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Performance of Laying Chickens with Feed Additive Cinnamon Flour (*Cinnamomum burmanni* (Nees & T.Nees) Blume)

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ABSTRACT
Chickens are important commodities due to human need eggs to meet animal protein. Increasing of resistance of bacteria to synthetic antibiotics and consumer understanding of health and food safety have stimulated use of antibiotic growth promoters (AGP) in poultry industry. AGP applied sustainable feed management steps to improve gut health and poultry growth performance. Cinnamon, one of the spices as a natural product. This useful source due to antioxidants, anti-microbial, anti-inflammatory, antifungal, and hypo-cholesterolemic effects and its capability to activate digestion enzymes in intestine. This research aimed to analyze the performance of laying chicken eggs fed with cinnamon flour. The treatments used were cinnamon flour with levels R0 (basal ration, without cinnamon flour/CF, R1 (99.5% BR+ 0.5% CF), R2 (99% BR+ 1% CF), R3 (98% BR + 1.5 % CF), and R4 (98% BR + 2% CF). Data were analyzed with Completely Randomized Design and Duncan's test. Variables were ration consumption, Hen Day Production/HDP and ration conversion. Results showed that adding 2% cinnamon flour significant effect on feed consumption, HDP (P< 0,01) but insignificant on ration conversion (P>0.05). Cinnamon flour as feed additive source up to 2% level can increase the performance of laying hens.
***Keywords**: health performance; laying hens; cinnamon flour; feed additive source*

INTRODUCTION
One egg has several functional components which are proteins namely antihypertensive and bactericidal proteins, amino acids, saturated and unsaturated fatty acids, and no carbohydrates or trans-fat. We can say, egg is an incredible food source (Dilawar et al., 2021). Laying chickens are one of the livestock commodities that can produce egg products to meet animal protein needs. Egg quality is an important thing to pay attention to both externally and internally qualities. The external quality of eggs namely egg weight and shell color, while the internal quality such as egg yolk color, egg yolk index and egg white. The better the quality of the eggs, the more consumers will like them, and this will increase selling value. Besides that, egg contains complete essential amino acids.

Feed is one of the main factors in the poultry industry. Feed refers to process of the amount of feed ingredients that supply all the nutrients needed by chickens. Deep the gastrointestinal tract affects intestinal health. The digestive tract is a very complex and dynamic organ that has an important role in intestinal health (Carrasco et al., 2019). PFAs *(polyfluoroalkyl substances)* are potential agents to improve chicken health by establishing a balanced gut ecosystem. PFA is considered a feed additive because there is no residue or toxin problem. Among PFAs, phytobiotics are used to modulate the poultry gut ecosystem through producing anti-microbials, Anti-inflammatory, and antioxidant response, improves nutrient absorption in the intestinal system (Mehdi et al., 2018). The natural bioactive cinnamon in feed contributes to produce and to maintain intestinal microflora, digestive function, blood biochemical performance, immune activities in poultry (Ali et al., 2021). Those things will improve health performance of the chickens.

The cinnamon plant (*Cinnamomum burmanni* (Nees & T.Nees) Blume) is categorized into spice plant which has many benefits. This plant has been long known as source of traditional medicine. The cinnamon plant has been known to the public as a medicinal and food flavoring plant. Cinnamon plant contains important compound such as vitamin A, vitamin B, vitamin K, phosphorus, selenium, potassium, iron, calcium, fiber, protein, essential oils. This plant also has various substances that have anti-inflammatory, antibacterial and antioxidant effects (Ali et al., 2021; Ribeiro-Santos et al., 2017).

Stem of cinnamon contains substances resin, mucus and essential oils which are widely used for health purposes. Besides that, it also contains around 4-8% eugenol and several compounds namely polyphenols, alkaloids, steroids, flavonoids and saponins (Sunarno, 2018). Cinnamon could be as an antioxidant, anti-platelet aggregation and anti-hypercholesterolemia. Tannin compounds (polyphenols) and flavonoids can function as antioxidants (Palinggi et al., 2022). The use of natural antioxidants can reduce the occurrence of fat oxidation in the processing and storage of feed ingredients. Eggs have fairly high unsaturated fat content and are easily oxidized thereby reducing their nutritional value. To reduce fat oxidation, natural antioxidants can be used which function to eliminate peroxyl radical carriers or reduce the formation of radicals (Antasionasti & Jayanto, 2021).

