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Calf Performance Offspring of Cow Fed with Depolarizing Katuk Leaves

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ABSTRACT

The birth and growth of dairy calves are important factors in the dairy cattle business. The growth of calves and mothers needs to be monitored in production management so that they can produce good seeds or milk according to the expected quality. This study aims to determine the effect of feeding depolarized katuk leaves on the performance of calves from cow consuming depolarized katuk. 21 gestation cows were three groups of seven cows each, the control group (feed complete),CF-DKPo (complete feed added with Depolarized Katuk Powder), CF-DKPe (complete feed added with Depolarized Katuk Pellets). As a feed addition, 100 grams of depolarized katuk feed were provided daily to each head which is given in the morning by mixing it with the morning feed. The treatment was served during at 10 days before calving day and up to 7 days birth. The research data consisted of gestational days data, daily gain data and calf body weight data from 0 – 90 days old. Data analysis on gestational age, body weight, and average daily gain of calf were by using one-way analysis of variance (ANOVA), and if there is a difference, continue with further testing (Dunnett's test) using SPSS. The results showed that there were differences in birth weight and body weight in calves from mothers that were given depolarized katuk leaves. Calves from broodstock that consumed depolarized katuk leaves in pellet form had higher weights compared to the control and BKD treatments. Significant differences occurred in birth weight and calf ADG for each treatment. Katuk leaves that have been depolarized can be added to feed to help calves grow bigger.

Keywords: depolarized katuk leaves, calves, birth weight, daily gain

ABSTRAK

Kelahiran dan pertumbuhan anak sapi perah termasuk faktor penting dalam usaha ternak sapi perah. Pertumbuhan pedet dan induk perlu untuk dipantau dalam manajemen produksinya sehingga dapat menghasilkan bibit ataupun susu yang bagus sesuai kualitas yang diharapkan. Tujuan dari penelitian ini untuk mengetahui bagaimana pakan tambahan daun katuk depolarisasi mempengaruhi kinerja pedet induk yang mengkonsumsi katuk depolarisasi. 21 induk sapi perah yang bunting dibagi menjadi 3 kelompok, dengan masing-masing 7 sapi perah. Kelompok kontrol memberikan pakan komplit, BKD (pakan komplit yang ditambahkan bubuk katuk depolarisasi), dan PKD (pakan komplit yang ditambahkan pellet katuk depolarisasi). Pakan ini dicampur dengan pakan pagi. Pemberiannya dilakukan sepuluh hari sebelum kelahiran dan tujuh hari setelah kelahiran. Data penelitian ini terdiri atas data lama kebuntingan, data PBBH dan data bobot badan pedet sapi perah dari umur 0 – 90 hari. Analisis data lama kebuntingan, berat badan, dan rata-rata pertambahan bobot badan harian pedet dilakukan dengan menggunakan one way analysis of variance (ANOVA), dan jika terdapat perbedaan dilanjutkan dengan pengujian lebih lanjut (uji Dunnett) dengan menggunakan SPSS. Hasil penelitian menunjukkan bahwa ada variasi pada bobot lahir dan pbbh pada pedet dari induk yang ditambahkan dengan daun katuk depolarisasi. Pedet dari induk yang mengkonsumsi daun katuk depolarisasi bentuk pellet memiliki bobot lebih tinggi dibandingkan dengan perlakuan kontrol dan BKD. Perbedaan nyata terjadi pada bobot lahir dan PBBH pedet setiap perlakuan. Daun katuk depolarisasi dapat meningkatkan bobot lahir dan pbbh pada pedet dengan menggunakan pakan tambahan.

Kata kunci: katuk depolarisasi, pedet, bobot lahir, pbbh

INTRODUCTION

The Holstein Friesian dairy cattle are the majority dairy cattle breed in the country when compared to other dairy cattle breeds. Dairy cows belong to the type of livestock in which the surrounding environmental conditions such as air, temperature, radiation, air humidity, and others will affect their physiological state. Dairy cows produce milk that contains nutrients or complete food substances needed for the human body. The general public likes cow's milk because it has a high nutritional content and requires dairy cows to be obtained with good maintenance and management.

