The Effect of Ca-PUFA, Protein Protected by Tannin and Organic Minerals (Zn, Cu, Cr, and Se) on Thyroxine Levels in Dairy Calves

Aulia Miftahunnisa Exa Putriyana[1,*], U Hidayat Tanuwiria[2], and Didin S Tasripin[2]

[1] *Student of Animal Husbandry, Padjadjaran University, 45363, Sumedang, Indonesia*
[2] *Lecture of Animal Husbandry, Padjadjaran University, 45363, Sumedang, Indonesia*
**Corresponding author. Email: auliamep@gmail.com*

ABSTRACT
Dairy cows live in a comfortable environment with a THI of less than 72, if it's higher than it can be affected by heat stress conditions that are indicated by changes in the concentration of the thyroxine hormone. This study aims to determine the level of thyroxine hormone in dairy cows that were given Ca-PUFA, tannin protected protein and organic minerals (Zn, Cu, Cr, and Se) as supplemental feed. This study was conducted for 12 weeks at BPPTIB TSP Bunikasih using 16 dairy calves with two treatments, which are R0= 60% forage + 40% K0 (100% concentrate) and R1= 60% Forage + 40% K1 (93% concentrate + 2% Ca-PUFA + 3% protein protected by tannin + 2% organic minerals (Zn, Cu, Cr, and Se). The experimental design used is the T-test with independent samples. The results showed that supplementary feeding on female calves of dairy cows showed a significant difference (P>0.05) it can increase the thyroxine hormone levels in dairy cows by using R1 which was 61.33 Nmol/ l. The conclusion of this study is that supplementary feeding on female calves of dairy cows has an effect for increasing thyroxine hormone levels, in avoiding the effects of heat stress.

Keywords: *Ca-PUFA, Protein, Minerals, Thyroxine*

1. INTRODUCTION

The environment is one of the factors that affect livestock productivity, one of which is altitude which is a consideration in the maintenance of dairy cattle Highlands usually have a temperature or environment that is more comfortable for dairy cattle, but the climate changes also affect the environmental conditions of the cattle to become uncomfortable. Generally, dairy cows live in a comfortable environment with a Temperature Humidity Index (THI) of less than 72 [7] because dairy cows are very sensitive to heat stress as indicated by changes in behavior and a decrease in the concentration of the thyroxine in the blood.

Stress is caused by the condition of livestock that are affected by changes in environmental conditions so that the body tries to maintain homeostatic conditions until it exceeds the balance limit. Stress occurs due to a stressor that causes the body's homeostatic response. Thermoregulation mechanism in maintaining thermal balance in dairy cattle can reduce productivity. Hormonal changes [9] caused by stress also cause animals that experience it to be easily irritated or inflamed.

Heat stress conditions will reduce the essence of energy use because of the energy efficiency for basic life and energy for thermoregulatory activities. When the animal's body is under heat stress, [4] the body will reduce the metabolic rate by suppressing the secretion of the hormone thyroxine and releasing heat shock protein which has an important role in responding to heat stress and other types of cellular stress and in regulating also growth efficiency.

Productivity improvement can be done not only by paying attention to genetic quality improvement, but also by fulfilling nutritional needs. Growth phase calves require intake of essential amino acids, essential fatty acids, and essential minerals to increase enzyme and growth hormone systems. Essential amino acids, essential fatty acids, and essential minerals from feed

must be guaranteed to be available in the small intestine. Several ways to meet the nutritional needs of calves include providing supplementary feeds such as Ca-PUFA as a source of energy and essential fatty acids, protein protected by tannin as a source of essential amino acids in the post-rumen tract and organic minerals Zn, Cu, Cr, and Se is required for enzyme function, immunity and maintaining hormone levels. Nutrient protection in feed is feed manipulation that is applied to maintain a continuous supply of high-quality feed nutrients. The feed consumed by livestock in a certain period of time is one of the important factors that will determine the function and response of livestock to the use of nutrients in feed.

Based on that, it is necessary to conduct study on the effect of adding Ca-PUFA, protein protected by tannin, and organic minerals Zn, Cu, Cr, and Se on thyroxine hormone levels in dairy cows.

2. MATERIALS AND METHOD

This study was conducted in a dairy farm at BPPTIB TSP Bunikasih, Cianjur Regency (<1000 masl) from January to March 2021. Laboratory analysiswas carried out at the Ruminant Livestock and Animal Feed Chemistry Laboratory, Faculty of Animal Science, University of Padjadjaran. The analysis of hormone levels was carried out at the Central Lab of Padjadjaran University. This study used 16 female dairy cows with a weight range of 150-200 kg. . Statistical analysis of the observations was use the Paired Sample T-Test.

