Effect of oxalic acid on ruminal function and microbiota in sheep fed a low quality diet

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Abstract. Oxalic acid is a potentially toxic compound present in many plants that can be consumed by ruminants in some less-favoured areas. However, its consequences on the ruminal function and microbiota remain unclear. To investigate those effects, five ewes fitted with a ruminal cannula and receiving low quality grass hay, were daily dosed 0.6 mmol of oxalic acid/kg body weight, through the cannula, for 14 days. On days 0 (before the start), 4, 7 and 14 of administration, alfalfa hay and barley straw were in situ incubated, and samples of rumen digesta were collected throughout the day (0, 3, 6 and 9 h after morning meal). The rumen bacterial community was studied using the terminal restriction fragment length polymorphism (T-RFLP) technique. Oxalic acid administration reduced the dry matter disappearance of alfalfa on days 7 and 14, and that of straw on day 7. Neither pH values nor total volatile fatty acid concentrations were affected. Nevertheless, ammonia and butyrate concentrations were reduced and molar proportions of acetic and propionic acids were increased. Although oxalic acid did not modify rumen bacterial diversity, it altered the structure of the community and the relative frequencies of a number of TR-fragments over the total peak area. Most of these changes, however, were reversed at the end of the experiment. Therefore, despite the slight negative effect on ruminal degradation, the lack of a clear detrimental effect on rumen fermentation and the recovery of the initial values in some parameters suggest an adaptation of the ruminal microbiota within 2 weeks.

Keywords. Oxalate, rumen fermentation, secondary compound, T-RFLP.
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