The effect of cinnamon powder on interior quality of duck eggs reported that cinnamon powder gave significant difference ($P<0.05$) to the yolk index value and yolk color *(*Fahrullah et al., 2021). Cinnamon powder also gave significant difference ($P<0.01$) to albumin index value, air sac depth, yolk texture and albumin not difference to Haugh Unit/HU ($P>0.01$). The HU value decreases as the age of the egg increases where the longer the storage is, the quality of the albumen will decrease because it is caused by the evaporation process of CO_2 gas which occurs through pores causing physical and chemical changes (watery albumen) and low ovomucin content (Lupu et al., 2019). Haugh Unit is a calculation of the inner height index albumen thickness corresponds to egg weight and deals with albumen quality from eggs. The higher the HU value, the better albumen egg quality. The higher the HU value the better egg quality. New laying eggs have HU value of 100 (Purwati et al., 2015).This good HU value is due to the help of the cinnamon content which acts as a preservative.

Cinnamon is per- and polyfluoroalkyl substances (PFAs) in poultry feed by US FDA. Cinnamon contains bioactive phenolic compounds such as cinnamaldehyde. In the poultry feed, this cinnamon can improve immunity, metabolism, health, growth performance. Cinnamon's bioactive compounds have powerful anti-inflammatory, anti-microbial and antioxidant properties. The pharmacological properties of cinnamon as a natural feed additive as a digestive stimulation in the consumption and egg production of laying hens (Dvorackova et al., 2015). Pharmacological properties of cinnamon are stimulation of digestion, stimulation of hypolipidemic effects, antioxidant, anti-inflammatory, antifungal, antimutagenic, and anticarcinogenic activities. Cinnamon contains antioxidants such as cinnamaldehyde compounds, eugenol, phenol, trans cinnamic acid and tannin so it can be applied as a natural antioxidant and preservative. The cinnamon essential oils and phenol compounds will slow down the damage process). The aim of this study was to analyze the performance of laying chicken eggs fed with cinnamon flour.

MATERIALS AND METHODS

Material

The materials used in this research were 100 36-week-old MB 402 layer laying hens.

Treatment Rations

Treatment rations were prepared based on needs of laying hens in layer phase, namely 17% - 18% protein and 2600 - 2700 Kcal/kg metabolic energy. The composition of treatment rations, nutrient content of treatment rations was showed at Tabel 1.

Table 1. Nutrient Content of Treatment Ration

Food Substances/Energy	R0	R1	R2	R3	R4
Protein (%)	17.44	17.50	17.64	17.79	17.93
Fat (%)	7.53	7.63	7.66	7.69	7.72
Crude Fiber (%)	5.34	5.73	6.06	6.38	6.71
Ca (%)	2.17	1.89	1.93	1.97	2.01
P (%)	1.02	1.03	1.04	1.06	1.07
Energy Metabolism (Kkal/kg)	2710.90	2735.84	2736.99	2738.13	2739.27

Research Methods

This research was experimental study applied Completely Randomized Design (CRD) with 5 treatments and 5 replications. The treatments were P0: 100% Basal Ration/BR without cinnamon flour; P1: 99.5% BR + 0.5% Cinnamon Flour (CF); P2: 99.0% BR + 1.0% CF; P3 = Basal Ration 98.5% + 1.5% CF; P4: 98.0% BR+ 2.0% CF. The obtained data were analyzed by Analysis of Variance (ANOVA).

RESULTS AND DISCUSSION

The effect of using cinnamon flour on feed consumption (g/head), Hen Day Production/HDP (%) and conversion can be seen at Table 2.

