Optimalization of Supplementation Time for Improving Reproductive Efficiency and Gene Expression of Goats

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Abstract: In general, there is a problem faced by smallholders of traditional farmers, especially in selecting the most appropriate quantity and quality of food stuff in the maintenance, production and reproduction of goat. Urea Molasses Multinutrient Block (UMMB) has been used and proven to improve production and reproduction performances in goat. Therefore the objective of this paper was to determine the optimal time of UMMB supplement as part of the feed for the pregnant goats. The research was conducted in May to December 2011 in the Tamalatea district of Jeneponto. There were 57 does given by the smallholders and were divided into six groups, namely (a) UMMB supplement from 0 day up to 1 month of pregnancy age (n=10), (b) UMMB supplement from 1 up to 3 months of pregnancy age (n=9), (c) UMMB supplementation from 1 to 5 months of pregnancy age (n=10); (d) UMMB supplementation during pregnancy - positive control (n=9), (d) Without UMMB supplement- negative control (n=9), (e) after birth UMMB supplement (n=10). The animals were fed with native grass *ad libitum* as base diets with drinking water. The growth variables measured were body weight, blood metabolites, blood progesterone profile and first estrus after birth. Data were analyzed using the variance analysis. Results indicated that UMMB supplement from 0 to 1 month of pregnancy age did significantly improve the reproduction of does.

Key words: Etawa Crossbreed Doe • Urea Molasses Multinutrient Block (UMMB) • Postpartum Estrus • Urea and Kreatinine

INTRODUCTION

Nutritional food as a regulator of reproductive function plays an important role in the whole process of an animal growth and reproduction. Essentially the nutritional needs such as protein, energy, minerals and vitamins for goat breeds are the same in both sex and age. However, the nutritional requirements vary from different breeds of goats [1]. The physiological mechanism between nutrition and reproduction is associated with inhibition of gonadotropin which releases hormone malnutrition. Nutritional deficiencies, especially of energy in the feed can cause abortion in particular during a period of 90 to 110 days of gestation because goats experiencing severe stress due to significant weight loss [2].

In order to improve the reproduction productivity of goats, farmers need to carefully and properly feed them before and during pregnancy (in utero nutrition). Thus, it is pertinent to acquire knowledge on the nature of reproduction and every single phase of the goat growth cycle to improve reproductive efficiency through improved nutrition and breeding maintenance [3]. Efforts to address the improvement of nutrition in livestock should deal with the food plus supplements known as
Multinutrient Urea Molasses Block (UMMB). UMMB is a modified form of processed animal feed consisting of a mixture of urea, molasses and other ingredients such as minerals, lime, rice bran and other essential nutrients. UMMB supplement is expected to provide a significant effect through increased microbial protein, digestibility and feed intake to obtain a better balance between the amino acids and energy in the nutrients are absorbed [4].

The addition of supplements to goat could increase the growth with increased reproductive performance [5] by increasing its body weight in sheep after 90 days [6]. Supplements with mineral concentrates can increase the blood (blood metabolites) goats [7]. As an example, a mineral concentrate supplement feeding of 16.1 g/head/day to the goats in the Philippines at the age of 4 months increased the body weight of 54.8/head/day besides adding some micro minerals in the blood [8]. A UMMB supplement in cattle showed her first marriage to the time of delivery was 127.6 days with 1.2 services per conception (s/c) and pregnancy rate of 75%. For the cattle without the UMMB supplement, birth after marriage reached 158.8 days, s/c 1.7 and 69.2% pregnancy rate [9]. UMMB supplements were also tested to the Direktur Jendral Peternakan beef cattle, dairy cattle and sheep in West Java and showed a positive increased in their reproductive performance efficiency.

There is a negative effect of nutrition on the doe’s embryonic phase due to an extreme lack of nutrients that led to the death of the embryo [10]. Prenatal development of a goat can generally be divided into three phases of pregnancy, i.e. fertilization of the ovum, followed by the embryonic period and finally the fetal period. During the fetal period, there was a marked change in the size and differential changes in various organs while tissues were formed in the embryonic period [11]. In the early embryonic development, the fetal size growth will be affected by the status of nutrients availability. Incidence of protein deficiency in the diet during early pregnancy can lead to slow growth of the fetus [2] after a half period of pregnancy in sheep [12]. There was no significant effect on the fetal body, tissue and organ growth except tractus gastro intestine. Doe nutritional needs during pregnancy are determined by the balance of metabolism in the blood with the balance of nutrition ratio.

MATERIALS AND METHODS

The goat breed Etawa (PE) doe belonging to the farmers in the Turatea village, Tamalatea District in Jeneponto was selected in this study. Goats were fed with the basic ration consisting of grass cut, gamal leaves, plant remnants and tofu waste which were given as adlibitum. The goats were grouped based on reproductive status with an added UMMB supplement treatment. A total of 57 Etawa crossbreed doe was divided into six groups UMMB supplements in three different times:

**Group I:** Feed supplement during pregnancy aged 0 to 1 month.

**Group II:** Feed supplement during gestation age 1 to 3 months

**Group III:** Feed supplement during pregnancy and after delivery of 1 to 5 months

**Group IV:** Without feed supplement during pregnancy (control)

**Group V:** Without supplement feed after delivery (control)

**Group VI:** Supplement feed after giving birth

All data analysis was subjected to ANOVA and SPPS 20 for windows. A T-student Test was performed on post-partum estrus time and weight gain data.

