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Application of *Moringa oleifera* Extract in Feed and Drinking Water as a Feed Additive for Broiler Chickens: A Meta-Analysis Study

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Abstract. Herbal plants in animal feed offers a more natural and safer alternative than synthetic antibiotics, which can lead to bacterial resistance and leave residues in poultry products. This meta-analysis study evaluated the potential of Moringa (*Moringa oleifera*) leaves extract as a feed additive for broiler chickens, comparing two administration methods, inclusion in feed or dilution in drinking water. Data were obtained from 29 relevant articles sourced from Google Scholar and Scopus, resulting in the analysis of 123 studies using SAS software. The results showed that administering Moringa leaves in feed significantly increased final body weight and improved feed conversion ratio (FCR), with an average FCR value of 1.92. No significant effects (P>0.05) on were identified in Moringa-boost drinking water. The average final weight of chickens given Moringa in feed compared to in drinking water was 2.09 kg vs. 2.04 kg. The carcass yield from Moringa extract in feed compared to drinking water was 71.11% vs. 78.35%. Conclusively, solid Moringa leaf extract at a dose of 0.71–1.04% is a more effective feed additive because higher dosages induce anti-nutritional factors like tannins and saponins that reduce performance. This finding offers a valuable reference for farmers to utilize local resources in cost-effective and eco-friendly way to enhance broiler chicken production efficiency.

Keywords: *Moringa oleifera*, broiler chickens, feed additive, performance, meta-analysis

Abstrak. Penelitian ini bertujuan untuk mengevaluasi potensi daun kelor (*Moringa oleifera*) sebagai imbuhan pakan pada ayam broiler melalui pendekatan meta-analisis. Penelitian ini secara khusus membandingkan dua metode pemberian: penambahan dalam pakan dan pengenceran dalam air minum. Penggunaan tanaman herbal dalam pakan ternak memberikan solusi lebih alami dan lebih aman dibandingkan penggunaan antibiotik sintetis yang dapat menimbulkan resistensi dan residu pada produk ternak. Data diperoleh dari 29 artikel yang relevan dari database Google Scholar dan Scopus, menghasilkan 123 studi yang dianalisis secara statistik menggunakan software SAS. Hasil penelitian menunjukkan bahwa pemberian daun kelor dalam pakan memiliki efek signifikan pada peningkatan bobot badan akhir dan konversi pakan (Feed Conversion Ratio, FCR) dengan nilai rata-rata FCR sebesar 1.92. Sebaliknya, pemberian daun kelor melalui air minum tidak memberikan pengaruh yang signifikan (P>0,05). Rata-rata bobot badan akhir ayam yang diberi kelor dalam pakan mencapai 2.09 kilogram, lebih tinggi dibandingkan pemberian melalui air minum yang hanya mencapai 2.04 kilogram. Persentase karkas yang diperoleh dari pemberian ekstrak daun kelor dalam pakan adalah 71.11%, sedangkan melalui air minum mencapai 78.35%. Penelitian ini menyimpulkan bahwa ekstrak daun kelor lebih efektif diberikan dalam bentuk pakan pada dosis optimal sebesar 0.71–1.04%. Dosis yang lebih tinggi justru dapat menurunkan performa akibat efek anti-nutrisi seperti tanin dan saponin. Hasil penelitian ini dapat menjadi referensi bagi peternak dalam memanfaatkan sumber daya lokal untuk meningkatkan efisiensi produksi ayam broiler secara ekonomis dan ramah lingkungan.

Kata kunci: *Moringa oleifera*, ayam broiler, imbuhan pakan, performa, Meta-Analisis.

Introduction

Antibiotics are chemical compounds that inhibit or kill microorganisms (excluding viruses), utilized to prevent infections and promote growth of broiler chickens. However, antibiotics leave residues in chicken carcasses, causing resistance, allergic reactions, toxicity, disruption of gut flora, immune response issues, and environmental and economic impacts (Etikaningrum and Iwantoro, 2017). Antibiotics commonly detected in meat include penicillin, and others. To address these negative effects, the Indonesian government issued Law No. 18 of 2009, which prohibits the use of hormones or antibiotics in animal feed, eventually reducing antibiotics for livestock (Cundawan et al., 2020).

Herbal plants have been used for livestock, including poultry in small and medium farms, as

feed additives to replace expensive synthetic drugs (Sudirman, 2017). Herbal supplements for poultry can increase disease resistance and enhance feed efficiency, resulting in healthier and more eco-friendly animal products (Ministry of Agriculture, 2021). Moringa (*Moringa oleifera*), a potential feed additive, is easy low-maintenance, prolific, and nutrient-densed with protein, flavonoids, and saponins, which act as antioxidants and reduce cholesterol (Putra et al., 2016; Rossida et al., 2019). While Moringa leaves can improve broiler performance of weight gain and feed efficiency, different dosage and administration method may produce varying results (Prasetiyo, 2015).

Trisna et al. (2014) revealed that administering 5% *Moringa oleifera* leaf extract through drinking water for broiler chickens aged 2-6 weeks result in an efficient feed conversion ration (FCR) while increasing their feed intake, water consumption, final body weight, and weight gain. Other study report that supplying Moringa extract up to 20% in drinking water does not affect on carcass percentage (Munandar, 2021), and that 60ml/l dosage drinking water does not significantly affect the carcass percentage and abdominal fat percentage of 5-week-old broiler chickens (Jefri et al., 2020). These varied findings highlight the importance of further meta-analysis studies to summarize the potential of Moringa leaves as a broiler feed additive. Meta-analysis allows for the generalization of results from multiple studies, providing more accurate guidance on the optimal dosage of Moringa leaves in livestock feed.