The birth and growth of dairy calves or commonly referred to as calves in this case are included in the important factors that are considered when producing seeds or milk, bearing in mind that the evaluation of calf growth needs to be monitored in production management so that it can produce good seeds or milk according to the quality expected. Dairy cows that are no longer producing will be replaced immediately by female calves. In addition, it should also be noted that it is only natural that calves as newborn calves are still weak in their body's antibodies which will easily catch disease, so this is the reason calves need special attention when compared to adult dairy cows. Calves in the first 2 months after birth are vulnerable to death because during this period calf mortality can reach 20% (Tanuwiria *et al*. 2020).

Livestock productivity has become a benchmark for the success rate of companies in the livestock sector, considering that livestock reproduction success is highly dependent on the process (Rasad 2009). This condition can occur because in the process feeding management is carried out properly to meet the needs of cows which will then have an impact on increasing body weight. Feed is food as the nutritional intake needed by the cow's body without any harmful effects. In general, calves are only given pure milk, but in livestock companies, they are also given calf starter or what is called replacement milk, considering that the price is more affordable and can accelerate the growth of the cattle themselves.

The katuk plant (*Sauropus androgynous*) has been known as a vegetable and medicinal plant that has a role as a galactagogue, which was a stimulant of breast milk production in nursing mothers. This plant can also improve reproductive performance. The increase in breast milk production so far has not caused the balance of the body weight of the lactating mother to be disrupted (Suprayogi 2013).

Depolarizing katuk is katuk leaves which polar substances are extracted and removed, leaving only non-polar substances. Depolarizing katuk leaves was one of several animal feed technology innovations produced by the Bogor Agricultural Institute (IPB) under the name Katuk IPB-3. Katuk IPB-3, namely as an animal feed additive that can give a positive response in increasing milk production (Suprayogi 2013). This katuk IPB-3 can stimulate milk production and increase the quality of milk in ruminants, including stimulating the growth of calves during lactation. This katuk IPB-3 can be given to the ration to increase the production of colostrum in the cow's body and colostrum milk of good quality which also contains good nutrients so that the growth of the calf can increase properly.

Colostrum is generally given for 7 days and after that, the calf is given colostrum milk. The maintenance of the calves at PT.GGL's Dairy Farm is only given colostrum from the mother on the first day when the calf is born. On the second day until the age of 90 days, the calves are given Kalvolac-type replacement milk with a volume of 6 liters/ day. A milk replacer is powdered milk that is given to the calf as a substitute for whole milk during the pre-weaning period. The replacement milk formula is 1: 8, namely 1 kg of replacement milk mixed with 8 liters of warm water.

The main feed for calves is milk which is generally given until they are three to four months old from the time of their birth. Substitute feed is given to the calf, but the development of the calf's digestive organs must be considered first. Feeding the calves can be done in many ways, depending on the breeder's management in managing the farm, the body condition of the calf itself, or the feed the calf will consume according to each breeder. The katuk plant has long been known as a vegetable and medicine, especially having a role in stimulating the production of breast milk for nursing mothers (*lactagogum*) (Sa'roni *et al*. 2004). This plant can improve reproductive performance. Katuk plants contain fat, protein, lactose, and dry content (total solids) which is very good for nursing mothers. As for the process, the increase in milk production so far has not caused the balance of the body weight of the lactating mother to be disrupted (Suprayogi 2013).

Depolarizing katuk leaves is given to the ration in order to increase the production of colostrum and colostrum milk with good nutritional quality for the growth of calves. In dairy cattle production, superior and good breeds can be obtained from the close relationship between growth and development or between body weight and body size. The size of the chest circumference in animals during their growth period can increase by 1-3% of their body weight (Yasir 2021). It should be noted that the birth weight of the calf is one of the factors that affect the appearance of the calf and can be the first information obtained by breeders on its potential for future development (Purwanto 2013).

The study aimed to determine the body weight gain of dairy cows from mothers that were given additional feed with a depolarized catapult from birth from the first to 90 days of age reared by Dairy Farm PT. Great Giant Livestock was precisely located in Central Lampung. The results of this study are expected to provide information and learning for the development of cattle farming as well as increase the productivity of dairy cows both at research sites and other locations with similar rearing conditions, especially in evaluating the growth of calves born to 90 days old.

MATERIAL AND METHODS

Material

The materials used in this study were notebooks, stationery, thermo-hygrometer, laptops, and mobile phones.

