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COMPARISON OF PREGNANCY RATE IN PRIMIPAROUS BOVINE FEMALES WITH DIFFERENT TYPES OF SUPPLEMENTATION: AN INTEGRATIVE REVIEW

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ABSTRACT

Nutrition is fundamental for the productivity and efficiency of cattle farming, which acts directly on puberty, and on the fertility of bovine females, as well as on the quality of the meat produced. To meet these requirements, several nutritional management strategies, such as continuous supplementation, stratified supplementation or intensive systems, have been successfully implemented, promoting the anticipation of puberty and improving reproductive efficiency. In this scenario, nutritional supplementation stands out as an essential tool to optimize herd performance and ensure more satisfactory results. Therefore, this integrative review aimed to compare the pregnancy rate in primiparous bovine females in different studies submitted to different types of nutritional supplementation. The results indicated that post-weaning supplementation plays an

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essential role, being associated with better endocrine responses, larger follicular diameter and higher pregnancy rate. However, practices such as creep feeding, despite improving calf weight gain, have shown limitations in terms of direct impact on cow fertility. Therefore, adequate nutritional strategies adjusted to the specific needs of females in different phases of the production cycle, combined with regularity in administration, is essential to ensure robust metabolic health, reproductive efficiency and greater sustainability in livestock.

Keywords: Nutritional Supplementation. Pregnancy Rate. Bovine Females. Reproductive Efficiency. Nutritional Strategies.

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INTRODUCTION

Beef cattle farming is an activity of great economic relevance in Brazil, present in all regions of the country and contributing significantly to the national GDP. The Brazilian beef cattle herd is mostly composed of Zebu breeds, with emphasis on the Nellore breed, which represents about 75% of the total. Nutrition plays a key role in the productivity and efficiency of this sector, directly influencing the puberty and fertility of bovine females, as well as impacting reproductive performance and the quality of the meat produced.

For heifers, proper nutrition is key, as it directly influences the age and weight at which they reach sexual maturity. Several nutritional management strategies, such as continuous supplementation frequencies, stratified supplementation, or more intensive systems, have been successfully employed to anticipate the onset of puberty and improve reproductive efficiency. Mineral and protein supplementation is especially important, given that most of the national beef herd is raised extensively, requiring supplements to meet nutritional deficiencies (ASBRAM, 2003).

When the diet is not adequate, the animals can suffer weight loss and body condition score, as well as energy deficiencies, which can be detected through the metabolic profile. If these deficiencies are not corrected in a timely manner, they can cause irreversible damage to the production process (ASBRAM, 2003). Inadequate nutrition reduces fertility and pregnancy rate in cattle, negatively impacting herd productivity. Thus, nutritional management strategies are essential to ensure that animals receive the necessary nutrients to maintain a good body condition and a balanced metabolic profile, preventing significant production losses and promoting the reproductive health of the herd.

Mineral supplementation is essential to maintain fertility and pregnancy in cattle, as minerals are indispensable for the proper functioning of the animals' vital functions. Inadequate mineral intake can result in decreased production, compromised reproductive performance, and in more severe cases, even death (Jubran, 2016). One of the main challenges faced by Brazilian livestock is the degradation of pastures. According to Moacyr (2016), 80% of pastures in Brazil are degraded and have low concentrations of phosphorus in forages. This mineral deficiency is especially critical for cattle raised on pasture, which need constant supplementation. Phosphorus deficiency can lead to decreased fertility, causing irregular reproductive cycles and an increase in cases of follicular cysts.

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This study aims to compare the pregnancy rate in primiparous bovine females submitted to different nutritional supplementation regimens. The research seeks to identify which types of supplementation are most effective in improving reproductive efficiency, providing data that can support the adoption of nutritional strategies that increase the pregnancy rate and, consequently, contribute to the productivity and sustainability of beef cattle farming in Brazil.

METHODOLOGY

DATA SOURCES

To carry out this narrative review, several recognized scientific databases were consulted, including PubMed, Scopus, Web of Science, Google Scholar and SciELO. The selection of these platforms was based on their scope and quality of the available studies, ensuring a comprehensive and representative collection of the literature on the impact of nutritional supplementation on the pregnancy rate of primiparous bovine females.

INCLUSION AND EXCLUSION CRITERIA

The selection of studies began with the initial screening of the titles and abstracts obtained in the search. Then, the selected articles were read completely for final evaluation of their relevance and adequacy to the objectives of the review. The pertinent information on methodology, results and conclusions was extracted and organized into tables to facilitate comparative analysis between the included studies.

DATA ANALYSIS AND SYNTHESIS

Qualitative analysis of the data was performed to identify patterns, similarities and divergences in the results obtained. The narrative review focused on comparing the effects of mineral and protein supplementation and the different supplementation systems (continuous, stratified, intensive) on pregnancy rate in primiparous bovine females. In the discussion phase, the results were contextualized within the current nutritional management practices in beef cattle.

