The Utilization of Sago Dregs to Increase Body Weight Gain and Feed Conversion Rate of Balitbangtan Superior Native Chicken

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Abstract. The utilization of local resource materials as the feed source for native chicken, such as sago dregs, is a potential solution to reduce the cost of conventional chicken feed. Sago dregs is produced from sago processing that is widely available in Meranti Island Regency, Riau Province. This research was aimed to determine how much evaluate the potential of sago dregs for native chicken feed in Meranti Regency. Testing sago-dregs based ration was carried out on 80 four-week-old Balitbangtan superior native chicken in four treatments (n=20) as follows: P1 = 60% fermented sago dregs (FSD)) + 10% corn + 30% trash fish; P2 = 60% FSD + 10% coffee skin + 30% trash fish; P3 = 50% FSD + 50% commercial chicken feed; P4 = 50% non-fermented sago dregs (NFSD)) + 50% commercial chicken feed. The commercial starter was given to 0-4 weeks-old chickens, while treatment feed was given to 4-12 weeks. The parameters observed were body weight gain and feed conversion ratio. The research data obtained were processed statistically using the T-test. The results showed a significantly lower (P <0.05) average body weight of chickens in P2 (630 grams) than that of P3 (808 grams) and of P4 (806 grams). Meanwhile, the P1 chickens' weight (722 grams) was not significantly different from the others. The feed conversion ratio of P1, P2, P3, and P4 was 3.2, 3.3, 3.1, and 3.5, respectively. Sago dregs is a potential substitute for conventional feed for Balitbangtan's superior native chickens.

Keywords: sago dregs, Balitbangtan superior native chickens

Abstrak. Pemanfaatan sumberdaya lokal sebagai sumber pakan ayam kampung seperti ampas sagu merupakan solusi yang dapat dilakukan untuk menekan biaya pakan konvensional. Ampas sagu merupakan limbah pengolahan sagu banyak tedapat di kabupaten Kepulauan Meranti Provinsi Riau. Kegiatan ini bertujuan untuk mengetahui seberapa besar pemanfaatan ampas sagu untuk pakan ayam kampung di Kabupaten Meranti. Pengujian ransum berbasis ampas sagu dilakukan pada 80 ekor ayam kampung Balitbangtan umur 4 minggu. Kegiatan ini dibagi dalam 4 perlakuan ransum. Masing-masing perlakuan terdiri dari 20 ekor ayam. Formulasi ransumperlakuan adalah: P1= ampas sagu fermentasi (ASF) 60%+ jagung 10%+ ikan rucah 30%; P2= ASF 60%+ kulit kopi 10% + ikan rucah 30%; P3= ASF 50% + pakan ayam komersil 50%; P4= ampas sagu non fermentasi (ASN) 50% + pakan ayam komersil 50%. Pemberian pakan perlakuan dilakukan hingga ayam berumur 12 minggu. Parameter yang diamati berupa pertambahan bobot ayam yang ditimbang setiap 2 minggu, konsumsi ransum dan konversi ransum. Data penelitian yang didapat diolah secara statistik menggunakan T-test. Hasil penelitian menunjukkan bahwa rataan bobot ayam P2= 630 gr/ekor nyata lebh rendah (P<0,05) dibandingkan P3= 808 gr/ekor dan P4=806 gr/ekor. Sementara bobot ayam P1=722 gr/ekor tidak berbeda nyata dengan ketiga perlakuan lainnya. Nilai konversi ransum untuk masing-masing perlakuan adalah P1=3,2; P2=3,3; P3= 3,1 dan P4=3,5. Pemanfaatan ampas sagu sebagai pakan untuk ayam kampung unggul Balitbangtan dapat menggantikan penggunaan bahan pakan konvensional.

