

# Relationship of Body Condition Score on the Ovary, Quality, and In-vitro Developmental Potential of Oocyte in Water Buffaloes

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*Abstract— The study investigated the impact of body condition score (BCS) on ovarian structures, oocyte quality, and in vitro developmental potential in water buffaloes. Two studies were conducted: Study 1 focused on ovarian size and structures, while Study 2 examined oocyte quality and development of BCS. Ovaries were collected from 50 slaughtered female buffaloes with varying BCS in two locations. Ovarian parameters such as length, width, circumference, weight, and follicle count were measured. Positive correlations were found between BCS and these parameters for both left and right ovaries. However, significant differences were observed in some parameters, such as the width and length of the ovaries, with varying p-values. Moderate correlations were found between BCS and oocyte maturation rate and subsequent development. The study concluded that BCS correlates with physical and physiological aspects of buffalo reproductive structures.*

*Keywords: in-vitro embryo, production, corpus luteum, corpus albicans, maturation, cleavage, morula, blastocyst.*

## I. INTRODUCTION

Reproductive efficiency is crucial for productivity in female buffaloes but is often hindered by factors such as delayed puberty, seasonal calving, prolonged postpartum anestrus, and extended calving intervals. Strategies like proper management, nutrition, and assisted reproductive technologies can mitigate these challenges. Nutrition significantly impacts fertilization and early embryonic development in buffaloes. Artificial insemination is a valuable tool for genetic improvement, but successful breeding requires attention to the animal's body condition or nutritional reserves, which can be monitored through body condition scoring (BCS). Based on assessing body fat reserves, BCS is a tool used to gauge the nutritional status of a herd and optimize production efficiency. While BCS has been correlated with reproductive function in various animals, its influence on ovarian activity and oocyte quality, particularly in water buffaloes, remains understudied. In vitro embryo production is utilized to assess oocyte quality to address reproductive inefficiency in buffaloes. This involves recovering primary oocytes, maturing them in vitro, fertilizing them, and culturing resulting embryos. Therefore, this study aims to investigate the relationship between body condition score and ovarian function, oocyte quality, and in vitro developmental potential in water buffaloes.

## II. OBJECTIVES OF THE STUDY

The study's general objective was to determine the relationship of body condition score to ovarian size, structures, oocyte quality, and subsequent embryonic development of in vitro fertilized oocytes of water buffaloes.

Specifically, the study aimed to:

1. Determine the ovarian size and structures present in the ovaries of slaughtered buffaloes regarding different body condition scores.
2. Evaluate the quality and in vitro development of oocytes collected from the ovaries of water buffaloes at different body condition scores.

## III. RESULTS AND DISCUSSION

The study aimed to investigate the relationship between body condition score (BCS) and ovarian structures, oocyte quality, and developmental potential in water buffaloes. Ovaries from fifty female buffaloes with varying BCS (ranging from 1 to 5) were collected and evaluated for parameters such as length, width, weight, circumference, number of visible follicles, and the presence or absence of corpus luteum/corpus albicans. Statistical analysis revealed positive correlations between BCS and ovarian parameters, with significant associations observed in certain measurements, such as the length and width of the ovaries. However, significant correlations were not always detected due to the small sample size. Nevertheless, the study suggests that BCS may influence ovarian structures, aligning with previous findings that nutritional status can impact ovary size and weight.

Further analysis of the collected data indicated variations in ovarian measurements among different BCS groups. For instance, the ovaries' mean length, width, circumference, and weight differed across BCS categories. Studies on other animals, such as goats, have also shown similar variations in ovarian parameters based on BCS. Additionally, the number of visible follicles was influenced by BCS, with higher BCS

generally associated with a greater follicular count. However, the presence or absence of corpus luteum/corpus albicans did not show significant differences across BCS groups, suggesting that BCS may not directly affect the cyclicity of the animals.

A functional corpus luteum indicated normal ovarian function and cyclicity, while the corpus albicans suggested a previous estrus cycle. However, these factors did not show significant correlations with BCS. Nutrition was highlighted as a crucial factor influencing *in vitro* embryo production, with BCS as a useful tool for selecting oocyte donors. Studies on different dietary energy levels in cows indicated that while increasing dietary energy did not affect oocyte numbers and quality, it did impact *in vitro* embryo production. *Bos indicus* cows were found to have greater oocyte quality and *in vitro* embryo yield compared to *Bos taurus* cows, emphasizing the importance of nutritional management in reproductive outcomes.

