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Performance of local Bali ducks (*Anas* sp.) on feeding *Asystasia gangetica* flour in rations

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Abstract
Utilization of *Asystasia gangetica* flour in rations to reduce production costs and the role of phytochemical compounds in maintaining the performance of local Bali ducks. This research aims to determine the response of local Bali ducks to the provision of *Asystasia gangetica* flour in rations. The study used were completely randomized design with 4 treatments and 5 replications. Treatment given: 100% commercial ration + 0% *Asystasia gangetica* flour as control (A); 95% commercial diet + 5% *Asystasia gangetica* flour (B); 90% commercial ration + 10% *Asystasia gangetica* (C) flour; and 85% commercial ration + 15% *Asystasia gangetica* flour (D). Observed performance variables: initial body weight, final body weight, body weight gain, ration consumption, drinking water consumption, feed conversion ratio and production cost efficiency. The results of the research showed that initial body weight, final weight, body weight gain and consumption of rations containing *Asystasia gangetica* flour in ration had no effect on the performance of local Bali ducks. In addition, replacing some commercial rations with *Asystasia gangetica* flour caused the FCR value to increase. The highest FCR value in treatment D4 was 3.74 and decreased respectively in treatments D3, D2 and D1 (3.65, 3.58 and 3.51). Production costs decreased along with the increasing use of *Asystasia gangetica* flour (2.02-6.03%). It can be concluded that replacing some commercial rations with *Asystasia gangetica* flour of 10-15% can provide the same performance as treatment without *Asystasia gangetica* flour and reduce production costs.

Keywords: Local Bali duck, *Asystasia gangetica* flour, performance

Introduction
Local Bali ducks is ducks that develop in the Bali area and need to be preserved as germplasm. The population of local Bali ducks from year to year is not constant, due to slow growth and low meat production. Livestock growth is less than optimal because the quality of the feed provided is not good. Good quality feed contains all the nutrients needed by livestock to support optimal growth. Herdiana *et al.* (2014) [8] stated that feed provided with nutritional content appropriate to the animal growth phase will support optimal growth. One of the obstacles in duck cultivation is that providing quality feed requires high costs, reaching 60 – 70% of total production costs. The *Asystasia gangetica* plant is used as duck feed because it has good nutritional content and utilizes the phytochemical compounds in the plant to maintain duck health and reduce production costs.

Utilizing the *Asystasia gangetica* plant as a feed source is a strategic step to improve the performance of local Bali ducks and reduce production costs. The *Asystasia gangetica* plant as feed for ducks is processed into flour and functions to meet the need for a fiber source if the livestock are given completely commercial feed. Feed sources that contain high fiber can help improve duck digestion and can supply the needs of vitamins and minerals. The amount given must be adjusted to the needs of the livestock, not too high so that it still provides benefits and does not affect the health and performance of the ducks. Herdiana *et al.* (2014) [8] stated that crude fiber content of up to 15% in the ration can still be tolerated by poultry. According to Putra (2018) [11] *Asystasia gangetica* has a crude protein content of 19.3% - 33% depending on the part of the plant used and the production of this plant reaches 167 - 359 g/m^2, crude protein 10.90% - 35.17%, fiber rough 10.22% - 48.97% (Rizal, 2018) [12]. Grubben (2004) [7] reported that *Asystasia gangetica* has high palatability and digestibility.

The potential of *Asystasia gangetica* as a food source is supported by the phytochemical

content found naturally in plants such as alkaloids, flavonoids, phenols, saponins, tannins, vitamin C and beta carotene. Kenza (2011) [10] and Daffodil *et al.* (2013) [6] reported that *Asystasia gangetica* contains phytochemical compounds such as: flavonoids, phenols, steroids, tannins, alkaloids, tannins, saponins, beta carotene and vitamin C. These phytochemical compounds have the potential to act as antioxidants and antimicrobials. Flavonoids as antioxidants can delay, slow down and prevent the oxidation process or neutralize free radicals. Free radicals are reactive because these compounds contain unpaired electrons in their outer orbits. An imbalance between the number of free radicals and the antioxidant system in the body can cause cellular oxidative stress. Cell protection from oxidative damage can use exogenous antioxidants in the form of water-soluble vitamin E, vitamin A, vitamin C and phytochemicals. Phenolic compounds act as antimicrobials which can improve the functioning of the digestive tract and increase appetite, thereby improving livestock performance. Beta carotene is a precursor to vitamin A and has antioxidant properties so it can improve health, prevent disease, and stimulate antibody responses in poultry.

