



利用体外法研究纳米氧化锌的添加对瘤胃发酵的影响

四川农业大学动物营养研究所, 动物抗病营养教育部重点实验室, 雅安625014

Effect of Nano-Zinc Oxide Supplementation on Rumen Fermentation in vitro

Institute of Animal Nutrition, Sichuan Agricultural University, Key Laboratory for Animal Disease-resistance Nutrition of China Ministry of Education, Ya'an 625014, China

- 摘要
- 参考文献
- 相关文章

Download: PDF (407KB) | HTML (1KB) | Export: BibTeX or EndNote (RIS) | Supporting Info

摘要 为探究饲料添加纳米氧化锌对瘤胃发酵的影响, 本试验通过体外发酵法研究了纳米氧化锌不同添加水平 (0、50、100、200、400 mg/kg, 干物质基础) 对瘤胃培养液pH、氨态氮 (NH₃-N)、微生物蛋白 (MCP)、挥发性脂肪酸 (VFA) 以及底物有机物发酵率 (FOM) 的影响。研究发现, 在体外培养条件下, 纳米氧化锌的添加对培养液pH无显著影响 (P>0.05); 与对照组相比, 添加100和200 mg/kg DM的纳米氧化锌在6和12 h显著提高了FOM和MCP及VFA浓度 (P<0.05), 降低了NH₃-N浓度和乙酸/丙酸的比例 (P<0.05)。上述结果表明, 纳米氧化锌的添加在体外培养前期 (6~12 h) 能够有效地促进瘤胃微生物对饲料有机物的发酵, 增加MCP产量, 提高瘤胃发酵的能量利用效率。

关键词: 纳米氧化锌 瘤胃发酵 体外法

Abstract: This study was carried out to investigate the effect of nano-zinc oxide supplementation on rumen fermentation in vitro. Five levels of nano-zinc oxide supplementation were 0, 50, 100, 200, 400 mg/kg of DM, respectively. Culture medium in vitro was sampled to determine pH, ammonia nitrogen (NH₃-N), microbial crude protein (MCP), volatile fatty acids (VFA) and fermentation of organic matter. Results from this study showed that pH was not affected by adding different levels of nano-zinc oxide (P>0.05). The concentration of VFA and MCP production and the fermentation of organic matter were significantly increased (P<0.05), while the concentration of ammonia nitrogen and the ratio of acetate to propionate were significantly decreased (P<0.05) with the supplementation levels of 100 and 200 mg/kg of nano-zinc oxide at the 6th and 12th hour of incubation in vitro. In conclusion, the supplementation of nano-zinc oxide can improve the growth of ruminal microorganisms, increase the ruminal microbial protein synthesis, and raise the energy utilization efficiency in early phase (6 to 12 h) of incubation in vitro. [Chinese Journal of Animal Nutrition, 2011, 23 (8) : 1415 - 1421]

Keywords: nano-zinc oxide, rumen fermentation, in vitro

基金资助:

现代农业 (肉牛) 产业技术体系专项经费资助 (项目编号: CARS-38)

通讯作者 王之盛, 教授, 博士生导师, E-mail: wangzs007@yahoo.com.cn

作者简介: 陈俊材 (1987—), 男, 四川成都人, 硕士研究生, 从事反刍动物营养与饲料的研究。E-mail: cjc1949@163.com

引用本文:

. 利用体外法研究纳米氧化锌的添加对瘤胃发酵的影响[J]. 动物营养学报, 2011, V23(08): 1415-1421

. Effect of Nano-Zinc Oxide Supplementation on Rumen Fermentation in vitro[J]. Chinese Journal of Animal Nutrition, 2011, V23(08): 1415-1421.

链接本文:

