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The growth rate of Etawah crossbreed kids fed with different level of cow's milk substitution.

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ABSTRACT

The research was conducted to study the growth response of Etawah crossbreed goat kids that were fed with cow's milk to substitute goat's milk. Eighteen male goat kids at 5-13 days old were used. This experimental design was a completely randomized design with three treatments, namely the control (T_0) fed 100% goat's milk, treatment 1 (T_1) fed 50 % goat's milk and 50 % cow's milk, treatment 2 (T_2) fed 100 % cow's milk. The treatment of substitution of cow's milk in the kids showed that significantly affected ($P<0.05$) on the average daily gain. The kids fed 100% cow's milk showed the lowest growth (57.3 g/day), but there were no differences in growth rate between kids fed 100% goat's milk and substituted 50% with cow's milk (72.2 vs 72.2 g/day). However, T_0 showed the highest growth rate in the first 3 weeks followed by T_1 then T_2. T_0 and T_1 body weights were equal from the 7th week, whereas T_2 showed the lowest body weight until the end of the treatment. The PE goat kids fed with 100% goat's milk and 50% substitute are not different in results, whereas fed with 100% cow's milk significantly affected the growth rate.

Keywords: growth response, local goat, milk substitution, pre-weaning

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INTRODUCTION

The local goats have an important role in Indonesian agricultural system. Goat farming system is dominated mostly by small-scale holder farm wich characterized by traditional and extensive rearing. Etawah crossbreed (PE) is dual-purpose type goats, as a producer of meat and milk. Economic parameters Profitability Index (PI) and Internal Rate of Return (IRR) on efforts goats as a dual-purpose (5.92 and 105.12%) were higher than only as a kids producer (1.002 and 20.05%) [1].

Pre-weaning management requires special attention because it will be the replacement for dams that will determine the future of farm business. The growth of kids from birth until weaning is a critical period. Survival and growth of kids after birth strongly depend on a nutrient derived from dam milk or the substitute milk because the rumen has not been functioned perfectly [2].

milk has a high economic value, base on the price of goat milk because of relativity limited availability, the price 4 times the price of cow's milk (IDR 20000 vs IDR 5000). This condition caused the farmers provide restricted cow's milk as a substitute for goat's milk on kids. The level of milk substitution must be formulated carefully to improving the survivability and growth of young ones. Restricted feeding reduced visceral organ mass compared with allowing lambs adlibitum access to feed. The reduction in visceral organ mass seemed to be partly responsible for lowered maintenance energy requirements [3]. Cow's milk and goat's milk nutrient contents are similar, but goat's milk is more easily digested and absorbed because it has smaller fat and protein globules [4]. There were not enough information about the substitution of goat's milk with cow's milk on the Etawah goat kids growth. The purpose of this study is to determine the growth response of kids fed cow's milk as the substitute of goat's milk.

MATERIAL AND METHODS

Animals

This study was conducted to Etawa Crossbreed (PE) kids at the Technical Implementation Unit of Livestock Breeding and Forages, Malang of East Java Province. Eighteen male goat kids born a twin at 5-13 days old selected from 3-4-year-old dams with an initial average body weight of 4.17 $\pm$ 0.413 kg were used. The kids were taken to an individual cage, weighed, identified and they were pre-adapted to the treatments and the house for 14 days. The experiment lasted for 84 days. The kids were weighed weekly at 07.00 am before feeding. This experimental design was a completely randomized design with three treatments with six replications per treatment, namely the control (T_0) fed 100% goat's milk, treatment 1 (T_1) fed 50 % goat's milk and 50 % cow's milk, treatment 2 (T_2) fed 100 % cow's milk.

