Feeding strategies to increase growth of early weaned Bali calves in East Java

Yenny Nur Anggraeny,* D. Pamungkas,* N.H. Krishna,* S.P. Quigley,† and D. P. Poppi†

*Beef Cattle Research Institute, Grati-Pasuruan Indonesia and †School of Animals Studies and Veterinary Science, University of Queensland, Australia

ABSTRACT: An experiment was conducted at the Beef Cattle Research Institute, Grati, East Java, to determine the best use of locally available feed resources to increase growth rates of Bali calves weaned at 6 months old age. Male Bali calves (n=20) aged 6 months (59.1 ± 1.9 kg live weight) were allocated to one of four treatment diets, elephant grass *ad libitum*, elephant grass *ad libitum* with leucaena at 10g DM/kg $W.d^{-1}$, leucaena *ad libitum* and native grass *ad libitum*, for 11 weeks. The animals were maintained in individual pens, with feed intake measured daily and live weight measured twice each week. On three separate occasions during the experiment digestibility, by collection of total faecal output over 7 consecutive days, and water intake were measured. Weaned Bali calves offered a diet of leucaena *ad libitum* had a greater live weight gain (0.336 kg/d) than animals offered elephant grass *ad libitum* (0.102 kg/d), elephant grass with leucaena (0.192 kg/d) and native grass *ad libitum* (0.122 kg/d), with no significant difference in live weight gain between the latter three treatments. Total dry matter intake did not differ between treatments and ranged from 24.3 to 29.3 g DM/kg $W.d^{-1}$. Dry matter digestibilty of the leucaena diet was higher (699 g/kg) than the other treatments (580 to 623 g/kg) and animals offered leaucean *ad libitum* had a greater digestible organic matter intake (16.9 g/kg $W.d^{-1}$) than animals offered elephant grass (12.5 g/kg $W.d^{-1}$) and elephant grass with leucaena (13.9 g/kg $W.d^{-1}$). Total water intake, imbibed plus contained in the feed, did not differ between the four treatments and ranged from 124.1 to 151.3 g/kg $W.d^{-1}$. It is concluded that a diet consisting solely of leucaena will result in greater live weight gain of early weaned Bali calves than elephant grass or native grass.

Key words: Bali cattle, live weight gain, forages

INTRODUCTION

The Indonesian government has placed a high priority on increasing domestic beef cattle production to gained meat self sufficiency program 2014. Domestic demand for beef is currently unable to be met from local supply alone under the present beef cattle production. It is predicted that under the present beef cattle production systems, meat import will continue to increase and by 2010 will account for approximately 37% of the Indonesian beef market.

With demand for beef increasing and a decline in cattle numbers (Talib et al., 2003) the Indonesian government is promotong initiatives to increase Bali cattle numbers and performance especially in eastern Indonesia. However the lack of reliable, high quality forage supply, especially during the dry season, is a major constraint to improving Bali Cattle performance throughout much of mixed crop livestock farming system of eastern Indonesia (Mastika, 2003 and talib et al, 2003). Bali cattle calf mortality is as high as 20-45%, one of them caused by cow's milk production is low (Wirdahayati et al., 1998).

One way to increase the productivity of Bali cattle calf is by early weaning, weaning which will also improve the reproductive Bali cows. Feeding strategy for weaning is required for optimal growth occurs it is because of adaptation of the digestive tract from monogastrik to true ruminant.

Native grass and crop residue are commonly feed to cattle in traditional smallholder farmers especially in eastern islands of Indonesia, whereas these islands have the potential to meet demand for beef. Bali cattle (*Bos sondaicus*) the predominant breed in eastern islands of Indonesia. Native grass and crop residue have a low nutritive value, so they did not give maximum productivity to the cattle.

Use high-quality forage such as *Leucaena* as a supplement is expected to maximize the productivity of cattle.

Leucaena is a multipurpose tree legume plants, originating from Central America and Mexico. Leucaena generally planted as fences and guards to plant commercial crops (Panjaitan, 2006). Leucaena is a parenial legume tree with deep roots so they can grow well in dry areas, relatively fast growth and resistance to repeated pruning. Besides the high adaptive plant to harsh environment, Leucaena has more preferred by animals.

Leucaena as cattle feed has a high quality with high forage production varies according to the level of soil fertility, plant spacing and rainfall. Nutrient content of Leucaena according Hartadi (1997) was 29% (DM), 23.40% (CP), 21.30% (CF) 4.5% (EE) and 8.20% (ash). Giving Leucaena leaves as supplements to low quality feed such as hay, food crops can increase the consumption and digestibility.