Kata Kunci: ampas sagu, ayam kampung unggul Balitbangtan

Introduction

Feed is a crucial factor in livestock development. Sjofjan and Adli (2021) identify feed as the major contributor to land occupation, primary production use, acidification, climate change, energy use, and water dependency. Massive utilizations in animal feeding of fishmeal pose severe environmental issues. Despite having long coastal lines, Indonesia still cannot produce fish meals as animal feed. Livestock production capability is related to the quality and quantity

of feed which should be available throughout the year. In other words, fluctuating feed availability and insufficient feed supply for livestock nutrition to fully express its genetic potential potentially result in relatively low livestock productivity (Ravindran, 2021).

Feed is the highest cost for livestock production activities, including chicken farming. Currently, the development of native chickens or better known as 'ayam kampung' shows an increasing trend after Balitbangtan (Indonesian Agency for Agricultural Research and Development) releases superior native chickens known as KUB and Sensi chickens with better feed efficiency, higher production of meat and egg, and better disease resistance than those of ordinary native chicken (Hidayat et al., 2011; Urfa et al., 2017). The obstacle in developing superior native chickens is the high price of feed which can negatively affect feed supply. Today, local resource-based feed is developed as an alternative to support sustainable, efficient, and competitive livestock production. Waste products from various types of plants are potential sources of alternative feed raw materials and solutions to overcome environmental pollution.

Sago palm (*Metroxylon sagu Rottb.*) is an important crop to support Indonesian food security (Fetriyuna et al., 2022). Sago palm spreads across the islands of Sumatra, Papua, Maluku, Kalimantan, and Sulawesi, but the largest production of sago starch is derived from Riau Province, among other areas. According to the data of Riau Central Statistics Agency, sago plantations in Riau take up around 82,713 hectares and produce 281,784 tons/year sago (Riau Central Statistics Agency, 2018). The largest sago plantation in Riau Province is in Meranti Islands Regency, accounting for 38,614 ha with a production of 202,063 tons (Meranti Island Central Statistical Agency, 2018). One sago tree can produce 17-25% sago starch and 75-83% sago pulp (Rahayu, 2016), and sago dregs is a viable alternative to feed material for livestock energy sources. In addition, Ternate, Moluccas, and Papua are three Indonesian islands with the biggest sago palm tropical farm in Indonesia. A total of 1.40 million ha areas in these three islands are planted with sago palms (Adli, 2021).

The sago dregs contained 65.75% carbohydrates, 21% lignin, and 20% cellulose. The utilization of sago dregs as animal feed should go through further processing because the protein content of sago dregs is only about 2%, and the crude fiber content of sago dregs is 39% (Rahayu, 2016). The fermentation process can improve the protein content and decrease the crude fiber of sago dregs. The process of fermentation is free from negative effects, easy, convenient (without special equipment), and relatively cheap. The fermentation substrate of sago dregs has a higher nutritional value than the original sago dregs (Susanti et al., 2022) because the catabolic and anabolic properties of the microorganisms in fermentation helps break down the more complex components for better digestibility. During the fermentation process, the accompanying benefits include feed preservation, removal of unwanted odors, increased feed digestibility, elimination of toxic in the raw material, and desired color (Datau and Fathan, 2021).

Sago dregs can be used with a balanced nutritional composition of up to 12.5% in broiler chicken rations and in native chicken rations up to 25% (Rianza and Denny, 2019). This research aimed to determine the potential of sago dregs for native chicken feed in Meranti Island Regency.

Materials and Methods

This research was conducted in Mekarsari Village, Merbau District, Meranti Island Regency, Riau Province, from May to November 2019. The materials used were sago dregs, tempeh yeast, ultra-minerals, urea, mineral mix, coffee skin, maize corn, bran, and fish trash.