Materials and Methods

Database Development

We built a database of published articles retrieved from Google Scholar and Scopus with the key words of kelor, performance, carcass, broiler chicken, feed additive, *Moringa oleifera*, and carcass yield. These keywords were connected using Boolean operators (AND or OR), resulting in 983 articles which were screened using the PRISMA flow diagram with Microsoft Excel and Mendeley (Figure 1). Data from 29 most relevant articles articles were then extracted in the meta-analysis and compiled into a Microsoft Excel database. All parameters were converted to the same unit for uniformity and analyzed simultaneously using SAS software.

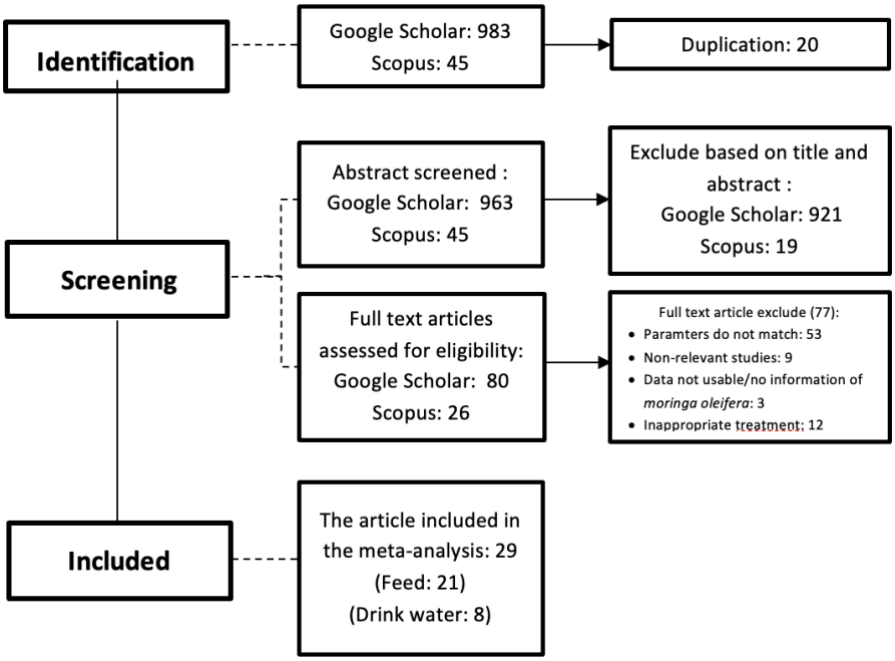

Figure 1. The preferred reporting items for systematic reviews and meta-analysis (PRISMA) flow chart of the literature review process

Table 1. Relevant articles include in the meta-analysis

Reference	Experiment	Studi	Mol Level	Nation	Treatment
Ahmad et al (2017)	2	7	0 - 1.5 %	Pakistan	Feed
Ahmad et al (2018)	2	6	0 - 1.5 %	Pakistan	Feed
Aiyedun et al (2020)	1	4	0 - 0.6 %	Nigeria	Feed
Alabi et al (2017)	2	6	0 - 0.15 %	South Africa	Water
Alabi et al (2020)	2	5	0 - 0.12 %	South Africa	Water
Ansari et al (2020)	1	5	0 - 0.5 %	India	Feed
Antyev et al (2020)	1	6	0 - 1 %	Nigeria	Feed
Arif et al (2019)	1	4	0 - 0.6 %	South Africa	Feed
Ayeni et al (2022)	1	7	0 - 0.02 %	Nigeria	Feed
Bünyamin et al (2018)	1	3	0 - 1 %	Turkey	Feed
Daramola and Temidayo (2019)	1	5	0 - 0.1 %	Nigeria	Feed
Daud et al (2022)	1	3	0.50%	Indonesia	Feed
Egbu et al (2022)	1	2	0 - 0.12 %	South Africa	Water
El Shabrawy et al (2022)	1	4	0 - 0.000125 %	Egypt	Water
Hussein and Jassim (2019)	1	5	0 - 0.006 %	Iraq	Feed
Islam et al (2024)	1	5	2%	Bangladesh	Feed
Julie A. Manuel (2015)	1	5	0 - 0.075 %	Phillippines	Water
Kairalla et al (2023)	1	4	0 - 0.75 %	Libya	Feed
Maha A. Abd El Latif (2022)	1	6	0.50%	Egypt	Feed
Ma'rifah et al (2023)	1	5	0 - 0.5 %	Indonesia	Feed
Mendoza et al (2020)	1	6	0 - 0.015	Mexico	Feed
Nkukwana et al (2015)	1	5	0 - 0.025 %	South Africa	Feed
Ogunsipe et al (2022)	1	6	0 - 1 %	Nigeria	Feed
Omar et al (2020)	1	5	0 - 0.0008 %	Egypt	Feed
Paul (2018)	1	3	0 - 1 %	Bangladesh	Water
Riwu et al (2024)	1	2	0 - 0.12 %	Indonesia	Water
Sugiharto et al (2018)	1	3	0 - 1 %	Indonesia	Feed
Ufele et al (2020)	1	5	0.01 - 0.02 %	Nigeria	Feed
Zeid et al (2023)	1	4	0 - 0.18 %	Egypt	Water

