International Journal of Livestock Research, Vol. 10 (8) Aug' 2020
http://www.ijlr.org
eISSN: 2277-1964
NAAS Rating 2020 – 5.36

Original Research

Impact of Mineral Supplementation in Improving Hoof Health in Dairy Cattle in Ayodhya District of Eastern Uttar Pradesh

Pragya Prakash Mishra[1], Sonu Jaiswal[2], Harnam Singh[1], Rakesh Kumar Gupta[3]*, Debasish Niyogi[3] and Vijay Kumar Singh[4]

[1]Department of Veterinary Surgery and Radiology, C.V.Sc & A.H, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh INDIA
[2]Department of Veterinary Clinical Complex, C.V.Sc & A.H, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, INDIA
[3]Department of Veterinary Pathology, C.V.Sc & A.H, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, INDIA
[4]Department of Animal Nutrition, C.V.Sc & A.H, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, INDIA

*Corresponding Author: rakeshguptaa96@gmail.com

How to cite this paper: Mishra, P., Jaiswal, S., Singh, H., Gupta, R., Niyogi, D., & Singh, V. (2020). Impact of Mineral Supplementation in Improving Hoof Health in Dairy Cattle in Ayodhya District of Eastern Uttar Pradesh. *International Journal of Livestock Research*, 10(8), 183-188. doi: http://dx.doi.org/10.5455/ijlr.20200605094155

Received : Jun 05, 2020
Accepted : Aug 01, 2020
Published : Aug 31, 2020

Copyright © Mishra *et al., 2020*

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0). http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

Hoof disorders and lameness are the one of most important health problems in cattle all over the world and have important economical and animal welfare issue. The present study was done to know the impact of mineral supplementation in improving the hoof health in dairy cattle in Ayodhya district of Uttar Pradesh, India. For the current study, 56 dairy animals having hoof disorders reared at various dairy farms in total eight villages of Ayodhya district were selected randomly. Selection of villages was done randomly from the two blocks each from the two tehsils out of five tehsils of Ayodhya district. In treatment group also slight to moderate improvement in lameness was observed on day 7 (1.3929 ± 0.13), which further improve significantly on day 15 (2.25 ±0.14). There was further improvement on day 30 (2.60 ±0.107) but it was not significant as compared to day 15, although it was significantly better as compared to day 7. In most of the animals of treatment group there was excellent improvement in lameness was noticed on day 30. In comparison to control group, scores for improvement in lameness in animals of treatment group were comparatively higher at every time interval.

Keywords: Ayodhya, Cattle, Hoof Disorder, Mineral Supplementation

Introduction

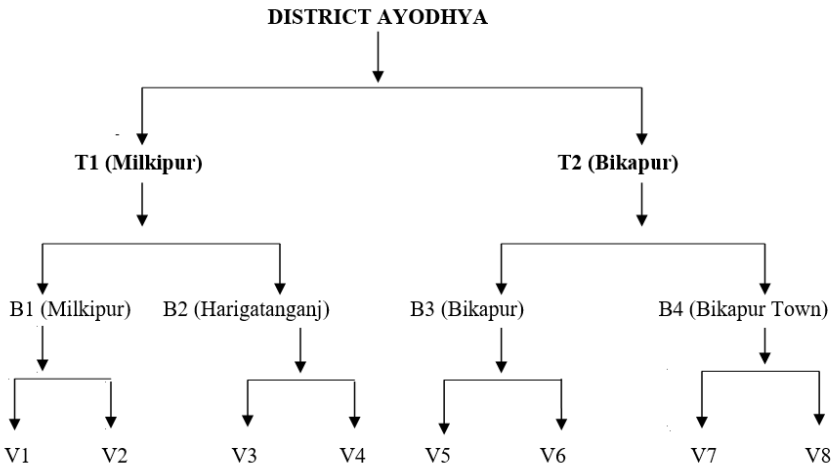
The modern husbandry and managemental practices increased the milk production in India but at the cost of higher incidences of health problems. Hoof disorders are the one of most important health problems in cattle. These are reported in dairy cattle all over the world. The majority of hoof problems in the bovine species affect dairy cows due to heavy body weight and milk yield. Hoof disorders and the resulting lameness are considered to be the most important welfare problem in dairy farming according to the parameters incidence, severity and duration (Whay *et al.*, 2003; Osorio *et al.*, 2016; Krpalkova *et al*., 2019). In modern scientific reports, it has been stated that farmers exaggerate their respective herd's hoof health status (Whay *et al*., 2002) and avoid claw trimming, which is perceived as both perilous and intrusive (Seabrook and Wilkinson, 2000). The factors which predispose the hoof for various clinical disorders include inherited factors e.g. body weight, conformation and hoof characteristics, nutritional factors, environmental factors e.g. climate, road, wear and tear, and managemental practices e.g. type of animal houses, flooring, sanitary conditions, regular cleaning and trimming of hooves (Chaplin2000; Huxley 2013; Adams *et al.*, 2017).