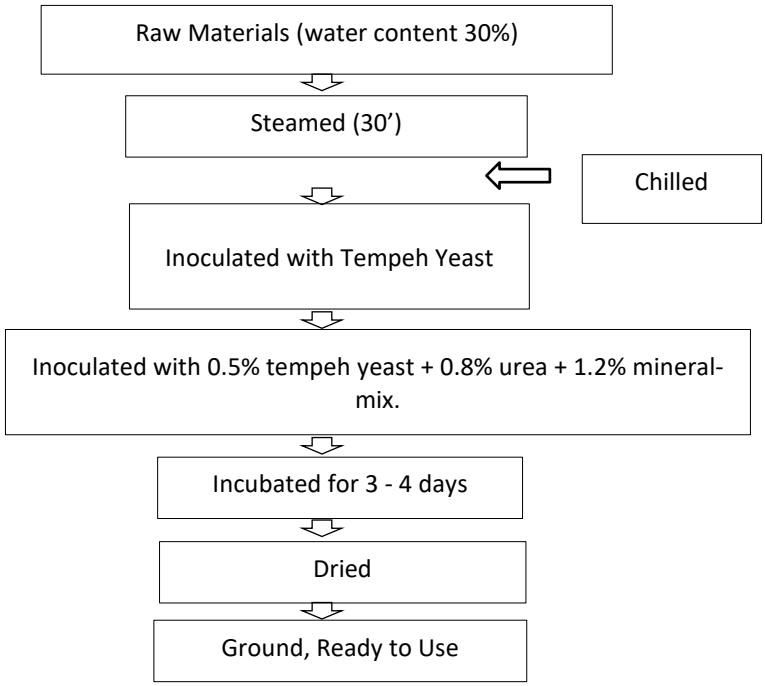

Figure 1. Flow Diagram of Sago Pulp Fermentation

The research equipment was a steamer pot, wooden spoon, plastic tub, fermentation tray, grinding machine, and the ingredients mixing machine. The sago dregs-based feed was tested on 80 Balitbangtan superior native chickens aged four weeks.

Fermented sago dregs

Sago dregs was fermented to improve its nutritional value as a feed ingredient in a process proposed by Zurriyati (1995) with slight modifications according to the field conditions.

Before fermentation, sago dregs were weighed to determine the amount of minerals and urea supplementation to the substrates. Sago dregs was slightly wet because it contained 30% of water, so it was steamed in a pan for 30 minutes, then let cool to room temperature. Then, the sago was added with 0.05% tempeh yeast, 0.8% urea, and 1.2% mineral for inoculation, placed on a fermentation tray, covered, then let incubated at room temperature to grow the molds. The growth process began with the presence of hyphae, mycelium, and spores on the surface of the substrate. If white spores had formed all over the surfaces of the substrates, the substrates could be harvested, dried, and ground. Next, the fermented materials were ready for feed preparation.

Reaserch treatment on Balitbangtan superior native chicken

The result of fermented sago dregs was used as the raw material for feed for Balitbangtan superior native chicken, and non-fermented sago dregs was utilized for comparison (see Table 1 for feed formulation). A total of 80 chickens were raised from DOC and offered commercial starter feed (21-23% CP, 5-8% EE, 3-5% CF, and 4-7% ash) from the age of 0-4 weeks and continued with treatment feed from 4 to 12 weeks.

These activities consisted of 4 treatments, each with 20 chickens. The observed parameters were body weight gain every two weeks and feed conversion. The obtained data were statistically analyzed using the T-test.

Table 1. Formulation of sago dregs-based treatment rations

Material Compositions	**Feed Formulation**			
	P1	**P2**	**P3**	**P4**
Non-fermented sago dregs (NFSD) (%)	0	0	0	50
Fermented sago dregs (FSD) (%)	60	60	50	0
Maize (%)	10	0	0	0
Coffee skin (%)	0	10	0	0
Trash fish (%)	30	30	0	0
Commercial chicken feed (%)	0	0	50	50
Cost of feed/kg (rp)	2,625	2,175	5,020	4,250
Feed nutritional composition				
Dry material (%)	85.64*	85.58*	87.30**	92.6**
Ash content (%)	15.85*	15.75*	6.7**	8.2**
Crude protein (%)	19.19*	20.13*	14**	11**
Crude fiber (%)	17.03*	17.84*	10.5**	9.45**
Extract ether (%)	1.92*	1.67*	2.38**	2.38**
Metabolic energy (kcal/kg)	2,184.7*	2,041.2*	2,500**	2,700**