Table 2. Descriptive statistics of the database used for meta-analysis

Parameter	Unit	n	Mean	SD	Min	Max
			Feed			
Performance						
FW	gr	69	2088.26	263.51	1493.50	2575
WG	gr	56	2032.27	319.70	1495	2606.59
AWG	gr	36	51.61	16.45	22.46	98.5
FI	gr	73	3928.37	946.49	2138.40	5843.10
DFI	gr	25	94.12	31.21	36.75	151.34
DWI	ml	4	188.59	8.34	179.46	199.69
FCR	-	87	1.92	0.33	1.38	2.78
Carcass						
DW	gr	28	1571.44	324.14	1006.13	1980
CY	%	60	71.11	8.47	52.38	91.59
			Water			
Performance						
FW	gr	30	2039.06	292.13	1435.30	2448.00
WG	gr	17	1543.51	537.82	708.98	2407.50
FI	gr	20	3264.34	472.39	2652.64	4316.00
FCR	-	20	2.29	0.89	1.48	4.53
Carcass						
DW	gr	11	2073.27	158.78	1918.00	2390.00
CY	%	19	78.35	11.02	64.23	94.93

Note: FW = final weight; WG = weight gain; AWG = average weight gain; FI = feed intake; DFI = daily feed intake; DWI = daily water intake; FCR = feed conversion ratio; DW = dressed weight; CY = carcass yield; n = number of studies; SD = standard deviation; Min = minimum value; Max = maximum value.

Table 3. Meta-analysis of the effect of *Moringa oleifera* usage as a feed additive on broiler performance

Response parameter	Unit	n	Model	Parameters Estimates				AIC	Trend	
				Intercept	SE Intercept	Slope	SE slope	P-Value		
Feed										
FW	gr	69	Q	2018.8	67.738	-185.55	70.721	0.0050	856.2	-
			L			274.92	93.741	0.0132		+
WG	gr	56	Q	1992.3	101.58	-230.62	77.248	0.0047	690.0	-
			L			366.24	99.456	0.0007		+
AWG	gr	36	L	52.421	5.5627	-3.8673	5.4728	0.4866	619.0	-
FI	gr	73	L	3790.7	224.82	69.520	133.90	0.6058	986.9	+
DFI	gr	25	L	91.314	12.952	15.838	14.983	0.3053	159.6	+
FCR	-	87	Q	1.9262	0.0700	0.1298	0.0679	0.0602	-69.2	+
			L			-0.2698	0.0837	0.0020		-
DW	gr	28	L	1534.1	137.54	221.10	109.26	0.0573	323.6	+
CY	%	60	L	70.724	2.2105	3.6523	1.9588	0.0689	293.7	+
Water										
FW	gr	34	Q	2008.0	109.86	178.03	637.70	0.28	362.6	+
			L			-96.051	607.12	-0.16		-
WG	gr	17	Q	1655.36	304.04	6602.8	14834	0.45	186.7	+
			L			-684.67	2220.4	-0.31		-
FI	gr	20	L	3271.62	231.70	1036.9	722.30	0.144	230.3	+
FCR	-	20	L	2.0191	0.4678	3.5885	2.1999	0.1268	27.9	+
DW	gr	15	Q	2128.28	129.83	5258.9	12940	0.41	90.9	+
			L			-1628.9	1709.1	-0.95		-
CY	%	19	L	77.2023	6.3303	5.3797	23.326	0.8212	70.1	+

Notes: FW = final weight; WG = weight gain; AWG = average weight gain; FI = feed intake; DFI = daily feed intake; DWI = daily water intake; FCR = feed conversion ratio; DW = dressed weight; CY = carcass yield; n = number of studies; SD = standard deviation; Min = minimum value; Max = maximum value; n: number of studies; Q: quadratic; L: linear; AIC: Akaike information criterion

The observed parameters included live weight, weight gain, average weight gain, feed intake, daily feed intake, daily water intake, feed conversion ratio (FCR), dressed weight, and carcass yield percentage. Descriptive statistics are presented in Table 2.

Data Analysis

This study applied quantitative, meta-analysis approach, utilizing statistical analysis to summarize quantitative data from the literature (Sauvant et al., 2008). The meta-analysis approach referred to Sauvant et al. (2008) and St. Pierre (2001), using the mixed model procedure in SAS software.

Results and Discussion

Broiler Performance and Carcass

The database's descriptive statistics (see Table 3) included 123 studies from 29 relevant articles reporting *Moringa oleifera* as a feed additive for broilers, with an average inclusion level of 0.30%. The research findings show that using Moringa leaves as a feed supplement for broiler chickens has a mixed effect on their performance and carcass yield. Specifically, adding Moringa leaves to their feed significantly decreases weight gain and the feed conversion ratio (FCR), exhibiting a quadratic effect ($P<0.01$). However, when Moringa leaves are provided in drinking water, there is no significant impact ($P>0.05$) on final weight, weight gain, or dressed weight.

Final Body Weight

In terms of final body weight, chickens receiving *Moringa oleifera* in their feed had a higher average of 2,088.26 grams compared to those receiving it through drinking water, which averaged 2,039.06 grams. This suggests that

Moringa oleifera may be more effective for growth when administered via feed, likely due to more consistent dosage.

