Effect of Native Grass Substitution with Jengkol (Archidendron jiringa) Peel on Sheep Performance

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Abstract. The effect of substitution native grass with jengkol (A. jiringa) peel on sheep performance was investigated. Three treatments substitution of jengkol peel (0, 15, 22.5%) were five replications in a randomized block design. This research used 15 sheep with body weight around 15-27 kg. The jengkol peel and concentrate were given in pellet form to reducing the strong odor from jengkol peel. Substitution of jengkol peel at 22.5% increased feed intake (746.74 g/h/d) but did not affect on every daily gain and feed efficiency. The more substitution of jengkol peel change the texture of pellets become more compact and solid so increased the palatability and lead to the feed intake increased. It is concluded that native grass can be substituted with jengkol peel until 22.5% to increase feed consumption of sheep

Key words: jengkol peel, native grass, sheep performance

1. Introduction
Agricultural by-products are abundant in Indonesia. Many farmers have been using these by-products as ruminant feed. Azevêdo et al [1] stated that ruminants are able to convert renewable natural resources, such as agricultural and agro-industrial by-products into high-quality feed for a ruminant. The utilization of agricultural wastes in farm animal nutrition has a significant effect on economic, environmental, and social factors[2]. Jengkol (Archidendron jiringa) is tropical plant that widely distributed in Indonesia, Malaysia and South Thailand [3]. Peel is one of by-product from jengkol that available in high quantity but has not been utilized optimally. The weight proportion of jengkol peel (59.99%) is higher than seed (40.01%), so if Indonesia produced 66,065 tons of jengkol [4], there would be 36,065 tons of peels available. Hidayah et al [5] reported that peel from jengkol plant
had potential as a crude fiber (33.07-35.28%), total digestible nutrient (51.56-52.81%) and saponin (17.91-35.13%) source which very potential to be used as ruminant feed.

In vitro study reported by Hidaya et al that jengkol peel capable for the substitution of native grass as energy source for ruminant until 22.5% on basal diet. The substitution of native grass with jengkol peel powder until 22.5% decreased rumen pH and protozoa, increased N-NH₃, did not disturb feed digestibility (DMD and OMD), total and partial VFA production, and did not increase microbial protein synthesis, methane production, and hydrogen balance. But there is no information reported yet research on the utilization of jengkol peel to substitute native grass on in vivo study. Therefore this research was designed to evaluate the effect of substitution native grass with jengkol (A. jiringa) peel on sheep performance.

2. Materials and Methods
The experiment was conducted at the Research Farm of Animal Science Faculty of IPB University in 2019. The experimental protocols were reviewed and approved by the Animal Care Committee of the IPB University, Bogor, Indonesia. Jengkol peel powder from Bengkulu province.

2.1 In Vivo Experiment
Fifteen sheep (about 15-25 kg live body weight) were used in this research. The animals were randomly divided into three groups of 5 lambs each. The feed contained 60% forage (native grass and jengkol peel) and 40% concentrate (rice bran, tapioca industry by-product, copra meal, molasses, CaCO₃, NaCl, urea, and premix) with 10-11% CP and 56-60% TDN (Table 1 and 2). All animals were fed their daily diet with 3.5-4% their body weight. The concentrate was offered twice a day at 8 am and 1 pm, whereas the native grass at 10 am and 3 pm. The jengkol peel and concentrate were given in pellet form to reducing the strong odor from jengkol peel. The native grass chopped to 5-8 cm and clean water had excess to the animals twice a day after concentrate given.

| Table 1. Feed Formulation (% DM) |
|----------------------------------|
| Treatments | Native grass | Jengkol peel | Rice bran | Cassava by-product | Copra meal | Molasses | NaCl | CaCO₃ | Urea | Premix |
|-----------|--------------|--------------|-----------|-------------------|------------|----------|------|-------|-----|--------|
| P1        | 60           | 0            | 5         | 8                 | 15         | 8        | 1    | 1.5   | 1   | 0.5    |
| P2        | 45           | 15           | 6         | 9                 | 13         | 8        | 1    | 1.5   | 1   | 0.5    |
| P3        | 30           | 22.5         | 9         | 9                 | 10         | 8        | 1    | 1.5   | 1   | 0.5    |

| Table 2. Nutrition Content Native Grass Substitution with Jengkol (A. jiringa) Peel (% DM) |
|----------------------------------|
| Treatments (%) | Ash | EE | CP | CF | NEF | TDN |
| Native grass | Jengkol peel | Concentrate | ---- | ---- | ---- | ---- |
| 60           | 0   | 40 | 10.54 | 3.08 | 11.12 | 22.93 | 52.32 | 60.24 |
| 45           | 15  | 40 | 8.41  | 1.84 | 10.74 | 24.32 | 54.70 | 56.81 |
| 37.5         | 22.5| 40 | 7.63  | 2.19 | 11.11 | 23.58 | 55.49 | 59.07 |

2.2 Sampling and Measurement
Dry matter intake (g/h/d) = the dry matter intake was measured every day. The formula is weight of dry matter feed given reduced by the weight of the dry matter remaining feed.