* Laboratory of IPB's Feed Science and Technology; ** The calculation results; Note: The nutritional value for each feeding treatment was different due to the varieties of raw materials available in the field and the feed price. While P2 treatment was the cheapest of all, price differences were due to the variety in raw material compositions. The following is the price list of the feed composition: FSD = Rp 2,000/kg; maize = Rp 5,000/kg; coffee skin = Rp 500/kg; commercial chicken feed = Rp 8,000/kg; trash fish = 500/kg

Results and Discussion

Nutritional analysis of sago dregs

The availability of quality feed ingredients is one of the requirements that must be in the livestock business (Gasco et al., 2020). The results of the nutritional analysis of sago dregs and fermented sago dregs in these activities included crude protein, extract ether, crude fiber, and ash content, which had been tested in the UIN SUSKA Riau laboratory, and would be presented in the following Table 2.

Table 2 shows changes in some nutritional components of sago dregs after the fermentation process in which protein levels increased from 1.4% to 7.6%, CF content increased from 13.9% to 16%, and NFE levels (energy sources) declined from 74.8% to 69.5%. *Rhizopus Oligosporus* molds found in tempeh yeast utilized carbohydrates in the substrate as an energy source for its growth and reproduction. During the fermentation process, the carbohydrate content dropped as reflected by the decreasing NFE value. Meanwhile, the more molds grow, the higher the protein content. Therefore, the proportional increase of protein content during the fermentation was due to the reduced carbohydrate and the activity of microbes to retain the proteins and turn them into a single protein (Sharma et al., 2020). Also, *Rhizopus oligosporus* contains high proteolytic properties to break down complex protein substrates into simpler ones. Meanwhile, the increase in CF content was assumed due to the growth of mycelium from the fungus *Rhizopus Oligosporus*. The crude fiber substrate increased due to the development of mycelium mold and the loss of the substrate's solidity during the fermentation process.

Table 2. Nutritional composition of sago dregs and fermented sago dregs

Materials	DM (%)	CP (%)	EE (%)	CF (%)	Ash (%)	NFE (%)
Non-fermented sago dregs (NFSD)	96.9	1.4	0.5	13.9	9.4	74.8
Fermented sago dregs (FSD)	86.4	7.6	0.5	16	6.4	69.5

Notes: DM= dry matter; CP = crude protein; EE = extract ether; CF = crude fiber; NFE = nitrogen free extract

Table 3. Average weight of Balitbang superior native chicken fed on local resource-based ration in meranti regency in 2019

Chicken Age (Weeks)	Weight			
	P1	P2	P3	P4
0	36	33	33,6	35
3	232	210	194	198
5	464	484	476	456
6	492	462	526	506
7	572	494	630	604
8	624^{ab}	532^{a}	672^{b}	650^{ab}
9	664^{ab}	580^{a}	728^{b}	706^{b}
10	680^{ab}	600^{a}	754^{b}	734^{b}
11	692^{ab}	596^{a}	776^{b}	760^{b}
12	722^{ab}	630^{a}	808^{b}	806^{b}

Note: Different letters in the same line show significant difference (P <0.05) at 5%

