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Effectiveness of Replacing Rice Bran with Palm Oil Processing Solid by-products (*Solid*) on the Performance of Kaur Cattle

Jarmuji, and A. R. Azis

Department of Animal Husbandry, Faculty of Agriculture, University of Bengkulu, Indonesia
**Corresponding Author:* jarmuji@unib.ac.id
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ABSTRACT

Sakura Block Plus is a feed supplement designed to enhance cattle performance, with rice bran accounting for 22% of its total ingredients. However, due to the increasing scarcity and rising prices of rice bran, palm oil processing solid by-products offer a potential alternative. This study aimed to assess the effect of Sakura Block Plus supplemented with solid at different levels as a substitute for rice bran on dry matter intake and body weight gain in Kaur cows fed a natural grass diet. A Latin Square Design (LSD) was employed, involving four treatments and four replications. The treatments consisted of wild grass plus a sakura block, with 5.5% (P1), 11% (P2), 16.5% (P3), and 22% (P4) of the solid as rice bran replacement. The results indicated that replacing rice bran with solid up to 22% did not significantly affect dry matter intake (P>0.05). Still, there was a trend toward increased body weight gain at the highest solid level. Dry matter intake averaged 7.22-7.96 kg/head/day (2.80-3.06% of body weight), while body weight gain ranged from 0.41-0.52 kg/head/day. These findings suggest that solid can replace up to 100% of rice bran in sakura block plus formulations without adversely affecting cattle performance.

Keywords: body weight gain, dry matter intake, rice bran, solid, Sakura Block Plus.

INTRODUCTION

Ruminants contribute significantly to human welfare by providing high-quality animal protein in the form of meat and milk. Kaur cattle are Indonesia's indigenous livestock genetic resources that require preservation and development to support the national meat self-sufficiency program. Adult bulls of this breed have a body weight of ±400 kg, while adult females reach ±250 kg (Efendi, 2018). Kaur cattle are local cattle that have been kept by people in the Regency of Bengkulu, Indonesia, for a long time (approximately 20 generations) and have undergone natural selection in a tropical environment with traditional conservation practices (Jarmuji *et al*., 2017). The latest data indicate that the Kaur cattle population reached 15,219 heads across all villages in Kaur (BPS Regency Bengkulu, 2022). Cattle rearing in Bengkulu remains traditional mainly, with cattle released throughout the day in oil palm plantation areas, and forage entirely dependent on natural grass. Natural grasses, including *Axonopus compressus*, are the dominant vegetation in our soil palm plantations, along with other species such as *Paspalum conjugatum*, *Ludwigia perennis*, *Ottochloa nodosa*, and *Cyperus kyllingia* (Syarifuddin, 2011; Herdiawan *et al*., 2022). Based on its nutritional content, natural grass species *Axonopus compressus* contains dry matter (DM) 29.6%, crude protein (CP) 7.5%, crude fat (CF) 30.8%, phosphorus (P) 0.05%, calcium (Ca) 0.39%, and energy metabolism (EM) 8.7 MJ/kg (Purwantari *et a*l., 2015). Despite its abundance, natural grass has the disadvantage of a high crude fiber content and low crude protein (Wahyono *et a*l., 2019).

Thus, the provision of natural grass must be accompanied by feed supplements to meet the nutritional needs of ruminants optimally. *Sakura block plus* is a feed supplement resulting from the modification of utilizing sakura block by earthworms and palm kernel meal (Jarmuji *et al*., 2021). Previous research showed that *sakura block plus*, when fed to local kaur cattle weighing 120 kg that received ammoniated palm frond rations, accounting for up to 10% of their dry matter requirements, produced body weight gain of 0.73 kg/day (Jarmuji *et al*., 2023). The ammoniated palm frond ration is made from a mixture of palm oil palm frond industry waste and agricultural waste, such as cassava, tofu pulp, palm meal, and *sakura block plus* (Jarmuji *et al*., 2022). Based on ingredient composition, rice bran is used as a raw material in the manufacture of sakura block and sakura block plus, accounting for 22% of total ingredients. The problem is that the price of bran continues to increase, and its availability is increasingly limited, especially in areas with oil palm plantations (Jarmuji *et al*., 2017; Jarmuji *et al*., 2019). Therefore, there is a need for locally available, affordable alternative feed ingredients to replace bran. Solid is a by-

product of processing fresh bunches of fruit into crude palm oil. During this time, solid waste is often discarded, thereby polluting the environment and incurring relatively high disposal costs.