In summary, the study contributes to understanding the relationship between BCS and reproductive parameters in water buffaloes. While positive correlations were observed between BCS and ovarian structures, the influence of BCS on oocyte quality and developmental potential requires further investigation. Nutritional status emerges as a key determinant of reproductive outcomes, underscoring the importance of proper dietary management in breeding programs for water buffaloes.

#### IV. SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study aimed to explore the relationship between body condition score (BCS) and various reproductive parameters in female buffaloes, including ovarian characteristics, oocyte quality, and *in vitro* developmental potential. Ovaries from 50 buffaloes with different BCS (ranging from 1 to 5) were collected post-slaughter and evaluated for length, width, circumference, weight, number of visible follicles, and the presence of corpus luteum/corpus albicans. Study 1 revealed significant differences in the weight and number of visible follicles of right ovaries among different BCS groups, indicating a potential influence of BCS on these parameters. However, no significant differences were found in the presence of corpus luteum/corpus albicans across BCS groups, suggesting that cyclicity may not be directly affected by BCS.

In Study 2, the relationship between BCS and oocyte maturation rate and subsequent developmental stages (cleavage, morula, blastocyst) was investigated. While no significant relationship was found between BCS and oocyte maturation rate, a moderately strong positive correlation was observed. Similarly, there was no significant relationship between BCS and the percentage of oocytes reaching various developmental stages, although a positive correlation was noted. These findings suggest the possibility of a relationship between BCS and oocyte quality and subsequent

development, particularly with a larger sample size.

In conclusion, the study highlights a positive relationship between BCS and various ovarian parameters in female buffaloes, indicating potential implications for reproductive efficiency. Despite no significant relationship found between BCS and oocyte maturation rate or developmental stages, the study suggests a correlation that warrants further investigation with larger sample sizes. These findings provide valuable insights for breeders and raisers, suggesting the importance of BCS assessment in reproductive management decisions, such as selecting animals for artificial insemination and determining the suitability of ovaries for collection based on BCS. Further research focusing on follicular stages and ovarian cycles is recommended to deepen understanding in this area.

#### REFERENCES

- [1] ABDOON, A. AND O. KANDIL. 2001. Factors affecting number of surface ovarian follicle and oocyte and quality in egyptian buffaloes. *Reproductive Nutrition Development, EDP Sciences* 41(1) pp.71-77.
- [2] ANITHA, A. SARJAN, R. SURESH, J. SRINAVASA, P. R. MOORTHY, AND R. Y. KOTILINGA. 2011. A body condition score (BCS) system in murrah buffaloes. *Buffalo bulletin* vol.30 no.1.
- [3] BOLAND, M. P. AND P. LONERGAN. 2005. Effects of nutrition on fertility in dairy cows. *Adv. Dairy Techn.* 15:19–33.
- [4] BUCKLEY F., K. O’SULLIVAN, J. F. MEE, R. D. EVANS, & DILLON, P. 2003. Relationships among milk yield, body condition, cow weight and reproduction in spring-calved Holstein-Friesians. *J. Dairy Sci.* 86, 2308–19
- [5] CHRENEK, P., E. KUBOVICOVA, L. OLEXIKOVA, A. MAKAREVICH, S. TOPORCEROVA AND A. OSTRO. 2014. Effect of body condition and season on yield and quality of *in vitro* produced embryo. *Cambridge Journal*, Vol. 23 Issue 06, Pp 893-899.
- [6] CHOUDHARY, K. K., K. M. KAVYA, A. JEROME, and R. K. SHARMA. 2016. Advances in reproductive biotechnologies. *Veterinary World* 9(40): 388-395.
- [7] DOMINGUEZ, M.M., 1995. Effects of body condition, reproductive status and breed on follicular population and oocyte quality in cows. *Theriogenology*, 43: 1405-1418.
- [8] GATIUS, F.L., J. YANIZ, and MADRILES H. D., 2002. Effects of body condition score and score change on the reproductive performance of dairy cows; a meta-analysis. *Journal of Dairy Science*.
- [9] GRAZUL-BILSKA, A., E. BOROWCZYK, J. S. CATON, J.J. BILSKI, R.M. WEIGL, R.M. VONNAHME, K.A. BOROWICZ, P.P. KIRSCH, J.D. KRAFT, K.C. AND REYNOLDS, L.P. 2006. Effects of plane of nutrition on *in vitro* fertilization and embryonic development in sheep. *Journal in Animal Science*. vol. 84 No. 6, p. 1593-1599.
- [10] GORDON, I., 2003. *Laboratory Production of Cattle Embryos*. Cabi Publishing, USA, p.38.
- [11] HAFEZ, E. S. E. and HAFEZ B., 2013. *Ovarian Morphology. Reproduction in Farm animals*. Seventh edition. Blackwell Publishing.
- [12] HAMIL, J., H.A. SAMAD, N. U. REHMAN, Z.I. KURESHI