Nutrition plays an important role in hoof health and maintaining proper growth rate. Nutritional management has been identified as a key component in the development of hoof disorders. Macro and trace Minerals (calcium, zinc, cobalt, copper and manganese) play a critical role in building and maintaining strong, healthy hoof (Kumar *et al.*, 2019). Trace elements plays an important role in minimizing hoof disorders through their roles in the immune function, the production of horn tissue, and the maintenance of epithelial and connective tissue in dairy animals (Kilic, 2004). Feeding a combination of various minerals (calcium, zinc and copper and manganese) helps in decreasing both the incidence and severity of hoof disorders (Doerfler *et al.*, 2017; Kumar *et al.*, 2019). Trace mineral zinc and copper are essential nutrients for developing healthy claw horn tissue, while zinc and manganese play a crucial role in wound healing. Research has shown that feeding a combination of trace minerals (Zn, Mn, Cu and Co) in a highly available complexed form helps decrease both the incidence and severity of common claw lesions. There has been extensive research work on the bovine foot diseases in western countries, but in India less work has been documented on hoof disorders of cattle. Therefore, current study is proposed in the Ayodhya district to study the impact of mineral supplementation in improving the hoof health in dairy cattle in Ayodhya district of Uttar Pradesh, India during July 2018-June 2019.

Material and Methods

Selection of Animals

For the current study fifty-six dairy animals having hoof disorders reared at various dairy farms in total eight villages of Ayodhya district were selected randomly. Selection of villages was done randomly from the two blocks each from the two tehsils out of five tehsils of Ayodhya district.



(V1-Pure Sirwar, V2-Kumarganj, V3-Rampur Johan, V4-Bashuwar Kala, V5-Bhitar Gaw, V6-Pali Purab, V7-Majha Sarwar, V8-Bikapur)

Hoof Examination

The lame animals were examined for the site and type of affection. Detailed examination of hoof lesion was carried out and hoof trimming was performed if necessary, to confirm the lesion.

Treatment Protocol

The selected animals were divided randomly in two groups *viz*. treatment and control groups having 28 animals in each. In control group only improvement in managemental practices, surgical maneuvers and medicinal treatment were performed. In treatment group mineral supplement i.e. Fastune Bolus (supplied by Sushima Pharma, composition is given in annexure) @ 1 bolus BID for 15 days was given in affected animals along with improvement in managemental practices, medicinal treatment and surgical maneuvers. Improvement in managemental practices including thorough and regular cleaning and trimming of hooves, proper feeding, flooring (dry soft floor with provision of bedding) and housing were incorporated.

Surgical maneuvers mainly included corrective trimming/ paring in similar manner as described by Raven (1989). Maneuvers were performed in lateral recumbency and animals were sedated with xylazine @ 0.1 mg/ kg body weight if required. A postoperative course of Enrofloxacin 10% solution (@ 5 mg/kg body weight IM daily), Ketoprofen (@ 3 mg/kg body weight IM daily) for five days was give along with antiseptic dressing with Povidone iodine solution (5% w/v), and D-mag* (supplied by Intas Pharmaceuticals). Improvement in the condition of the hoof were recorded at definite interval i.e. at 0 day, 7th day, 15th day and 30th day after start of treatment.