The p-value for final body weight in broilers supplemented with *Moringa oleifera* through feed is 0.0050, indicating a statistically significant effect ($p < 0.05$). This suggests that *Moringa oleifera* in feed positively influences the final body weight of broilers. In contrast, the p-value for final body weight when given through drinking water is 0.28, indicating no significant effect. Therefore, *Moringa oleifera* appears to enhance final body weight more effectively when provided in feed rather than in drinking water.

Moringa oleifera is rich in essential nutrients like protein, calcium, potassium, magnesium, and phosphorus, along with trace minerals such as iron and zinc, which are found in higher concentrations than in many other vegetables. These nutrients support broiler growth by boosting metabolism and enhancing nutrient absorption. Additionally, *Moringa oleifera* contains bioactive compounds with antimicrobial properties that can help reduce pathogenic bacteria, thereby promoting better health and development in broiler chickens (Olugbemi et al., 2010; Yameogo et al., 2011; Ogbe & Affiku, 2011; Abbas, 2013; Gopalakrishnan et al., 2016; Voemesse et al., 2018).

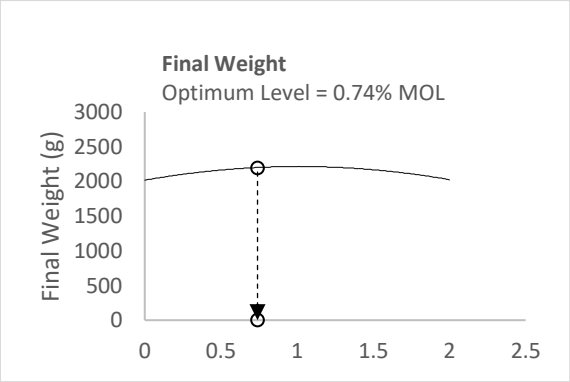

Figure 2. The optimum level of giving *Moringa oleifera* to the final weight of broiler chickens in the feed form

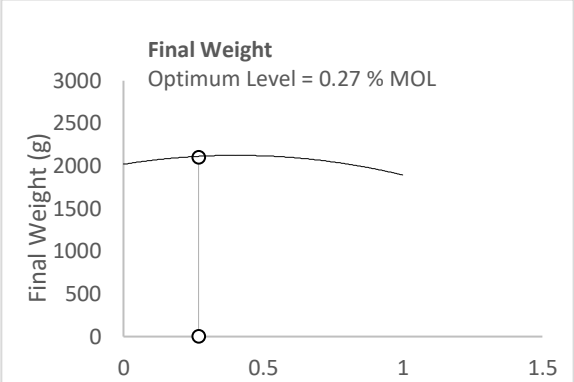

Figure 3. The optimum level of giving *Moringa oleifera* to the final weight of broiler chickens in the water form

Figures 2 and 3 indicate that *Moringa oleifera* had the best effect on the final weight of broilers when administered at 0.74% through feed and 0.27% through drinking water. The feed method led to a greater final weight, likely due to a more consistent dosage. Excess levels beyond this optimum resulted in reduced growth, highlighting the importance of correct dosing.

Carcass Weight and Percentage

According to Table 2, using *Moringa oleifera* as a feed additive resulted in an average carcass weight of 1,571.44 grams and a carcass yield percentage of 71.11% when given through feed. In contrast, providing Moringa leaves through drinking water resulted in a higher average carcass weight of 2,073.27 grams and a carcass yield percentage of 78.35%. While this percentage is higher than that achieved through feed, the difference is not statistically significant ($P>0.05$). This suggests that, although supplying Moringa leaves in drinking water can slightly improve carcass yield, the effect remains minimal and insignificant.

The analysis indicated that carcass weight followed a linear trend, with a nearly significant increase ($P=0.057$), particularly at low to moderate dosage levels. However, the carcass percentage followed a quadratic trend, indicating that optimal dosages of Moringa

leaves led to better results, while higher dosages decreased carcass yield due to anti-nutritional effects.

Previous studies support the connection between body weight and carcass weight. Research by Akhadiarto (2010) and Sjofjan (2008) suggests that heavier chickens typically produce higher carcass yields, generally ranging from 65% to 75% in broilers (Daud et al., 2007). These findings emphasize the need to optimize both the dosage and method of Moringa leaf administration to maximize carcass yield.

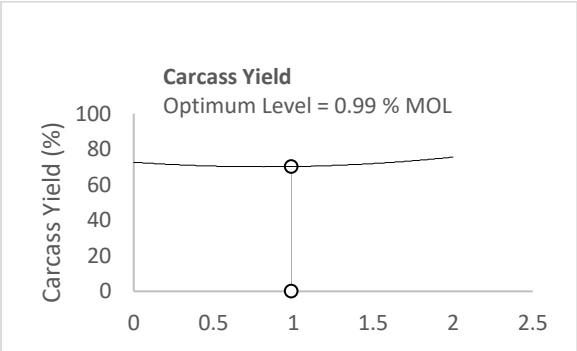

Figure 4. The optimum level of giving *Moringa oleifera* to the carcass Yield of broiler chickens in feed form

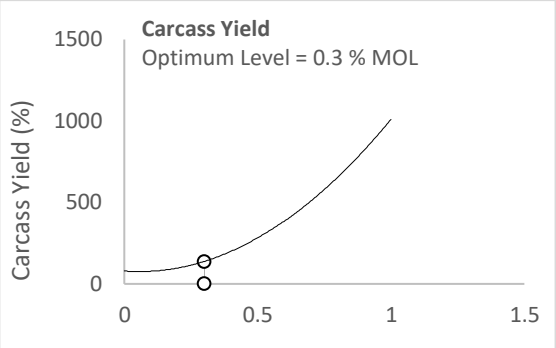

Figure 5. The optimum level of giving *Moringa oleifera* to the carcass yield of broiler chickens in the feed form

Figures 4 and 5 reveal that the ideal level of *Moringa oleifera* for enhancing carcass yield in broiler chickens was 0.99% when administered through feed and 0.3% through drinking water. The feed method showed a more consistent and effective increase in carcass yield at higher concentrations. Meanwhile, the water method exhibited a steep upward trend, indicating potential benefits even at lower levels. These results suggest that both methods can improve carcass yield, with the feed method allowing for higher optimal dosages.

