

Performance and carcass characteristics of native chicken fed with drinking water containing *Indigofera zollingeriana* aqueous extract

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World Journal of Biology Pharmacy and Health Sciences, 2023, 15(01), 055–059

Publication history: Received on 29 May 2023; revised on 07 July 2023; accepted on 10 July 2023

Article DOI: <https://doi.org/10.30574/wjbphs.2023.15.1.0303>

Abstract

Currently, the use of herbal leaves is increasingly being used to improve the performance and health of poultry. Herbal leaves contain phytochemical compounds that can promote growth and improve the health of poultry. This study aims to examine the effect of giving *Indigofera zollingeriana* leaf aqueous extract (ILE) via drinking water from 2-10 weeks of age on the performance and carcass characteristics of native chickens. This study used a completely randomized design with four treatments and 5 replications, and each replication consisted of 25 native chickens aged 2 weeks with homogeneous body weight (94.36 ± 1.94 g). The four treatments are ILE levels in drinking water, namely: 0% (P1); 2% (P2); 4% (P3); and 6% (P4), respectively. The results showed that giving 2-6% ILE via drinking water had no significant effect ($P \geq 0.05$) on the growth and carcass of chickens. However, it has a significant effect (≤ 0.05) on feed consumption and carcass bones. Based on the results of the study it can be concluded that administration of *Indigofera* leaf aqueous extract via drinking water reduced feed consumption and increased carcass bone weight of native chickens.

Keywords: *Indigofera* leaf aqueous extract; Growth; Carcass; Native Chickens

1. Introduction

Native chicken is a local Indonesian chicken that is easy to adapt. According to [1], Indonesian native chickens come from the Subspecies: *Gallus gallus bankiva* originating from Lampung, Java and Bali. Native chickens are adaptive which can adapt to situations and changes in climate and weather. In addition, the texture of the meat is different from that of broilers, so it is liked by many consumers. This makes native chickens widely cultivated by various groups of people.

The use of antibiotics as a growth promoter is growing in line with the development of the livestock industry for food. Bacteria that cause infections in livestock can reduce production yields, and the use of subtherapeutic doses of antibiotics appears to be effective in improving production yields. AGP substitute can use the properties of phytochemical compounds from *Indigofera*. Flavonoids, tannins, saponins, sterols and quinones contained in *Indigofera* can act as antibacterials and β -carotene as a carcass dye [2]. The content of tannins and saponins is ideal enough to support the value of nutritional benefits.

The crude protein content of several *Indigofera sp.* species is relatively high, ranging from 22-28%, 3.70% crude fat and 14.96% crude fiber [3]. The addition of herbal leaf extracts (*Moriga*, *Allium sativum*, *Sauropus*) via drinking water can increase productivity and feed efficiency in broilers and hens [4,5].

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Indigofera leaf aqueous extract has an antioxidant activity of 943.67 ppm which indicates that this plant has a very high ability to ward off free radicals, slow down and prevent oxidation processes or neutralize free radicals [6]. Efficacy of herbal leaves are widely used to increase the productivity and health of poultry. Herbal leaves contain phytochemical compounds that can stimulate growth, increase feed digestibility, immune response, suppress pathogenic bacteria, and improve carcass characteristics of broiler [7,8,9].

This study aims to examine the effect of giving *Indigofera zollingeriana* leaf aqueous extract (ILE) via drinking water from 2-10 weeks of age on the performance and carcass characteristics of native chickens.

2. Material and methods

2.1. Material

This research was conducted at the Research Station of the Faculty of Animal Husbandry, Udayana University in Jl. Raya Sesetan, Denpasar, Bali. The tools used consist of a set of scalpels and scissors, analytical scales, and a heating stove. The chickens used were 2 weeks old native chickens obtained from native chickens breeding farms in Mengwi Village, Badung Regency, Bali. The feed given was commercial complete feed 511 HI-PRO-VITE, Produced by PT. Charoen Pokphand Indonesia, Tbk., in Jl. Raya Surabaya-Mojokerto Km. 26 Keboharan Village, Krian District, Sidoarjo Regency, East Java, Indonesia. The feed which was recommended for native chickens in the starter-grower phase. All chickens were kept in battery colony cages made of aluminum.

2.2. Methods

This study used a completely randomized design (CRD) with four treatments and 5 replications, and each replication consisted of 25 native chickens aged 2 weeks with homogeneous body weight (94.36 ± 1.94 g). The four treatments were ILE levels in drinking water, namely: 0% (P1); 2% (P2); 4% (P3); and 6% (P4), respectively.

