Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **44** Issue **02 Year 2023** Page **156:160***

Effect of Vitamin A on Estrous Intensity, Number of Follicles, Follicles Diameter and Pregnancy Rate in Beef Cows

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Article History

Received: 06 June 2023
Revised: 22 Sept 2023
Accepted:01 Oct 2023

Abstract

Moringa leaves are used as feed to increase the intensity of estrus. It is assumed that the positive effect on the Moringa leaves is due to the presence of vitamin A. This study aims to see the response of vitamin A as a supplement feed to the reproductive performance of beef cows including estrous intensity, number of follicles, follicle diameter, and pregnancy rate. The research was conducted in September-November 2022 in Lappariaja District, Bone Regency, South Sulawesi Province. 10 cows were used which were divided into 2 groups, each group consisting of 5 cows. Group 1 was the control group without vitamin A and group 2 was supplemented with vitamin A. The data on estrus intensity, number of follicles and pregnancy rate obtained were processed using the Chi-square analysis of 2x2 contingency tables. If the Chi-square test does not meet the requirements, the formula used is the Fisher exact test. While the data on the diameter of the follicles were analyzed by ANOVA test. The results of the research data showed that supplementation of vitamin A had a significant difference ($P<0.05$) on the intensity of estrous. Meanwhile, the results of the chi-square test on the number of follicles and pregnancy rates ($P>0.05$) showed that there was no significant difference. Likewise, the ANOVA test on follicle diameter between control cows and vitamin A treated cows did not have a significant difference. Although in this study it did not affect the number of follicles, follicle diameter and pregnancy rate. However, it has an economic effect of 20% on the pregnancy rate in the livestock industry scale.

Keywords: *Vitamin A, Beef cows, Estrous, Follicle, Pregnancy rate*

1. Introduction

Artificial insemination is known among breeders as an effective technology for the reproduction of beef cows. However, the success rate of artificial insemination is still relatively low. The factors that influence the success of artificial insemination are the reproductive conditions of livestock and the timing of artificial insemination. The low success of artificial insemination is related to the low intensity of estrus associated with follicles and the level of pregnancy. If the quality of the follicles is good, the level of estrus intensity and success of artificial insemination will be higher.

Postpartum estrous intensity is closely related to ovarian activity which is influenced by nutritional status and energy balance (Kertawirawan et al., 2021). Growth rates, poor health, and nutrition during rearing are often the causes of fertility disturbances (Eastham et al., 2018). Low pregnancy success rates can be detrimental to farmers so that this problem can be overcome through improved feed and improved reproductive management to support increased beef cows' population and productivity.

Based on research (Toleng et al., 2010) that Moringa leaves used as feed can increase the intensity of post-partum estrus of Bali cows. The content of vitamin A in Moringa leaves is known to be quite high and it is assumed that the positive effect on Moringa leaves is due to the presence of vitamin A. This is the background for conducting research to see the response of vitamin A supplementation to estrus intensity, number of follicles, follicle diameter, and pregnancy rate in beef cows.

2. Materials And Methods

A This research was conducted in September-November 2022 in Lappariaja, Bone Regency, South Sulawesi Province. The method used in this study is the field experiment, The sample in the form of non-pregnant beef cows came from smallholder farms in Lappariaja, Bone South Sulawesi Province. A sample of 10 individuals was divided into 2 groups. In the control group (P0) the sample was not given vitamin A supplements. Meanwhile in the treatment group (P1) the samples were given vitamin A supplements. All samples were given forage and concentrates.

Research Parameters

1. The intensity of estrous

The level of estrous intensity is determined by a score of (+), (++), and (+++). The estrus intensity score (+) is given to cows that are experiencing silent heat and which shows one of the signs of estrous, namely mucous discharge, the state of the vulva (swollen, wet and red) that is not clear, and restless, while the estrous intensity score (++) is given to cows that secrete a lot of mucus and almost show all the symptoms of estrous above clearly and with intensity with a score (+++) given to cows that show all the symptoms of estrous very clearly.

2. Number of follicles and diameter of follicles

The number of follicles and the diameter of the follicles were examined on the right and left ovaries by rectal palpation.

3. Pregnancy rate

Pregnancy status was observed through NRR observations for 18-25 days (1 cycle of estrous) with samples showing signs of estrous or not showing signs of estrous. Iswoyo and Widyaningrum (2008) put forward the formula for calculating NRR as follows:

$$\text{NRR} = \frac{\Sigma \text{ cow in AI} - \Sigma \text{ pregnant cow}}{\Sigma \text{ cow in IB}} \times 100\%$$

Data Collection Techniq

1. Estrous synchronization

The estrus synchronization is carried out using the hormones prostaglandin and estradiol. In the early stages of synchronization, rectal palpation was performed to examine the right and left ovaries for the presence of a corpus luteum. If the luteal phase is then injected using with hormone PGF2α. Meanwhile, if the follicular phase is injected using with hormone estradiol.

2. Observation of stage first estrous intensity

Observation of estrous intensity is carried out by interviewing farmers and/or direct observation of samples. Observation of estrus intensity at this stage was carried out 0-3 days after synchronization.

3. Provision of vitamin A supplements

Giving vitamin A supplements is done orally for 18-25 days (1 cycle of estrus) which is done 4 days after hormone injection. Giving vitamin A supplements is done by giving 1 capsule/head/day with a vitamin A content of 25,000 IU/capsule.