Feed Intake

According to Table 2, administering *Moringa oleifera* as a feed additive resulted in an average feed intake of 3,928.37 grams, which had a statistically significant impact ($P<0.01$). Including Moringa leaves in the feed seems to enhance the appetite of broilers, potentially boosting growth. In contrast, broilers that consumed Moringa leaves through drinking water had a lower average feed intake of 3,264.34 grams, with no significant effect ($P>0.05$). This difference is likely due to inconsistent water consumption among the chickens, which reduced the treatment's effectiveness.

A linear model indicated that as the dosage of Moringa leaves increased, feed intake also rose, with no negative effects noted at higher doses. However, water-based supplementation did not consistently affect feed consumption, likely due to the uneven distribution of Moringa leaves among the chickens. While some studies reported no significant impact of Moringa on feed consumption, others emphasized its potential to improve feed efficiency, especially when given at optimal levels (Alibi et al., 2017).

Figures 6 and 7 illustrate the influence of *Moringa oleifera* on feed intake in broiler chickens. The ideal inclusion level was found to be 0.3% when administered through feed (Figure 6) and 0.41% when provided through drinking water (Figure 7). Feed intake increased with *Moringa oleifera* in feed form up to the optimal level, while intake showed a slight decline when administered through water. This suggests that *Moringa oleifera* is more effective in promoting feed intake when included in feed, likely due to better palatability and stability compared to water administration.

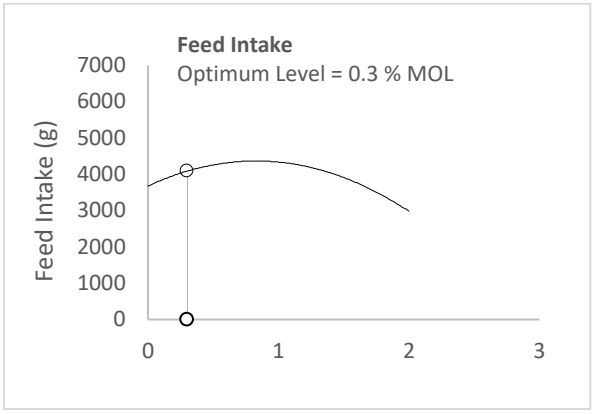

Figure 6. The optimum level of giving *Moringa oleifera* to the feed intake of broiler chickens in feed form

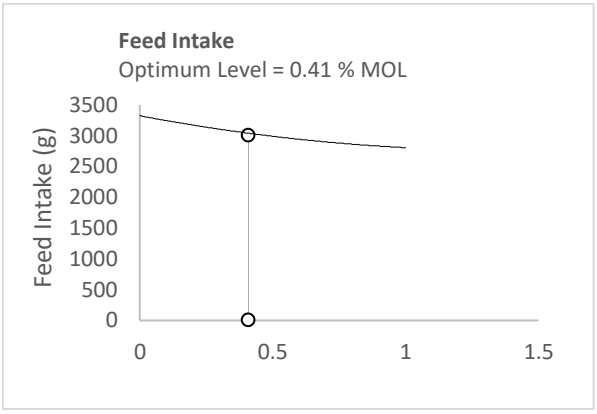

Figure 7. The optimum level of giving *Moringa oleifera* to the feed intake of broiler chickens in water form

Feed Conversion Ratio

In terms of Feed Conversion Ratio (FCR), the use of *Moringa oleifera* leaves in broiler chickens resulted in a lower FCR of 1.92 when given through feed. This reflects a significant improvement in feed conversion efficiency ($P<0.01$), indicating that chickens consuming Moringa leaves in their feed converted feed into body weight more effectively. On the other hand, chickens receiving Moringa leaves via drinking water had a higher average FCR of 2.29, which was not statistically significant ($P>0.05$). This suggests that administering Moringa leaves through drinking water is less effective, possibly due to uneven dosage distribution among flock.

A quadratic model analysis revealed that administering Moringa leaves at low to moderate doses significantly reduced FCR ($P<0.01$), enhancing feed efficiency. However, the FCR value increased at higher doses, indicating a decline in feed efficiency. This effect is likely due to anti-nutritional compounds like tannins and saponins found in Moringa leaves, which can affect appetite and feed palatability. Therefore, finding the right dosage of Moringa leaves for broiler feed is essential to maintain FCR efficiency.

According to Wijayanti (2011), variations in FCR can be attributed to the differences between the amount of feed consumed and the resulting body weight gain. The tannins and saponins present in Moringa leaves might contribute to bitterness, reducing the chickens' appetite and decreasing feed consumption efficiency. Thus, while Moringa leaves can be a beneficial feed additive, it is crucial to determine the appropriate dosage to avoid diminished efficiency due to these anti-nutritional effects.

