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The Relationship between Dietary Calcium Intakes Contain in Goats' Feed with Calcium Serum Concentration in Pregnant Boer Goats

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ABSTRACT

The aim of this research is to identify the relationship present between calcium concentrations in goats' feed with calcium serum level for pregnant meat goat. The calcium was tested from both samples. There were between feed and blood serum. The biochemical parameters were studied using 40 pregnant does (10 animals in each group). The present study indicates those hematological calcium deficiencies are likely to happen due to low level of calcium concentration content in feed.
KEY WORD: Boer, pregnant, calcium, serum, feed

INTRODUCTION

A study made by [21], had found that, the high nutrient is needed in animals' active stage especially during the crucial phase such as pregnancy period. Moreover, there are also two types of mineral that are really needed by the animals, which are macromineral and micromineral [20]. Calcium is the mineral that present in macromineral groups, which means need in the significant amount of quantity. In addition, it is the most abundant mineral in the body [7]. Moreover, research by [21] also added that the complete nutrient from all feed diet need to be achieved in order to maintain the best level of calcium during gestation and lactation stage. Furthermore, research made by [9] also told that one of the main causes that can contribute to calcium deficiency is through improper calcium intake in diet.

MATERIALS AND METHODS

Animals: Forty pregnant Boer goats age between 1½ to 2½ years, 38.03 ± 0.63kg body weight was used for this research (10 pregnant goats were present in each group). The does were kept in pens. All those groups have the same body condition and diet ration. The commercial feed was provided ad libitum while drinking water was made available at all times.

Feed Sample: Reffering to standard farm practice, animals were fed twice/ day and had an *ad libitum* source of drinking water. They were fed with fresh Napier (40%), Silage (20%), and Concentrate (30%) and last but not least Soy wastes (10%) every day. Approximately 0.5 kg of feed samples was collected, keep in the separate plastic bag and recorded for mineral analysis (calcium content).

Feed Analysis (Ash as total minerals): Mineral analysis of feed samples was using the dry ashing technique at Nutrition Laboratory Manual, UPM, [23] method. All the feeds were cut and mash into small bits. The samples were after that was dried in an oven at 650C. The samples have ignited in a muffle furnace at 5500C for 3 hours until it turned into ash color. Then, the total minerals (ash) remained in the crucible was collected and for extraction of calcium. The ashes were then, digested with dilute 20ml HCl for 30 minutes at 1000C. The resulting mixture had been added to distilled water up to 100 ml in the volumetric flask, and then it was mixed thoroughly. Determination of mineral (Ca) was conducted using the Atomic Absorption Spectrophotometer (Emission Flame Photometry: PSS-AVR-Model SS103) was used for reading process. Calcium will be measured by emission flame photometry on a multichannel flame spectrometer using 50% of strontium solution as an internal standard. To five dry beakers, 250 ml was added to deionized water by applying a graduated cylinder. 500µL automatic pipette was used to add 0.0, 0.5, 1.0, 1.5, and 2.0 ml of the calcium samples to the beaker and mixed thoroughly. The putting up of the spectrometer was built with a long axis of the flame both

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parallel and perpendicular to the light path. After finishing up the steps with one flame position, the burner turned head of 90 degrees. After that, the measurement continues to create the other measurement of the other flame position. Finally, in emission intensity measuring steps, auto zero on the instrument with deionized water has used all standards and samples were measured. The concentrations of calcium were measured and the unit is in Mg/L and it worked as the auto run machine.

Blood sampling: The blood sampling were done in mid trimester stage for all the groups. No calcium supplement was provided. On the other hand, 10 ml of blood was collected through the jugular vein by using disposal syringe and sterile needle 18 gauge x 1½. Finally, the blood was then placed in the plain vacutainer and the serum was transferred into Eppendorf tubes for further biochemistry test. On top of that, blood sampling used according to the report found by [22].

Biochemistry test: Blood samples were stored for 30 minutes at room temperature and had been centrifuged for 15 minutes by using (Sigma, centrifuge model Sigma 203, B. Braun, Melsungen, Germany) at 2500 rpm to get the serum. The storage of the serum present at -20ºC until the analysis was started. The analysis was conducted by using automatic chemistry analyzer (Siemen Chemistry Xpand Plus Intergrated Chemistry System, Siemens AG Wittelsbacherplatz 2, 8033, Muenchen, Germany) and the result were directly come out after auto rerun of the loaded serum into the automatic chemistry analyzer for 30 minutes run. Finally, the machine's temperature works at (17-30ºC) and the maximum fluctuation was (2.8ºC) per hour. On top of that, the blood test was conducted at Biochemistry Laboratory at Faculty of Veterinary and Medicine, Universiti Putra Malaysia.