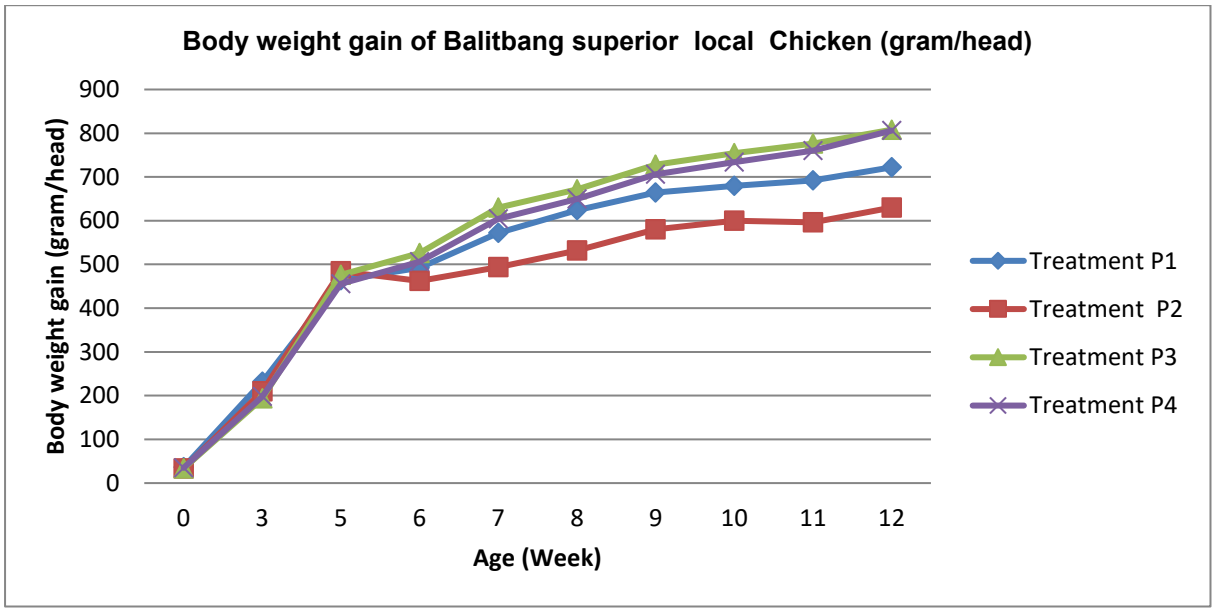

Figure 2. Body weight gain of Balitbangtan superior native chicken with local resource-based feeding.

The performance of Balitbang superior native chicken fed by sago dregs

The average feed consumption per chicken in P1, P2, P3, and P4 was 2.3 kg, 2.1 kg, 2.5 kg, and 2.8 kg, respectively. The amount of ration consumption was calculated from the differences between the offered feed and the leftover feed. Ration consumption means the amount of feed consumed by livestock for their basic living and production (Rianza et al., 2019). The average ration consumption of P1 and P2 was relatively lower than that of P3 and P4. Also, P1 and P2 fee was darker in color.

The average body weight gain is presented in Table 3. Statistically, Statistically, body weight gain across treatments was not significantly different until the age of 7 weeks, with an average of 494-630 grams/chicken. However, discrepancies in body weights occurred from 8 to 12 weeks of age across treatments. P2 and P3 showed significantly (P <0.05) different average body weights of 12-week-old chickens, while that of P1 and P4 was no different. The highest body weight gain was observed in P3, while the lowest was in P2. At 12 weeks of age, the average body weight of chicken in P1, P2, P3, and P4 was 722 grams, 630 grams, 808 grams, and 806

grams, respectively. In P3, 50% fermented sago pulp and commercial chicken feed resulted in a higher final body weight. The feed cost in P3 was Rp 5,020/kg which was relatively lower than full commercial feed at Rp 8,000/kg. Body weight gain is influenced by feed consumption (Leeson and Summers (2008), serves as one of the production standards parameters (Muharlien et al., 2011), and a measure of growth rate (Rianza et al., 2019). In other words, optimal feed consumption results in optimal body weight gain.

The feed conversion ratio of P1, P2, P3, and P4 was 3.2, 3.3, 3.1, and 3.5, respectively. It is evident that the lowest ratio was in P3. The feed conversion ratio reflects the level of feed efficiency; therefore, the higher the feed conversion, the less efficient feed utilization. In contrast, the lower the feed conversion, the more efficient feed utilization (Yunilas, 2005). Lacy and Vest (2000) state that the main contributing factors to feed conversion are genetics, feed quality, disease, temperature, cage sanitation, ventilation, medication, and cage management (Moreki et al., 2020).

Conclusions

The utilization of sago dregs as feed for the Balitbangtan superior native chickens could replace conventional feed. Fermented sago dregs (FSD) increase crude protein from 1.4 to 7.6 % compared to non-fermented ordinary sago dregs. Treatment feed made of 50% fermented sago dregs and 50% of commercial feed resulted in the highest average final weight per chicken (808 grams) and the lowest feed conversion ratio (3:1).

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