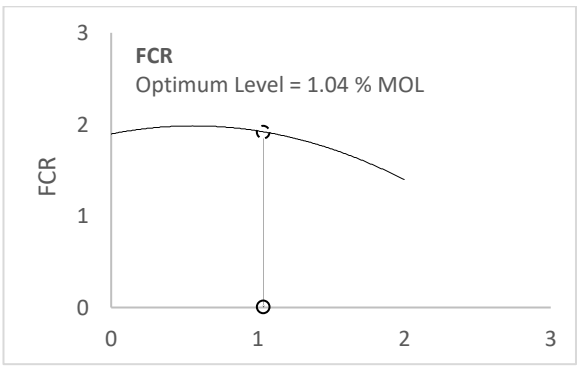

Figure 8. The optimum level of giving *Moringa oleifera* to the FCR of broiler chickens in feed form

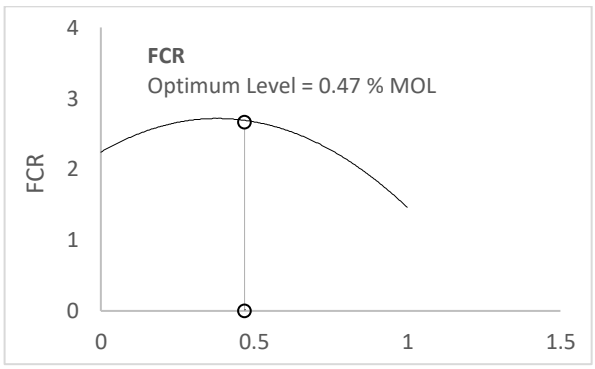

Figure 9. The optimum level of giving *Moringa oleifera* to the FCR of broiler chickens in water form

Figures 8 and 9 depict the impact of *Moringa oleifera* on FCR in broiler chickens. The optimal levels were found to be 1.04% in feed form and 0.47% in water form. Both graphs illustrate a decrease in FCR up to the optimal point, indicating improved feed efficiency. A lower FCR value signifies better growth performance, suggesting that *Moringa oleifera* in feed form enhances feed utilization in broilers.

Conclusions

Research on using *Moringa oleifera* as a feed additive for broilers has shown varying effects based on the amount and method of administration. When Moringa leaves were added to feed at low to moderate levels, they significantly improved the birds' final body weight and FCR. However, at higher levels, the effectiveness declined due to the presence of anti-nutritional compounds like tannins. In contrast, providing Moringa leaves through drinking water did not have a significant impact on the broiler's performance.

The ideal amount of Moringa leaves in feed was found to be between 0.71% and 1.04%, while a suitable level for water supplementation was 0.23%. Higher concentrations resulted in reduced benefits because of these anti-nutritional effects. These results suggest that *Moringa oleifera* has the potential to improve broiler production efficiency in a cost-effective and environmentally friendly way. Further research on optimizing dosages and exploring alternative delivery methods could enhance the advantages of Moringa supplementation.

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References

Abidin Z. 2002. Meningkatkan Produktivitas Puyuh Si Kecil yang Penuh Potensi. *Agro Media Pustaka*. Jakarta.

Akhadiarto S. 2010. Pengaruh Pemberian Probiotik Temban, Biovet dan Biolacta Terhadap Persentase Karkas, Bobot Lemak Abdomen dan Organ Dalam Ayam Broiler. *Jurnal Sains dan Teknologi Indonesia*, 12(1) : 53-59.

Alibi O, A Malik, J Ng'ambi, P Obaje, B Ojo. 2017. Effect of Aqueous *Moringa oleifera* (Lam) Leaf Extraction Growth Performance and Carcass Characteristics of Hubbard Broiler Chicken. *Brazilian Journal Poultry Science*, 19 : 273–280.

Badan Standarisasi Nasional. 2009. Mutu Karkas Dan Daging Ayam, Jakarta: *Badan Standarisasi Nasional* (SNI 3924:2009).

Banjo OS. 2012. Growth and Performance as Affected by Inclusion of *Moringa oleifera* Leaf Meal in Broiler Chicken Diet. *Journal Biology Agriculture Healthcare*. 2 : 35-38.

Boki I. 2020. Pengaruh Pakan Komersial Terfermentasi EM4 Terhadap Pertambahan Bobot Badan, Konsumsi Pakan, dan Konversi Pakan Ayam Broiler. J*ournal of Animal Science*, 5(2) : 28-30.

Cundawan AJ, IW Sudira, and Siswanto. 2020. Uji residu antibiotika pada hati sapi bali di beberapa pasar daerah di Provinsi Bali. *Buletin Veteriner Udayana*, 12(1): 39-44.

Daud M, WG Piliang, and P Kompiang. 2007. Persentase dan kualitas karkas ayam pedaging yang diberi probiotik dan prebiotik dalam ransum. *JITV*, 12(3): 167-174.

Daud M. 2006. Presentase dan Kualitas Karkas Ayam Pedaging yang diberi Probiotik dan Prebiotik dalam Ransum. *Jurnal Ilmu Ternak*, 6(2) : 167-174.

Desy KU, and OR Puspitarini. 2021. Potensi Tepung Daun Kelor (Moringa oliefera) sebagai Feed Additive Broiler (Literature Review). *Jurnal Dinamika Rekasatwa*, 4(1) : 46-52.

