zasmeli

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Production Potential of Local Duck in West Sumatera for Human Nutrition and Biodiversity Conservation

Zasmeli Suhaemi[1]*, Nelzi Fati[2], Julinda Romauli Manullang[3]

[1]Department of Animal Science Universitas Tamansiswa, Padang, West Sumatera-25138, Indonesia
[2]Dep. of Animal Science Agriculture Polytechnic, Payakumbuh, West Sumatera-25163, Indonesia
[3]Department of Animal Science Universitas Mulawarman, Samarinda, East Kalimantan, Indonesia
Corresponding author : emizasmeli@gmail.com;

ABSTRACT

This research aimed to determine the potency of three local West Sumatran ducks (*Pitalah, Kamang and Bayang*). Three-hundred ducks have been raised since Day old Duck (DOD), were randomly chosen from three duck populations (100 ducks of each population). For sample of cholesterol content measurement, 25 ducks of each populations type were randomly chosen for blood serum and meat analyses. We investigated the production potencial of each West Sumatran ducks, and tested the ability of flour salam leaf (FSL) to reduce the cholesterol content of duck derived products. The results show that at 12-weeks olds, the Pitalah breed had the greatest body weight, follow by Kamang and Bayang. Feed Consumption Ratio (FCR) followed the same trend. Pitalah duck egg production also siginificantly highest, followed by Bayang and Kamang. FCR followed the same trend as egg production during the laying period. Bayang had the highest average egg weight, followed by Pitalah and Kamang. The Pitalah duck meat was healthier, with the lowest blood cholesterol content compared to the Bayang and Kamang ducks. Those subject above that important role for human nutrition and biodiversity conservation.

Keywords : human nutrition; west sumatera duck; biodiversity; conservation

INTRODUCTION

Local breeds make up most of the world's poultry genetic diversity, and are still very important in developing countries where they represent up to 95 percent of the total poultry population. These local breeds, which are well-adapted to extensive husbandry systems and suitable for resources-poor poultry farmers endowed with very limited means, should be thoroughly studied as a basis for enhancing their use and conservation [1]. In the developed world, food production is changing from being producer driven to consumer driven. The consumer is increasingly concerned about health, environment, ethics and animal welfare, and demand for certified products such as a free or organic meat and eggs have emerged.

Indonesia has long been known as a world leader in biodiversity. Ducks are largely raised for egg production in the country, and since utilization of duck meat is limited, male ducks have not been reared using optimal practices [2]. However, some plant and animal populations in Indonesia have been decreasing in the recent decades, including local ducks in West Sumatera, namely *Pitalah, Kamang and Bayang*, which originated from and are distributed in West Sumatera, Indonesia. The Pitalah and Kamang ducks represent two of the many Indonesian fauna species that have experienced population loss and are in danger of becoming extinct, despite the admirable efforts of the conservation community. The conservation and management practices for these species could be improved with a better understanding of their genetic diversity and structure. One possibility is the use of DNA markers like microsatellites and because it can be found in large numbers. On the other hand, they are well distributed in the genome with high polymorphism.

Previous research regarding the phylogenetic relationship of these species has demonstrated that all the microsatellite loci are highly polymorphic, ranging from 3 – 7 alleles, with a total of 42 alleles detected while typing all three local duck breeds. The UPGMA dendrogram method based on Nei genetic distances revealed that the Bayang and Kamang ducks were clustered in one group, while the Pitalah duck was clustered in a different group [3].

Ducks experience remarkably rapid growth during the first week of life. The potential of the animal can be seen in their development and growth, which are closely associated processes. The first dominates during embryogenesis, and the second in the postnatal period of life [4].

Cholesterol is an integral lipid component that has been villainized for its perceived negative effect on health. Public concern is more specifically related to meat products, red meat in particular [5]. Cholesterol concentration in meat and poultry can be influenced by various factors, effects of animal species, muscle fiber type, and muscle fat content [6]. Cholesterol is an important structural component of membranes and acts as a precursor for synthesis of steroid hormones, vitamin D and bile acids. Cholesterol can be obtained directly from feed or synthesized in cells through acetyl-coenzyme A pathways [7]. Cholesterol of blood, can be affecting by genetic and environment [8].

MATERIALS AND METHODS

Three hundred ducks were randomly chosen from three populations in West Sumatera (100 ducks from each population): Pitalah, Kamang and Bayang. All ducks were reared from DOD (Day old Duck), and body weight and FCR were

collected at 2, 4, 6, 8, 10 and 12 weeks of age. Egg production and quality were also measured in each population as follows: 1) egg production percentage for 20 weeks; 2) FCR in the layer period for 20 weeks; and 3) weight of eggs after 70% production. Twenty-five ducks from each group were randomly chosen for cholesterol analysis of their blood serum and meat. All collected data were tested for significance among the three populations using a *z-test*. All ducks gave iso calorie and protein ration during the growing and laying periods (Table 1 and 2).