Feeding preparation and treatments

Table 1. Nutrient compositions of goat's milk, cow's milk, CCS and *gliricidia sepium*

	Goat's milk	Cow's milk	CCS	Gliricidia
Dry mater (%)	15.4	13.1	91.1	82.3
Ash (%)	0.61	0.64	8.54[a]	8.42[a]
Protein (%)	3.93	2.81	16.2[a]	21[a]
Fiber (%)	0.00	0.00	10.4[a]	20.4[a]
Fat (%)	7.12	5.42	6.17[a]	2.97[a]

[a]Dry mater base

The milk pasteurized at 75^0 C for 15 seconds and given at 35-37^0 C with bottle feeding. The daily amount of milk per kid at 2, 3, 4 and 5 weeks old were 8%, 9%, 10% and 8% of birth weight (BW). starting at the age of 6 weeks until the end of the study, it was given 5% BW. The feeding was divided into 4 times at the first 5 weeks, and 3 times at the second 5 weeks. From the 11th week, it was fed twice daily. All of the kids were fed with the same amount of commercial calf starter (CCS) and dried gliricidia sepium leaf. The daily amount of CCS per kid were 50 g, 100 g, 150 g and 200 g at the 3rd-4th week, 5th-6th week, 7th-8th week and from the 9th week to the end of the study. The daily amount of gliricidia sepium per kid were 50 g, 100 g, 150 g, 200 g and 250 g at the 3rd-4th week, 5th-6th week, 7th-8th week, 9th week and from the 10th week to the

end of the study. The milk composition was analyzed every day and solid feed proximate analysis was performed before the treatment. The milk and solid feed composition are presented in Table 1.

Statistical analysis

The data analyzed with ANOVA was carried out using Microsoft Excel®, means where significant differences occurred were separated using least significance different.

RESULTS AND DISCUSSION

Growth Rate

There were no differences in growth rate between T_0 and T_1; the lowest growth rate was with T_2 (Table 2).

Table 2. Average daily gain and milk nutrient consumption of each treatment

Variable	Treatment			SEM	p
	T_0	T_1	T_2		
ADG (g/day)	72.2^{b}	72.2^{b}	57.3^{a}	2.83	0.0339
Milk nutrient consumption					
Total Solid (g/head/day)	38.1	35.3	34.6	1.16	0.641
Protein (g/head/day)	9.69^{y}	8.34^{xy}	7.42^{x}	0.348	0.0165
Fat (g/head/day)	17.6	15.5	14.3	0.587	0.0647

ab Different superscripts in the same row indicate a significantly difference.
ADG- Average daily gain, T_0- fed 100% goat's milk, T_1- fed 50 % goat's milk and 50 % cow's milk, T_2- fed 100 % cow's milk, SEM- Standart error of means.

This study results in a lower ADG than previous studies; they were the male kids fed milk substitute (MR) and suckling (63.6±14.1and 91.8±32.5 g/day) [5], fed cow's milk and milk substitutes (96±11.8 and 83.6±16.3 g/day) [6]. It was caused by the amount of milk consumed.

The difference in the growth of T2 caused the consumptions of protein and fat of the milk were the lowest (Table 3). The amount and quality of protein consumed affect the growth of the digestive organs and the rumen microbial digestion products. Pre-ruminants depend solely on the dietary source of protein until the functional rumen is developed. Fats constitute a major source of energy in pre-ruminants [7]. Protein is one of the most important nutrients to support the growth of bacteria in the rumen, muscle growth and as a source of energy [2]. According to [3], high-protein diets resulted in greater ($P<0.01$) weights and faster accretion rates of liver and kidney compared with normal protein. The kids fed low and medium crude protein diets gain less weight ($P<0.05$) than those fed the highest protein level [8]. The increasing CP levels from 14 to 16% in diet improve the feed intake, average body gain and feed efficiency [9]. The average daily gain is significantly ($P<0.05$) higher in the kids fed dam's milk than fed milk replacer prepared by using fresh eggs and wheat flower and milk replacer prepared from skim milk powder [10].

The kids fed with 100% goat's milk and substituted with cow's milk at level 50% are not different, it was showed that the kids are tolerant with the quality differences of milk protein and fat at these level. Nonprotein nitrogen (NPN) content of goat and human milk are higher than in cow milk [11]. The size of casein micelles varies considerably within and between species. They seem to be smaller in goats milk than in cow's milk [12]. Fat globules of goats milk resemble those of cows milk in lipids composition and properties of the globule membrane but goats milk lacks agglutinin [13]. In this respect, goat milk resembles cows milk, however, contained significantly more free lipids than did for cows milk [14].