The material used is complete feed company, depolarizing katuk in the form of powder and pellets, data on colostrum production and mother colostrum milk, birth data, and body weight of dairy cows from 0 – 90 days old at Dairy Farm PT. Great Giant Livestock, Central Lampung.

Methods

Work Steps

A total of 21 cows were selected and divided into 3 treatments. The cow used is at least the 2nd lactation period. The treatments were grouped into Control (P0), BKD (Depolarized Katuk Powder, P1), and PKD (Depolarized Katuk Pellet, P2). The control group was cows that were given a complete ration from PT GGL, the P1 treatment was a cow that was given a complete ration plus depolarizing katuk in the form of powder, the P2 treatment was cows that were given a complete ration plus depolarized katuk in the form of pellets. Depolarizing katuk leaves is given in the morning as much as 100 g/head/day. Treatment begins 10 days before delivery up to 7 days birth. After parturition, the calf is given colostrum, then on the second day it is given replacement milk. Data collection in this study was taken as a whole, namely taking gestational age data, body weight data, and calf ADG data.

Statistical Methods

Data analysis on gestational age, body weight, and ADG of calf were by using one-way analysis of variance (ANOVA), and if there is a difference, continue with further testing (Dunnett's test) using SPSS.

RESULTS AND DISCUSSION

General Condition of Research Area

Dairy Farm PT. Great Giant Livestock is a business company engaged in the dairy production industry as well as Friesian Holstein dairy cattle breeding with good health management in Indonesia. Dairy Farm PT. GGL is a dairy farm that is a subsidiary of PT Gunung Sewu Group with an area of ± 200 hectares which was built in 2016 in the middle of a pineapple plantation located in Central Lampung. This company is located in an agricultural area with an altitude of 25-50 meters above sea level and an average air temperature of 23-33 ^{o}C with humidity of 89% throughout the year and an average rainfall of 2800 mm/year.

The temperature in the PT. GGL is quite hot so this area is suitable for beef cattle. Nurdin (2011) states that the ideal air temperature for dairy cattle is in the range of 15 - 22 ^{o}C. In addition, McDowell (1972) stated that livestock kept in areas with comfortable environmental conditions are the most suitable areas for livestock life itself. Dairy Farm PT. GGL overcomes this problem by building semi-close house pens which are equipped with a fan that is turned on for 24 hours and a water shower so that the temperature in the area in the pen is stable which keeps the livestock comfortable and not experiencing stress.

Length of Pregnancy Against Birth Weight of Calves

The birth weight of the calf is an important factor for the continuity of the calf's growth period in the future. Calves that have high birth weights and are born to normal broodstock have a better chance of sustaining life in the future. Large birth weight is generally associated with the body's ability to survive better during the growth period. Dairy Farm PT. GGL carries outweighing of the calf's birth weight, which is on the first day the calf is born. The cows used in the study were cows with the second lactation period with an average gestation period of 269.63 – 271.71 days. These results are consistent with research by Atashi and Assadi (2019) which reported that cows with more than 1 lactation period have a gestation period of 268.20 – 285.10 days.

Based on Table 1 there were differences in birth weight and duration of pregnancy for each treatment. In treatment P2, the highest birth weight was 41.34 ± 2.30 kg, compared to treatment P1 of 37.57 ± 1.23 kg, and P0 of 36.20 ± 2.02 kg. The average birth weight of the calves in the P2 treatment was significantly different ($p < 0.05$) compared to the average birth weight of the P0 and P1 calves. Suprayogi (2015) states that the presence of growth hormone is predicted to stimulate cell growth and increase body weight during growth. The compound *3-ethyl-3-hydroxy-5α-androstan-17-one* found in the depolarizing katuk leaves can stimulate the release of growth hormone which is an anabolic steroid (Fachruddin *et al*. 2017). Until now it has not been known why the P1 treatment did not show the same response as p2, it is possible that giving katuk in pellet form strengthens the effectiveness of the active compound in increasing reproductive performance and lactation.