The variables observed in this study were final body weight (FBW), live weight gain (LWG), feed consumption (difference between the feed given and the remaining feed), feed conversion ratio (feed consumption: weight gain). All measurements were made every week throughout the study period. Slaughter of chickens to obtain carcasses according to ethical procedures for slaughtering chickens in Indonesia. Carcass percentage (final weight: carcass weight x 100%), carcass components (bone, meat and subcutaneous fat including skin). Each carcass component was then divided by carcass weight x 100 g carcass weight.

2.3. *Indigofera* leaf aqueous extract.

The *Indigofera* leaves used were young leaves, which were light green in color (Figure 1), with a ratio of 1 kg of *Indigofera* leaves to 2 liters of water (1:2; v/v), then blended, then filtered and put into a plastic bottle. After that, then stored in the refrigerator for the next use.



Figure 1 *Indigofera zollingeriana* leaves

Data analysis used one-way ANOVA, if there was a significant difference ($P < 0.05$), followed by Duncan's multiple range test.

3. Results and discussion

3.1. Native chicken performance

Table 1 shows the response of free-range chickens to giving ILE in drinking water from 2-10 weeks of age. Final body weight, LWG, and FCR in groups P2, P3, and P4 did not show a significant difference ($P>0.05$) compared to group P1 (control). However, administration of ILE in drinking water significantly ($P<0.05$) reduced feed consumption. The inclusion of ILE in the drinking water of the P2, P3 and P4 chicken groups were: 3.70%; 1.13%; and 3.95% significantly ($P<0.05$) lower than the P1 chicken group (control).

Table 1 Performance of native chickens fed drinking water with the addition of ILE from 2-10 weeks of age

Variable	ILE level in drinking water (cc/100 cc)				SEM
	0	2	4	6	
Initial body weight (g/head)	94.36	94.24	94.23	94.80	0.571
Final body weight (g/head)	822.95	809.64	848.17	812.71	10.93
Live weight gains (g/head/8 weeks)	728.59	715.40	752.94	717.91	10.63
Feed consumption (g/head/8 weeks)	2800.77 ^a	2697.13 ^c	2769.13 ^b	2690.25 ^c	11.11
Feed conversion ratio (feed consumption:LWGs)	3.86	3.79	3.68	3.76	0.050

Note: The mean with superscript (^{a,b,c}) was significantly different ($P\leq 0.05$); SEM= Standard error of the treatment means

Supplementation of 2-6% ILE via drinking water had no effect on final body weight, weight gain and feed efficiency. The effect of ILE is only seen to significantly reduce feed consumption. The decrease in feed consumption is caused by compounds contained in *Indigofera* leaves, such as saponins, flavonoids, tannins, and several other phenolic compounds that have antimicrobial activity, where saponins have been shown to have antimicrobial properties [10]. By reducing the number of harmful bacteria (*E. coli* and *Coliform*) in the digestive tract of chickens, the absorption of nutrients becomes optimal, resulting in a decrease in feed consumption. This is in accordance with the statement of [11], that feed consumption is influenced by energy requirements and feed energy levels. If energy needs have been met then the chicken will stop consuming feed. Different results were reported by [12,13,14] that administration of herbal leaf water extract (*Moringa*) through drinking water significantly increased the production performance of laying hens. Similar results were also reported by [15] that addition of 2% *Morinda* leaf aqueous extract via drinking water can increase FBW, LWGs, and feed efficiency in starter phase duckling.

According to [16], *Moringa* leaves in rations do not cause adverse effects on nutrient absorption, but can increase protein digestibility, energy, and mineral utilization. Conflicting results were reported by [17], that increased levels of saponins as antinutrients in herbal leaves can reduce the digestibility and absorption of nutrients, especially lipids in poultry.

3.2. Carcass characteristics

Supplementation of 2-6% ILE via drinking water of chickens from 2-10 weeks of age did not have a significant effect ($P>0.05$) on carcass weight, carcass percentage, carcass meat, thigh and drumstick. However, inclusion of 6% ILE in drinking water significantly ($P<0.05$) increased bone weight. There was no significant increase ($P>0.05$) in the carcass breast meat of the chicken group that received ILE in their drinking water. The weight of breast meat in the P2, P3, and P4 chicken groups were: 5.09%; 4.04%; and 7.50% heavier than the P1 group (control). More detail is presented in Table 2.