Average daily gain (g/h/d)
Measurement of average daily gain was determined by reducing the final weight with the initial weight of the sheep at a certain time.

Feed efficiency (%)
Feed efficiency measured average daily gain divided dry matter intake
2.3 Statistical Analysis

The experiment was conducted in a randomized block design with 3 treatments and 5 replications. The treatment tested was the ration:

- P1: Concentrate (40%) + Native grass (60%)
- P2: Concentrate (40%) + Native grass (45%) + Jengkol peel powder (15%)
- P3: Concentrate (40%) + Native grass (37.5%) + Jengkol peel powder (22.5%)

The data were tested using Analysis of Variance (ANOVA) and the differences among treatments’ means were examined by Duncan Multiple Range Test [6].

3. Results and Discussions

The result (Table 3) showed that the highest jengkol peel supplementation (22.5%) had highest dry matter intake (746.74 g/h/d) than the others treatments ($p<0.05$), but there were no significant differences ($p>0.05$) in average daily gain and feed efficiency. The increasing dry matter intake with high jengkol peel supplementation presumably kinds of crude fiber and carbohydrate of jengkol peel can improve the pellets texture which more compact and solid so it increased the feed palatability. Gimeno et al. [7] reported that gums such as carboxymethyl cellulose (CMC) and xanthan gum (XG) have the ability to improve the volume, structure, and texture of pellet products, due to their effects on moisture retention and rheological properties. Pond et al. [8] stated that texture feed can influence animal feed palatability level.

Palatability is animal preference level for feed that given over period time. Palatability can be stimulated by several factors including eyesight, smelling, touching and tasting. Beside that it is caused by differences of psychological and physiological animal, chemical and physical characteristic of feed ingredients. Physical characteristic of feed ingredients includes hardness, color, shape and taste of feed while chemical characteristic includes content of water, protein, fat and feed odor. Mulyono [9] stated that high and low feed ruminant consumption strongly influenced by external and internal factors, there were environmental temperature, palatability, taste, physiological status (age, sex, body condition), nutrient concentration, feed form, body weight and production.

Dry matter intake in this study ranged from 610-746 g/h/d. This result was accordance with NRC [10] ranges from 682-1010 g/h/d. Ekawati et al. [11] reported that the sheep treated concentrate and fresh elephant grass had dry matter intake at 678.27 g/h/d. Almost same result reported Kriskenda et al. [12] that local sheep fed diet containing treated corn cob by-product and rice husk ash filtrate 20% until 60% to replaced native grass had dry matter intake at 601.47-755.20 g/h/d.

| Treatments (%) | Native grass Jengkol peel Concentrate | Final body weight (kg) | DM intake (g/h/d) | Average daily gain (g/h/d) | Feed efficiency (%) |
|----------------|--------------------------------------|------------------------|------------------|--------------------------|------------------|
| 60 0 40        | 21.04 ± 4.23                         | 610.42 ± 69.27         | 48.00 ± 0.77     | 7.62 ± 3.62              |
| 45 15 40       | 21.80 ± 4.66                         | 662.53 ± 100.63        | 46.67 ± 0.42     | 7.43 ± 3.14              |
| 37.5 22.5 40   | 21.20 ± 4.62                         | 746.74 ± 97.55         | 36.67 ± 0.22     | 5.06 ± 1.66              |

The average daily gain range from 36.67-48.00 g/h/d and feed efficiency from 5.06-7.62%. This result lower than research reported by Kriskenda et al. [12] that substitution native grass with corn cob by-product and rice husk ash filtrate 20% until 60% (CP at 9.55-10.74%) and TDN at 59.66-65.46%) had 58.53-84.41 g/h/d average daily gain and 9.60-11.17% feed efficiency. This condition presumably jengkol peel more high of lignin content. Hidayah et al. [5] reported that lignin of jengkol peel at 15.48-16.42%, whereas lignin corn cob by-product at 14.19% [12]. Schiere and Ibrahim [13] stated that lignin has complex components which are difficult to
degrade thus to break it down requires cellulose enzymes, hemicellulose and ligninase enzyme, because of lignin influence formation of cross-linkages between cellulose and hemicellulose. Rumen microflora rapidly and extensively degraded hemicellulose and cellulose but absence on lignin [14]

4. Conclusion
Native grass can be substituted with jengkol peel until 22.5% to increase feed consumption of sheep

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