MATERIALS AND METHODS

Experiments were conducted at the BCRI, Grati, Jatim, between February 2006 to July 2006. Twenty male Bali calves, approximately 6 months of age, and 59.1 ± 1.9 kg live weight, were allocated to one of four different feeding strategies. The experiment was conducted in the late wet / early dry season and consisted of a four week preliminary period followed by an eleven week experimental period. The four experimental treatments were

A = elephant grass *ad libitum*.
B = elephant grass supplemented with leucaena (10 g DM/kg W/d).
C = leucaena *ad libitum*.
D = native grass *ad libitum*

Each experiment used a randomised block design. Parameters observed are 1) live weight; 2) feed quality (dry matter, organic matter, crude protein, ash-free neutral detergent fibre, ash-free acid detergent fibre, ether extract); 3) Feed intake; 4) digestibility; 4) water intake. All data were analysed by analysis of variance procedures in GenStat 2008 (GenStat for Windows, 11th Edition. VSN International Ltd.).

RESULTS AND DISCUSSION

The nutritional composition of the feedstuffs (elephant grass, Leucaena and Native Grass) evaluated did not vary from week to week during each of the experiments and were within the range of values expected for each of the feedstuffs investigated (Table 1).

Table 1. Nutritive composition of feedstuffs (elephant grass, Leucaena and Native Grass) offered to early weaned Bali calves in on-station feeding studies conducted in Beef Cattle Research Station

Feedstuff	DM[2] (g/kg)	OM[2] (g/kg DM)	CP[2] (g/kg DM)	NDF[2] (g/kg DM)	ADF[2] (g/kg DM)	EE[2] (g/kg DM)
Elephant grass	219[a]	815[b]	82[a]	709[b]	421[b]	23[a]
Leucaena	287[c]	843[c]	254[b]	379[a]	276[a]	47[b]
Native grass	252[b]	769[a]	100[a]	678[b]	391[b]	19[a]
SEM[1]	8	6	9	24	27	2

[a,b,c] Different alphabetical superscripts within a column within an experiment are significantly different (P<0.05).
Dry matter (DM), organic matter (OM), crude protein (CP), ash-free neutral detergent fibre (NDF), ash-free acid detergent fibre (ADF), ether extract (EE).

Nutrient content of feed (DM, OM, CP and EE) in Leucaena was higher (P <0.05) than in the elephant grass and native grass. Leucaena has the NDF and ADF contents were lower than native grass and elephant grass. Leucaena is a legume crop that has a characteristic high in protein content than grass.

Weaned Bali cattle fed leucaena *ad libitum* grew faster than cattle fed elephant grass, elephant grass supplemented with leucaena and native grass (Table 2).

Table 2. Average daily live weight gain, feed and water intake and digestibility of 6 to 12 month old weaned Bali calves fed different diets conducted at Beef Cattle Research Station

	Experiment 1				
Parameter	Elephant grass	Elephant grass + leucaena[2]	Leucaena	Native grass	SEM[1]
Live weight gain, kg/d	0.102[a]	0.192[a]	0.336[b]	0.122[a]	0.04
Feed intake, kg DM[3]/d	1.56[ab]	1.14[a]	1.82[b]	1.90[b]	0.2
Supplement intake, kg DM/d	-	0.85	-	-	0.19
Total intake, kg DM/d	1.56	1.68	1.82	1.90	0.23
Total intake, g DM/kg W/d	24.3	26.3	26.8	29.4	2.5
DM digestibility, g/kg	579.3[a]	608.5[a]	698.6[b]	623.0[a]	23.4
DOMI[4], g/kg W/d	12.5[a]	13.9[ab]	16.9[c]	16.2[bc]	1.2
Drinking water intake, kg/d	2.1[ab]	1.3[a]	3.0[b]	0.7[a]	0.6
Total water intake[6] , g/kg W/d	151.3	141.7	130.4	124.1	14.7

[1]Values are treatment means; SEM is standard error of the difference of the means; alphabetical superscripts across the rows indicate significant difference between treatment means ($P<0.05$).
[2]Leucaena fed at 10 g DM/kg W/d before feeding basal diet.
[3]Dry matter (DM).
[4]Digestible organic matter intake (DOMI).
[6]Estimated total water consumed from drinking water and feed intake.

