan Pangan Nasional. Bogor: Pust Penelitian dan Pengembangan Peternakan.
18. Wardhana, Y.W. dan Kuniawansyah, I.S. (2012). Uji Aktivitas Anti Bakteri Rimpang Temulawak (Curcuma Xanthorrhiza Roxb) Terhadap Staphylococcus aureus, Staphylococcus epidermidis dan Streptococcus mutans Menggunakan Konsentrasi Hambat Tumbuh Minimum (KHTM). Conference: Seminar Nasional Kimia Bahan Alam, At Universitas Islam Negeri Syarif Hidayatullah Jakarta. 1-8.