Table 1. The nutrient content of feedstufs for diet

Feedstuffs	Crude Protein (%)	Crude Lipid (%)	Crude Fiber (%)	Ca (%)	P (%)	ME (Kkal/Kg)
Concentrate 144	34,00	3,00	5,00	12,00	1,20	2600
Kale vegetable	4,19	1,20	7,28	0,05	5,23	419
Rice bran	12,04	1,70	12,00	0,20	1,00	1630
Cornstarch	8,60	4,20	2,70	1,00	2,56	3420

Table 2. The composition and nutrient content of diet.

Feedstuffs	Formulation growth periods (%)	Formulation laying periods (%)
Concentrate 144	25,00	32,00
Kale vegetable	2,00	2,60
Rice bran	30,00	25,00
Cornstarch	43,00	40,00
Mineral	0,00	0,40
Total (%)	100,00	100,00
Nutrient content		
Crude Protein (%)	15,46	17,08
Crude lipid (%)	3,09	3,09
Crude Fiber (%)	8,16	7,78
Ca (%)	3,49	4,69
P (%)	1,78	2,17
ME (Kkal/Kg)	2609,20	2610,16

The nutrient content based on Table 1

RESULTS AND DISCUSSION

Table 3 shows that the body weight of the 2-week-old Pitalah duck was the highest, followed by the Bayang and Kamang ducks, which had approximately the same body weight at 4 weeks of age. However, the body weights at 10 and 12

weeks had a different order across the three breeds. At 10 weeks, the Kamang duck was the heaviest, followed by the Bayang and Pitalah ducks. At 12 weeks, the Pitalah duck again became the heaviest, followed by the Kamang and Bayang ducks.

Table 3. Average body weight of three population West Sumatran ducks.

Age (week)	Type of duck		
	Pitalah (g/e)	Kamang (g/e)	Bayang (g/e)
2	240,57^{a} ± 20.03	208,87^{b} ± 19,74	216,25^{b} ± 27,72
4	460,25^{ab} ± 77.42	423,99^{c} ± 53,71	435,99^{bc} ± 71,56
6	878,51^{a} ± 78.90	854,82^{ab} ± 52,38	838,74^{b} ± 44,32
8	1084,03^{a} ± 82.86	1067,82^{a} ± 91,86	1033,67^{b} ± 84,02
10	1128,81^{a} ± 43.96	1196,66^{a} ± 52,26	1158,96^{b} ± 73,77
12	1315,12^{a} ± 64.55	1304,02^{a} ± 70,21	1254,30^{b} ± 73,48

Witihin in row of each variable with superscript (a,b and c), significantly by *t*- test (P<0,05).

The *Z test* results from the three populations demonstrated that from 8 to 12 weeks of age, the Pitalah duck was significantly heavier (P<0.05), and the Kamang duck had the second highest weight, though it was not significantly different from that of the Pitalah duck. Broiler or layer potential in ducks is determined by body weight up to 8 or 12 weeks of age.

Figure 1, descripted that three population local duck have increse of body weight up to 12 weeks of age, and Pitalah duck almost on the top, follow by Kamang and than Bayang to the bottom. All local duck have potency for broiler but Pitalah or Kamang were better, because between Pitalah and Kamang almost not significant neither, than Bayang.

Table 4. Average FCR of ducks in growing period .

Age (week)	Population		
	Pitalah	Kamang	Bayang
0 - 8	2,57^{a} ± 0,22	2,56^{a} ± 0,30	2,67^{b} ± 0,25
0 - 12	7,04^{a} ± 0,34	7,10^{a} ± 0,39	7,42^{b} ± 0,46

Witihin in row of each variable with superscript (a and b), significantly by *t*- test (P<0,05).

Table 4 shows that the Pitalah duck had the lowest FCR and the Bayang duck had the highest. As broilers, ducks may be kept until the age of 8 to 12 weeks; Tables 3 and 4 describe which duck populations may be most efficient as broilers. The *z Test* results showed that at both 8 and 12 weeks old, the FCR of the Pitalah duck was not significantly better than that of the Kamang duck, though it was significantly better than that of the Bayang duck. These results were different from those of previous research regarding the FCR of Alabio ducks at 10 weeks old, which was 8.8 or lower, while a value of 8.92 was found for Cihateup ducks [9].