http://211.154.163.124/Jweb_dwyy/CN/10.3969/j.issn.1006-267x.2011.08.022 或

Service

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ Email Alert
- ▶ RSS

作者相关文章

- [1] NUNNERY G A, VASCONCELOS J T, PARSONS C H, et al. Effects of source of supplemental zinc on performance and humoral immunity in beef heifers[J]. *Journal of Animal Science*, 2007, 85(9):2304-2313.
- [2] 姚军虎,曹斌云,窦铖,等. 锌对青年牛生长发育的影响[J]. *西北农业大学学报*,1996,24(4):55-58.
- [3] HUBBERT F J, CHEN S, BURROUGHS W. Mineral requirement of rumen microorganisms for cellulose digestion in vitro[J]. *Journal of Animal Science*, 1958, 17:559-568.
- [4] FROETSCH M A, MARTIN A C, AMOS H E, et al. Effects of zinc sulfate concentration and feeding frequency on ruminal protozoal numbers, fermentation patterns and amino acid passage in steers[J]. *Journal of Animal Science*, 1990, 68(9):2874-2884.
- [5] BATEMAN J, WILLIAMS C C, HUANG Y H, et al. Effects of supplemental zinc in high quality diets on ruminal fermentation and degradation of urea in vitro and in vivo[J]. *The Professional Animal Scientist*, 2002, 18(4):363-367.
- [6] 王之盛,况应谷,任守国,等. 纳米氧化锌对仔猪生产性能和粪便微生物群落的影响[J]. *中国畜牧杂志*,2006,42(9):22-24.
- [7] 田丽娜,朱风华,任慧英,等. 纳米氧化锌对肉仔鸡抗氧化性能的影响[J]. *动物营养学报*,2009,21(4):534-539.
- [8] MENKE K H, STEINGASS H. Estimation of the energetic feed value obtained from chemical analysis and in vitro gas production using rumen fluid [J]. *Animal Research and Development*, 1988, 28:7-55.
- [9] 冯宗慈,高民. 通过比色法测定瘤胃液氨氮含量方法的改进[J]. *内蒙古畜牧科学*,1993,4:40-41.
- [10] ZINN R A, OWENS F N. A rapid procedure for purine measurement and its use for estimating net ruminal protein synthesis[J]. *Canadian Journal of Animal Science*, 1986, 66:157-166.
- [11] MAKKAR H P S, BECKER K. Purine quantification in digesta from ruminants by spectrophotometric and HPLC methods[J]. *British Journal of Nutrition*, 1999, 81:107-112.
- [12] 杨胜. 饲料分析及饲料质量检测技术[M]. 北京:北京农业大学出版社,1991:17-28.
- [13] BROWN M S, PONCE C H, PULIKANTI R, et al. Adaptation of beef cattle to high-concentrate diets: performance and ruminal metabolism[J]. *Journal of Animal Science*, 2006, 84:E25-E33.
- [14] CALSAMIGLIA S, FERRET A, DEVANT M, et al. Effects of pH and pH fluctuations on microbial fermentation and nutrient flow from a dual-flow continuous culture system[J]. *Journal of Dairy Science*, 2002, 85(3):574-579.
- [15] ARELOVICH H M, OWENS F N, HORN G W, et al. Effects of supplemental zinc and manganese on ruminal fermentation, forage intake, and digestion by cattle fed prairie hay and urea [J]. *Journal of Animal Science*, 2000, 78(11):2972-2979.
- [16] ALLISON M N, SMITH R H. Biosynthesis of amino acids by ruminal microorganisms[J]. *Journal of Animal Science*, 1967, 29:797-807.
- [17] ZEREBCOV P I, NABIEV N H. Effect of different amounts of Zn on N and carbohydrate metabolism in the rumen of cattle[J]. *Nutrition Abstract Research*, 1971, 41:130.
- [18] ARELOVICH H M, LABORDE H E, AMELA M I, et al. Effects of dietary addition of zinc and (or) monensin on performance, rumen fermentation and digesta kinetics in beef cattle[J]. *Spanish Journal of Agricultural Research*, 2008, 6(3):362-372.
- [19] KENNEDY D W, CRAIG W M, SOUTHERN L L, et al. Ruminal distribution of zinc in steers fed a polysaccharide complex or zinc oxide[J]. *Journal of Animal Science*, 1993, 71(5):1281.
- [20] 张吉鹏,邹庆华,钟小军. 稻草添补矮象草体外发酵组合效应的综合评定研究[J]. *中国畜牧杂志*,2008,44(21):38-41.
- [21] 匡伟,郭玉华,尹召华,等. 利用体位法研究不同水平维生素A对奶牛瘤胃内环境参数的影响[J]. *动物营养学报*,2006,18(3):197-202.
- [22] BATEMAN H G, WILLIAMS C C, GANTT D T, et al. Effects of zinc and sodium monensin on ruminal degradation of lysine-HCl and liquid 2-hydroxy-4-methylthiobutanoic acid[J]. *Journal of Dairy Science*, 2004, 87(8):2571-2577.
- [23] 王峰,莫放,黄应祥,等. 肉牛日粮补锌对粗料纤维和玉米有机物瘤胃降解的影响[J]. *中国草食动物*,2008,28(6):10-14.
- [24] 田丽娜,姜建阳,朱风华,等. 纳米氧化锌对肉鸡生长性能和屠宰性能的影响[J]. *中国农学通报*,2009,25(2):1-5.
- [25] SPEARS J W, SCHLEGEL P, SEAL M C, et al. Bioavailability of zinc from zinc sulfate and different organic zinc sources and their effects on ruminal volatile fatty acid proportions[J]. *Livestock Production Science*, 2004, 90:211-217.
- [1] 王文娟,万发春,杨维仁,宋恩亮,刘晓牧,谭秀文,刘桂芬. 瘤胃灌注大豆小肽对肉牛瘤胃发酵的影响[J]. *动物营养学报*, 2011,23(08): 1324-1331
- [2] 李兴伟,薛白,王之盛,徐世晓,王基恒,李占锋. 羧氨缩合尿素的营养价值评价[J]. *动物营养学报*, 2011,23(07): 1239-1246
- [3] 张莹,郭旭生,龙瑞军,周建伟,朱玉环,米见对. 饲料粮水平对牦牛瘤胃发酵及营养物质消化代谢特征的影响[J]. *动物营养学报*, 2011,23(06): 956-964
- [4] 曹秀青,刘立成,任燕锋,刘大森. 饲料相同亚油酸水平下不同植物油对绵羊瘤胃发酵和微生物酶活性的影响[J]. *动物营养学报*, 2011,23(05): 748-754
- [5] 刘彩娟,孙满吉,孙金艳,吕文龙,刘薇,单安山,张永根. 饲料中添加复合益生菌对奶牛瘤胃发酵及纤维素酶活的影响[J]. *动物营养学报*, 2011,23(05): 821-827
- [6] 吕文龙^{1,2}, 李杰^{1*}, 刘彩娟¹, 任燕锋¹. 益生菌与石灰复合处理玉米秸秆对东北细毛羊瘤胃发酵的影响[J]. *动物营养学报*, 2011,23(02): 316-321
- [7] 王洪荣,郝志敏,李世霞,秦韬,王梦芝. 植物次生代谢产物对瘤胃发酵调控的研究进展[J]. *动物营养学报*, 2010,22(06): 1471-1476
- [8] 冯志华^{1,2}, 高艳霞¹, 李建国^{1*}. 皂苷调控反刍动物瘤胃发酵和生产性能的研究进展[J]. *动物营养学报*, 2010,22(06): 1515-1522

