

The Evaluation of Wafer Feed Supplement Containing *Leucaena* Leaf on Pasundan Calves

¹Y. Retnani, ¹S. Suharti, ¹Taryati, ²Herni and ¹D. Argadyasto

¹Department of Nutrition Science and Feed Technnolgy, Faculty of Animal Science,
Bogor Agricultural University, Jl. Agatis, Kampus IPB Darmaga, 16680 Bogor, Indonesia

²Department of Nutrition and Feed Science, Graduate School of Bogor Agricultural University,
Bogor, Indonesia

Abstract: Livestock productivity required a variety of factors, one of which is the quality of feed. Limitation of livestock productivity in several area in Indonesia are low quality of feed, restricted of forage, especially, in dry season. A feed processing technology that might be adopted by to farmers the feed of wafers. Feed wafer processing technology is easy and cheap and can be used to treat these wastes into durable feed, easily to stored and easily given to livestock. Supplementation level in 5, 10 and 15% of wafer and without supplementation was observed in this research. The average daily weight gain by giving 10% of wafer feed supplement to pasundan calves is 58% most highest than other treatment. Final body weight of local calves by giving 10% of wafer supplement most higest than other treatment, the final body weight by giving 10% of wafer supplement around 14% higher than giving conventional feed only. Giving wafer feed supplements did not affect the physiological condition of the cattle based on haematology of blood.

Key words: Calves, growth, *Leucaena* sp. leaf , wafer feed supplement, livestock, physiological condition

INTRODUCTION

Beef requirement in Indonesia continued to increase every year. Beef requirement continues to increase it was not in line with the local production for temporary solution by goverment is import. Beef import value in 2014 almost US\$ 700 million. To lower the value of imports started in 2016, beef imports began to be restricted, resulting in increased production of local beef encouraged to be improved.

As an example of the development of local livestock is pasundan cattle as a indigenous cattle in West Java. Pasundan cattle is a specified genetic resource from Indonesia that widely cultivated in buffer zone of teak forest in several district of West Java such as Ciamis, Pangandaran, Tasikmalaya, Cianjur, Sukabumi, Garut, Purwakarta, Kuningan and Majalengka. Pasundan cattles is able to live in poor quality of feed but can produce good quality of meat, resistant to heat stress can be applied to extensive breeding pattern and resistant to parasite (Anonymous, 2017a-c). Body size of pasundan cattle are shoulder height 115 in males and 109 cm in females. Body length of bulls an average 120 and 110 cm in females. Chest size bulls average 150 and 138 cm in females (Anonymous, 2017a-c). Pasundan cattle had been adaptive to weather and envirotnment conditions in West Java. With this potential, so that, it can be

developed as livestock to fullfil the demand for beef, especially, in the region of West Java. To support livestock productivity, required a variety of factors, one of which is the quality of feed. In several area in Indonesia, to produce high quality of forage for cattle is not easy. In addition in dry season, quantity of forage descreased. This conditions causes the efforts to increase livestock production is difficult to achieve. The farmers in Indonesia not usual to collect and store while feed quantity is increase in rainy season. There has been no effort to collect and store forage in the rainy season for use as feed in the dry season. In the rainy season bring their animals to the land is overgrown with grass naturally, bind his livestock in these locations in some region the livestock may be moved outdoor during night, the livestock may be moved and only shifted his position if the grass is almost gone consumed by livestock.

One way to overcome the limitations of forage mainly by using alternative feed resources. As an example of using the leaves of *Leucaena*. In several area in Indonesia, *Leucaena* peas already consumed as food. So that, leaves of *Leucaena* not used for a human. *Leucaena* leaf can be used as a feed for livestock. But there is a should be considered in use *Leucaena* leaf is the content of antinutritive agent as a mimosine (Askar, 1997). Mimosine is non protein amino acid complex by a structure similar to tyrosine. Protein content of pea and

leaf of *Leucaena* are 34 and 31%, respectively. Mimosine level containing in pea and leaf of *Leucaena* are more than 10% can decreased productivity of livestock (Sutardi, 1980). Previous research by the wafer feed supplement containing *Leucaena* leaf can decreased the mimosine level more than 30% and protein only for 0.6% (Argadyasto, 2015). So that, wafer feed supplement can be used as a supplement for livestock to optimalization of *Leucaena* leaf and increased livestock productivity.