Table 1. Average calf birth weight for gestational age

Treatment	Birth Weight (kg)	Length of Pregnancy (days)
P0	36.20 ± 2.02a	269.63 ± 4.93a
P1	37.57 ± 1.23a	267.57 ± 3.51a
P2	41.34 ± 2.30b	271.71 ± 4.39a

*Different superscript letters in the same column are significantly different $P<0.05$

P0 = control, P1 = powder depolarizing katuk leaves, P2 = pelled depolarizing katuk leaves

The average calf birth weight in the P2 treatment was greater than the average calf birth weight in the findings of a study done by Aprily *et al*. (2016) at BBPTU HPT Baturraden, which weighs 40.39 kg. Several factors such as the breed of the cattle themselves, a bull cow, genetics or offspring of the calf, the age of the broodstock, the feed given during the gestation period for the broodstock, and the length of the gestation period for the broodstock, which is in line with the opinion according to Hartati and Dikman (2007) that Several things that affect the birth weight of the calf are the nation of the breed of cows, the age of the cow during pregnancy, the sex type calf, the birth period of the calf, and ancestor cow calving number. Purohit *et al*. (2019) stated that differences in calf birth weight could also occur due to differences in the type of cattle, livestock management systems, and environmental conditions at the location of the farm itself.

Table 2. Pregnancy duration based on calf sex

Length of Gestation based on:	The sex of the calf		Average
	Male Calf	Female Calf	
Average (days)	270.11 ± 4.46	269.75 ± 3.49	269.90 ± 3.83
Average birth weight (kg)	39.76 ± 3.28	37.38 ± 2.19	38.40 ± 2.89
Number of calves (heads)	9	12	-
Minimum (days)	262	264	-
Maximum (days)	278	278	-

Gestation period is determined by maternal, environmental, and fetal factors (Jainudeen and Hafez 2000). Fetal influences include the sex of the fetus, the adrenal and pituitary glands, and the size of the fetus. The size of the fetus can also be interpreted as the birth weight of the fetus at birth. Sanker *et al.* (2014) stated that gestational age in various types of animals, heifers that are pregnant at a relatively young age will have a shorter gestation period than older cows, and mother size has a positive correlation with prenatal growth. The results in Table 1 show that the average duration of pregnancy in the P2 treatment was longer than in the P1 and P0 treatments. This indicates the weight of the calf increases with increasing gestational days and vice versa. The Table 2 shows the average length of gestation by sex, namely the gestation period for male calves tends to be longer when compared to female calves for broodstock. According to Berry and Cromie (2007), the sex of the newly-born calf is affected when fertilization occurs. Differences in the duration of gestation for broodstock can occur due to management when rearing, the feed given during pregnancy, the environmental climate in the livestock area, and the type of livestock (Purohit *et al*. 2019).

The results of the study in Table 2 show that when compared to female calves, male calves had considerably larger birth weights. According to Prasojo (2010), birth weight is an important factor that can determine the growth period of the calf itself in the future. Calves that have a relatively large birth weight and are born from broodstock in a normal process can be said to be stronger to maintain their life during the growth period to adulthood. Broodstock that gives birth at old age will give birth to calves with relatively higher birth weights when compared to young brooders (Tavares 2012). The year of birth and the body weight of the broodstock will have a direct effect on the calves' birth weight resulting from crossbreeding (Ali *et al*. 2015). Akdag *et al*. (2011) stated that management and feeding including the environment around the farm are also factors that have an impact on calf birth weight. The cows who receive additional nutrition at the end of their pregnancy can give birth to calves that have higher birth weights, considering that the high nutritional content provided will have an impact on fetal growth during gestation (Bohnert *et al*. 2013).

Growth of Daily Body Weight (ADG) of FH Calves

Based on the Table 3, It is apparent that the P2 treatment has a body weight that tends to be higher compared to other calf. This could happen because the P2 treatment had a greater birth weight compared to the P0 and P1 treatments. This happens because there were active compounds contained in depolarizing katuk consumed by cows during pregnancy. It was known that the compound Androstan-17-one,3-ethyl-3-hydroxy-5 alpha which is present in the depolarizing valve indirectly stimulates cells of the anterior and posterior pituitary glands to release the hormone prolactin (PRL), growth hormone (GH), and oxytocin. It was known that these three hormones are directly involved in the synthesis of milk in the udder glands (Suprayogi 2017). Steroid compounds contained in katuk leaves were also precursors in the biosynthesis of the hormones estrogen and progesterone which have a role in maintaining and maintaining pregnancy. According to Forde *et al*. (2011) increased levels of progesterone in the pregnant mother's body can provide optimization of the uterine environment to support and sustain the growth period as well as the development of the embryos they contain. Progesterone levels that increase during the early development of the embryo can also improve the survival rate of the embryo itself (Beltman *et al*. 2009). It can be concluded that calves born to mothers who were given