Institutional Animal Ethical Committee (IAEC) Approval

The proposed experimental work was approved by Institutional Animal Ethical Committee IAEC (Reference number IAEC/ CVSc/ 2019/01).

Statistical Analysis

Statistical analysis of the data was performed by using the one-way ANOVA.

Result and Discussion

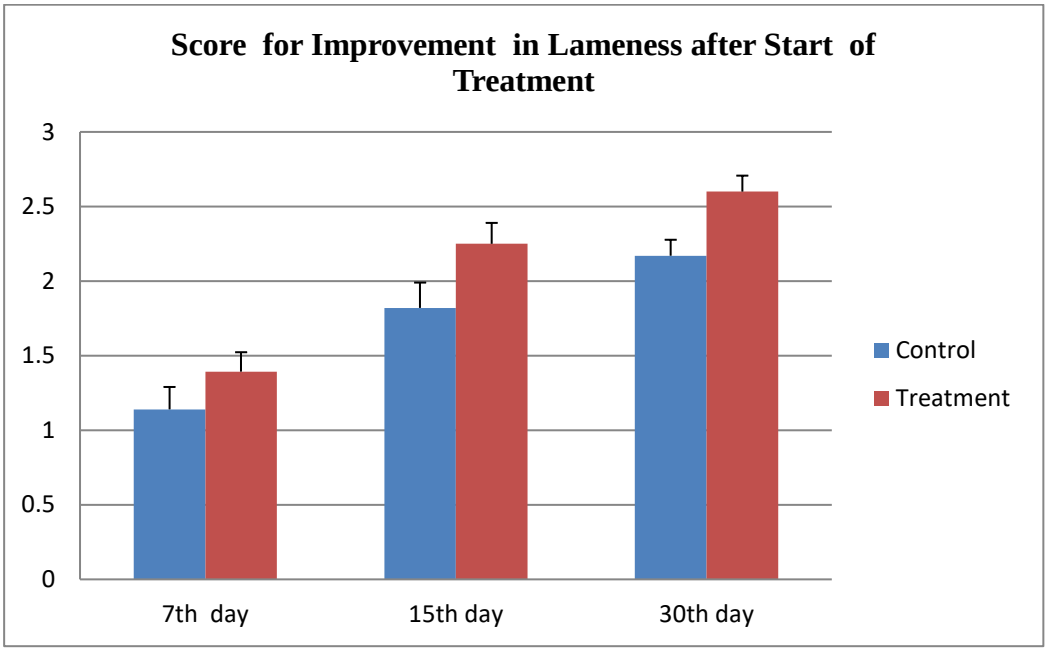
Scores for improvement in lameness after start of treatment in cattle of both the groups is given in Table 1 and Graph 1. In control group slight to moderate improvement in lameness was observed on day 7 (1.14 ± 0.15), which further improve significantly on day 15 (1.82 ± 0.17). There was further improvement on day 30 (2.17 ± 0.107) but it was not significant as compared to day 15. It was significantly better as compared to day 7, even in some of the animals of control group excellent improvement was seen. In treatment group also slight to moderate improvement in lameness was observed on day 7 (1.3929 ± 0.13), which further improve significantly on day 15 (2.25 ± 0.14). There was further improvement on day 30 (2.60 ± 0.107) but it was not significant as compared to day 15, although it was significantly better as compared to day 7. In most of the animals of treatment group there was excellent improvement in lameness was noticed on day 30. In comparison to control group, scores for improvement in lameness in animals of treatment group were comparatively higher at every time interval.