The production of solid by-products is substantial: each processing of 1 ton of fresh bunches of fruit yields approximately 20 kg of solid, equivalent to 10% of crude palm oil (Mathius, 2004; Saleh et al., 2021). Based on its nutritional content, solid has the potential to serve as a raw material for animal rations, replacing rice bran. Solid contains 81-90% dry matter, 9.6-15.52% crude protein, 11.5-32.9% crude fiber, 7.00-10.5% crude fat, 0.5-0.97% Ca And 0.17-0.75% phosphorus (Utomo *et a*l., 1999; Sinurat, 2003; Ginting and Krisnan, 2005; Yulianti et al., 2019).Based on this description, this study aims to evaluate the use of solid as a bran substitute in the raw material of the sakura block plus, on dry matter intake and body weight gain in Kaur cattle fed a natural grass basal diet. This study hypothesizes that a solid can be used as a bran substitute in the formulation of sakura block plus without adversely affecting the performance of Kaur cattle.

MATERIALS AND METHODS

Experimental livestock

The cattle used in the study were local cattle from Kaur (Regency Kaur), Cattle males, aged 3-4 years, with an initial body weight of 260±10 kg. This research was conducted for 60 days at the *Commercial Zone* Animal *Laboratory (CZAL),* the Department of Animal Husbandry, Faculty of Agriculture, Bengkulu University.

Experimental ration

Sakura block plus (SBP) is composed of ingredients such as coconut sugar, bran, solid palm meal, earthworm, urea, salt, triple superphosphate, mineral mix, and top mix (Table 1). Basal feed consisted of wild grass (Axonopus compressus) collected from oil palm plantations near the research site. Wild grass was fed at up to 10% of the cattle's body weight, and *sakura block plus* was fed at 0.4 kg/cattle/day (Jarmuji *et al*., 2017). Drinking water is provided twice daily at 9:00 a.m. and 4:00 p.m. and is freely available.

Research Design

This study used a Latin Square Design with four treatments and four replicates. The four treatments were:

P1 : Wild grass + SBP (5.5% solid)
P2 : Wild grass + SBP (11% solid)
P3 : Wild grass + SBP (16.5% solid)
P4 : Wild grass + SBP (22% solid)

Research data on feed consumption and body weight gain were collected over 4 months, divided into 4 periods.

Consumption of dry matter of feed

Livestock are kept in individual cages to enable the accurate collection of feed consumption data. Consumption data were collected daily between 8:00 and 9:00 am. To determine dry matter (DM), the sample was analyzed using the Proximate procedure (AOAC, 2012). The formula for calculating DM Intake data is:

Feed given (DM) - remaining feed (DM)

The ingredients of the *sakura block plus* treatment are presented in Table 1.

Table 1. *Sakura Blok Plus* formula in the arrangement of each research treatment

Material	Treatment			
	P1	P2	P3	P4
Palm sugar	32,00%	32,00%	32,00%	32,00%
Rice bran	16,50%	11,00%	5,50%	0%
Solid*	5,50%	11,00%	16,50%	22,00%
Palm kernel	15,00%	15,00%	15,00%	15,00%
Earthworms	6,00%	6,00%	6,00%	6,00%
Sago	15,00%	15,00%	15,00%	15,00%
Urea	5,00%	5,00%	5,00%	5,00%
Salt	2,00%	2,00%	2,00%	2,00%
TSP	1,00%	1,00%	1,00%	1,00%
Mineralmix	1,00%	1,00%	1,00%	1,00%
Topmix	1,00%	1,00%	1,00%	1,00%
Total	100%	100%	100%	100%

Notes: *composition of solid use of research materials, TSP: Triple superphosphate

Body Weight Gain

Measurement of Body Weight Gain (BWG) was carried out for ± 4 months by weighing the body weight of livestock every period (30 days). Body weight gain is calculated as the difference between the initial and final body weight.

$$BWG\ (kg/day) = \frac{(Final\ weight - Initial\ weight)}{Research\ Duration}$$

Data Analysis

All data obtained were processed and analyzed for diversity using *Analysis of Variance* (*ANOVA)*. If the treatment has a significant effect, the Duncan multiple-range test (DMRT) is then applied.