Table 3. Average body weight and gain of calves within 1 – 90 days

Component	P0	P1	P2
Birth Weight 1 days (kg)	36.29±2.17a	37.57±1.33a	41.34±2.30b
Body Weight 60 days (kg)	63.14±2.54	57.14±8.83	66.09±9.05
Body Weight 90 days (kg)	80.43±8.42	78.57±13.48	88.57±14.00
Difference in BW (kg)	44.14±19.26	41.00±19.31	47.23±21.81
ADG 1-60 days (kg)	0.45±0.06	0.33±0.14	0.41±0.12
ADG 60-90 days (kg)	0.58±0.25	0.71±0.45	0.75±0.23
ADG 1-90 days (kg)	0.49±0.09	0.46±0.15	0.52±0.14

ADG = Average Daily Gain, P0 = control, P1 = powder depolarizing katuk leaves, P2 = pelled depolarizing katuk leaves

katuk plants have been shown to experience a significant increase in body weight.

The katuk leaf plant, which has been known so far, besides having active substances that play a role in metabolic as well as hormonal activities, also has anabolic steroid substances which can stimulate protein synthesis in the body of livestock and stimulate the growth period, especially regarding body weight in the livestock itself (Suprayogi 2015). The compounds contained in the leaves have opposite properties, which depend on the polarity or solubility of the compounds in water (Suprayogi *et al*. 2015). So far, most of the compounds of the non-polar type have anabolic steroid properties, while the polar types have the property of inhibiting the activity of fat anabolism in the animal's body itself.

Table 3 data demonstrates that the average daily increase in body weight from the results of research conducted tends to increase. The increase in daily gain in the calf is likely to occur due to a synergism between the nutritional adequacy factors consumed by the broodstock and the depolarizing active compounds consumed by the calves through the mother's colostrum. In addition, Fachruddin *et al*. (2017) stated that katuk gave a positive response, especially in increasing body weight in rats. Suprayogi (2015) also reported that administration of the lipid extract fraction (hexane) and ethanol crude extract to katuk leaves can cause an increase in growth in rams, including an increase in the percentage of carcass and fat in them.

The growth, reproduction, and health of the cattle themselves are factors that are controlled by feeding management, therefore the addition of protein levels in the ration can trigger an increase in livestock body weight. In order to boost the protein content of feed, calf milk replacer, sometimes referred to as replacement milk, is supplemented with additional feed nutrients (Martinus *et al*. 2019). Calves that are reared and are the object of research at replacement milk from calves 2 days after birth until after weaning. Kalvolac is a substitute milk used for calf enlargement. The calves were given 6 liters of replacement milk per day until they are 90 days old. This milk substitute can be used immediately after the calf consumes colostrum. The protein content in this type of milk substitute is 22%. Feeding rations using a mixture of Creepfeed and Alfalfa ad libitum. Rations are given according to SOP at the company from calves aged 0 to 120 days.

Replacement milk is formulated from by-products of the dairy industry and animal feed ingredients (Karlsson *et al.* 2018). In this study, the average consumption of replacement milk for calves were 6 liters per day. This is one of the company's operational standards so that calves can grow quickly and optimally. Calves that experience optimal growth are expected to become livestock with optimal productivity according to the standards, namely the achievement of body weight according to their age. Body weight gain is influenced by the feed consumed by the animal itself. This is related to the nutrients contained in the feed and the level of digestibility of the feed itself. According to Cullison *et al*. (2003) that the function of feeding livestock is to supply energy in the body to produce heat and also to deposit fat, maintain cells in the body, manage functions in the body, processes, and activities of organs and enzymes in the body.

CONCLUSION

The addition of a depolarizing katuk has been shown to increase the development of calves from the gestation period. Calves from cows supplemented with depolarizing katuk leaves have relatively high birth weights and daily gain due to the presence of an active substance in depolarizing corticosteroids which affects calf growth when the cows are pregnant. Calves born to mothers who were given katuk plants have been shown to experience a significant increase in body weight. Katuk as a supplement feed for cows around a week before and after calving delivery given scientifically evidence increase the calf performance, mainly on the birth weight till 60 days of body weight. Depolarized katuk leaves in pellet form showed better performance than in powder form.

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