Feed wafer processing is a technology using heat and pressure that could be disseminated to farmers is feed in the wafer form. Feed wafer processing technology is easy and inexpensive and can be used transform waste into an easy stored and distribute feed (Retnani *et al.*, 2010). Feed wafers made using the aid of heat and pressure. Wafer is a material that has the dimensions (length, width and height) with a composition consisting of several fibers (Standard, 1994). Composition of product innovation of wafer is made to resemble the composition of the forage that is expected to be palatable and can be supplied with up to and overcome the scarcity of feed in the dry season.

In the previous research, supplementation of wafer containing *Leucaena* leaf for 10% can increased final body weight 28% more higher than conventional feed only using Bali calves (Retnani *et al.*, 2014). In the other research for processing of *Leucaena* leaf as supplement in mash, pellet and wafer form, the best result for livestock performance used wafer form (Argadyasto, 2015). So that, the negative impact of mimosine to livestock can be minimize by using wafer form.

The aim of this research to assess the effect of wafer feed supplement containing *Leucaena* leaf on the production of pasundan calves.

MATERIALS AND METHODS

The 20 female calves used were distribute randomly create. The treatment about similar average weight. There to the the treatment were grouped in 5 categories very small, small, medium, large, very large. The research was conducted at Laboratory of Feed Industry, Faculty of Animal Science, Bogor Agricultural University and animal conducted on Cijeungjing, Ciamis Regency, West Java, Indonesia. The research started from September 2016 until December 2016. The 20 female a grouping based on body weight are very small, small, medium, large and very large with the age range of 6 months to 1 year. The average body weight in range 99±20 kg (Table 1).

Experimental design: The design used was a randomized block design with 4 treatments and 5 blocks as replication consisting of T0 = control (conventional feed), T1 = conventional feed+5% wafer feed supplement, T2 = conventional feed+10% wafer feed supplement and T3 = conventional feed+15% wafer feed supplement. The variable that would be measured by:

Table 1: Nutrient content (%Dry matter) of feed

Feed	Rice bran	Elephant	Rice straw	Wafer feed supplement
Ash	10.25	17.27	0.73	11.40
Crude protein	13.18	11.39	4.15	25.05
Crude fat	14.62	2.77	1.47	5.68
Crude fiber	10.41	27.52	32.50	9.86
NFE	48.45	58.96	44.98	51.99
TDN	73.79	49.70	43.20	71.12

- *In-vitro* digestibility using Tilley and Terry methode
- Average Daily Gain (ADG)

Average daily gain (ghead/day) =

$$\frac{\text{Final body weight gain (g)} - \text{Initial body weight (g)}}{\text{During this research (day)}}$$

- Blood haematology profile

Haemoglobin was used sahli tube methode and type of leukocytes observed directly under the microscope.

RESULTS AND DISCUSSION

***In-vitro* digestibility of wafer feed supplement:** In this research, the wafer feed supplement the *in-vitro* Dry Matter Digestibility (DMD) and Organic Matter Digestibility (OMD) were 83 and 82%, respectively. High digestibility reflect the contribution of nutrients in cattle while the feed have lower digestibility showed that the feed is less able to supply the basic nutrients for life and production (Rubianti *et al.*, 2010). The DMD of the wafer containing *Leucaena* leaf was higher than founded by previous researcher who added *Leucaena* leaf meal up to 20-66% (Haris, 2012). Digestibility of feed depends on the activity of ruminal microorganisms, rumen fermentation role in the process while the activity of ruminal microorganisms itself influenced by the nutrients in the feed (Crampton and Harris, 1969). Digestibility of organic material indicates the amount of protein, fat and carbohydrates that can be digested while the crude fiber is the limiting factor that will determine the level of the digestibility coefficient (Ter Meulen *et al.*, 1979). The OMD of a wafer was 82%. This shows that with the process feed processing can increase the organic matter digestibility.

The average concentrations of NH₃ are high at 9.3 mM. The high concentrations of NH₃ on a wafer feed supplements then pass to the post rumen organ will be low and the possibility of protein available to the animal itself is also low. In other feed processing, amino acids in the rumen will always form ammonia (NH₃). Ammonia is important for rumen microorganisms because as a major source of nitrogen and protein

synthesized (Wartini, 2002). About 80% of the rumen microorganisms prefer ammonia over to peptide and amino (Baldwin and Allison, 1983). The concentration of ammonia in the rumen is a balance between the amount produced which is used by microorganisms and is absorbed by rumen. Various concentration of NH_3 depending on the type of feed (Hungate, 1966).