Practical recommendations were formulated based on the reviewed evidence, aiming to improve the pregnancy rate and reproductive efficiency of primiparous bovine females. The discussion addressed the practical and theoretical implications of the findings, providing support for nutritional management decisions. In addition, gaps were

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identified in the existing literature, highlighting areas of research not yet explored or in need of further investigation. These gaps suggested promising directions for future studies, contributing to the advancement of scientific and technological knowledge in the area of reproductive nutrition in beef cattle.

RESULTS

The study was conducted based on a sample of five articles, published between 2009 and 2021, which investigated the effect of nutritional supplementation on the efficiency of reproductive performance of primiparous cows. The selected articles were published in the following journals: Research, Society and Development and Brazilian Journal of Animal Science. Based on this, Chart 1 was produced, which presents an overview of these studies.

Chart 1 - Results of studies on nutritional supplementation and its influence on pregnancy rate in primiparous bovine females

Author(s)	Year	Title	Type of Supplementation	Key results	Source
Lobato *et al.*	2021	Supplementation and productive and reproductive performance of primiparous cows at 24 months of age	Supplementation	Adequate supplementation resulted in better productive and reproductive performance of primiparous cows.	Lobato *et al*., 2021
E.Nogueira *et al.*	2009	Effect of creep feeding on calf performance and reproductive efficiency of Nellore primiparous grazing	Creep feeding	Creep feeding increased the average daily weight gain of calves, however it did not improve the reproductive efficiency of primiparous Nellore cows when they entered with low condition	Nogueira *et al*., 2009
Alcides Pilau, José Fernando Piva Lobato	2009	Pre-mating energy supplementation at 13/15 months of age for beef heifers: development and reproductive performance	Varied supplementation	A higher pre-calving nutritional level allows primiparous heifers at 22/24 months of age to develop better at calving and at the beginning of the reproductive period, so that approximately 94% of conceptions occur in the initial and intermediate periods of mating.	Furnace & Lobato, 2009
Moriel *et al.*	2012	Effects of frequency of energy supplementation and forage quality on performance, reproductive and physiological responses of beef heifers	Baixo Teor Energy Supplement from Amido	Heifers that received daily supplementation showed less variation in forage intake. Sexual maturity and gestation were anticipated in heifers with daily supplementation compared to those supplemented 3 times a week.	Moriel *et al.,* 2012

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Silva *et al*.	2018	Performance, Endocrine, Metabolic and Reproductive Responses of Heifers Nellore Subjected to Different Levels of Pre- and Post-Weaning Supplementation.	High and low supplementation	The level of supplement provided post-weaning improved performance, endocrine, metabolic and reproductive responses. Heifers receiving 6 g/kg BW in the post-weaning period gained more weight and had a larger follicle diameter and consequent improvement in the gestation rate	Silva *et al*., 2018

Source: Prepared by the author (2024)

DISCUSSION

The study by Lobato et al. (2021) demonstrates that adequate nutritional supplementation has a significant positive effect on the productive and reproductive performance of primiparous cows. This result is consistent with the literature that suggests that supplementation can improve the body condition of cows, resulting in a higher pregnancy rate and better reproductive performance. The success of supplementation seems to be related to the adequacy of the nutrients offered, which reflects on the general health of the cows and their ability to conceive.

On the other hand, the study by E. Nogueira et al. (2009) addresses the effect of creep feeding, which is a practice of feed supplementation for calves that aims to improve weight gain and, indirectly, the reproductive performance of females. Although creep feeding increased the average daily weight gain of calves, there was no corresponding improvement in the reproductive efficiency of primiparous cows. This result suggests that, while creep feeding may be beneficial for calf growth, it may not be sufficient to improve the reproductive efficiency of cows if they have low body condition at the beginning of the breeding season.

The study by Pilau and Lobato (2009) points out that pre-mating energy supplementation for beef heifers resulted in improvements in reproductive development and performance. Heifers that received a higher nutritional level before calving showed better development and higher pregnancy rates in the initial and intermediate mating periods. This study reinforces the importance of nutritional adequacy before and during the reproductive period, showing that energy supplementation can be crucial to ensure reproductive efficiency.

The study by Moriel et al. (2012) contributes to this discussion by demonstrating that supplementation frequency and forage quality significantly affect the performance,

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metabolic responses, and ovarian activity of heifers. Heifers that received daily supplementation showed better performance and higher metabolic and reproductive responses compared to those that were supplemented only 3 times a week. This study highlights the importance of adequate and consistent supplementation to optimize the metabolic and reproductive health of heifers, corroborating the idea that regularity in supplementation can be key to improving reproductive performance.

