

Effects of dietary acetic and propionic acid supplementation on performance of weaning Nubian goats at different environmental temperatures

Aswah Ridhowi¹, Liang Chou Hsia¹, Jai-Wei Lee¹

¹Department of Tropical Agriculture and International Cooperation
National Pingtung University of Science and Technology
No 1. Shuefu Road, Neipu, Pingtung Country 912, Taiwan, ROC

Abstract

The purpose of this experiment was to investigate the effects of acetic and propionic acid supplementation in the diet on growth performance of weaning goats under different environmental temperatures. Thirty female Nubian weaning goats used in this experiment were randomly allocated to 3 group diets (control group, 1.5% acetic acid, and 1.5% propionic acid) × 2 ambient temperatures (controlled temperature and high temperature) treatments, with 5 goats per treatment. Each goat pen was equipped with a feed trough and a water bowl, and feed and water were provided *ad libitum* for 24 weeks. The temperature in the high temperature group was 30°C, and in the controlled temperature group the temperature was reduced from 30°C to 24°C by two degrees per two weeks. The results of the experiment showed that acetic acid supplementation tended to increase feed intake and weight gain in 19 - 24 weeks. While propionic acid tended to increase weight gain and feed efficiency ($P < 0.01$) in 7 -12 week. Raising goats at controlled temperature resulted higher feed intake in all weeks during 6 months experiment, however, the feed efficiency was lower compared with high temperature. There was interaction between acetic and propionic acid with temperature on feed intake, weight gain and feed efficiency.

Keywords: Acetic acid, propionic acid, Nubian, feed intake, weight gain, feed efficiency

Liang Chou Hsia
林忠序

References

- Amstrong, D.G., and K.L. Blaxter. 1957. The utilization of acetic, propionic and butyric acids by fattening sheep. *Br. J. Nutr.* 11: 413 – 425.
- Anil, M.H., J.N. Mbanya, H.W. Symonds, and J.M. Forbes. 1993. Response in the voluntary intake of hay or silage by lactating cows to intraruminal infusions of sodium acetate or sodium propionate, the tonicity of rumen fluid or rumen distension. *Br. J. Nutr.* 69:699-712.
- Elliot, J.M. D.E. Hogue, G.S. Mers, and J.K. Loosli. 1965. Effect of acetate and propionate on the utilization of energy by growing-fattening lambs. *J. Nutr.* 87: 233-238.
- Farmingham, D.A.H., and C.C. Whyte. The role of propionate and acetate in the control of food intake in sheep. *Br. J. Ntr.* 70:37-46.
- Forbes, J.M., J.N. Mbanya, and M.H. Anil. 1992. Effect of intraruminal infusions of sodium acetate and sodium chloride on silage intake by lactating cows. *Appetite.* 19:293-302.
- Fujihara, T., M. Sakaguchi, and S.A. Abdulrazak. 2002. The effect of ruminal infusion of acetic and propionic acid on eating and rumination behavior in sheep fed low quality hay. *J. Anim. Feed Sci.* 11:79-90.
- Gerlach, K., J.L.P. Daniel, C.C. Jobim, and L.G. Nusio. 2021. A data analysis on the effect of acetic acid on dry matter intake in dairy cattle. *Anim. Feed Sci. Technol.* 27: 1-7
- Holter, J.B., L.A. Jones, N.F. Colovos, and W.E. Urban. 1972. Caloric value of acetate and propionate for lactating dairy cows. *J. Dairy Sci.* 55:1757-1762.
- Hurtaud, C., and H. Rulquin. 1993. Effect of infused volatile fatty acid and caseinate on milk composition and coagulation in dairy cows. *J. Dairy Sci.* 76:3011-3020.
- Laura, B.G.D., and M.S. Allen. 2018. Effects of acetic acid or sodium acetate infused into the rumen or abomasum on feeding behavior and metabolic response of cows in the postpartum period. *J. Dairy Sci.* 101:1–11.
- Maldini, G., and M.S. Allen. 2019. Effects of rate and amount of propionic acid infused into the rumen on feeding behavior of Holstein cows in the postpartum period. *J. Dairy Sci.* 102:8120–8126.
- Miettinen, H., and P. Huhtanen. 1998. Effect of the ratio of ruminal propionate to butyrate on milk yield and blood metabolites in dairy cows. *J. Dairy Sci.* 79:851-861.
- Oba M., and M.S. Allen. 2003. Intraruminal infusion of propionate alters feeding behavior and decreases energy intake of lactating dairy cows. *J. Nutr.* 133:1094–1099.
- Orskov, E.R., W.P. Flatt, P.M. Moe, and A.W. Munson. 1969. The influence of ruminal infusion of volatile fatty acids on milk yield and composition and on energy utilization by lactating cows. *Br. J. Nutr.* 23: 443-453.
- Papas, A., and E.E. Hatfield. 1978. Effect of oral and abomasal administration of volatile fatty acids on voluntary feed intake of growing lambs. *J. Anim. Sci.* 46.1:188-297.
- Quigley, J.D., and R.N. Heitmann. 1991. Effect of propionate infusion and dietary energy on dry matter intake in sheep. *J. Anim. Sci.* 69:1178-1187.
- Senel, S.H., and F.G. Owen. 1966. Relation of dietary acetic and butyric acids to intake, digestibility, lactation performance, ruminal and blood level of certain metabolites. *J. Dairy Sci.* 50:327-333.
- Sheperd, A. C., and D. K. Combs. 1998. Long-term effects of acetate and propionate on voluntary feed intake by midlactation cows. *J. Dairy Sci.* 81.8: 2240-2250.
- Stocks, S.E., and M.S. Allen. 2012. Hypophagic effects of propionate increase with elevated hepatic acetyl coenzyme A concentration for cows in the early postpartum period. *J. Dairy Sci.* 95:3259–3268.
- Yohe, T.T., H. Schramm, R.R. White, M.D. Hanigan, C.L.M. Parsons, and H.L.M. Tucker. 2019. Form of calf diet and the rumen. II: impact on volatile fatty acid absorption. *J. Dairy Sci.* 102:8502–8512.