Carbohydrates are the main energy source for livestock. Over 60-75% ruminant rations was eaten consist of carbohydrates (Sutardi, 1980). Carbohydrate fermentation in the rumen occurs in two steps. The first stage is the breakdown of complex carbohydrates into simple sugars, the next will be generated from simple Fatty Acids (VFA) which is the main energy source for ruminants (Owens and Bergen, 1983). Wafer feed supplement has a high VFA value is 164.55 mM.

Consumption of dry matter and protein: Table 2 based on the result of reserach showed that the treatment and block significant effect on dry matter intake of local calves ($p < 0.05$). Ability of cattle to consume is very limited. Factors affecting feed intake in ruminants are given dietary factors, animal factors and environmental factors (Parakkasi, 1995). Dry matter consumption in this research was 2.3-2.8 kg/head/day. The level of dry matter consumption of this study is higher than before research amounted to 1, 2 kg/day in bali calves who received *Leucaena* supplements (Jelantik, 2001), even more higher than reported by other research is 1.1 kg/day bali cattle receiving supplemental feed solid starter with a 16.3% protein content. In this research indicates the wafer feed supplements can increased dry matter consumption. The supplementation 15% wafer feed supplement can increase dry matter consumption occurred compared with conventional feed about 19%.

Nutrient requirement of cattle for weight 130 kg/head are dry matter 3.9 kg with consist of protein 13.6 and TDN 64% (NRC., 1996). In this study, protein consumption most higest in T3. Adequacy protein consumption in T3 about 13.3% appoched the NRC value. Treatment T3 is the most value for dry matter and protein consumption. This indicates giving higher of the wafer feed supplements can increasing consumption of local calves. Nutrient requirement are met will support the growth of calves in accordance with the genetic potential that the nutrient content and feed consumption has a great influence for growth (Soeparno, 2005).

Average daily gain and final body weight: Growth generally expressed with increasing body weight as a reflection of the nutrient adequacy consumption to the body's metabolism. Body weight gain is influenced by several factors such as the total consumption of protein obtained each day, gender, age, genetic, environmental,

Table 2: Consumption of dry matter and protein

Consumption	T0	T1	T2	T3
Dry matter g/head/day	2261 ^a	2490 ^b	2597 ^c	2819 ^d
Protein g/head/day	246 ^a	304 ^b	340 ^c	397 ^d

^{a-d} Significant values

Table 3: Final body weight and average daily gain

Parameter	Treatment			
	T0	T1	T2	T3
Initial body weight (X) (kg/head)	103	102	98	97
Final body weight (Y) (kg/head)	125±18 ^a	138± 23 ^b	142±17 ^b	132±25 ^{ab}
ΔXY (kg)	22	36	45	35
Percentage of body weight gain (%)	17,2	26,3	31,4	26,6
ADG (g/head/day)	330±217 ^a	660±171 ^b	789±149 ^c	608±124 ^b

^{a-d} Significant values

physiological condition of the cattle and management. In general, the growth determined by measurements of weight and height (NRC., 1985). In addition to knowing the growth, measurement of body weight can determine the level of consumption, feed efficiency and price (Parakkasi, 1995) (Table 3).

The results showed that treatment of wafer feed supplements significantly in body weight gain ($p < 0.05$). The wafer feed supplements treatment had no significant effect ($p > 0.05$) on the block of final body weight. Final body weight gain in this study ranged 330-789 g/head/day. Giving of wafer in 10% level had Average Daily Gain (ADG) was higher than the other treatments. The wafer feed supplement was given to the local calves which has a weight of small, medium and large have the same response. Daily weight gain is influenced by several factors, namely the total consumption of protein, gender, age, genetic, environmental, physiological condition and management of livestock (NRC., 1985).

Body weight gain by giving of wafer feed supplement T1 (50%), T2 (58%), T3 (46%) higher compared with conventional feed. While previous research daily weight gain of sumba ongol calves giving 15% of wafer feed supplements 42-45% higher compared to body weight daily by the conventional feed (Arief *et al.*, 2016).

The results showed that treatment of wafer feed supplements significantly ($p < 0.05$) in final body weight of bali calves during the research. The final body weight of calves with the wafer feed supplements at T1-T3 were 138, 142 and 132.16 kg/head, respectively. Giving wafer feed supplements significantly ($p < 0.05$) increased the end of final body weight of local calves. Final body weight by giving 10% of wafer feed supplements 12% higher than conventional feed.

