



IMPACT OF HUMIC SUBSTANCES AS AN ORGANIC ADDITIVE ON RUMINAL FERMENTATION CONSTITUENTS, BLOOD PARAMETERS AND MILK QUALITY IN COWS

František Zigo¹, Šimon Halás¹, Zuzana Farkašová¹, Zuzana Lacková¹, Silvia Ondrašovičová¹, Mária Vargová¹, Ewa Pecka-Kielb², Andrzej Zachwieja², Gerda Kiss³

¹University of Veterinary Medicine and Pharmacy in Košice, Slovakia

²Wroclaw University of Environmental and Life Sciences, Poland

³University of Veterinary Medicine Budapest, Hungary

ABSTRACT: The present trial aimed to evaluate the impact of humic substances (HS) on rumen fermentation, milk yield and composition in dairy cows during the first 50 days of lactation. Sixty healthy pregnant Slovak Spotted cows in the 2 months preceding calving were allocated to two groups (30 cows per group). The control group (C-group) received a diet without HS, while the experimental group (HS-group) received HS at 100 g/day per cow for 60 days antepartum (d.a.p.) and 8 days postpartum (d.p.p.). The results revealed that HS supplementation increased ruminal pH and the acetate-to-propionate ratio (C2:C3; 3.46% vs 2.56%), while ammonia concentrations decreased on the 8th d.p.p. At the same time, animals treated with HS showed reduced milk urea levels. Furthermore, milk protein and non-fat dry matter content increased, while SCC decreased. As demonstrated in our study, the chosen dose of 100 g HS per cow per day has beneficial effects on stabilizing the ruminal environment and on key indicators of ruminal fermentation and milk composition, while reducing SCC. As demonstrated in our study, HS can be efficiently used as a promising organic additive in the diet for both dry and fresh cows as part of a comprehensive herd health program.

MATERIAL AND METHODS

Dairy production farm and humic substances (HS) supplementation:

Two groups of pregnant dairy cows - 30 cows in each group
HS-group – supplemented with HS at a dose of 100 g/head/day for 60 days before calving, including the first 8 days after calving.
C-group – control, without HS supplementation.
Sampling of rumen contents and milk on days 8 and 50 after calving.

Fermentation parameters evaluated: pH, ammonia, leaky fatty acids

Quantitative and qualitative parameters of milk evaluated: PSB, protein, fat, dry matter, non-fat dry matter, milk urea (MU).



RESULTS AND DISCUSSION

The results of rumen content analysis in both groups of cows on day 8 after calving and at the peak of lactation (day 50 after calving) confirmed lower pH ($P < 0.05$) in the rumen content of dairy cows in the control group (C) compared to the group whose TMR was supplemented with HS. Conversely, the content of ammonia in the rumen content in the control group was higher ($P < 0.05$) on both days 8 and 50 after calving compared to the supplemented group. The decrease in ammonia nitrogen (NH₃-N) concentration in our study indicates a good absorption capacity of humates and an improved efficiency in the ratio of acetic and propionic acid. The observed decrease in MU in cows fed the HS-supplemented diet can be explained by the lower blood urea level, which was a consequence of the lower concentration of NH₃-N in the rumen. The observed improved milk components such as protein and non-fat dry matter in HS-supplemented cows are currently associated with improved rumen function, which serves as a precursor for their production.

CONCLUSION

Based on the results obtained in this study, HS could be used to modulate rumen fermentation by stabilizing pH and reducing ammonia excretion, thereby reducing the ammonia content in the rumen due to its better utilization by microorganisms. This led to a more efficient conversion, which was reflected in reduced urea levels in milk, increased milk protein synthesis and higher non-fat dry matter content. As demonstrated in our study, HS at a dose of 100 g/head/day for 60 days before calving, including the first 8 days after calving, had beneficial effects on the stabilization of the rumen environment and on key indicators of rumen fermentation, milk production and quality. Consequently, we recommend that farmers include HS in the TMR for dry cows as part of a comprehensive herd health program.

Acknowledgments: The study was conducted as part of the Visegrad Fund project no. **22420065**: Non-antibiotic approaches to control mastitis in dairy cows. The project is co-financed by the governments of Czechia, Hungary, Poland and Slovakia through Visegrad Grants from the International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe. Additional financial support for the study's implementation was provided by the Slovak Research and Development Agency under Contract no. **APVV-22-0457** and **NAWA BPN/BSK/2023/1/00049**.

Contact: František Zigo, Assoc. prof., DVM., PhD.

Department of Animal Nutrition and Hsbandry, UVMP in Košice, SR

Email: frantisek.zigo@uvlf.sk