4. Observation of follicles

Observation of follicles is done by rectal palpation. Follicle observation was carried out on the 16th day after supplementation of vitamin A. In this observation, the number and diameter of the follicles were measured.

5. Observation of the second of estrous intensity

Observation of estrous intensity is carried out by interviewing farmers and/or direct observation of samples. Observation of the intensity of estrus at this stage was carried out 18-25 days (1 cycle of estrous) after supplementation of vitamin A.

6. Artificial insemination

Artificial insemination is carried out by local inseminator.

7. Examination of pregnancy status

Examination of pregnancy status is carried out by observing samples with NRR (Non return rate)

8. Data analysis

Data in this study included estrus intensity, number of follicles, and pregnancy rates were analyzed using a 2x2 contingency table Chi-Square analysis.If it does not meet the requirements in the Chi-square test, the formula used is Fisher's exact test. While the diameter of the follicle was analyzed using the ANOVA test.

3. Results and Discussion

Table 1. Estrous intensity, number of follicles, diameter follicle and pregnancy rate of beef cows in control and treatment group.

Group	Estrous Intensity	Number of Follicle	Diameter of Follicle	Pregnancy Rate (%)
Control	1±0	1.25±0.5	0.54±0.19	40
Vitamin A	2.6±0.5**	2.25±1.25	0.6±0.25	60

** Statistically significant to the same column (P<0.05)

Estrous intensity, number of follicles, diameter of follicle and pregnancy rate of beef cows with and without vitamin A supplementation are shown in the table 1.

Based on the results of this study showed that the level of intensity of estrus in cows with the control group only showed a score (+) both in estrus I and II observations. Meanwhile, cows that were given vitamin A experienced an increase in the score (++) of 2 cows and the score (+++) of 3 cows. From the calculation results, the Chi-square test results obtained with a value (P <0.05) which can be concluded that the supplementation of vitamin A has a significant effect on the intensity of estrus in cows. This is according to (Byrne et al., 2017) that cows that have high nutrition can positively affect the presence of reproductive hormones for endocrinological functions produced by the hypothalamus

It shows that the number of follicles in the vitamin A group is more than in the control group. From the Chi-square test, a value (P>0.05) was obtained which concluded that there was no significant difference between the control group and the vitamin A treatment group. However, the highest number of follicles developed in cows' group after vitamin A supplementation because at that time the estrus intensity score showed a score of (++) and (+++) while the estrous intensity in the control group only had a score of (+).

This is in accordance with the opinion (Izquierdo et al., 2021) that livestock that experience malnutrition results in delayed sexual maturity and low fertility. Retinoids which are vitamin A derivatives are involved in follicular growth, oocyte development, in vitro maturation, fertilization,

and early embryonic growth. In cow, the level of retinoid acid in ovarian follicular fluid can be considered as a marker of follicular health status (Abdelnour et al., 2019).

The results of this study indicated that the average size of the follicle diameter in both the control group and the vitamin A treatment group in the left ovary had the same follicle diameter size, while the right ovary in the vitamin A group had a larger follicle diameter compared to the control group. The results of the ANOVA test with a value (P>0.05) showed that the diameter of the follicle did not have a significant difference between the control group and the vitamin A treatment group. trend is good, if the size of the follicle is large, it will produce more and more estrogen hormone which will show good signs of estrus in cows.

Based on research (Gouvea et al., 2018) that the diameter of the follicles in cows fed a combination of β-carotene and vitamin ADE was larger than that of the control group. The concentration of vitamin A supplements was positively related to the quality of the follicles which was used as a factor for requirements. selection and growth. Meanwhile, according to (Abdelnour et al., 2019) that a high level of retinol substance is present in the fluid of large bovine ovarian follicles than in smaller ovarian follicles.

The percentage of NRR in the control group, namely 40% and the vitamin A treatment group, namely 60%. The results of the chi-square test with a value (P>0.05) showed that there was no significant difference between the control group and the vitamin A treatment group. Retinoid acid as a source of vitamin A plays an important role in reproduction, its presence in excessive or insufficient amounts can cause loss of embryos (Abdelnour et al., 2019). Meanwhile, according to (Ruiz et al., 2022) that vitamin and mineral supplementation from breeding to delivery has the potential to have beneficial effects on the development of placental vessels in cows.

4. Conclusion

Giving vitamin A supplements to cows has a significant effect on the intensity of estrus. However, it did not have a significant effect on the number of follicles, follicle diameter and pregnancy rate. Although this study had no effect on the number of follicles, follicle diameter and pregnancy rate because it had a small sample. However, it has an economic effect on the scale of the livestock industry.

Acknowledgements:
Authors extend thanks for Faculty of Animal Science, Hasanuddin University, farmers and inseminator in Lappariaja, Bone. Thank you for technical assistance to Hasrin, Sahrul, Nur Aeni Jawi, Athhar Manabi Diansyah, and Salam.

Authors Contribution

St. Zaqiya Darajat collected literature data, drafted method, analysis and drafted the manuscript. All authors designed the study plan, and drafted the manuscript, provided technical help in the write-up of this manuscript, reviewed and performed the final check. All the authors read and approved the final manuscript.

Conflict of Interests

The authors declared no conflict of interests.

Ethical Consideration

The authors have confirmed ethical issues such as plagiarism, misconduct, information fabrication and/or falsification, consent to publish, duplicate publishing and/or submission and redundancy.

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