Chapter 124

Influence of body condition score (CCS) on structures ovarian of zebu cows submitted to artificial insemination in fixed time (IATF) in western Paraná

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ABSTRACT

The reproductive performace of cattle is directly related to their feeding, in Brazil cattle are raised mostly extensively, where adequate management of pastures is not carried out, being common overcrowding of animals and seasons of drought, resulting in low fertility of the animals. Therefore, reproduction in the species is negatively affected, because CCS is one of the factors that directly influence their cyclicality, where it is of paramount importance to adequate food and management that contribute to maintaining better CCS of animals at the beginning of the reproductive season, improving the indexes mainly at the beginning of the season. The objective of this study was to evaluate the animals the ovarian structure present in (D0) of the IATF and thus relate the data obtained with their body condition score (CCS), verifying whether the CCS influenced the structures found. In addition, 17 animals presented with ECC ≤ 3, 41 animals with ECC > 3 and < 4 and 42 animals with ECC ≥, while animals with corpus luteum (LC), presented with body score >3, totaling 89% of the animals and the other structures showed no difference between the CCS. Thus, the body condition of animals is one of the factors that influence the ovarian structure of animals.

Keywords: ovary. cattle. follicles, reproduction.

1 INTRODUCTION

In Brazil, the vast majority of cattle herds are raised on an extensive basis and with few technologies of sanitary, reproductive and nutritional management, where these deficiencies can directly influence reproduction, so the implementation of technologies to increase the capacity of stocking per hectare (ha) in pastures is hampered, being due to the particularity of the land or even by some producers not accepting this idea, directly impacting the production and reproduction of animals (FILHO, 2016). According to Suzuki and Queiroz (2021) in Brazil, the stocking rate per hectare is 0.91 animal unit (AU) per hectare (ha), reflecting the rate of conception of the animals.

According to Sartori and Guardieiro, (2010) reproductive perfomance is related to CCS, being a determining factor in the growth and persistence of a dominant follicle, where factors such as breastfeeding, malnutrition and loss of body condition is directly related to the low pulsatility of LH.

The follicular diameter of cows is influenced by endocrine and exocrinol factors, such as hormonal factors characteristic of each animal, metabolic hormones, release of gonadotropins in the hypothalamus axis - pituitary - gonadal and body condition score (CCS), the latter being a challenge for cattle culture throughout the country, due to the scarcity of forage in winter, because it is a period with low water availability, and usually the cows are breastfeeding their young, where at the beginning of the fixed-time artificial insemination protocol (IATF) the animals still present in negative energy balance (BEN), directly influencing the ovulatory rate and consequently on the pregnancy rate (ONO, 2014).

Therefore, physiology understands that the animal needs to be gaining weight so that it can maintain a pregnancy, because it has other indispensable roles to preserve life, and reproduction is considered a "luxury event" in the life of a bovine matrix (GOTTSCHALL, 2012).

Thus, this study is justified, because we know that most beef cattle producers do not perform an adequate management of pastures, thus the animals end up going through a long period of food scarcity and the low reproductive rates end up being one of the sequelae of this management of diet and poor quality food, the low availability of food decreases the ovulatory rate of the animals.

The study aims to evaluate the animals that will be submitted to the IATF protocol, identifying the condition of the body score of the animals relating it to their ovarian structure, thus evaluating whether there is influence of CCS on follicular size and presence of corpus luteum (CL) in the animals.

2 THEORETICAL FOUNDATION

Fixed-time artificial insemination (IATF) aims to synchronize the ovulation of cows, causing follicular emergence and follicular growth of animals submitted to IATF to be controlled exogenously even in the pre-ovulatory process by the veterinarian (BARUSELLI *et al*, 2004).

Therefore, the IATF allows females to increase their pregnancy rate at the beginning of the mating season, and this happens faster than females submitted to other mating methods, such as natural riding (GOTTSCHALL *et al.* 2012).

The cows have as characteristic in their estral cycle two or three follicular waves, so that it can ovulate, thus begins the recruitment of primordial follicles through the hormone FSH, where the follicles undergo differentiation in their size, thus resulting in a dominant follicle, which in addition to suppressing the concentration of FSH below the need of the other follicles, produces estradiol and inibine that perform atresia of the smallest follicles (OLIVEIRA *et al*, 2010).

According to Sartori and Guardieiro (2010), FSH is the hormone responsible for follicular wave recruitment and LH is responsible for the maturation and ovulation of follicles, the same being secreted by the anterior pituitary gland under the GnRH stimulus, through a polypeptide transported by the pituitary portal system, produced in the hypothalamus. In addition, after the formation of the den, where it occurs through the pressure of teak and granulous liquids, and is subsequently filled by liquid, the follicle depends on fsh, LH and also estrogen (E2), so that its development and ovulation occur, as well as for the atresia process (ANTONIOLLI, 2002).

