NUTRIENT COMPOSITION AND TOTAL TRACT NUTRIENT DIGESTIBILITY COEFFICIENT OF SAGO (*PUTAK* MEAL) FROM DIFFERENT LOCATION

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Abstract

The aim of the study was to evaluate the proximate composition and nutrient digestibility of sago meal from different origin on growing broilers. The experimental design used was randomized complete design consisting of five treatments and four replications. A total of 100 growing broilers were randomly distributed to 20 cages (5 birds/cage). Corn-soybean basal diets were formulated and then the assay diets were developed by substituting sago meal 20% (w/w) of the basal diets. The results showed that location significantly affected (P < 0.05) the crude protein (CP) and crude fibre (CF) contents of sago, but it did not affect (P > 0.05) the ash and gross energy contents. The digestibility coefficient (DC) of crude lipid (CL), CF and energy of sago were significantly affected (P < 0.05) by location. There were no differences (P > 0.05) on DCCL of sago meal from Lili dan Naibonat and between Naibonat and Pariti. The DCCL of Bipolo sago meal was not different (P > 0.05) from DCCL of Lili sago meal, however, it was significantly different (P < 0.05) from the DCCL of sago from Naibonat and Pariti. The DCCF of Naibonat sago was significantly different (P < 0.05) from the DCCF of sago from Pariti, Bipolo and Lili. The DCE of Naibonat sago was significantly higher (P < 0.05) that that of Pariti and Bipolo sago. In conclusion, 1) the nutrient composition and digestibility of sago meal were affected by the different origin; 2) sago is potential to be used as energy source feed ingredient in poultry diet due to its high energy content.

Keywords: Broiler, Location, Proximate, Nutrient digestibility, Sago

Introduction

Corn is still the main energy source used in the broiler diet formulation. However, the price of corn is not stable and the corn production is depending on season. In addition, the corn sold to the feed industry tends to have high moisture level. The high moisture corn are a good medium for fungus to invest the corn and and produce toxins which could give detrimental effects to birds when they consume it. Based on this condition, it is important to find out the alterative feed ingredient which can substitute or replace corn in the diets. Sago (*putak* meal) has been reported to be used as alternative energy sources for broiler diets which are locally available and cheap (Nalle *et al.,* 2017). The nutrient composition of sago (*putak* meal) has been publicly reported (Nalle *et al.,* 2019) however the

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evaluation of nutrient digestibility of sago from different location has not been conducted yet. The nutrient digestibility data of sago is important to be determined because it is related with the ability of birds to utilize nutrients in this feed ingredient. All of this information becomes the main reason why the present study was conducted. The objective of the present study was to measure and to compare the nutrient composition ann digestibility of sago (*putak* meal) from different location.

Methodology

The experiment was designed using randomized complete design consisting of 5 treatments and 4 replications. The treatments were basal diet, basal diet containing 20% sago from Naibonat, basal diet containing 20% sago from Pariti, basal diet containing 20% sago from Bipolo, basal diet containing 20% sago from Lili. A total 100 growing broilers (21 day old) were randomly distributed to 20 cages (5 birds each cage). Variables measured were 1) proximate and gross energy content of sago (putak meal), 2) total tract digestibility coefficient of crude lipid, crude fiber and energy. The formulas used to calculate the digestibility coefficient were

$$\text{Nutrient digestibility coefficient}_{diet} = \frac{\text{(Feed intake x Diet nutrient) x (Excreta output x Excreta nutrient)}}{\text{(Feed intake x Diet nutrient)}}$$

$$\text{Total tract nutrient digestibility coefficient}_{\text{sago (}putak\text{ meal) 1/2/3/4}} = \frac{(\text{Nutrient digestibility coefficient}_{sagodiet} \times \text{Nutrient}_{sagodiet}) - \text{Nutrient digestibility coefficient}_{basaldiet} \times (0.80 \times \text{Nutrient}_{basaldiet}))}{0.20 \times \text{nutrient}_{sago}}$$

Data were analised using general linear model (SAS University Edition).

Results and discussion

Nutrient composition of sago (*putak* meal) from different location

As can be seen from Table 1., except for crude lipid, ash and gross energy, location significantly affected ($P < 0.05$ to $P < 0.01$) the nutrient composition of sago (*putak* meal). Significant differences ($P < 0.05$) were found in dry matter content of sago from *Naibonat2* and sago from *Naibonat1*, *Pariti* and *Bipolo*.

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Table 1. Nutrient composition of sago (putak meal) from different location and corn as a reference[1]

	Dry matter	**Crude protein**	**Crude lipid**	**Crude fiber**	**Ash**	**Gross energy**
Sago sample	**……g/100 g DM……**					**Kcal/kg DM**
Naibonat1	88.88[b]	2.265[b]	0.290	6.370[a]	2.470	4381.29
Naibonat2	89.56[a]	2.250[b]	0.687	3.480[a]	4.310	4264.64
Pariti	88.91[b]	2.230[b]	0.335	6.565[a]	3.600	4391.65
Bipolo	88.18[c]	3.175[a]	0.535	3.355[b]	4.790	4248.45
Lili	89.44[ab]	2.010 [b]	0.660	6.230[a]	5.230	4283.57
Average	**88.99**	**2.407**	**0.501**	**5.200**	**4.082**	**4313.92**
SEM	**0.177**	**0.171**	**0.129**	**0.279**	**0.662**	**56.37**
Pr > F	**0.014**	**0.031**	**0.231**	**0.0008**	**0.153**	**0.346**
Corn	85.56	10.97	0.230	3.340	1.900	4769.28
SEM	**0.16**	**0.49**	**0.04**	**0.21**	**0.05**	**14.46**