Table 1: Score for improvement in lameness after start of treatment in cattle (n=56)

Groups	7th day	15th day	30th day
Control	1.14± .15^{b}	1.82±.17^{a}	2.17±.107^{a}
Treatment	1.3929±.13^{b}	2.25±.14^{a}	2.60±.107^{a}

Mean bearing different superscript show significant difference within the groups at different time intervals (p≤0.05)

In both the group of animal's improvement in condition of hooves and lameness started after 7th day in most of the animals which continued on day 15 till 30th day at the end of observation period. But in comparison to animals of control group, in treatment group improvement was comparatively higher at every time interval. The improvement after start of treatment in control group might be attributed to the improvement in sanitary condition, improvement in bedding material, proper hoof trimming, hoof dressing and provision of proper balanced diet.



Graph 1: Score for improvement in lameness after start of treatment in cattle (n=56)
(0= no improvement, 1= slight improvement, 2= moderate improvement, 3= excellent improvement)

Regular foot care and hoof trimming is not a luxury provided to the cow, but is a must to achieve maximum productivity and longevity. It has been stated that most lame cows are not treated by veterinarians, rather by hoof trimmers or farmers, or are left untreated (Whay *et al*., 2002; Huxley 2013 and Adams *et al.*, 2017). Claw trimming significantly reduced the risk of sole ulcer (Hultgren and Bergsten, 2001; Kumar *et al.*, 2019).

In treatment group addition of balanced mineral mixture was might be the cause of better results. Onyiro *et al*. (2008) and Olmos *et al*. (2009) have found that sufficient levels of minerals in the feed are essential for improving the hoof quality. They also found that high concentrate diet has a postive effect on digital dermatitis and locomotion score. Various minerals like zinc, calcium, manganese, copper, cobalt, selenium and iodine are essential to enzymatic functions relating to catalytic, structural and regulatory control of keratinization processes (NRC, 2001). Mulling *et al*. (1999), have reported that trace minerals are important for production and maintenance of healthy keratinized tissues. Ballantine *et al*. (2002) and Huxley (2013) have reported that trace minerals helps in improving the claw horn production. Puls (1994) have reported that subclinical iodine deficiency may lead to increased incidence of foot rot. Miller and Tillapaugh (1967) have reported that dietary supplementation of iodine prevents foot rot. Dietary supplementation of Zinc reported to prevents claw problems like heel cracks, interdigital dermatitis and laminitis in cows (Moore *et al*., 1989; Huxley 2013 and Kumar *et al.*, 2019).

Conclusion

From the above study it may be concluded that improvement in managemental practices including provision of balanced mineral mixture in feed, hoof trimming, improvement in hygiene and floor of animal house etc., medicinal and surgical treatment are required for management of lameness due to different hoof disorders. Trace minerals are important for production and maintenance of healthy keratinized tissues as well as in improving the claw horn production. Regular foot care and hoof trimming is not a luxury provided to the cow, but it is a must to achieve maximum productivity and longevity.

Acknowledgement

The current study is a part of M.V.Sc thesis submitted to the ANDUAT, Kumarganj, Ayodhya. The Authors acknowledge Department of Veterinary Surgery and Radiology, Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, ANDUAT, Kumarganj, Ayodhya, India for providing all necessary facilities for this study.

Funding Agency

All facilities require for the study were provided by Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, ANDUAT, Kumarganj, Ayodhya, India.

Conflict of Interests

There is no conflict of interest.

Publisher Disclaimer

IJLR remains neutral concerning jurisdictional claims in published institutional affiliation.