According to Carvalho (2017), nutrition is of great importance in reproduction, because it is known that reproduction has little influence of heritability, that is, reproduction has little influence of its antecedents, and adequate management and nutrition are necessary to achieve high rates of reproduction.

In this way, cows can be productive within the property, expressing the maximum of their potential, they must give birth with a good body condition score, which is only one of the factors that influence the

conception of animals, and thus return to cycling and to contract within 75 days postpartum, generating one child per year, reducing the interval between deliveries (GODOI *et al*, 2010).

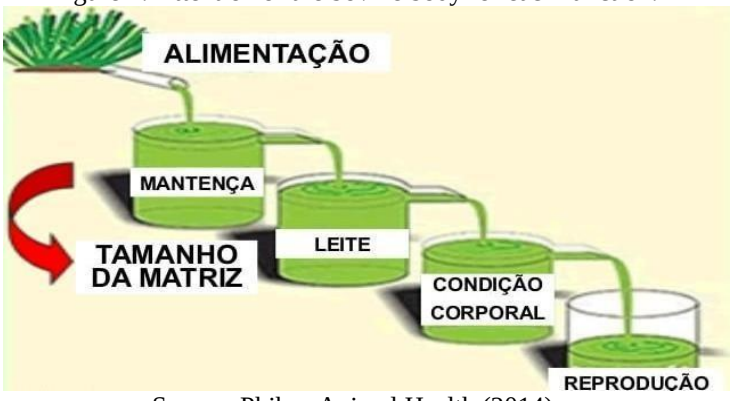
In situations with low forage availability, there is a decrease in plasma leptin concentrations and an increase in serum values of neuropeptide Y (NPY), which is responsible for inhibiting the secretion of GnRH by the hypothalamus (ONO, 2014).

According to Godoi *et al.*, (2010) regardless of the season, animals must have sufficient energy reserves to maintain the homeostat of the hypothalamus-pituitary-gonadal axis, so that the release of hormones that will be responsible for ovulation does not suffer depression, reestablishing the postpartum conception. However, in rainy times the animals have higher availability of forage and also with higher nutritional value, supplying the needs of the animals, however, in times of drought the nutritive value of the plants decrease, as well as the availability of forage, hindering reproduction in these periods (CARVALHO, 2017).

The body condition score exerts a lot of influence on the pregnancy rate, because it is necessary that the hypothalamus identifies the weight gain of the animal so that it can reproduce, having a good pregnancy index (FERREIRA *et al.* 2013).

Body score is the amount of adipose tissue that the animal has in its body, being responsible for directly influencing the fertility of the animal, because the animals prioritize the survival of the species and later the reproduction of the same (ABREU *et al*, 2018).

Figure 1: Attention of the bovine body for each function.



Source: Phibro Animal Health (2014).

As described by Abreu, Silva and Gottschall (2018), the body condition of the animals is directly related to their reproductive performance, because the animals prioritize the survival of the species and later the proliferation of the same. In addition to body condition, factors such as the feeding effect of the calf and insulin-like growth factors (IGF-I and IGF-II), the latter being carrying and receptor proteins that are located by the body, controlling the anabolic and catabolic processes responsible for changes in nutritional levels, play an important role in animal reproduction (DELLA-FLORA and*t al.* 2010).

The folliculogenesis of cattle has on average 3 follicular waves, this process occurs because serum P4 levels are high, and at the beginning there is the recruitment of primordial follicles, later becoming dominant, and after that ovulation occurs (EMERICK *et al.* 2009).

Animals with low body condition score (CCS), in turn, enter follicular divergence, however, do not have lh pulsatility to perform follicular maturation, this due to the estrogen that is produced by the follicle after its divergence, which performs a negative feedback, for the release of GnRH and consequently lh, thus avoiding follicular maturation and ovulation, causing follicular atresia (IMAKAWA *apud* CARVALHO, 2017).

The body condition score of beef cattle is evaluated from 1 to 5, where the animals classified as 1 are caquechical or emaciated animals, presenting the transverse and spinous processes prominently, while animals with body score 2 are animals considered thin, with very protruding bones. Animals with ECC 3, are animals considered average, with little coverage of muscle mass, not having much layer of fat, while animals with ECC 4 are animals that have a good coverage of muscle mass, having a certain fat deposition in the insertion of the tail, finally the animals with ECC 5 are obese animals, having all angles of the body covered in fat (MACHADO *et al.* 2008).

3 MATERIALS AND METHODS

In the present study, a field research was carried out, in which we used the inductive method, to collect the data at Fazenda Nossa Senhora da Auxiliadora, in the Rio da Paz Km 24 community, in the municipality of Cascavel-PR.

To perform the work, 100 female sands aged between 2 years and 10 years were evaluated, and were evaluated by means of a DP-3300vet ultrasound device to verify the ovarian structures of the animals, and the data obtained were described in a spreadsheet.