- [9] 曾银, 贺鸣, 曹志军, 李胜利*. 全混合日粮中粗饲料长度对奶牛咀嚼行为和瘤胃发酵的影响[J]. 动物营养学报, 2010,22(06): 1571-1578
- [10] 张倩, 夏建民, 李胜利*, 曹志军. 不同比例压块秸秆与羊草组成粗饲料对奶牛瘤胃发酵和生产性能的影响[J]. 动物营养学报, 2010,22(02): 474-480
- [11] 王建平^{1,2,3}, 王加启^{2*}, 卜登攀², 霍小凯², 郭同军². 高温条件下高产和中产奶牛产奶性能及瘤胃发酵的研究[J]. 动物营养学报, 2010,22(01): 51-56
- [12] 云强, 刁其玉*, 屠焰, 周怿. 开食料中粗蛋白质水平对荷斯坦犊牛瘤胃发育的影响[J]. 动物营养学报, 2010,22(01): 57-62
- [13] 杨红建¹, 黎大洪², 谢春元², 岳群². 阿魏酸酯酶处理对羊草、玉米秸、稻秸及麦秸瘤胃体外发酵特性的影响[J]. 动物营养学报, 2010,22(01): 207-211
- [14] 袁章琴^{1,2}, 谭支良^{1*}, 沈辰辰³. 烷基多糖苷添加水平对山羊瘤胃发酵特性的影响[J]. 动物营养学报, 2009,21(06): 872-877
- [15] 田丽娜, 朱风华, 任慧英, 姜建阳, 李文立*. 纳米氧化锌对肉仔鸡抗氧化性能的影响[J]. 动物营养学报, 2009,21(04): 534-539