Statistical Analysis: The analysis was performed using SPSS software (ver. 17.0, SPSS inc., Chicago, IL, USA) for calcium serum concentration in blood samples. Therefore, we suspected that there might be high significant changes between those systemic approaches in this research. Evaluations above were using one-way ANOVA. Finally, data obtain were expressed as mean ± standard error. A probability of $p<0.05$ was considered significant for the statistical test.

RESULTS

Table 1: Analysis of calcium level in feed

Type of feed	Calcium level in feed -sampling (mg/L)	Normal calcium level in feed (mg/L) – References	
Silage	19.99	23 25 31	(Department of Veterinary Services, 2009). (Portal Rasmi Jabatan Veterinary Malaysia, 2015). (http://www.dvs.gov.my/pemakanan) (Das *et al.,* 2010)
Concentrate	15.44	17	(Department of Veterinary Services, 2009)
Soy waste	13.80	116 116	(Dong *et al.,* 2005) (Rahman *et al.,* 2013)
Napier Grass	12.66	36 30 29 40	(Department of Veterinary Services, 2009) (Portal Rasmi Jabatan Veterinary Malaysia, 2015). (http://www.dvs.gov.my/pemakanan) (Rahman *et al.,* 2013) (Rahman *et al.,* 2014)

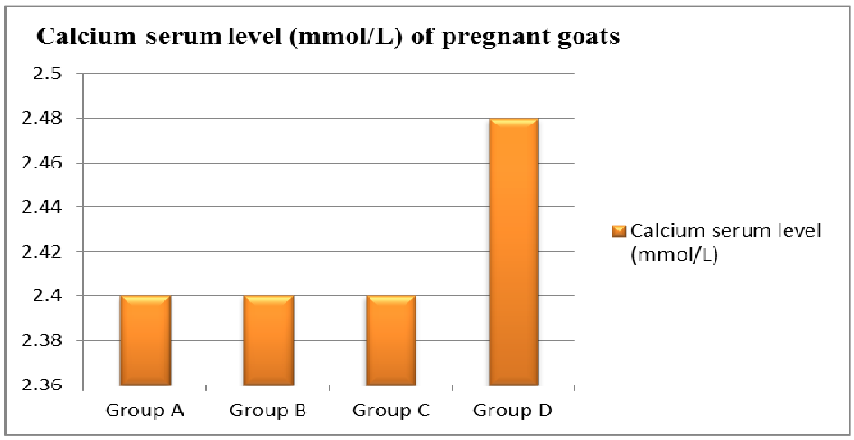

Figure 1: Bar chart demonstrating the mean relation between pregnancy (mid-trimester) and calcium serum level in the goats.

DISCUSSIONS

Table 1 shows the mean values of calcium concentration in feed with the comparison to the reference had been made by the previous researches. The calcium concentration in feed can directly be related to the calcium serum level in Figure 1. Referring to Table 1, there is a low level of calcium in all types of feed compared to the references given by the previous researches. Furthermore, the calcium level present still depends on a few other factors, such as plant age; time of harvesting; fertilizer use and many other reasons. Furthermore, a study made by [34] found that, the calcium concentration in harvesting yield will significantly higher where the soil was amended with calcium fertilizer. The components noted above could lead to calcium deficiency observed in Napier grass, as well as Napier silage.

Harvesting late during the plant old can cause the declination in protein as well as minerals in ashes together with its digestibility [25]. Thus, it is highly recommended that the best haversting time of Napier grass is at least at 1 to 1.2 cm (3 to 4 months after planting). In addition, the plant also should be in an interval of 6-8 weeks at the same height during a harvesting session either in both wet or hot surrounding.

Some other element leading to lack of calcium is might be cause to the land condition. The soil contained the highest stage of mineral, and one of the macro minerals that are necessary for the plant is calcium which has been transferred from calcium fertilizer directly to plant [11]. A Study by [34] reported that the calcium concentration in harvesting yield will significantly higher where the soil improved and contain with calcium. They found that, calcium uptakes in the plant or by passive transport and its mobility take place mainly in xylem together with water. Consequently, the water is really essential for transportation of calcium. Moreover, transpiration rate is thought to contribute to this process. Exploration by [15] had stated that there are four primary reasons for calcium deficiency in the plant, such as high humidity; cold temperature; low transpiration and salinity build up. Calcium is not moving freely within the plant. Hence, the plant is dependent on the process of transpiration, whereby the roots take up the soil solution that contains calcium is needed, and transports it to the new part where the calcium is used. Excess water vapor escapes out through holes in the leaves called stomata. The investigation also said that any situation that has slowed transpiration, such as high humidity or cold temperatures can cause calcium deficiency even if the calcium levels are normal in the growing medium. The dominant salt in nature that is NaCl will generate a primary effect on the plant. In normal conditions, the osmotic pressure of plant cells is higher than soil solution. Unfortunately, under soil stress, the condition was vice versa due to conditions of high salt in the ground. Therefore, it will cut back the ability of the plant to contain up the minerals like calcium.