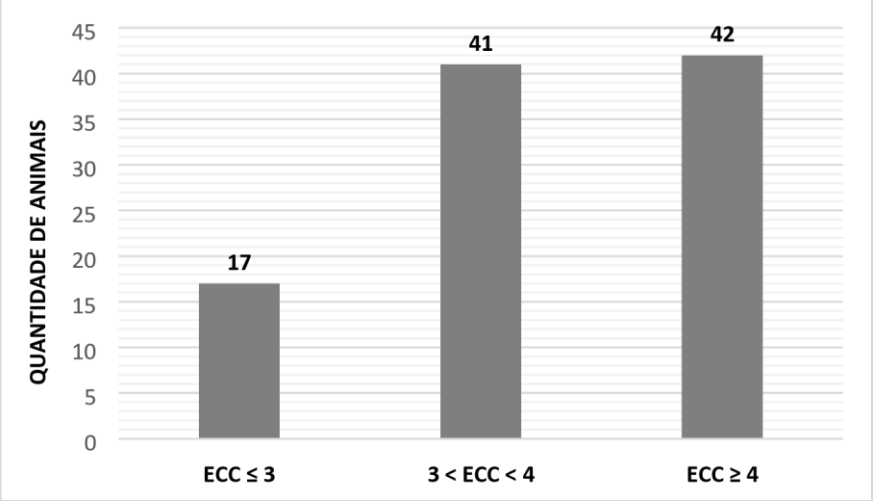
Data collection occurred on October 1st, and the animals were evaluated in a specific containment trunk for cattle and thus, through transrectal ultrasound, the ovarian structures and visualally evaluated the CCS of all animals, to later analyze them comparing the relationship of CCS with the ovarian structure of the animals.

The CCS was classified according to the author Machado (2008) which classifies from 1 to 5, being 1 the caquectic animal and 5 the obese animal, where the animals were classified by the (CCS), being divided into 3 groups: animals with CCS up to 3; animals with CCS between 3 and 4 and animals with CCS above 4, after that the largest structure present in the ovary was evaluated, being classified into primary follicles (F1) < than 3 mm; secondary follicles (F2) between 3 mm and 5 mm; tertiary follicles (F3) between 6 mm and 10 mm and dominant follicle (FD) > than 10 mm, in addition it was also evaluated whether there was the presence of corpus luteum (LC).

4 ANALYSIS AND DISCUSSION OF RESULTS

As described in (graph 1), the animals that had ECC < 3 totaled 17%, the animals with CCS between 3 and 4 totaled 41% and the animals with ECC ≥ 4 (42%).

Graph 1: Number of animals according to the ECC.



(Source: Author, 2021)

The animals were also classified by ultrasound to identify ovarian structures, be they follicles or corpus luteum, where animals with secondary follicular structures (F2), tertiary ovarian structures (F3) and dominant follicles (DF), did not present significant difference between CCS, however, animals with cSC > 4 and presence of CL represented 55% of the total animals (Table 1).

Table 1: Follicular structure according to CCS.

ESTRUTURA FOLICULAR	ECC ≤ 3	3 < ECC < 4	ECC ≥ 4
Primária (F1): até 3 mm	0 (0%)	2 (5%)	0 (0%)
Secundária(F2): 3 a 5 mm	4 (24%)	9 (22%)	5 (12%)
Terciária (F3): 6 a 10 mm	5 (29%)	5 (12%)	7 (17%)
Dominante (FD): acima de 10 mm	3 (18%)	7 (17%)	7 (17%)
Presença de Corpo Lúteo (CL)	5 (29%)	18 (44%)	23 (55%)
TOTAL	**17**	**41**	**42**

(Fonte: Autor, 2021).