- AND LODHI, L.A. 2007. In vitro maturation and fertilization of riverine buffalo follicular oocytes in media supplemented with estrus buffalo serum and hormones. ACTA VET BRNO. 76:399-400
- [13] KHANDOKER, M., N. JAHAN, L. ASAD, S. HOQUE, S. AHMED AND FAROQUE M., 2011. Qualitative and quantitative analysis of buffalo ovaries, follicles and oocytes in view of in-vitro production of embryos. Bangladesh Journal of animal Science, 409(1-2) 23-27.
- [14] KOAMO, J., S. M. DAWAYE, A.P. ZOLI and BAH, G.S. 2014. Evaluation of bovine (*Bos indicus*) ovarian potential for in vitro embryo production in the Adamawa plateau (Cameroon). Vet J.; 4(2): 128– 136
- [15] KUBOVICOVA E., A.V. MAKAREVIC, Z. HEGEDUESOVA, M. SLEZAKOVA ANDBESDICEK, J., 2012. Effect of body condition score on oocyte yield and in vitro embryo development. AGRIS vol. 54:1, 17-22.
- [16] KUNKLE, W.E., R. S. SAND AND RAE, D.O., 1998. Effects of body condition in evaluating nutritional status than live weight or change in lightweight. Journal of Dairy Science.
- [17] MAINA, V.A., A. MUKTAR, AND SABO, Y.G., 2008. Effects of body condition score on ovarian activity of *Bos Indicus* (Zebu) cows. Asian Journal of Scien 421-428.
- [18] MINGHUI, Y., JINGLI, T., MENGLONG, C., HAO, W., JING, W., GUANGDONG, L., LU, X., PENGYUN, J., YUNPING, D., LIGUO, Y., AND L. GUOSHO, 2017. Molecule. 22(12), 2059.
- [19] MOHAMMED A. A. and ATTAI, 2011. Effects of dietary urea on timing of embryo cleavage. Veterinary World. Vol. 4 (8): 360-363.
- [20] MOHAMMED, S.H. and S.A. HATIF 2010. Bovine oocyte and maturation collected from abattoir and in vitro fertilization. Al-Anbar J. Vet. Sci., vol.:3 No. (2).
- [21] O'CALLAGHAN, D., H. YAAKUB, P. HYTTEL, L. J. SPICER, and M. P. BOLAND. 2000. Effect of nutrition and superovulation on oocyte morphology, follicular fluid composition and systemic hormone concentrations in ewes. J. Reprod. Fertil. 18:303. –313
- [22] PENITENTE-FILHO, J.M., E. CARRASCSL, F. A., OLIVEIRA, A. M. ZOLINI, C. T. OLIVEIRA, I. A. COSTA SUARES and C. A. ALVES TORRES. 2014. Influence of dominant follicle and corpus luteum on recovery of good quality oocytes for in vitro embryo production in cattle. British Biotechnology Journal. 4 (12):1305-1312.
- [23] PRYCE, J.I., COFFY, M.P. and SIMON, G., 2001. Relationship between body condition score and reproductive performance. Journal of Dairy Science.
- [24] RODGERS, R. J. and H. F. IRVING-RODGERS, 2009. Morphological classification of bovine ovarian follicles. Journal of the Society for Reproduction and Fertility.
- [25] SAJJAN, S., DHANDA, O. P. AND MALIK, R.K. 2001. Effect on the presence of CL on the oocyte recovery and subsequent in vitro maturation and fertilization in buffaloes. Asian-Australian Journal Anim.Sci. vol. 14, no.12: 1675-1677.
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