References

1. Adams, A.E., Lombard, J.E., Fossler, C.P., Roman-Muniz, I.N., Kopral, C.A. (2017). Association between housing and management practices, and the prevalence of lameness, hock lesions and thin cows on US dairy operations. *Journal of Dairy Science*, 100: 2119–2136.
2. Ballantine, H. T., Socha, M. T., Tomlinson, D. J., Johnson, A. B., Fielding, A. S., Shearer, J.K. and van Amstel, S. R. (2002). Effect of feeding complexes zinc, manganese, copper and cobalt to late gestation and lactating dairy cows on incidence and severity of claw lesions.*12th International Symposium on Lameness in Ruminants, Orlando.,* 12: 241.
3. Chaplin, S.J., Tierney, G., Stockwell, C., Logue, D.N., Kelly, M. (2000). An evaluation of mattresses and mats in two dairy units. *Applied Animal Behaviour Science,* 66: 263-272.
4. Doerfler, R.L., Martin, R., Bernhardt, H. (2017). Implications of Robotic Walkway Cleaning for Hoof Disorders in Dairy Cattle. *International Journal of Engineering Research and Application,* 7 (1): 98-104.
5. Hultgren, J., Bergsten, C. (2001). Effect of a rubber-slatted flooring system on cleanliness and foot health in tied dairy cows. *Preventive Veterinary Medicine,* 52: 75-89.
6. Huxley, J.N. (2013). Impact of lameness and claw lesions in cows on health and production. *Livestock Science*, 156: 64–70.
7. Kilic, N. (2004). Hoof lesion of dairy cattle in Turkey. *Indian Veterinary Journal*, 8 (1): 1053-1054.
8. Krpalkova, L., Cabrera, V., Zavadilova, L., Stipkova, M. (2019). The importance of hoof health in dairy production. *Czech Journal of Animal Science*, 64 (3): 107–117.
9. Kumar, R., Kataktalware, M.A., Senani, S., Sivaram, M., Devi, G.L., Jeyakumar, S., Ramesha, K.P. (2019). Risk factors associated with the incidence of hoof disorders in crossbred dairy cattle under field conditions. *International Journal Current Microbiology and Applied Science*, 8(3): 2284-2292.
10. Miller, J. K., and Tillapaugh K. (1967). Iodine medicated salt for beef cattle. *Cornell Feed Serv.*, 62:11.
11. Moore, C. L., Walker, P.M., Jones, M. A. and Webb, J. M. (1989). Zinc methionine supplementation for dairy cattle. *Academy Sciences,* 82:99
12. Mulling, C.K., Bragulla, H.H., Reese, S., Budras, K.D. and Steinberg, W. (1999). How structures in bovine hoof epidermis are influenced by nutritional factors. *Anatomia Histologia Embryologia,* 28 (2): 103-108.
13. National Research Council, NRC. (2001). Nutrient Requirements of Dairy Cattle. 7th rev. ed. Natl. Acad. Sci.Washington, D.C. Nocek, J. E. 1997. Bovine acidosis: Implications on laminitis. *Journal of Dairy Science,* 80: 1005- 1028.
14. Olmos, G., Boyle, L., Horan, B., Berry, D. P., O'Connor, P., Mee, J. F. and Hanlon, A. (2009). Effect of genetic group and feed system on locomotion score, clinical lameness and hoof disorders of pasture-based Holstein-Friesian cow. *Animal,* 3: 96-107.
15. Onyiro,O. M., Offer, J. and Brotherstone S. (2008). Risk factors and milk yield losses associated with lameness in Holstein-Friesian dairy cattle. *Animal,* 2 (8): 1230-1237.
16. Osorio, J.S., Batistel, F., Garrett, E.F., Elhanafy, M.M., Tariq, M.R., Socha, M.T., Loor, J.J. (2016). Corium molecular biomarkers reveal a beneficial effect on hoof transcriptomics in peripartal dairy cows supplemented

with zinc, manganese, and copper from amino acid complexes and cobalt from cobalt glucoheptonate. *Journal of Dairy Science,* 99: 9974–9982.

17. Puls, R. (1984). Mineral Levels in Animal Health. Diagnostic Data. 2nd. Edition. Sherpa International, Clearbrook, BC, Canada.
18. Raven, T. (1989). Cattle Foot care and Claw Trimming. Farming Press Ltd., Ipswich, UK.
19. Whay, H.R., Main, D.C.J., Green, L.E. and Webster, A.J.F. (2002). Farmer perception of lameness prevalence. In: Shearer, J.K. (Ed.) Proc. 12th Int. Symp. On Lameness in Ruminants. Orlando, Florida, USA, 13, 355-358.
20. Whay, H.R., Main, D.C.J., Green, L.E., Webster, A.J.F. (2003). Assessment of the welfare of dairy cattle using animal-based measurements: direct observations and investigation of farm records. *Veterinary Record*, 153:197-202.

****