Table 2. Effect of Using Cinnamon Flour on Ration Consumption, Hen Day Production and Conversion of Laying Hens

Treatment	Ration Consumption (g/ekor)	Hen Day Production	Conversion
R0	$115.20^{c}\pm3.56$	$82.10^{a}\pm5.67$	2.34 ± 0.20
R1	$115.15^{c}\pm 2.78$	$83.45^{b}\pm5.78$	2.45 ± 0.34
R2	$110.56^{b}\pm3.57$	$83.20^{b}\pm3.87$	2.65 ± 0.24
R3	$100.24^{a}\pm3.56$	$83.20^{b}\pm5.27$	2.10 ± 0.56
R4	$100.57^{a}\pm4.55$	$84.20^{c}\pm6.98$	2.10 ± 0.45

Note: Ration Consumption and Hen Day Production were significantly different ($P<0.01$) but not significantly ($P>0.05$) on conversion.

The adding cinnamon flour up to 2% had very significant effect ($P <0.01$) on ration consumption and HDP but not significantly different effect ($P> 0.05$) on

conversion. An increase in ration consumption will provide good egg production. This egg production increased in line with cinnamon flour to level of 2 percent. Cinnamon has effects as an anti-inflammatory and also can boost immunity and increase egg production. It has cinnamaldehyde which has anti-inflammatory potential ultimately improves immunity in laying hens (Sharifi-Rad et al., 2021). Phytochemicals of bioactive non-nutrient compounds of plants in small quantities are phenolic compounds, phytosterols, phytoestrogens, glucosinolates, saponins, terpenoids, protease inhibitors (Chou et al., 2021).

The more the level of cinnamon flour increases, the less the consumption of laying hen rations. It is the presence of chemical substances that function in the digestive tract of laying hens. Cinnamon anthocyanins have poultry health effects as phytopigments in plant, biochemical, anti-inflammatory, immunomodulatory and antioxidant (Pathirana & Senaratne, 2020; Sharifi-Rad et al., 2021).

The cinnamon flour contains nutrients and antioxidants. The bark extract of cinnamon has an antioxidant compound, is MHCP (Methyl Hydroxy Chalcone Polymer). This compound is a flavonoid which has significant correlation with antioxidant activity (Ali et al., 2021). To reduce oxidative stress, antioxidants are needed. Cinnamon bark extract has many ingredients that function as antioxidants and at the same time has activity similar to insulin (insulin-mimetic) (Irmayani et al., 2022; Sayuti & Yenrira, 2015) Economical, safe and healthy production can be achieved using this feed additives without compromising animal health and growth performance. The fundamental relationship of this feed additive with the improvement of intestinal microflora.

CONCLUSION

Cinnamon flour as a feed additive source up to 2% level can improve the performance of laying hens. Natural feed additive cinnamon flour can increase egg production and consumption. Ration conversion is getting better where consumption of small rations can increase egg production because cinnamon flour contains nutrients and antioxidants.

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REFERENCES

Ali A, Ponnampalam EN, Pushpakumara G, Cottrell JJ, Suleria HAR, Frank RD. (2021). Cinnamon: a natural feed additive for poultry health and production: a review. *Animals.*11(2026):1-11. https://doi.org/10.3390/ani11072026.

Antasionasti I, Jayanto I. (2021). Aktivitas antioksidan ekstrak etanol kayu manis (*Cinnamomum burmani*) secara in vitro. *Jurnal Farmasi Udayana*. 10(1): 38-47. DOI:10.24843/JFU.2021.v10.i01.p05.

Carrasco JMD, Casanova NA, Miyakawa ME. (2019). Microbiota, gut health and chicken productivity: what is the connection? *Microorganisms*. 7(374):3-15. DOI: 10.3390/microorganisms7100374.

Chou O, Ali A, Subbiah V, Barrow CJ, Dunshea FR, Suleria HAR. (2021). LC-ESI-QTOF-MS/MS characterisation of phenolics in herbal tea infusion and their antioxidant potential. *Fermentation*. 7(2):1–24. https://doi.org/10.3390/fermentation7020073

Dilawar MA, Hong SM , Dhanushka R, Yang EJ , Seo YS , Park HS ,Yang CJ.(2021). Egg quality parameters, production performance and immunity of laying hens supplemented with plant extracts. *Animals*. 11 (4):975. DOI: 10.3390/ani11040975.