[a,b] Means of column with the superscripts significant difference (P<0.05),
[1]each value is the average of 2 replicates

Crude protein (CP) content of sago from *Bipolo* was higher (P < 0.05) than the CP from other location. The crude fiber content of sago from *Bipolo* was lower (P < 0.05) that those from *Naibonat*, *Pariti* and *Lili*. The differences in the nutrient composition of sago among treatments were probably due to the differences in soil fertility and harvested time. The crude protein content of sago samples in the present study (2.010 to 3.175 g/100 g DM) was lower than the sago sample reported by Nalle *et al.* (2017) which was 3.66 g/100 g DM. However the CP values of the present study were nearly similar to those reported by Nalle *et al.* (2019) which were 2.387 to 2.849 g/100g DM. The average of crude fiber (CF) in the present study (5.20 g/100 g DM) was lower compared to that of Nalle *et al.* (2017) which was 9.95 g/ 100 g DM. The CF content obtained in this study was higher than those evaluated by Nalle *et al.* (2019) which was 4.972 g/100g DM. The differences in crude protein and crude fiber contents were probably due to the differences in sample location and harvested time.

The result of the present study was in agreement with Lee *et al.* (2016) who reported that the nutrient composition of corn, wheat and barley was affected by different origin. Corn and wheat samples which were evaluated by Lee *et al.* (2016) were from five different countries, whereas barley samples were from three different countries.

Compare to corn, the gross energy of sago was nearly similar to the gross energy of corn. Sago (*putak* meal) has lower crude protein content that that of corn, but it has higher crude fiber than that of corn crude fiber.

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Nutrient digestibility coefficient of sago (*putak* meal) from different location

Table 2 depicted the nutrient digestibility coefficient of sago (*putak* meal). The statistical analysis showed that location significantly influenced ($P < 0.05$ to $P < 0.01$) the nutrient digestibility of sago (*putak* meal).

Table 2. Total tract nutrient digestibility coefficient of sago (*putak* meal) from different location

Sample location	Digestibility coefficient		
	Crude Lipid	Crude Fiber	Energy
Naibonat	0.475^{bc}	0.699^{a}	0.687^{a}
Pariti	0.358^{c}	0.201^{b}	0.477^{b}
Bipolo	0.675^{a}	0.363^{b}	0.412^{b}
Lili	0.561^{ab}	0.176^{b}	0.584^{ab}
SEM	**0.055**	**0.077**	**0.057**
Pr > F	**0.010**	**0.002**	**0.026**

[a,b] Means of column with the superscripts significant defference (P<0.05)

[1]each value is the average of 4 replicates (5 birds/replicate)

The crude lipid digestibility coefficient (CLDC) of sago from *Bipolo* was significantly higher ($P < 0.05$) than the CLDC of sago from *Naibonat*, *Pariti* and *Lili*. The crude fiber digestibility coefficient (CFDC) of sago from Naibonat was higher ($P < 0.05$) than others. No significant differences in CFDC ($P > 0.05$) were found among *Pariti*, *Bipolo* and *Lili* sago (*putak* meal). Naibonat sago has higher ($P < 0.05$) energy digestibility coefficient (EDC) compared to Pariti and Bipolo sago.

The differences in nutrient digestibility of sago were probably due to the differences in crude fibre content (Table 1) and anti-nutritional factors. As the crude fiber increases, the crude lipid digestibility coefficient decreases (Table 1 and 2). Tancharoenrat (2012) stated that the digestion and absorption of lipid were affected by the fiber content, in which high fiber content will lead to high viscosity of digesta in the small intestine. The high digesta viscosity in the small intestine of chickens will cause problems such as 1) the difficulty of enzymes to attack target substrates so the nutrient digestibility will decrease; 2) decrease gut health as a result of the increase of pathogenic microbial in the intestine. The decrease of lipid digestibility in broilers will affect the change of digestive organs, and lipid deposition. Saki *et al.* (2011) reported that chicken digestive organs changed as a result of soluble and insoluble fiber.

Nalle *et al.* (2019) reported that sago (*putak* meal) contain phytic acid (28.6-33.7 g/kg DM), tannin (1.3-22.7 g/kg DM), and NDF (188.7-235 g/kg DM). Woyengo and Nyachoti (2012) reported that phytic acid plays an important role in the decrease of energy digestibility through reducing the digestibility of carbohydrate, protein and lipid. All those nutrients are energy generating

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nutrients. Phytic acid reduces the activity of carbohydrase through binding with digestive enzymes, dietary proteins, and starch.

Conclusions

It is concluded that location affects the nutrient composition and digestibility of sago (*putak* meal). Sago is potential to be used as alternative energy source due to its high energy, but it cannot fully replace corn in broiler diets due to its low crude protein and high crude fiber contents. It is suggested that when use sago in broiler diets, it is better to supplement with multy enzymes in order to improve the nutrient digestibility.

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