RESULTS AND DISCUSSION

Dry matter intake of the ration

Dry matter intake is a key parameter for evaluating technical efficiency and livestock performance. The results showed that the use of solid as a substitute for rice bran in the *sakura block plus*, up to 22%, had no significant effect (P>0.05) on the ratio of dry matter intake (Table 3). This is consistent with the nutritional composition of *sakura block plus* across treatments, which is relatively homogeneous (Table 2). Overall, the nutritional content of the sakura block plus containing solid at various levels exhibits a favorable profile, with crude protein ranging from 21.93% to 24.99% and crude fiber ranging from 9.88% to 11.47%. This nutritional balance can support rumen microbial activity during fermentation and feed digestion.

Table 2. Nutrient content of wild and grass sakura block plus

Nutrient	DM %	OM %	CP %	CF %	NDF %	ADF %
Wild grass	30.28	69.54	10.70	22.17	58.03	42.55
SBP (5.5% solid)	91.63	79.82	24.99	9.94	23.90	17.72
SBP (11% solid)	91.67	82.05	21.93	9.88	23.22	17.98
SBP (16.5% solid)	93.76	80.55	22.19	11.47	27.09	19.17
SBP (22% solid)	92.58	80.98	24.96	11.04	28.07	21.67

Notes: SBP (*Sakura Block Plus*), DM (Dry matter), CP (Crude Protein), CF (Crude Fiber), NDF (Neutral Detergent Fiber), ADF Acid Detergent Fiber)

Source: Laboratory of the Poultry and Miscellaneous Livestock Instrument Standard Testing Center (BALITNAK) Ciawi-Bogor (2025).

The average total dry matter intake of Kaur cattle weighing 260±10 kg fed wild sakura blocks and grass plus rations ranged from 7.22 to 7.96 kg/head/day, equivalent to 2.80-3.06% of body weight. This is in line with the opinion of Orskov and Ibrahim (1991), who stated that dry matter intake in cattle ranges from 2-3% of body weight, and is in line with Lubis' (1992) recommendation that the percentage of dry matter intake relative to cattle body weight should be in the range of 2-4%. Although not statistically different, there was a tendency for dry matter intake to increase in the treatment with the highest solid content (P4). This indicates that the solids are palatable and do not affect feed intake, even when used as a total replacement for rice bran in the *sakura block plus*.

Interestingly, dry matter intake in this study was lower than in a previous survey of Kaur cattle that received a ration of 50% oil palm frond and 50% Setaria grass at 3.13% (Jarmuji *et al*., 2017), as well as Kaur cattle receiving a ration of fermented palm fronds with a consumption of 3.06% (Jarmuji *et al*., 2022). This difference may be due to differences in the composition of the basic ration: the natural grass in this study had lower digestibility than the ammoniated palm leaves, which had higher nutritional value due to ammoniation. Feed intake is generally influenced by factors such as feed digestibility, degradation characteristics, and rumen capacity (Arora, 1995; Wilson and Kennedy, 1996). Higher-quality feed tends to degrade more rapidly in the rumen, is absorbed more quickly by the digestive organs, and leaves the rumen more quickly, allowing livestock to consume more feed (Ismartoyo, 2011). In this study, the use of up to 22% solid material as a substitute for rice bran did not affect rumen dynamics or fermentation, as evidenced by stable feed intake across treatments.

