Utilization of durian seeds as a substitute for corn in the laying hen feed on consumption and nutrient digestibility for improving local

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Abstract. The objective of this study was to evaluate the effects of durian seed meal as a substitute for corn in the ration on feed and nutrient consumption, egg weight, and production. The study was conducted for six weeks. The material used is laying hens strain Lohmann Brown age 42 weeks as much as 120 birds. The study used Completely Randomized Design (RAL) with four treatments and five replications; each replication consisted of 6 birds. The treatments were the use of durian seed meal as a substitute for corn as much as 0, 3, 6, and 9%. Data were analyzed by ANOVA. The results showed that durian seed meal as a corn substitution significantly affects the parameter observed except feed and protein consumption. In conclusion, corn can be replaced with durian seed meal maximally by 6% without decreasing productive performance of laying hens.

1. Introduction
Yellow corn is the primary source of energy in formulating laying hen feed. The use of yellow corn in poultry rations in general and laying hen in particular due to its high energy content, as about 3.313 kcal / kg, and contains lots of starch in the form of amylopectin, and high digestibility. Although yellow corn contains low protein (8%), it's as rich in a yellow pigment called xanthophyll on average 5 ppm and carotene 0.5 ppm. Rations containing yellow corn in large quantities affect the color of the yolk. Domestic corn production is lower than demand, so imports should fulfill it. Based on the Central Bureau of Statistics [1], the amount of corn imported in 2014 was about 3,253,616 tons and increased in 2015 to be 3,267,694 tons. One of the fruit seeds that contain high carbohydrates similar to corn is durian seeds. Durian fruit was composed of flesh of the fruit (20-35%), seeds (5-15%) and rind (60-75%). Durian production in Indonesia is highly available because of the average harvesting time for eight months per year [2]. According to data of Central Bureau of Statistics (BPS), Indonesia is high durian producing country, it was reported in 2012 durian production reached 6,917 tons/year and increased in 2015 to be 10,173 tons/year [3]. In general, durian rind and seeds were just thrown away into waste, whereas durian seeds can be processed and utilized for further purpose [4]. Nutrient content of durian seeds was carbohydrate 67.40%; crude protein 6.43%; crude fat 1.48%; crude fiber 6.15%; and calcium 0.92% [5]. Besides, durian seeds also contain polysaccharides gels and antioxidants, which are useful for disease resistance and health [6,7,8]. On the other hand, durian seed
contain anti-nutritional factors in the form of cyclopropene acid and oxalic acid [9] which can negatively affect productivity if excessive feeding level and possibly can be toxic [2]. Other anti-nutritional substances in durian seeds were crude gum [10]. Crude gum is a water-soluble polysaccharide that included nonstarch polysaccharides that have high water holding capacity when dissolved in water, high viscosity, and stability so that the particles in the durian seeds were difficult to be absorbed [8]. The presence of crude gum in durian seeds can affect the digestion process of nutrients and the number of nutrients absorbed. Previous studies have shown that durian seeds can be used in qual rations as much as 5%, and if their use was more than 5%, it caused a decrease in consumption and productivity [11].

Feeding durian seeds in broiler chickens was not more than 10% [5]. Utilization of processed durian seeds as laying hen feed has not been previously carried out. Based on the background described above, the present research was conducted to evaluate the effect of feeding durian seed meal to substitute yellow corn on consumption and nutrient digestibility on laying hen.

2. Materials and methods
The study used 120 laying hens of 52 weeks and reared in individual cages (battery). The experimental ration was Experimental ration composition and nutrient content are presented in Table 1. The study was assigned in a completely randomized design 4x5. The treatment was the level of feeding durian seed meal, namely 0, 3, 6, and 9%. The parameters observed in the present study were as follows:

- Feed consumption = the amount of ration given - the amount of residual ration
- Protein or crude fiber consumption was calculated by multiplying feed consumption with a nutrient percentage in the ration
- Nutrient digestibility was calculated using the formula of [12] namely: Nutrient digestibility = (nutrient consumption – nutrient in excreta) : nutrient consumption x 100%

Data were analyzed of variance and continued to Duncan test [13].

3. Results and discussion
3.1. Feed and nutrient consumptions
Feeding durian seed meal did not significantly affect on the feed and protein consumption in laying hens (Table 2). This was caused by the dietary energy content given that was relatively the same, ranging between 2858.73 - 2879.60 kcal/kg. Substitution of corn with durian seeds up to 9% did not cause any change in dietary energy content. The metabolizable energy (ME) content of durian seeds meal was 2,780 kcal/kg, slightly lower than yellow corn energy (3,167.98 kcal/kg), but in this study, a slight decreased in energy levels did not reduce feed consumption. Feed consumption depends on dietary metabolizable energy because chickens consume rations to meet energy needs. Base on reported by [14] that feed intake is inversely proportional to the concentration of energy in the diet [15]. Lower feed consumption in chickens depends on crude protein (CP) and metabolizable energy content; if ME is low, then feed consumption is higher.