The highest daily weight gain (0.336 g / head / day) was in Bali Cattle fed Leucaena *ad libitum.* Average dayli gain in this research was higher than on result from Paat and Winugroho (1990) that states Average dayli gain of weaned Bali Cattle in South Sulawesi was 40 g/day that grazing in native grass. Abduh et al (1992) reported that the growth of weaned Bali Cattle that grazing on native grass is 321 g/day.

Total dry matter intake did not differ between treatments but dry matter digestibility and digestible organic matter intake were higher for animals which received leucaena. Dry matter digestibility (698.6 g/kg), digestible organic matter intake (16.9 g / kg / d) on weaned Bali cattle fed leucaena ad libitum higher than on other treatments. While drinking water intake was highest for animals fed leucaena there was no difference in estimated total water intake between the four treatments.

Results from this research indicate that the inclusion of small quantities of material higher in crude protein than commonly fed basal diets, such as native grass, resulted in a significant increase in average daily live weight gain. Average daily gain of weaned Bali cattle fed elephant grass which supplemented with leucaena higher (0,192 g / head / day) than on fed elephant grass (0.102 kg/day) and native grass (0.122 kg/day).

In order to increase the production of ruminant need to feed good quality and in sufficient quantity. Livestock will achieve the highest productivity levels in accordance with their genetic potential if the gain of protein, carbohydrates, fats, vitamins, minerals and water through food consumption.

Digestibility of feed is an important indicator because the digestibility values can be used as an indication of feed utilization by animal or determining the amount of nutrients from feed ingredients to be absorbed by the digestive tract. Furthermore, Weston (1982) states that the high digestibility of feed that is marked by increasingly of rate of passage of feed out of the rumen and was followed by increases of consumption.

Protein content of feed has a significant influence on digestibility. A higher protein content of feed would increase rumen microbial activity that also increases the ability to digest feed.

CONCLUSIONS

Leucaena can be used ad libitum as fed for weaned Bali cattle, and supplementation with Leucaena for 50.6% of DM can increase the productivity of Bali cattle on native grass and elephant grass as basal diet.

LITERATURE CITED

Abduh, U. Paat. P.C. and Tikupadang. Effect of improved management on garing bali cattle in nature pasture. Proc. Meeting on Research Result Communication in South Sulawesi. Sub Research of Animal production Gowa. IAARD. Agriculture Department. Pp 44 – 47.

Hartadi, H., S. Reksohadiprodjo dan A.D. Tillman. 1997. Table Komposisi Pakan untuk Indonesia. Gadjah Mada University Press. Yogyakarta.

Mastika, M. 2003. Feeding Strategies to Improve the Production Performance and Meat Quality of Bali Cattle (Bos Sondaicus). In: Enswistle, K. Lindsay, D.R. (Eds.). Strategies to Improve Bali Cattle in Eastern Indonesia. Proceedings of a Workshop 4-7 February 2002. Bali. Indonesia. Canberra.

Talib, C., Enswistle., Siregar, A., Budiarti-Turner,. Lindsay, D. 2003. In Strategies to Improve Bali Cattle in Eastern Indonesia. ACIAR Monograph Series. No 110. 94 pp.

Paat, P.C. and Winugroho, M. 1990. Increasing productivity of Bali Cattle in Village by the use of rice bran as feed supplement. Proc. Seminar on Bali Cattle. Faculty of Animal Husbandry. Universitas of Udayana, Denpasar, Bali, pp : B11-B14.

Panjaitan, T.S. 2006. Mengenal Potensi Lamtoro F1 (KX2) Sebagai Sumber Hijauan Pakan Ternak. http\\ntb.litbang.deptan.gi.id.potex/kx_2.htm. Acessation date May 1, 2006.

Wirdahayati, R. B., P.T. Fernandez, C. Liem., A. Bamualim. 1998. Strategies to Improve Beef Cattle Productivity in Nusa Tenggara Region, Indonesia. Bull. Anim. Sci. Suppl. Ed:Beef Cattle Productivity in Nusa Tenggara Region, Indonesia. Bull. Anim. Sci. Suppl. Ed:16-322.

Weston, R.H. 1982. Principle of Feed Control in Ruminant Given Roughages. In the Utilization of Fibrous Agricultural Residue as Animal Feed: In: P.T. Doyle. Ed. Proceedings of the 3rd Annual Workshop of the Australian-Asian Fibrous Agricultural Residue. Research Network Held at the University Paradenya. Srilanka. 14-17.