Growth Pattern

The kids grew slowly in the first 3 weeks, then increased starting at week 4^{th} until week 10^{th}, then they became slow at the end of the study. T_0 showed the highest growth rate in the first 3 weeks, followed by T_1

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then T_2. T_0 and T_1 body weight were equal from the 7th week, whereas T_2 showed the lowest body weight until the end of the treatment. The growth pattern is presented in Figure 1.

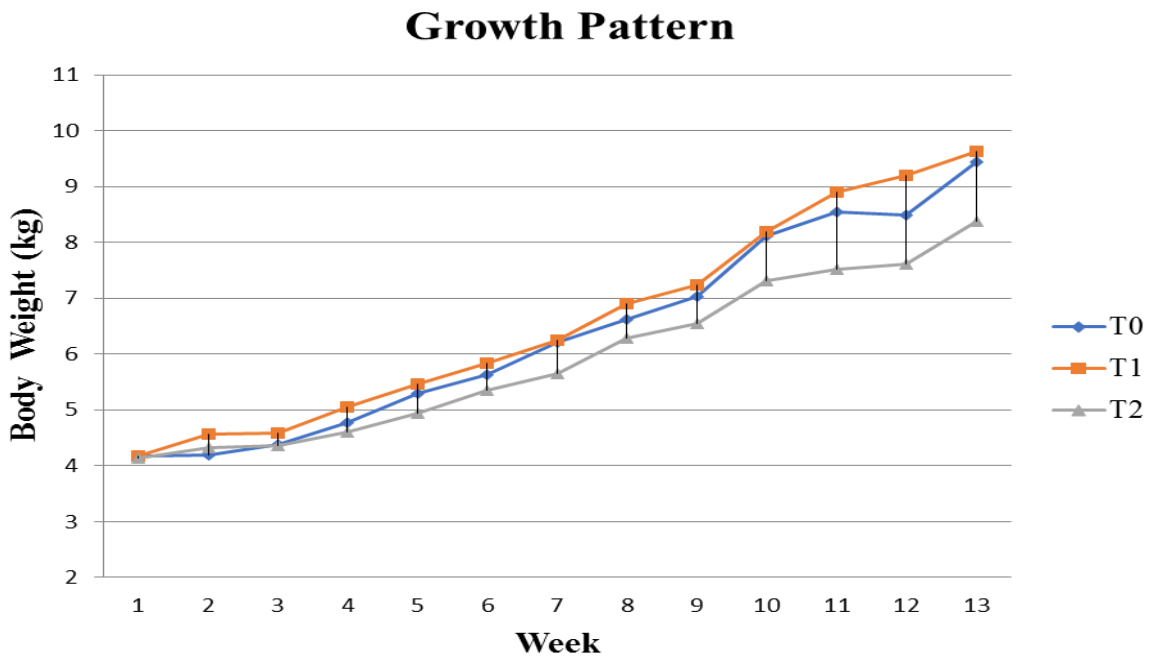

Figure 1. The growth pattern of pre-weaning kids fed goat's milk (T_0), the substitution of goat's milk with 50% cow's milk (T_1) and substitution with 100% cow's milk (T_2)

A similar growth pattern with this study is obtained by [15] on Saanen kids, [10] on Black Bengal kids and [16] on the male Kacang kids. These results are different from [17] obtaining that the growth of daily body weight is relatively stable until the age of 13 weeks. It causes the kid suckling on the dams, so the feeding is as many as the dam's milk production. The acceleration of growth after the third week is because the goats are not dependent on milk, but they begin to utilize nutrients from a solid feed. When the suckling goat kid starts to eat vegetation during the first or second week after birth, the rumen, reticulum, and omasum gradually develop in size [18].

CONCLUSION

The substitution of goat's milk with cow's milk in the kids causes significantly different in average daily gain. The kids fed 100% goat's milk and 50% substitute are not different in results, whereas fed with 100% cow's milk significantly affected the growth rate. it was concluded that the substitution up to 50 % cow milk could be use for both economic and practical reason for smallholder farm of local goat in Indonesia.

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