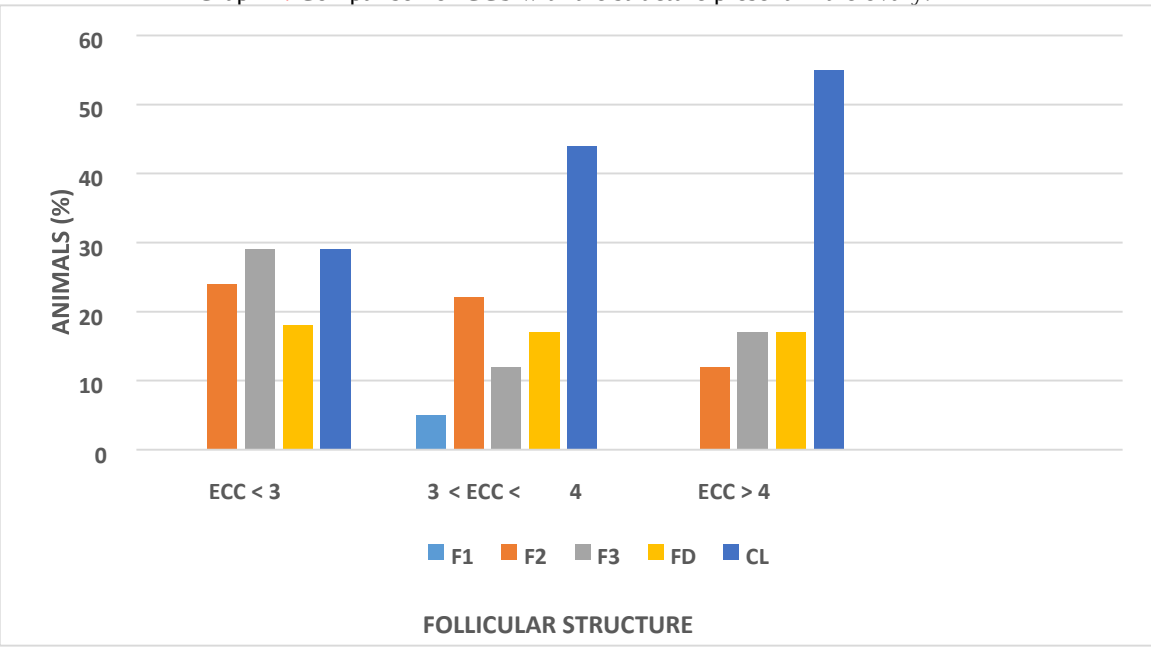
17 cows presented ECC ≤ 3, and 24% had secondary follicular structure (F2), 29% had tertiary follicular structure (F3), 18% dominant follicular structure (FD) and 29% presence of corpus luteum (LC).

In the evaluation of animals with body condition 3 to 4 (3 < ECC < 4), of the 41 cows, 5% presented primary follicular structure (F1), 22% had secondary follicular structure (F2), 12% had tertiary follicular structure (F3), 17% dominant follicular structure (FD) and 44% presence of corpus luteum (CL).

Regarding ecc ≥ 4, of the 42 cows analyzed, 12% presented secondary follicular structure (F2), 17% tertiary follicular structure (F3), 17% dominant follicular structure (FD) and 55% presence of corpus luteum (LC).

Graph 2 shows that animals with better body condition have already ovulated at the beginning of The IATF, seen through the corpus luteum (LC).

Graph 2: Comparison of CCS with the structure present in the ovary.



(Source: Author, 2021)

It was observed that cows with CCS ≤ 3 had secondary follicular (F2) and tertiary (F3) structures in greater proportion. The presence of dominant follicles (DF) did not differ in the three groups evaluated. The study showed that cows with CCS ≥ 4 have a higher corpus luteum (CL) index.

According to Ono, (2014), which evaluated cows with low body score, they presented a smaller follicular diameter in the IATF protocol, in addition, animals with these characteristics also presented lower rates of heat, ovulation and pregnancy at the end of the IATF, thus corroborating the results obtained in the study presented, which reports that animals with higher RATES of CCS, presented with CL.

In a study conducted by Santos (2016), animals with ECC 4 obtained a higher frequency of the presence of corpus luteum (CL), in addition, they had larger dominant follicles.

Gonçalves *et al.* (2014) reports that follicular diameter is related to estradiol concentration, and with the increase of this rate there is an increase in ovulation.

As reported by MAFFI *et al.* (2015) the loss of CCS is influenced by insulin, leptin and IGF-1, because the alteration of these hormones can directly influence the follicular growth and quality of the corpus luteum (LC).

The return to ovarian activity in the postpartum period occurs through the reestablishment of the LH stock, because due to the long gestation period and consequently the negative and prolonged effect of

steroid hormones such as progesterone (P4) which exerts negative feedback on the gonodotrophinre-releasing hormone (GnRH) and on the luteinizing hormone (LH), causing a depletion of the LH stock, causing it to take longer to reestablish this stock, and thus the animal returns to ovulate, however, the Postpartum FSH does not occur exhaustion of the same as it occurs with the LH (EMERICK *et al.* 2009).

5 FINAL CONSIDERATIONS

Through the use of transrectal ultrasonography, it was possible to verify that animals that presented themselves with better CCS at the beginning of the IATF protocol were already cyclic, verified through the presence of a corpus luteum, thus the body condition score exerts influence on the ovarian structure present at the beginning of the IATF of zebu cows, where according to the increase in body score, a better structure found in the animal's ovary is also observed.

It was concluded that the ECC of the animals influences the follicular structure of the cows, and 41 of the 46 animals with CL, obtained CCS above 3.0 representing 89.1% of the animals with CL. Therefore, factors such as: correct feeding, pasture management, winter diet schedule and periods of food shortage, can contribute to the maintenance of adequate CCS, in order to obtain better reproductive indices within the property.

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