The results of ADG and final body weight, T3 not higher than T2, contrary with dry matter and protein consumption (Table 2). Dry matter and protein consumption of T3 was higher than the other treatment,

especially, T2. This condition caused by limiting factor of mimosine content in *Leucaena* leaf. The *Leucaena* mimosine at a certain level in feed can caused loss of body weight of cattle. In treatment T2, mimosin level may still within the limits that can be tolerated by the animals. But in T3, mimosin level has exceeded the threshold of tolerance (Ghosh and Samiran, 2007).

In vivo digestibility: Measurement of the amount of undigested nutrients that can be done by knowing the dry matter and organic matter digestibility. Digestibility is the amount of feed that can be absorbed by the animal (McDonald *et al.*, 2002). Value of digestibility of feed ingredients is an attempt to determine the amount of nutrients that feed material can be degraded and absorbed in the digestive tract of animals (Anggorodi, 1994). The value of dry matter and organic matter can indicated the degree of digestibility of a feed in the digestive tract of cattle and how much contribution a feed for livestock as well as an indicator of the ability of cattle to take advantage of a certain type of feed (Simanihuruk *et al.*, 2006). Factors affecting the digestibility among other nutrient content of feed, feed composition, feed processing, feeding level and the factors of the animal itself. In Table 4 can be seen in dry matter, organic matter, protein and lipid digestibility showed no difference in treatment. Dry matter digestibility entire treatment is in the range 48-61%. For organic matter digestibility in the range of 55-66%. The digestibility was slightly lower than the type of cattle such as madura cattle with a dry matter of about 64-83% (Arief *et al.*, 2016). Sumba ongol calves by wafer feed supplement has a 74-76% dry matter and organic matter digestibility 76-78% (Retnani *et al.*, 2014) is higher than the digestibility of this research. Dry matter digestibility in cattle in the range of 50-75% (NRC., 2000).

Digestibility of protein in this study are in the range of 54-70%, this result is also lower than studies with madura in the range of 74-89% (Arief *et al.*, 2016). Rough fat digestibility in this study are in the range of 80-85%, fat digestibility in this study was higher than the digestibility of crude protein. The treatment has no effect on *in vivo* digestibility of calves weaning caused by many factors such as genetics and environmental conditions.

Blood haematology profile: Value hematocrit of calves in this study are in the range of 29.33-36.00%. The value is still within the same range as those reported 28.14-30.32% (Sattar and Mirza, 2009) and which is 25.89-36.01% (Mirzadeh *et al.*, 2010). Heat stress can lead to increased hematocrit value it is caused by the increased production of erythrocytes and a decrease in blood plasma (Santosa *et al.*, 2012). In this study showed that cows pasundan in this study is not under stress that can reduce performance.

Haemoglobin levels in this study were in the range of 10.13-12.37 g/dL, this value is in the same range as those reported before which is about 9.95-11.81 g/dL⁻¹ (Sattar and Mirza, 2009) and also which is about 8.25-11.97 g/dL (Mirzadeh *et al.*, 2010). Oxygen (O₂) requirements when cattle are stressed, so, the impact on the increase in hemoglobin. The conditions resulted in an increased rate of metabolism of the body during heat stress. In addition O₂ levels were thin in the air as a result of the relatively high humidity can also increase the levels of hemoglobin in the blood (Santosa *et al.*, 2012). This study did not show signs of an increase in hemoglobin. The number of leukocytes contained in the blood of local calves in this study is the range 11,100-13,167/mL by another research from 6.5-11.50 thousand/mL (Mirzadeh *et al.*, 2010). In general, leukocytes does not indicated a problem (infection or inflammation) in the calves. This indicates that administration of wafer feed supplements did not affect the physiological condition of the calves weaning this indicates that the wafer feed supplements containing mimosin although not toxic.

CONCLUSION

Giving wafer 5, 10 and 15% resulted in the average daily weight gain higher compared with conventional feed. The average daily weight gain by giving 10% of wafer feed supplements reached 789 g/head/day or 58% was higher than compared with conventional feeding only reached 330 g/head/day. Final body weight of local calves by giving 10% of wafer supplement reach the average 142 kg/head higher than conventional feeding reaches the average final body weight 125 kg/head. Giving wafer feed supplements did not affect the physiological condition of the female calves.

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