Finally, the study by Silva et al. (2018) shows that adequate post-weaning supplementation had a positive impact on the performance, endocrine, metabolic and reproductive responses of Nellore heifers. Heifers that received a higher level of supplement post-weaning showed greater weight gain and better development of ovarian follicles. This study reinforces the idea that post-weaning supplementation is crucial for reproductive performance and heifer growth, indicating that the adequacy of supplementation levels after weaning can be decisive to optimize reproductive outcomes.

CONCLUSION

The review of studies on nutritional supplementation and its influence on pregnancy rate in primiparous bovine females demonstrates the critical importance of adequate nutritional strategies to optimize reproductive performance. The results analyzed indicate that supplementation, both pre- and post-weaning, plays a fundamental role in improving the productive and reproductive performance of primiparous cows and heifers.

In summary, the available evidence suggests that the implementation of well-structured nutritional supplementation practices adjusted to the specific needs of each phase of the production cycle is crucial to optimize reproductive and productive performance. Adequacy of supplementation levels and regularity in the administration of supplements are key to achieving robust metabolic health and improved reproductive efficiency. The development of integrated and customized nutritional strategies can provide significant improvements in the productivity and sustainability of cattle breeding operations.

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REFERENCES

1. Associação Brasileira de Indústria de Suplementos Minerais. (2003). Guia prático para a correta suplementação pecuária: Bovinos de corte. São Paulo: ASBRAM.

2. Euclides, V. P. B., Costa, F. P., Euclides Filho, K., Montagner, D. B., & Figueiredo, G. R. (2018). Biological and economic performance of animal genetic groups under different diets. Bioscience Journal, 34(6), 1683-1692. https://doi.org/10.14393/BJ-v34n6a2018-39551

3. Ferraz, J. B. S., & Eler, J. P. (2010). Parceria público x privada no desenvolvimento de pesquisa em melhoramento genético animal. Revista Brasileira de Zootecnia, 39, 216-222.

4. Gomes, M. F., & Gasperini, M. M. (2020). Agronegócio, bovinocultura de corte, responsabilidade social e corrupção/Agribusiness, beef industry, social responsibility and corruption. Brazilian Journal of Development, 6(5), 28428-28443. https://doi.org/10.5935/2238-2715.20200061

5. Huntington, G. B., & Archibeque, S. L. (1999). Practical aspects of urea and ammonia metabolism in ruminants. Journal of Animal Science, 77(5), 1-11.

6. ÍTavo, L. C. V., Dias, A. M., Ítavo, C. C. B. F., Euclides Filho, F. K., Morais, M. G., Silva, F. F., Gomes, R. C., & Silva, J. P. B. (2008). Desempenho produtivo, características de carcaça e avaliação econômica de bovinos cruzados, castrados e não-castrados, terminados em pastagens de Brachiaria decumbens. Arquivos de Medicina Veterinária e Zootecnia, 60(5), 1157-1165.

7. Jubran, M. S. (2024). Importância da suplementação mineral para bovinos. Biosan: Biotecnologia em Saúde Animal. Available at: http://biosan.ind.br/artigos/importancia-da-suplemetacao-mineral-para-bovinos/. Accessed on: June 8, 2024.

8. Lobato, J. F. P., Cadó, L. M., Poli, C. H. E. C., Jacondino, L. R., Souza, C. B. de O. de, Oliveira, A. B. de, Pötter, L., Eloy, L. R., & Vaz, R. Z. (2021). Supplementation and productive and reproductive performance of primiparous cows at 24 months of age. Research, Society and Development, 10(1), 1-11. https://doi.org/10.33448/rsd-v10i1.834

9. Maggioni, D., Prado, I. N., Zawadzki, F., Valero, M. V., Marques, J. A., Bridi, A. M., Moleta, J. L., & Abrahão, J. J. S. (2012). Grupos genéticos e graus de acabamento sobre qualidade da carne de bovinos. Semina: Ciências Agrárias, 33(12), 391-402.

10. Malafaia, P., Cabral, L. D. S., Vieira, R. A. M., Costa, R. M., & Carvalho, C. D. (2003). Suplementação proteico-energética para bovinos criados em pastagens: Aspectos teóricos e principais resultados publicados no Brasil. Livestock Research for Rural Development, 15(12), 1-33.

Revista ARACÊ
ISSN: 2358-2472

11. Mapa, M. da A. P. E. A. (2018). Pecuária de baixa emissão de carbono. Available at: http://www.gov.br/mappa. Accessed on: December 2021.

12. Nicodemo, M. L. F. (2017). Desafios para a pecuária bovina: Pontos para alinhamento da pesquisa e da extensão rural nas próximas décadas. Revista Universidade Federal de Goiás, 13(13), 1-10.