Research by Sobayo *et al.* (2012) [14] that the use of *Asystasia gangetica* leaf meal was 2.5 - 7.5% in broiler chicken rations, indicating that feed consumption and feed conversion had no significant effect, final body weight and body weight gain of broiler chickens decreased with increasing levels of *Asystasia gangetica* leaf meal. The use of other types of forage was reported by Siti (2016) [13] that supplementation of papaya leaf flour in commercial rations at level 2 - 6% had no effect on duck performance. Akbarillah *et al.* (2010) [1] stated that the percentage of Indigofera leaf flour used is around 5 - 15% which can still be used as a mixture of duck feed ingredients.

Material and Methods

Ducks and Cage

Using 200 local bali ducks aged 2-8 weeks and caged with a "battery colony" system of 20 cage plots.

Rations and drinking water

The standard nutritional requirement ratio refers to the Indonesian National Standard (SNI, 2018) [18] with a metabolic energy content 2900 kcal/kg and crude protein of 21%. *Asystasia gangetica* flour was given according to treatment and drinking water was given *ad libitum.* The composition of the ration ingredients is presented in (Table 1) and the nutritional content of the ration (Table 2).

Table 1: Composition of Ration Materials

Composition Ration	Treatment[1)]			
	A	B	C	D
Commercial rations (CP 511B)	100	95	90	85
Asystasia gangetica flour	0	5	10	15
Total	100	100	100	100

Information: 1) A: 100% Commercial ration + 0% A. gangetica flour; B: 95% Commercial ration + 5% *A. gangetica* flour; C: 90% Commercial ration + 10% *A. gangetica* flour; D: 85% Commercial ration + 15% *A. gangetica* flour

Table 2: Nutritional content of rations

Nutritional Content	Commercial ration[5)]	*Asystasia* flour	Treatment[1)]				Standar[2)] SNI 8507-2018
			A	B	C	D	
Metabolic energy (Kkal/kg)	2900	2850.57[3)]	2900	2898	2895	2893	2900-3000
Crude protein (%)	21	21.03[4)]	21	21.03	21.06	21.08	20-22
Crude fiber (%)	5	16.89[4)]	5	5.59	6.19	6.78	3-7
Crude fiber (%)	5	7.26[4)]	5	5.14	5.28	5,41	3-3.5
Calsium (%)	0.90	0.02[4)]	0.90	0.86	0.81	0.77	0.9-1.06
Fosfor (%)	0.60	1.52[4)]	0.60	0.60	0.70	0.70	0.45-0.60

Information:
A: 100% Commercial ration + 0% *A. gangetica* flour; B: 95% Commercial ration + 5% *A. gangetica* flour; C: 90% Commercial ration + 10% *A. gangetica* flour; D: 85% Commercial ration + 15% *A. gangetica* flour
Standar SNI-8507-2018
Sobayo *et al.* (2012)
Lab.Nutrisi dan Makanan ternak, Fakultas Peternakan, Universitas Udayana (2021)
Commercial ration CP511 B

Asystasia gangetica flour

The stems and leaves of the *Asystasia gangetica* plant are cut to a size of 2 - 3 cm to speed up the drying process in the sun, then placed in an oven at 70 °C until the weight is constant, then ground to make flour. *Asystasia gangetica* flour is ready to be mixed with commercial feed (CP 511 B).

Experimental design

The experiment used a completely randomized design (Completely Randomized Design) with 4 treatments and 5 replications. The four treatments were: 100% commercial ration + 0% *Asystasia gangetica* flour (A); 95% commercial ration + 5% *Asystasia gangetica* flour (B); 90% commercial ration + 10% *Asystasia gangetica* flour (C); 85% commercial ration + 15% *Asystasia gangetica* flour (D).

Observed Variables

The local bali duck performance variables observed were: (1) Initial body weight; (2) Final body weight; (3) Weight gain; (4) Ration consumption; (5) Drinking water consumption; (6) Feed Conversion Ratio; and (7) Production cost efficiency.

Statistical analysis

The research all data were analyzed using one-way ANOVA to determine the differences among treatments. If differences were found (p<0.05) then further analysis was performed with Duncan's multiple range test (Steel and Torrie, 2015) [15].

Results

The results of research on the performance of local bali ducks (*Anas* sp.) aged 1-8 weeks given *Asystasia gangetica* flour in the diet are presented (Table 3). In Table 3 it can be seen that the performance of local bali ducks aged 1-8 weeks on the variables initial body weight, final body weight, body weight gain and consumption of rations given *Asystasia gangetica*

flour at levels 5% (B), 10% (C) and 15% (D) statistically shows no significant difference (p>0.05). The average initial body weight of local bali ducks in the four treatments ranged from 143.00-143.60 g/head. The average final body weight in treatment A (1532.20 g/head/7weeks) and was not significantly different (p>0.05) from treatments B, C and D (0.22%, 0.09% and 3.00%). The average weight gain of local Bali ducks that received treatment A (1397.00 g/head/7weeks), in ducks treated B, C and D was not significantly (p>0.05) lower than treatment A (0.47%, 0.68% and 3.89%). The average feed consumption of local Bali ducks given *Asystasia gangetica* flour for seven weeks ranged from (4917.40 - 5069.00 g/head). In treatment A (4917.40 g/head/7weeks), in treatments B, C and D respectively 1.33%, 3.08% and 2.38% were not significantly (p>0.05) higher than treatment A.