Treatment groups consists of R0: 60% forages + 40% K0 (100% concentrates); and R1: 60% forages + 40% K1 (93% concentrates + 2% Ca-PUFA + 3% protein protected by tannin + 2% organic minerals Zn, Cu, Cr, and Se). The nutrient content of the supplementary feed is listed in the following table;

Table 1. Nutrient Content of Ca-PUFA, Protein Protected by Tannin, and Organic Minerals Zn, Cu, Cr, Se (%)

Nutrient	Ca-PUFA	Protein Protected by Tannin	Organic Minerals
Water	2,44	17,09	4,90
Ash	6,85	32,29	4,83
Crude protein	1,60	28,56	20,74
Crude fiber	6,42	0,77	2,88
Crude fat	45,44	12,58	9,61
BETN	39,69	25,80	61,93
TDN	98,00	80,64	96,90

The thyroxine content was measured twice, at the beginning and at the end of the study. Tests for the presence and concentration of thyroxine hormone sample were determined by the ELISA method and each sample was replicated three times. With the work order as follows:

a. The well coated with antigen, filled with 25 l standard solution.
b. The sample to be saturated was added and added 100 l of Conjugate Reagent to each well, and allowed to mix for 30 seconds.
c. Incubated at room temperature 18 ºC – 25 ºC for 60 minutes.
d. The microplate was washed in a waste container, and dried with a paper towel.
e. 100 l of TBM reagent was added to each well and allowed to mix for 5 seconds.
f. Incubate at room temperature and in a dark room for 20 minutes. To stop the reaction, 100 l of Stop Solution was added to each well.
g. Visual observations were made if there was a color change, there was an indication that the sample tested was positive.
h. The results were read using an ELISA reader with a wavelength of 450 mm.

The thyroxine hormone concentration of the sample was determined using the T-4 antibody kit. The standard range used to create the standard curve is from 1 to 25 g/dl. For the accuracy of the T4 hormone concentration, each sample was analyzed in duplicate.

3. RESULT AND DISCUSSION

The results of the analysis of variance showed that the addition of supplementary feed showed a significant difference ($P<0.05$) it can increase thyroxine hormone levels in dairy cows. The average hormone levels of dairy cows can be seen in Table 2.

Table 2. Thyroxine hormone levels

	Beginning	End
R0	$56,16^{a}$	$56,25^{a}$
R1	$59,52^{b}$	$61,33^{c}$

Note: The values of different superscripts show significant differences ($P<0.05$)

Based on Table 2, it can be seen that the R1 had better levels of thyroxine hormone during the end of the study compared R0. Thyroxine hormone [6] is a hormone that plays an important role in growth. Its main function is to regulate the body's metabolism. Therefore, the levels and function of the thyroxine hormone need to be maintained so that the body's metabolism can run properly..

The decrease in thyroxine hormone levels [10] can occur as a result of physiological changes due to heat

stress. When dairy calves are under heat stress [4], their body will reduce the metabolic rate by suppressing secretion hormone thyroxine and secrete heat shock proteins that play an important role in responding to heat stress and other types of cellular stress.

Heat stress [10] causes the concentration of T4 (thyroxine) and T3 (triiodothyronine) in blood plasma to decrease by up to 25% and it takes several days for T3 and T4 to reach new normal levels. Thyroid activity in summer is lower than in winter [3]. Changes in this activity are associated with a decrease in metabolic rate, feed consumption [10], and growth and milk production in heat-stressed cattle [1].

Changes in hormone levels are often difficult to distinguish what is the cause [11], whether it occurs due to the influence of decreased dry matter consumption or due to the direct influence of high temperatures or uncomfortable environmental conditions.

Weight loss [2] also affects the decrease in blood thyroxine levels, which consequently will interfere with cell metabolism, disturbances in thyroxine hormone production result in metabolic disorders, not digesting nutrients properly will reduce the body's intake of building materials The hormone thyroxine [5] can stimulate the rate of oxidation of feedstuffs, increase the rate of oxygen consumption, increase growth, and accelerate the process of metamorphosis.

Based on the study results, it can be concluded that there is an interaction between the treatment and the rearing area on thyroxine hormone levels in dairy cows, R1 treatment on both plains can prevent suppression of thyroxine hormone production caused by heat stress. Increased levels of the hormone thyroxine can cause the ability of livestock to dissipate body heat. The presence of Zn minerals functions in the secretion of enzymes [8] including growth, digestion and respiration, also Zn [12] is involved in the secretion and function of hormones such as thyroid, insulin and growth.

4. CONCLUSION

The conclusion of this study is that supplementary feeding on female calves of dairy cows has an effect for increasing thyroxine hormone levels, in avoiding the effects of heat stress.

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