Fadilah, R., Iswandari, A. d Polana, A. 2007. Kunci Sukses Beternak Ayam Broiler Di Daerah Tropis. *Agromedia Pustaka*. Jakarta.

Fadli, C. 2015. Pertambahan Bobot Badan Ayam Broiler Dengan Pemberian Ransum Yang Berbeda. *Lentera*, 15 : 36-44.

Fijana M, E Suprijatna and U Atmomarsono. 2012. Pengaruh Proporsi Pemberian Pakan pada Siang Malam Hari dan Pencahayaan pada Malam Hari Terhadap Produksi Karkas Ayam Broiler. *Anim. Agric*, 1(1) : 697-710.

Hernandez FJ, V Madrid, J Garcia, Orengo, and MD Megias. 2004. Influence of two plants extracts on broilers performance, digestibility, and digestive organ size. *Poult.Sci*, 83 : 169-174.

Imamudin UA, and MH Nasoetion. 2012. Pengaruh Berbagai Frekuensi Pemberian Pakan pada Pembatasan Pakan Terhadap Produksi Karkas Ayam Broiler. *Anim. Agric*, 1(1) : 87-89.

Irawan I, Sunarti and LD Mahfudz. 2012. Pengaruh Pemberian Pakan Bebas Pilih Terhadap Kecernaan Protein Burung Puyuh (Coturnix Japonica). *Animal Agriculture Journal*, 1(2) : 238-245.

Isnan W and M Nurhaedah. 2017. Ragam Manfaat Tanaman Kelor (*Moringa oleifera* Lam.) Bagi Masyarakat, *Info Teknis Eboni*, 14 : 63-75.

Jayanata CE and B Harianto. 2011. Hari Panen Ayam Broiler. Agromedia Pustaka. Jakarta.

Jefri IK, H Has, and L Malesi. 2020. Pengaruh pemberian sari daun kelor melalui air minum terhadap bobot potong, persentase karkas, giblet dan lemak abdominal ayam broiler umur 5 minggu. *JIPHO*, 2(3): 253-256.

Kartasudjana R and S Edjeng. 2006. Manajemen Ternak Unggas. Penebar Swadaya. Jakarta

Kementerian Pertanian Badan Penelitian dan Pengembangan Pertanian,. 2021. Tanaman Obat Warisan Tradisi Nusantara Untuk Kesejahteraan Rakyat. *Kementrian Pertanian*, Provinsi Jawa Barat. Bogor.

Liberati A, DG Altman, J Tetzlaff, C Mulrow, PC Gøtzsche, JPA Ioannidis, M Clarke, PJ Devereaux, J Kleijnen, and D Moher. 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ (Clinical research ed.)*. Volume 339.

Muiz A. 2016. Pengaruh Penggunaan Tepung Daun Binahong sebagai Feed Additive Terhadap Kualitas Karkas Ayam Pedaging. *Jurnal Agrisains*, 17(1) : 54-61.

Munandar I. 2021. Pengaruh pemberian larutan daun kelor (*Moringa oleifera*) dalam air minum terhadap berat badan akhir dan parsentase karkas pada ayam broiler. *Skripsi*. Fakultas Pertanian Universitas Bosowa Makassar.

Oktaviana D, and ES Zuprizal. 2010. Pengaruh Penambahan Ampas Virgin Coconut Oil Dalam Ransum Terhadap Performans dan Produksi Karkas Ayam Broiler. *Buletin Peternak*. 34 : 159-164.

Otemusus K. 2018. Perbandingan Penggunaan Dua Jenis Ransum terhadap Pertambahan Bobot BadanHarian (PBBH) Konsumsi Ransum dan Konversi Ransum Broiler. *Journal of Animal Science*, 3(3) : 35-37.

Page MJ, JE McKenzie, PM Bossuyt, I Boutron, TC Hoffmann, CD Mulrow, L Shamseer, JM Tetzlaff, EA Akl, SE Brennan, R Chou, J Glanville, JM Grimshaw, A Hróbjartsson, MM Lalu, T Li, EW Loder, EM Wilson, S McDonald, LA McGuinness, LA Stewart, J Thomas, AA Tricco, VA Welch, P Whiting, and D Moher. 2021. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ*, 372 : 1-9.

Prasetiyo MA. 2015. Efek Pemberian Vitamin E Terhadap Kadar SGOT dan SGPT Serum Darah Tikus Putih (Rattus Norvegicus) Jantan Galur Wistar yang Diberi Aktivitas Fisik. *Skripsi.* Universitas Negeri Semarang.

Putra IDWP, AA Dharmayudha AAGO, and LM Sudimartini. 2016. Identifikasi Senyawa Kimia Ekstrak Etanol Daun Kelor (*Moringa oleifera* L) di Bali. *Jurnal Indonesia Medicus Veterinus*, 5(5) : 464-473.

Rasyaf M. 1993. Beternak Ayam Pedaging. Edisi Revisi. *Penebar Swadaya*. Jakarta.

Resnawati. 2004. Bobot Potongan Karkas dan Lemak Abdomen Ayam Ras Pedaging yang diberi Ransum Mengandung Tepung Cacing Tanah. *Pusat Penelitian Dan Pengembangan Peternakan*, Bogor.

Rihi JL. 2004. Produksi karkas dan kualitas fisik daging kelinci lokal yang diberi kosentrat dengan level protein berbeda. *Buletin Peternakan*, 28 (2): 65-71.