RESULTS AND DISCUSSION

**Daily Weight Gain of Doe:** An increase in the UMMB supplement feeding level on the pregnant goat’s gestation period showed an increasing mean weight gain of the doe (Figure 1). These results indicate that a longer feeding time with UMMB supplements can effectively promote weight loss for pregnant doe. UMMB supplements may influence the doe’s body weight through an increased microbial protein, digestibility and feed intake for a better balance of amino acids and energy absorption during nutrients intake [4].

UMMB supplement improved weight gain of the doe as compared to not giving it (control). The age of the goats when UMMB supplement was given can significantly (P <0.05) affect their body weight. Results indicated that Group I (age 0 to 1 month pregnancy) produced an average weight gain of 0.133 kg/day compared to Group II (1 to 3 months) with a weight of 0.100 kg/day and Group III (1 to 5 months) of 0.0934 kg/day. Goat in group IV that was not supplemented with UMMB only had a body weight of 0.0218 kg/day.
These results indicate that feeding time of UMMB supplements can effectively promote weight loss of pregnant goat. The addition of supplements to goats could increase the growth by increasing body weight in sheep after 90 days of UMMB supplements [6]. The UMMB supplement fed to 4 months age goats in the Philippines increased their body weight of 54.8 g/head/day compared to non-supplements feeding of only 16.1 g /head/day [8]. Thus, UMMB supplement clearly resulted in higher weight gain for Group I with gestational ages of 0 to 1 month than Group II and III which showed the feed requirement supplements have been sufficiently met the nutritional needs of the parent during the early pregnancy. Doe’s nutritional needs during pregnancy are determined by the balance of metabolism and nutrition in the blood.

**Weight Gain of Post-Partum Doe:** UMMB supplement fed on postpartum mothers showed a higher increase than the doe that was not given with UMMB. Figure 2 illustrated the postpartum goats that were fed with UMMB supplements (Group IV) had a mean weight gain of 0.2058 kg/head/day which was higher than the parent without UMMB supplement of 0.0293 kg/ head/day (Group V). Thus, UMMB as animal feed supplements may increase the consumption of concentrations of ammonia and soluble fatty acids in rumen fluid to increase production of the Etawa (PE) goat breed in Central Java.

**Blood Metabolites (Urea and Kreatinine):** The content of urea in the blood increased by administering UMMB on Group I (57.66mg/dl), Group II (51.77mg/dl) and Group III (55.0 mg/dl). UMMB supplement tend to significantly ($P <0.01$) influence the levels of urea in the blood as shown Figures 3 and 4. Urea content of Group I, II and III were very significantly higher than Group IV (26.8 mg/dl) that were not supplied with UMMB supplement. The supplements given to the goats in the Philippines affect the concentration of micro mineral in the blood [8]. The kreatinine content in the blood was influenced by UMMB where kreatinine content in Groups I (0.62 mg/dl), II (0.68 mg/dl) and III (0.556) was lower than the Control Group IV (0.95 mg/dl).

**Estrus Time of Post Partum:** The goats that were supplemented with UMMB showed a faster estrus postpartum time compared to the ones not supplemented with UMMB. The goats with no UMMB supplements have not shown any signs of estrus after giving birth. Table 1 showed first estrus postpartum in a given parent UMMB (Group VI) showed estrus back on day 23.4, while the doe without UMMB supplement (Group V) has not shown signs of estrus due to the lack of nutrients which inhibit sexual development and puberty [13]. Anaestrus interval after delivery of the doe with supplement tend to wean earlier (1 week shorter) than without supplements fed to postpartum that weaned 2 months later, depending on the conditions of feeding [14].

**Table 1: Estrus postpartum time**

<table>
<thead>
<tr>
<th>Description</th>
<th>Estrus</th>
<th>Anestrous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doe</td>
<td>-9</td>
<td>5/10</td>
</tr>
<tr>
<td>Estrus time (days)</td>
<td>-</td>
<td>23.4 days</td>
</tr>
</tbody>
</table>

With the UMMB supplement, the body weight gain of 105.2 g /head/day can be easily achieved as compared to the non-supplement UMMB body weight of 91.6 g/head/day [4].
Progesterone Hormone Profile: Measurement of progesterone hormone levels was used as one of the hormonal pregnancy diagnosis. This technique aims to measure the level of progesterone in blood plasma or serum and to monitor the estrous cycle or pregnancy in domesticated livestock species. The average levels of the hormone progesterone in a given parent with UMMB supplement was 0.1 - 7.2 ng /ml and the parent without UMMB was 0.91 - 2.13 ng /ml which indicated some pregnancy or having the estrous cycle. In sheep, the luteal phase takes approximately 2-4 ng /ml, while the time estrus is approximately 0.15 - 0.8 ng/ml. Increased progesterone concentrations of 2-4 ng /ml to 12-20 ng /ml also occurred in gestation period of 60-125 days. This increase is due to the progesterone which was also produced by the placenta.

CONCLUSION

UMMB supplements feed can increase the weight gain leading towards birth of pregnant doe. The optimum time of feeding the supplements to the pregnant doe gestation is 0 to 1 month. The content of blood metabolites (urea and creatinine) increased in the doe fed by UMMB supplements since it accelerates the emergence of post-partum estrus. UMMB supplements can also increase weight gain of a pregnant goat after birth with an optimum time of feeding supplements to the pregnant doe gestation of 0 to 1 month.

REFERENCES