Drinking water consumption for ducks given *Asystasia gangetica* flour was highest in treatment D (22906.60 ml/head/7weeks). In treatments A, B and C, drinking water consumption decreased by 12.55%, 6.49% and 5.72% (p<0.05) compared to treatment D. The drinking water consumption of ducks in treatments B and C (21418.80 and 21594.20 ml/ek/7weeks) was not significantly different (p>0.05).

The average Feed Coverage Ratio (FCR) of local bali ducks fed a diet without *Asystasia gangetica* flour (A) for 7 weeks produced the lowest FCR of 3.51. The average FCR of local Bali ducks in treatment B was not significantly (p>0.05) 1.99% higher than treatment A, while treatments C and D were respectively 3.95% and 6.55% significantly (P<0.05) higher than treatment A. FCR value in treatment B it was 3.58, not significantly different (p>0.05) from treatments A and C, but in treatment D it was significantly (p<0.05) higher by 4.46% compared to treatment B. The highest FCR in ducks was in treatment D (3.74) which was different not significant (p>0.05) with treatment C (3.65).

Table 3: Performance of local Bali ducks (*Anas* sp.) aged 1-8 weeks given *Asystasia gangetica* flour in rations

Variable	Treatment[1)]				SEM[3)]
	A	B	C	D	
Initial body weight (g)	143.00[a]	143.00[a]	143.60[a]	143.00[a]	0.23
Final body weight (g/ek/7 minggu)	1532.20[a]	1535.60[a]	1530.80[a]	1486.20[a]	15.59
Body weight gain (g/ek/7 minggu)	1397.00[a]	1390.40[a]	1387.40[a]	1342.60[a]	16.73
Feed consumption (g/ek/7 minggu)	4917.40[a]	4983.20[a]	5069.00[a]	5034.80[a]	54.06
Drinking water consumption (ml/ek/7 minggu)	20030.20[c2)]	21418.80[b]	21594.20[b]	22906.60[a]	298.16
FCR	3.51[c]	3.58[bc]	3.65[ab]	3.74[a]	0.03

Information:
A: 100% Commercial ration + 0% *A. gangetica* flour; B: 95% Commercial ration + 5% *A. gangetica* flour; C: 90% Commercial ration + 10% *A. gangetica* flour; D: 85% Commercial ration + 15% *A. gangetica* flour
Numbers on the same row followed by different letters are significantly different (P<0.05)
SEM: Standard Error of the Treatment Means

Production cost efficiency

The amount of feed costs required to increase the weight of local bali ducks every 1 kg takes into account the size of the feed costs/kg of ingredients and the feed conversion ratio value (FCR). According to Sumadi (2018) [17] and Bidura (2019) [4] to calculate production cost efficiency using the formula: Production cost efficiency = (Feed cost) x (FCR value). The efficiency of production costs to increase the body weight of local bali ducks (Table 4).

Table 4: Production Cost Efficiency Values to Produce Weight Gain in Local Bali Ducks

Description	Treatment[1)]			
	A	B	C	D
Feed price (IDR/kg)	9.400	9.030	8.660	8.290
FCR	3.51	3.58	3.65	3.74
Production costs/kg body weight	32.994	32.327	31.609	31.005

Information:
A: 100% Commercial ration + 0% *A. gangetica* flour; B: 95% Commercial ration + 5% *A. gangetica* flour; C: 90% Commercial ration + 10% *A. gangetica* flour; D: 85% Commercial ration + 15% *A. gangetica* flour

The feed price used to calculate is based on the feed price at the time of the research. The price of commercial feed IDR. 9400/kg and the price of *Asystasia gangetica* flour IDR. 2000/kg. The price of feed for each treatment depends on the composition of the ingredients in the ration (Table 1). In Table 4, in treatment A the costs required to produce 1 kg of weight gain IDR. 9400. In treatments B, C and D (3.93%; 7.87% and 11.81%) lower than treatment A. From the results of this research the replacement of some commercial feed with *Asystasia gangetica* flour in the ration was: 5%; 10% and 15% can provide production cost efficiency/head in treatments B (2.02%), C (4.20%), and D (6.03%).

Discussion

Replacing part of the commercial diet with *Asystasia gangetica* flour resulted in the performance of the ducks being the same as the control (Table 3). These results indicate that *Asystasia gangetica* flour given at level 5-15% can still be used by ducks. Replacing some commercial rations with feed from forage sources still takes into account the nutritional needs of ducks. The nutritional content of the rations in the four treatments, especially the balance of energy and protein, was the same so that the final body weight and body weight gain gave the same results. Kartasudjana and Suprijatna (2010) [9] stated that balanced nutritional content of rations, in terms of quality and quantity, is the main requirement for obtaining optimal livestock growth.