Rossida KFP. et al. 2019. Pengaruh imbuhan tepung daun kelor (*Moringa oleifera* Lam.) dalam pakan pada kandungan protein dan kolesterol telur itik pengging (Anas platyrhyncos domesticus L.). *Jurnal Biologi Tropika*, 2(2) : 41–47.

Saputri GR, Tutik, and AI Permatasari. 2019. Penetapan Kadar Protein pada Daun Kelor Muda dan Daun Kelor Tua (*Moringa oleifera* L.) dengan Menggunakan Metode Kjeldahl. *Jurnal Analis Farmasi*, 4 (2): 108-116.

Sio AK, OR Nahak, and AA Dethan. 2015. Perbandingan Penggunaan Dua Jenis Ransum Terhadap PBBH, Konsumsi Ransum dan Konversi Ransum Ayam Broiler. *Journal of Animal Science*, 1(1) : 1-3.

Siregar J, A Jatikusumah, R Komalasari. 2017. Panduan Praktis Untuk Manajemen Ayam Broiler. *Publisher B.V*. Netherland

Situmorang NA, LD Mahfudz and U Atmomarsono. 2013. Pengaruh pemberian rumput laut (Glacilaria verrucosa) dalam ransum terhadap efisiensi penggunaan protein ayam broiler. *J. Anim. Agric,* 2(2) : 49-56

Sjofjan O. 2008. Efek Penggunaan Tepung Daun Kelor (*Moringa oleifera*) dalam Pakan Terhadap Penampilan Produksi Ayam Pedaging. *Prosiding Seminar Nasional*. Teknologi Peternakan dan Veteriner, Bogor.

Soeparno. 2005. Ilmu Dan Teknologi Daging. *Gadjah Mada University Press.* Yogyakarta.

Sudirman S. 2017. Aktivitas Antiinflamasi Ekstrak Etanol Daun Beluntas (Pluchea indica L.) pada Model Inflamasi Terinduksi CFA (Complete Freund's Adjuvant). *Jurnal Farmasi Galenika*, 3 (2): 191-198.

Suhartini T, AP Zakaria, and Mustamin. 2018. Kandungan Protein dan Kalsium pada Biskuit Formula Tempe dengan Penambahan Tepung Daun Kelor (*Moringa oleifera*). *Media Gizi Pangan,* 25 (1): 64-68.

Sukaryana Y, U Atmomarsono, VD Yunianto, E Supriyatna. 2011. Peningkatan nilai kecernaan protein kasar dan lemak kasar produk fermentasi campuran bungkil inti sawit dan dedak padi pada broiler. *Jurnal Ilmu dan Teknologi Peternakan*, 1 : 167-172.

Sulasmi Y, E Sapshua and Saelan. 2013. Pengaruh Penambahan Tepung Daun Leguminosa yang Berbeda terhadap Konsumsi, Pertambahan Bobot Badan dan Konversi Ransum Ayam Broiler. *Jurnal Ilmiah Agribisnis dan Perikana*, 6(1): 10-16.

Suprijatna E, U Atmomarsono, and R Kartasudjana. 2008. Ilmu Dasar Ternak Unggas. Penebar *Swadaya*. Jakarta.

Syafaat MA, E Erwan, and J Handoko. 2021. Karakteristik karkas ayam broiler fase finisher yang diberi ekstrak daun jambu mete (Anacardium occidentale linn.) di dalam air minum. *J. Livestock Animal Health*, Volume 4.

Trisna DK, IGNG Bidura, and DPMA Candrawati. 2014. Pengaruh Pemberian Ekstrak Daun Kelor (*Moringa oleifera* Lam) Dan Bawang Putih (Allium Sativum) Pada Air Minum Terhadap Penampilan Broiler Umur 2- 6 Minggu. *E- Jurnal Peternakan Tropika*. Universitas Udayana. Denpasar.

Utami DP. 2011. Pembatasan Ransum Berpengaruh Terhadap Pertambahan Bobot Badan Ayam Broiler Pada Priode Pertumbuhan. *Mediargo*, 7(1) : 59-67.

Uzer F, N Iriyanti and Roesdiyanto. 2013. Penggunaan Pakan Fungsional dalam Ransum Terhadap Konsumsi Pakan dan Pertambahan Bobot Badan. *Jurnal Ilmiah Peternakan*, 1 : 282-288.

Voemesse K, A Teteh, D Nideou, O N'Nanlé, M Gbeassor, E Decuypere, and K Tona. 2018. Effect of *Moringa oleifera* leaf meal on growth performance and blood parameters of egg type chicken during juvenile growth. *International Journal of Poultry Science*, 17(4) : 154–159.

Wihastuti TA. 2007. Efek Ekstrak Daun Kelor (*Moringa oleifera*) dalam Menghambat Aktifitas NfkB, Ekspresi TNF-α dan ICAm-1 pada HUVECS yang Dipapar LDL Teroksidasi. *Jurnal Kardiologi Indonesia*. Universitas Brawijaya, Malang.

Wijiyanti RP. 2011. Pengaruh suhu kandang yang berbeda terhadap performans ayam pedaging periode starter. *Skripsi.* Fakultas Peternakan. Universitas Brawijaya. Malang.

Yusrizal Y and TC Chen. 2003. Effect of adding chicory fructans in feed on faecal and intestinal and excretory volatile ammonia. *Journal of Poultry Science*, 2 : 188-194.

Zulkarnaen D. 2013. Lebih Sukses dan Untung Beternak Ayam Broiler. *Daffa Publishing*. Surabaya.