Anti-nutritional factors in the form of cyclopropene fatty acids and oxalic acid in durian seed meal did not affect feed consumption, because the level was low. (T0 = 0%, T1 = 0.0199, T2 = 0.038% and T3 = 0.057%). Oxalic acid content of durian seed meal was also low, namely T0 = 0%, T1 = 0.011%, T2 = 0.023% and T3 = 0.034%. The higher feeding durian seed meal in the present study resulted in the higher fatty acid of cyclopropene and oxalic acid. Anti-nutritional substances of oxalic acid and cyclopropene in the ration did not significantly reduce feed consumption, and also did not affect palatability. The results of the present study were different from that of Hasnawati et al. [16] that 5% of boiled durian seed meals given in male local duck reduced feed consumption by 5,069 g/bird compared to control group.
Table 1. Composition and nutrient content of the experimental ration.

| Ingredients         | Treatment | T0   | T1   | T2   | T3   |
|---------------------|-----------|------|------|------|------|
|                     |           | (%)  | (%)  | (%)  | (%)  |
| Yellow corn         |           | 43   | 40   | 37   | 34   |
| Rice bran           |           | 18   | 18   | 18   | 18   |
| Palm oil            |           | 0.5  | 0.5  | 0.5  | 0.5  |
| Durian seeds        |           | 0    | 3    | 6    | 9    |
| Soybean meal        |           | 19   | 19   | 19   | 19   |
| Fish meal           |           | 10   | 10   | 10   | 10   |
| CaCO₃               |           | 3.5  | 3.5  | 3.5  | 3.5  |
| Oyster shell        |           | 5    | 5    | 5    | 5    |
| Mineral mix         |           | 1    | 1    | 1    | 1    |
| **TOTAL**           |           | 100  | 100  | 100  | 100  |
| Nutrient content *(%) |         | 2733.84 | 2609.66 | 2513.73 | 2417.80 |
| Metabolizable energy**(kcal/kg) |   | 17.78  | 17.58  | 17.36  | 17.14  |
| Crude protein       |           | 4.44  | 4.53  | 4.25  | 4.15  |
| Crude Fiber         |           | 6.32  | 6.19  | 6.07  | 5.94  |
| Ether extract       |           | 3.31  | 3.30  | 3.29  | 3.28  |
| Calcium             |           | 0.63  | 0.68  | 0.66  | 0.65  |
| Phosphorus          |           |       |       |       |       |

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** Calculated base on the value of metabolizable energy = 70% x Gross Energy

Protein consumption also indicated a similar pattern with feed consumption. However, the result of crude fiber consumption increased significantly by the feeding level of durian seed meal at the level of 6 and 9% (T2 and T3) (Table 2). The higher level of feeding durian seed meal resulted higher consumption of crude fiber as well, although feed consumption was not significantly different. The higher crude fiber in the ration, also caused higher crude fiber consumption, and it could have an impact on decreasing nutrient digestibility [17].

Table 2. Nutrient consumption and nutrient digestibility of rations contain durian seeds.

| Parameter                        | Treatment | T0   | T1   | T2   | T3   |
|----------------------------------|-----------|------|------|------|------|
| Feed consumption (g/bird/28 d)   |           | 3,202.2 | 3,146.4 | 3,039.6 | 3,082.5 |
| Protein consumption (g/bird/day) |           | 18.88  | 18.57 | 17.95 | 18.21 |
| Crude fiber consumption (g/bird/day) |         | 4.72<sup>a</sup> | 5.17<sup>a</sup> | 5.50<sup>b</sup> | 6.10<sup>b</sup> |
| Protein digestibility (%)        |           | 71.84<sup>a</sup> | 70.43<sup>a</sup> | 68.12<sup>b</sup> | 60.69<sup>b</sup> |
| Crude fiber digestibility (%)    |           | 25.56<sup>a</sup> | 15.16<sup>b</sup> | 15.08<sup>b</sup> | 14.93<sup>b</sup> |

3.2. Nutrient digestibility

Feeding durian seeds meal at 3% resulted in the same protein digestibility as that of control group. However, level 6% and 9% durian seed meal, significantly reduced protein digestibility. The digestibility of crude fiber at T0 was significantly higher than that of T1, T2, and T3. This was due to the presence of anti-nutritional substances content in the form of cyclopropene and oxalic acids in...
durian seed meal. Hasnawati et al. [16] reported that durian seed meal contains anti-nutritional substances that can affect nutrient digestibility.

The content of oxalic acid in durian seeds can bind calcium to be calcium oxalate that cannot be absorbed by the animal so that it reduces the process of calcium absorption and causes the damage to the intestine, thereby reducing the process of protein absorption in the digestive tract [18].

Durian seeds have a slippery water-soluble polysaccharide called crude gum. The compound can interfere with the process of nutrient absorption, so that nutrients released through the excreta. The amount of nutrient release together along with the excreta when the feeding durian seed meal increase. Gum derived from durian seeds had a high water holding capacity [10]. The high water holding capacity causes the digest to become thick and affects the rate of passage. The decrease in protein digestibility and crude fiber digestibility due to the feeding durian seed meal lowered the absorption of amino acids and decrease in egg production.

4. Conclusion
In conclusion, corn can be replaced with durian seed meals maximally by 6% without decreasing the productive performance of laying hens.

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