Table 5. Average egg production of three population West Sumatran ducks

Variable	Population		
	Pitalah	Kamang	Bayang
Daily egg production (%)	$60,80^{a} \pm 16,88$	$40,28^{b} \pm 13,23$	$53,35^{c} \pm 8,09$
FCR laying period	$5,44^{b} \pm 2,61$	$9,01^{a} \pm 3,10$	$5,90^{b} \pm 2,27$
Egg weight (g)	$68,10^{ab} \pm 4,67$	$67,67^{b} \pm 2,18$	$68,84^{a} \pm 5,18$

Witihin in row of each variable with superscript (a,b and c), significantly by *t*- test (P<0,05).

The three populations of local duck were significantly different (P<0.05) with respect to daily egg production (Table 5). The Pitalah duck produced the most, followed by the Bayang and Kamang ducks. The feed conversion ratio (FCR) was determined using the average layer production over 20 weeks. It showed that the Pitalah duck was the most efficient, followed by the Bayang and Kamang ducks. This demonstrated that the Pitalah duck was better than the Bayang duck and especially better than the Kamang duck. The FCR of the Pitalah duck was lower than that of the Kamang duck at a highly significantly level (P<0.01) but not significantly different than that of the Bayang duck (P>0.05). Egg weights were not significantly different (P>0.05) between the Pitalah and Bayang ducks or between

the Pitalah and Kamang ducks ($P>0.05$). However, they were highly significant ($P<0.01$) different between the Kamang and Bayang ducks.

Duck growth up to 12 weeks of age was highly significant ($P<0.05$) among the three populations. Similar to the results of Setioko *et al* [10], the maximum growth of ducks increased from 4 to 10 weeks and then decreased. On the other hand, it has been reported that the increased rate of growth in ducks, namely, the Pegagan duck, only lasted until 9 weeks of age and then decreased [11]. The FCR layer period of the Pitalah duck was the lowest among the three populations, suggesting that the Pitalah duck has the greatest potential to be a successful layer.

The three populations of local duck were significantly different ($P<0.05$) in daily egg production. Differences in egg production can be caused by phenotypic diversity because of genetic diversity, the diversity of the environment or genetic interactions with the environment. In this study, the environments were assumed to be equal, so any phenotypic diversity that occurred was caused by genetic factors. Genetic diversity is produced through additive and non-additive gene actions consisting of gene dominance and epistasis. The average egg height difference, indicating the value of heterocyst, suggests that egg production was affected by additive gene action [12]. Table 5 demonstrates that the Bayang duck had greater egg weight than the Pitalah and Kamang ducks but that the average daily egg production of the Bayang duck was lower than that of the Pitalah duck. This results in the non-statistically significant difference in the average feed conversion ratio between the Pitalah and Bayang ducks. Genetic diversity appears as differences in base sequences, which generate unique sequences of amino acids in a protein encoded by a locus. Variations in these proteins in turn cause biochemical or

morphological differences in function, which eventually lead to differences in the rate of reproduction, survival, or behavior of an individual [13].

The analysis of meat and blood cholesterol, HDL and LDL contents of the Pitalah and Bayang ducks is represented in Table 6. The average cholesterol content in the blood of the local Tegal duck in Java, which was provided a different type of feed than the three populations in this study, was 181.22 ml/dl. The duck's blood cholesterol was not affected by feed type. The average cholesterol content of duck meat, from animals given different types of feed, was 186.26 mg/100 g, and meat cholesterol was significantly affected by feed form [14]. This was just lower than the cholesterol blood content of the local ducks in this study (Table 6). The blood cholesterol content of the Kamang duck was highest, followed by the Bayang and then the Pitalah. However, the meat cholesterol content of the local ducks in this study was lower than that of the Tegal duck. The cholesterol content of the Kamang meat was the highest, follow by the Bayang and then the Pitalah.

Table 6. Average cholesterol content of blood (ml/dl) and meat (mg/100g).

Variable	Pitalah		Bayang		Kamang	
	Meat	Blood	Meat	Blood	Meat	Blood
Cholesterol	79.00^{a}	193.77^{A}	92.50^{b}	240.71^{B}	153.00^{c}	283.00^{C}
HDL	7.00^{a}	47.11^{A}	8.00^{a}	47.73^{A}	18.00^{b}	65.90^{B}
LDL	8.00^{a}	11.80^{A}	8.20^{a}	14.10^{B}	6.00^{b}	12.20^{A}

Witihin in row of each variable with superscript (a,b and c or A, B and C), significantly by Duncat test (P<0,05).

CONCLUSION

The results from this study suggest that the Pitalah duck has potential both for broiler and layer usages. However, the Bayang duck was better as a layer, and the Kamang duck was suitable only as a broiler. The Pitalah duck meat was

healthier, with the lowest blood cholesterol content compared to the Bayang and Kamang ducks. However, both the meat and egg of these local ducks have high cholesterol contents. This potential plays an important role for increasing productivity and improving human nutrition and conservation.

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