The results showed that consuming rations with *Asystasia gangetica* flour gave the same results as the control. The amount of feed consumed by livestock is influenced by palatability, digestibility and nutritional composition in the ration. In table 3, it can be seen that even though there was an increase in feed consumption, it still gave the same results as ducks without *Asystasia gangetica* flour. The increase in ration consumption was due to the nutritional content of the ration (Table 2) in the treatment of giving *Asystasia gangetica* flour causing the crude fiber content of the ration to increase.

Feed from forage will be limited by the crude fiber content, so attention must be paid to providing forage to ducks. Forage that contains high crude fiber can help improve duck digestion and can supply the needs of vitamins and minerals. Herdiana *et al.* (2014) [8] stated that the amount of crude fiber given must be adjusted to the needs of the livestock, not too high so that it still provides benefits and does not affect the health and performance of ducks. Amrullah (2004) [2] stated that the ability of birds to digest crude fiber is very limited because ducks are single-hulled animals. Research by Sobayo *et al.* (2012) [14] that the use of *Asystasia gangetica* leaf meal was 2.5 - 7.5% in broiler rations, indicating that the final body weight and body weight gain of broiler chickens decreased with increasing levels of *Asystasia gangetica* leaf meal. The use of forage by Siti (2016) [13] shows that papaya leaf flour supplementation in commercial rations at level 2 - 6% does not affect the performance of ducks. Akbarillah *et al.* (2010) [1] stated that the percentage of Indigofera leaf flour used is around 5 - 15% which can still be used as a mixture of duck feed ingredients.

Apart from the high crude fiber content in the ration due to the use of *Asystasia gangetica* flour, it also has the ability of *Asystasia gangetica* to contain phytochemical compounds. Daffodil *et al.* (2013) [6] reported that *Asystasia* contains flavonoids, phenols, steroids, tannins, glycosides. Phytochemical compounds in *Asystasia gangetica* act as antioxidants and antimicrobials. Phenol compounds have been proven to have antimicrobial properties (Bukar *et al.*, 2010) [5]. The role of this compound is in being able to reduce the number of harmful bacteria in the duck's digestive tract, so that the absorption of food substances becomes optimal which has an impact on increasing the duck's performance. This proves that in this study, even though the ducks were partially replaced with commercial feed with *Asystasia ganggetica* flour, the performance of the ducks was still the same as the control.

The performance indicator for local bali ducks apart from weight gain is feed conversion. The ration conversion value is used as a benchmark for the efficiency of the feed given to ducks to produce body weight. The lower the ration conversion value means the more efficient the amount of ration used to produce 1 kg of meat (Kartasudjana and Suprijatna, 2010) [9]. Furthermore Bidura *et al.* (2019) [4] stated that the ration conversion value is an indicator that can provide an overview of the level of efficiency of ration use with the lower the ration conversion value, the higher the level of efficiency of ration use.

The results of the study showed that the FCR value increased with the administration of *Asystasia ganggetica* flour. There is an increase in the amount of feed consumed which is not balanced by an increase in body weight of local bali ducks. Bidura (2010) [3] and Sumadi (2018) [17] stated that the smaller the FCR value of the feed, the better the quality of the ration. Amrullah (2004) [2] states that the smaller the FCR value (1.75- 2.00) means the feed quality is better. The research results showed that the FCR value of local bali ducks given *Asystasia gangetica* flour at level 5-15% FCR value (3.58 - 3.74) (Table 3). The results of this research are close to the research of Witarja *et al.* (2020) [19] FCR values bali ducks commercial rations with fermented green bean sprout waste flour (3.71 - 4.05). FCR value obtained in this study was higher than the research of Sobayo *et al.* (2012) [14] that broilers were given *Asystasia gangetica* leaf flour at 2.5 - 7.5% (3.06 - 3.13) and lower with research Siti (2016) [13] that male bali ducks were given papaya leaf flour (2-6%) in commercial ration FCR value (5.07-5.10).

In table 3 the drinking water consumption of local bali ducks given 5-15% *Asystasia gangetica* flour has increased. Increasing drinking water consumption in ducks functions to facilitate the process of digestion of food and metabolic processes in the ducks body. Sudaro (2000) [16] states that a lack of water can cause metabolic disorders in the body and if the water content in the feed is low it will cause slow movement of food from the cache. In general, ducks will consume two to three times more drinking water than their food consumption (Sudaro, 2000) [16].

Conclusion

Replacing some commercial rations with 5-15% *Asystasia gangetica* flour provides local bali ducks with the same performance as without *Asystasia gangetica* flour and production costs decrease.

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Conflict of interest declaration

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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