Indigofera leaf water extract (ILE) did not provide significant nutritional contribution to increase carcass weight and carcass percentage. If essential nutrients such as protein, energy, amino acids, vitamins, and minerals are insufficient or unbalanced in the ration, then ILE supplementation also does not provide significant changes to the carcass. The results of this study were supported by [18] who reported that the addition of dragon fruit peel flour (*Hylocereus undatus*) as a feed additive to feed did not have a significant effect on broiler carcass weight. Different results were reported by [19] that the administration of herbal extracts had an effect on carcass weight and carcass percentage.

Table 2 Supplementation of ILE level in drinking water on native chicken carcass characteristics at 10 weeks of age

Variablele	ILE level in drinking water (cc/100 cc)				SEM
	0	2	4	6	
Carcass weigt (g)	575.58	522.42	511.96	482.70	16.491
Carcass percentage (%)	61.06	62.55	62.53	62.26	0.420
Meat (g/100 g carcass weight)	55.79	53.39	54.01	53.67	0.440
Bone g/100 g carcass weight)	29.90 ^a	30.82 ^{ab}	30.78 ^{ab}	32.35 ^b	0.380
Subcutaneous fat including skin (g/100 g carcass weight)	14.31	15.79	15.21	13.96	0.321
Breast meat (g/100 g carcass weight)	25.75	27.06	26.79	27.68	0.810
Thigh (g/100 g carcass weight)	19.07	18.99	17.62	17.49	0.741
Drumstick (g/100 g carcass weight)	16.74	16.39	15.75	15.51	0.570

Note: The mean with superscript (^{a,b}) was significantly different ($P \leq 0.05$); SEM= Standard error of the treatment means

The trend of increasing breast meat is thought to be due to the presence of phytochemical compounds in *Indigofera* leaves which can increase nutrient absorption. This opinion is supported by [20] that the more nutrients absorbed, the impact on increasing the growth of the body's organs, and one of them is breast meat. The bioactive substances contained in plants can stimulate the pancreas to secrete pancreatic juice which contains digestive enzymes, such as amylase, lipase and protease enzymes, where these enzymes function to break down food nutrients into simple forms [21]. Saponin compounds contained in *Indigofera* leaves can increase the permeability of the cell walls in the intestine, so that the nutrient absorption process is maximized [22].

4. Conclusion

It can be concluded that ILE supplementation in native chicken drinking water from 2-10 weeks of age significantly reduced feed consumption and conversely increased bone weight and breast meat of native chicken carcasses.

Compliance with ethical standards

Acknowledgments

The author would like to thank the head of the Research Station, Faculty of Animal Husbandry, Udayana University for the cage facilities.

Disclosure of conflict of interest

No conflict of interest to be disclosed

Statement of ethical approval

This research was approved by the Research Ethics Commission from the Faculty of Animal Husbandry and the Faculty of Veterinary Medicine, Udayana University.

References

- [1] Pramual P, Meeyen K, Wongpakam K, Klinhom U. Genetic diversity of Thai native chicken inferred from mitochondrial DNA sequences. *Trop Nat Hist*, 2013; 13:97-106.
- [2] Santoso. Reduction of triglyceride content by early feed restriction in broiler chicks. *Bulletin Peternakan*, 2000; 24: 1-6
- [3] Santi MA. Use of *Indigofera zollingeriana* shoot meal as a substitute for soybean meal in rations and its effect on the health of broiler chickens. *Jurnal Peternakan*, 2018; 1(2): 17-22.