Body Weight Gain

Body Weight Gain (BWG) is a leading indicator of livestock productivity. Results showed that feeding the sakura block plus at different solid levels resulted in body weight gain of 0.41-0.52 kg/head/day in Kaur cattle (Table 3). Although there was no statistically significant difference ($P > 0.05$), there was a tendency toward increased BWG in treatments with higher solid levels (P3 and P4). This indicates that solid can replace rice bran in the sakura block plus formulation without adversely affecting the growth of Kaur cattle.

Table 3. Ration consumption, body and weight gain, and ration efficiency of kaur cattle

Parameters	Treatment			
	P1	P2	P3	P4
Wild grass intake of dry matter (kg/day)	6.85	6.94	7.05	7.58
Sakura block plus intake of dry matter (kg/day)	0.37	0.37	0.37	0.37
Total rations intake of dry matter (kg/ /day)	7.22±0.47	7.31±0.46	7.42±0.30	7.96±0.59
Dry matter intake of body weight (%)	2.80±0.27	2.82±0.14	2.83±0.11	3.06±0.21
Dry matter intake of body weight metabolism (g/body weight $^{0.75}$)	112.38±10.08	113.15±6.48	113.46±4.93	114.38±9.02
BWG (kg/day)	0.41±0.18^{a}	0.45±0.09 ^{ab}	0.51±0.14^{b}	0.52±0.11^{b}

Description: BWG (Body Weight Gain)

Body weight gain in this study was relatively low compared with previous studies. Balinese cattle aged 1-1.5 years, fed a ration of 50% ammoniated palm fronds, 50% concentrate, and supplements of cassava leaves and minerals S and P, were reported to produce a BWG of 0.49 kg/day (Nurhaita *et a*l., 2014). Jarmuji *et a*l. (2017) reported that Kaur cattle aged 10-12 months, with a body weight of 100 ± 5.5 kg, fed a ration of 50% Staria grass and 50% palm fronds, and receiving 400 g of sakura block supplement, reached a BWG of 0.60 kg/day. Meanwhile, 1.5-year-old Kaur cattle with a body weight of 120 kg, receiving a ration of 40% ammoniated palm fronds, 40% concentrate, and 10% *sakura block plus* an average body weight gain of 0.70 kg/day (Jarmuji *et al*., 2022). Several factors may cause the difference. First, differences in age and initial body weight of the cattle in this study were that the cattle were older (3-4 years old) with a larger initial body weight (260 ± 10 kg), so the growth rate was relatively slower than that of the young cattle. Second, differences in basal ration composition: this study used only wild grass, without the addition of concentrate or ammoniated palm fronds, which have higher nutritional value. Third, the lower dry matter intake in this study resulted in lower nutrient intake to support optimal performance. Nevertheless, the BWG results in this study are relatively good for local cattle fed only a basal diet of natural grass. Hasbullah (2003) reported an average BWG of 0.65 kg/day for cattle fed agricultural waste and rice bran. Parakkasi (1999) also emphasized that cattle that receive less than the required nutrient intake cannot achieve optimal productivity because, to support body weight gain, they must meet the requirements for dry matter, protein, and energy. The ability of solids to replace rice bran in the sakura block plus formulation without adversely affecting cow growth demonstrates the potential to utilize alternative feed ingredients derived from the palm oil industry waste. Solid has good nutritional content, especially crude protein (9.6-15.52%) and crude fat (7.00-10.5%), which can play a role in providing energy and protein for livestock (Sinurat, 2003; Yulianti *et al*., 2019). The use of solid as a rice bran substitute also adds value to the palm oil industry waste while reducing the potential for environmental pollution.

CONCLUSIONS

Based on the study results, it can be concluded that solid, used as a substitute for rice bran up to 22% in the formulation of *sakura block plus*, does not affect dry matter intake or body weight gain in local kaur cattle fed a wild grass basal diet. There was a tendency toward increased body weight during the weight-gain treatment, with the highest solid level, although the difference was not statistically significant. These indicate that solid, a waste product of the palm oil industry, has good potential as an alternative feed ingredient to replace rice bran in ruminant feed

supplement formulations, thereby helping to overcome the increasingly limited availability of bran and its rising market price. The utilization of solid in animal feed also provides added value to palm oil industry waste while supporting a sustainable palm oil-cattle integration system.

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