13. Nogueira, E., et al. (2006). Efeito do creep feeding sobre o desempenho de bezerros e a eficiência reprodutiva de primíparas Nelore, em pastejo. Arquivo Brasileiro de Medicina Veterinária e Zootecnia, 58, 607-613.

14. Oliveira, A. L. F., Cabral, L. S., Valadares Filho, S. C., & Detmann, E. (2005). Efeito da fermentação de proteínas na cinética de produção de gases in vitro. In Anais do ZOOTEC'2005 (pp. 35-40). Campo Grande: Associação Brasileira de Zootecnistas.

15. Oliveira Dantas, C. C., & Mattos Negrão, F. (2010). Funções e sintomas de deficiência de minerais essenciais utilizados para suplementação dos bovinos de corte. Uniciências, 14(2), 199-223.

16. Ornaghi, M. G., Guerrero, A., Vital, A. C. P., Souza, K. A., Passetti, R. A. C., Mottin, C., Castilho, R. C., Sañudo, C., & Prado, I. N. (2020). Improvements in the quality of meat from beef cattle fed natural additives. Meat Science, 163, 108059. https://doi.org/10.1016/j.meatsci.2020.108059

17. Passetti, R. A. C., Torrecilhas, J. A., Ornaghi, M. G., Mottin, C., & Guerrero, A. (2016). Determinação da coloração e a disposição de compra pelos consumidores da carne bovina. PUBVET, 10(2), 179-189.

18. Peixoto, P. V., Malafaia, P., Barbosa, J. D., & Tokarnia, C. H. (2005). Princípios de suplementação mineral em ruminantes. Pesquisa Veterinária Brasileira, 25(3), 195-200.

19. Pilau, A., & Lobato, J. F. P. (2009). Suplementação energética pré-acasalamento aos 13/15 meses de idade para novilhas de corte: Desenvolvimento e desempenho reprodutivo. Revista Brasileira de Zootecnia, 38, 2482-2489.

20. Prado, I. N., Moreira, F. B., Cecato, U., Souza, N. E., Wada, F. Y., & Nascimento, W. G. (2002). Desempenho de bovinos em crescimento e terminação mantidos em pastagens durante o verão e suplementados com sal proteinado. Acta Scientiarum, 24(4), 1059-1064.

21. Rocha, W. J. B., Silva, R. R., Da Silva, F. F., De Carvalho, G. G., Da Silva, A. P. G., Silva, J. W. D., Paixão, T. R., Freitas, T. B., Mendes, F. B. L., Barroso, D. S., Souza, S. O., Santos, L. V. (2019). Intake, digestibility, and growth performance of Girolando bulls supplemented on pasture in Bahia, Brazil. Tropical Animal Health and Production, 51(6), 1413-1420. https://doi.org/10.1007/s11250-019-01934-y

22. Russell, J. B. (2002). Rumen microbiology and its role in ruminant nutrition. Ithaca: James B. Russell.

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ISSN: 2358-2472

23. Santos, M. E. R., Fonseca, D. M., Braz, T. G. S., Silva, S. P., Gomes, V. M., & Silva, G. P. (2011). Características morfogênicas e estruturais de perfilhos de capim braquiária em locais do pasto com alturas variáveis. Revista Brasileira de Zootecnia, 40(3), 535-542.

24. Silva, D. J., & Queiroz, A. C. (2002). Análise de alimentos: Métodos químicos e biológicos (3rd ed.). Viçosa: Editora UFV.

25. Silva, F. F., Valadares Filho, S. C., Ítavo, L. C. V., et al. (2002). Exigências líquidas e dietéticas de energia, proteína e macroelementos minerais de bovinos de corte no Brasil. Revista Brasileira de Zootecnia, 31(2), 776-792.

26. Socreppa, L. M., Morais, E. H. B. K., Moraes, K. A. K., Oliveira, A. S., Drosghic, L. C. A. B., Botini, L. A., & Stinguel, H. (2015). Glicerina bruta para bovinos de corte em pastejo no período das águas: Viabilidade produtiva e econômica. Revista Brasileira de Saúde e Produção Animal, 16(1), 232-243.

27. Thiago, L. R. L. S., Silva, J. M., & Torres Junior, R. A. A. (2003). Desempenho de novilhos mestiços, com suplementação em pastagens de “B. brizantha”, durante a época de chuva. In Anais da Reunião Anual da Sociedade Brasileira de Zootecnia (39th ed., pp. 2482-2489). Santa Maria: SBZ.

28. Zarth, P. A. (2016). Introdução de novas raças de gado no sul do Brasil (1870-1950). História: Debates e Tendências, 16(1), 72-91.

29. Zervoudakis, J. T., Paulino, M. F., Detmann, E., et al. (2002). Conteúdo corporal e exigências líquidas de proteína e energia de novilhos suplementados no período das águas. Revista Brasileira de Zootecnia, 31(1), 530-537.