- [4] Ekayuni AA, Bidura IGNG, and Partama IBG. The effect of water extract of two leaves (*Moringa oleivera* and *Sauropus androgynus*) on growth performance and meat cholesterol levels in broilers. J. Biol. Chem. Research, 2017; 34(1): 72-79.
- [5] Bidura IGNG, Partama IBG, Putri BRT, and Watiniasih NL. Effect of water extract of two leaves (*Allium sativum* and *Sauropus androgynus*) on egg production and yolk cholesterol levels in egg laying hens. Pakistan J. of Nutrition, 2017; 16(7): 482-487.
- [6] Fajriah S, Darmawan A, Sundowo A, and Artanti N. Isolation of antioxidant compounds from the ethyl acetate extract of the leaves of the parasite *Dendrophthoe pentandra* L. Miq growing on Lobby hosts. Jurnal Kimia Indonesia, 2017; 2: 17-20.
- [7] Dalukdeniya DACK, DeSilva KLSR, and Rathnayaka RMUSK. Antimicrobial activity of different extracts of leaves bark and roots of *Moringa oleifera* (Lam). International Journal Curr. Microbiol. App. Sci. 2016; 5(7): 687-691. doi: <http://dx.doi.org/10.20546/ijcmas.2016.507.078>
- [8] Oso AO, Suganthi RU, Manjunatha Reddy GB, Malik PK, Thirumalaisamy G, Awachat VB, Selvaraju S, Arangasamy, Bhatta R. Effect of dietary supplementation with phytogetic blend on growth performance, apparent ileal digestibility of nutrients, intestinal morphology, and cecal microflora of broiler chickens. Poult. Sci. 2019; (98): 4755-4766, <https://doi.org/10.3382/ps/pez191>
- [9] Bidura IGNG. Supplementation of *Moringa oleifera* leaves flour in diet on carcass characteristics of broiler. WJPLS, 2020;6(11): 149-154
- [10] Bukar A, Uba TI, and Oyeyi. 2010. Antimicrobial profile of *Moringa oleifera* lam. extracts against some food-borne microorganism. Bayero Journal of Pure and Applied Sciences, 2010; 3(1): 43-48.
- [11] Prayogi HS. Effect of using coconut oil in rations on feed consumption, increase in body weight, feed conversion, and finisher period broiler carcasses. Jurnal Ternak Tropika, 2007; 7(2): 18-27.
- [12] Siti NW, Bidura IGNG, and Utami IAP. The effect of water extract of leaves *Moringa oleifera* on egg production and yolk cholesterol levels in egg laying hens. Journal Biol. Chem. Research, 2017; 34(2): 657-665
- [13] Siti NW, Bidura IGNG, and Utami IAP. Effect of fermented *Moringa oleifera* leaf with *Saccharomyces spp.* extract in drinking water on egg production, yolk colour, and egg cholesterol levels in laying chicken. J. Biol. Chem. Research, 2018; 35(2): 662-669
- [14] Siti NW, Bidura IGNG, Mayuni SN, Suasta IM, Wibawa AAPP, and Utami IAP. Effect of *Moringa oleifera* leaf powder in diets on feed digestibility and external egg quality characteristics in laying hens. International Journal of Fauna and Biological Studies, 2019; 6(4): 113-118.
- [15] Siti NW, Partama IBG, Wibawa AAPP, and Bidura IGNG. Combination effect of water extract herbal leaves on drinking water to stimulate the growth and bio-control of pathogenic bacteria in broiler. Plant Archives, 2021; 21(1): 1644-1649
- [16] Ossebi W. Etudes digestive, métabolique et nutritionnelle des farines de feuilles de légumineuses incorporées dans des rations alimentaires chez les poulets locaux du Sénégal: cas des feuilles de *Moringa oleifera* (Lam.), de *Leucaena leucocephala* (Lam.) et de *Cassia tora* (Linn.). Thèse Méd. Vét., EISMV: Dakar, 2010.
- [17] Teteh A, Lawson E, Tona K, Decuypere E, and Gbeassor M. *Moringa oleifera* leave: Hydro-Alcoholic extract and effects on growth performance of broilers. International Journal of Poultry Science, 2013; 12(7): 401-405.
- [18] Trisnayuni NMA, Dewi GAMK, and Wijana IW. Performance of white gold crossbreed chickens with Lancy chicks aged 6-14 weeks fed drinking water containing extract of dragon fruit skin (*Hylocereus polyrhizus*). Peternakan Tropika, 2019; 7(1): 291-303
- [19] Wardani NPK, Dewi GAMK, and Candrawati DPMA. Broiler performance given turmeric extract (*Curcuma domestica* Val.) and tamarind (*Tamarindus indica* L.) in drinking water. Majalah Ilmiah Peternakan, 2021; 3(1): 5-11
- [20] Asmawati, H. The effect of in ovo feeding on hatching weight and small intestinal tissue development of native chicken. Dissertation, Hasanuddin University, Faculty of Animal Husbandry, Makassar, 2013.
- [21] Widyanata RA. Response of Abdominal Fat and Gastrointestinal Tract of Free-range Chicken and Arabic Chicken to High Crude Fiber Diet with Katuk Leaves. Thesis. Faculty of Animal Husbandry, Bogor Agricultural Institute, Bogor, 2013.
- [22] Irwani N, and Candra AA. Application of binahong leaf extract (*Anredera cordifolia*) to the physiological conditions of the digestive tract and visceral organs in broilers. Jurnal Peternakan Terapan, 2020; 2(1): 22-29.