The elements that make Napier is preferable by Malaysian farmers is due to the several factors. It is easier to produce and spread, and it is easy to manage as well, reported by International Livestock. The most important purpose when feeding does is to run into its maintenance requirement. It is the species of intermediate class between grass and roughage eater and concentrate selectors [3]. A research did by [10] and [26] found that goats are not tolerated with high character level and forced to select less fibrous parts of plants according to seasonal diet availability. Therefore, the goal is to maintain body weight and shape.

There is the advantage of using concentrate because it is in dry form and can be stored longer compared to other feed. Additionally, a study by [14] noted that pellet form has lots of advantages because a polarization process encourages the elimination of contamination microorganisms; increase shelf life; make transportation and storage easier which is very good factor for the farmers. Unfortunately, forage diets alone cannot fulfill the nutritional demands of high producing animals, such as lactating females. Green plants consist mainly of a material called cellulose, which is digested by bacteria in the gut [33]. But some of the farmers have replaced full grain in higher quantity to increase the increase rate of goat in quick way [1], Furthermore, studies by [19, 30] found that the goats should be provided with both types of feed, forage and concentrate on passing over the nutrient requirement. Fiber is very important for the rumen to function in the right way. A drastic change of diet in all at once is not indicated to the farmer in order to satisfy the healthy new portion of nutrition. The farmer must not feeding them in great amounts of new feed as it may cause serious digestive upset for goats [2]. In addition, several works in small ruminants have shown that energy from concentrate improved the productivity of animals [1, 18].

Exploration by [17] bring into being that ruminant can digest phytate because of phytase produced by rumen microorganism. Therefore, ruminant will indirectly get calcium mineral from the digestion process. Bindings form has a stronger binding affinity to the important mineral such as calcium [8]. Regrettably, heating process of heat treatment was used along the ashing process which can interrupt the phytic acid and calcium binding. Therefore, the interaction between phytic acid with minerals (calcium) to form insoluble complexes [36] will automatically affect the level of calcium.

Thus, poor nutrition at the calcium level facing by this farm had been identified. Thus, by increasing calcium intake in the supplement may even out the demand for that mineral in blood serum of the pregnant goats. There is a relation between feed and calcium serum in blood serum. [32] had stated that, the health condition of goats is the main factor of the efficiency in animal production. In addition, research by [16] noted

that, the identification level of blood parameters is very important in health prediction status. On top of that, the study by [4] also stated that the blood profiling is useful in determining subclinical metabolic disorders and reflects the actual condition of the animals. It can also induce the need to determine levels of blood analytes such as serum minerals [32], which is the fundamental role in feed digestion; reproductive performance; and the development of bones, muscles and teeth [35]. Finally, finding by [13] found that, below or above normal calcium serum levels indicate problems with health status of goats and [32] also supported that there are relation between feed calcium levels with the calcium serum level in animals.

Unfortunately, studies made by [5, 12, 24] found that there are low calcium and high oxalate level in Napier grass. [29] also supported that a higher amount of silage made by Napier will directly increase the oxalate level as well and it will be secreted through feces. Then the calcium supplied was wasted without being absorbed by the animals. Besides that, calcium also will be excreted by the urine cause by oxalate in Napier grass [28]. Thus, this is the reason of calcium serum in mid-trimester (without supplement for all groups) in (Graph 1) was only between 2.4 mmol/L and 2.48 mmol/L. Unfortunately, the report made by [37] said that the normal calcium levels in serum for pregnant meat goats should be between 2.2–3.05 mmol/L but unluckily the levels plotted show in this research is not really high and it may cause by Napier supplied as animals' daily diet along gestation period. The percentage of Napier supplied by farmers is quite high that are 40% for fresh Napier and 20% for silage made by Napier; and the balance is for Concentrate 30% and Soy waste 10%.

Conclusion

In conclusion, there is a relation between feed and calcium serum absorption in the animal's body. From this result, we can recommend new types of forages as another alternative to the local farmers, in order to increase the calcium serum absorption in the animals especially during pregnancy.

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