Dvorackova E, Snoblova M, Chromcova L, Hrdlicka P. (2015). Effects of extraction methods on the phenolic compounds contents and antioxidant capacities of cinnamon extracts. *Food Sci. Biotechnol*.24:1201–1207. https://link.springer.com/article/10.1007/s10068-015-0154-4.

Fahrullah F. (2021). Efek perendaman menggunakan bubuk kayu manis (*Cinnamomum burmanni*) terhadap kualitas interior telur itik.*Jurnal Peternakan Sriwijaya*. 10(2):19-28. DOI: https://doi.org/10.36706/JPS.10.2.2021.15131.

Irmayani, Daming H, Munir M, Fitriyani F, Asikin N.(2022). Pengaruh pemberian tepung kayu manis (*Cinnamomum burmannii*) dalam ransum terhadap bobot dan persentase karkas itik pedaging. *Anoa: Journal of Animal Husbandry*. 1(1): 32-38.DOI: https://doi.org/10.24252/anoa.v1i1.28277.

Lupu JSI, Wuri DA, Detha AIR. (2016). Perbandingan kualitas telur ayam kampung yang disimpan pada suhu ruang dan suhu lemari pendingin ditinjau dari tinggi kantung hawa, indeks kuning telur, indeks albumin, Haugh Unit dan Total Plate Count (TPC). *Jurnal Veteriner Nusantara*. 1(1): 46-52. DOI: https://doi.org/10.35508/jvn.v1i1.931.

Mehdi Y, Létourneau-Montminy M-P, Gaucher M-L,Chorfi Y, Suresh G, Rouissi T, Brar SK, Côté C, Ramirez AA, Godbout S. (2018). Use of antibiotics in broiler production: global impacts and alternatives. *Anim. Nutr*. 4(2): 170–178. DOI: 10.1016/j.aninu.2018.03.002.

Palinggi AF, Rasbawati R, Nurhapsa N, Irmayani I, Kadir MJ. (2022). Uji organoleptik daging itik (*Anas domesticus*) dengan penambahan tepung kayu manis (*Cinnamomum burmani*) dalam ransum. *Journal Gallus Gallus*. 1(1): 1-8. https://ojs.polipangkep.ac.id/index.php/gallus.

Pathirana R, Senaratne R. (2020). Cinnamon. In *Cinnamon: Botany, Agronomy, Chemistry and Industrial Applications*. Springer. https://doi.org/10.1007/978-3-030-54426-3_3.

Purwati D, Djaelani MA, Yuniwarti EYW. (2015). Indeks Kuning Telur (IKT), Haugh Unit (HU) dan Bobot Telur pada Berbagai Itik Lokal di Jawa Tengah. *Jurnal Biologi*. 4(2): 1–9. https://ejournal3.undip.ac.id/index.php/biologi/article/view/19405/18404.

Ribeiro-Santos R, Andrade MA, Madella D, Martinazzo AP, Moura LDAG, de Melo NR, Sanches-Silva A. (2017). A revisiting an ancient spice with medicinal purposes: cinnamon. *Trends Food Sci.&Technol*. 62(1):154–169. DOI:10.1016/j.tifs.2017.02.011.

Sayuti K, Yenrira R. (2015). *Antioksidan Alami dan Sintetik* (I). Andalas University Press. http://repository.unand.ac.id/23714/1/Kesuma Sayuti_Antioksidan Alami dan Sintetik OK.pdf.

Sharifi-Rad J, Song S, Ali A, Subbiah V, Taheri Y, Suleria HAR. (2021). LC-ESI-QTOF-MS/MS characterization of phenolic compounds from *Pyracantha coccinea* M.Roem and their antioxidant capacity. *Cellu. Molec. Biol*. 67(1):201-211.DOI: 10.14715/cmb/2021.67.1.29.

Sunarno S. (2018). Efek suplemen kulit kayu manis dan daun pegagan terhadap produktivitas puyuh petelur strain australia (*Coturnix coturnix australica*). *Buletin Anatomi dan Fisiologi*. 3(1): 89-96. DOI: https://doi.org/10.14710/baf.3.1.2018.89-96.