THE ROLE OF PLANT LIPASES IN THE BOVINE RUMEN

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ABSTRACT

The role of plant lipases in the hydrolysis of dietary lipids in the rumen of pasture-fed ruminants has been investigated by means of *in vitro* and *in vivo* experiments with rumen contents. Lipases present in the leaves of numerous pasture plants remained highly active for at least 5h in the presence of actively metabolising rumen microorganisms, leading to the hydrolysis of triglyceride. Parallel experiments showed that the lipase activity of actively metabolising rumen microorganisms in rumen fluid was very low. A slight increase in lipase activity attributable to microorganisms occurred after about a 4h incubation with autoclaved plant extract at which stage the metabolic activity of the microbial population had passed its peak.

In vivo experiments showed that the lipolytic activity of rumen fluid obtained 0.5h to 5.0h after feeding fresh grass was about twice that of rumen fluid obtained after overnight fasting.

Lipase activity was present in clarified rumen fluid. Paired-feeding experiments with monozygotic twin cows demonstrated that the lipase activity of clarified rumen fluid prepared from the twin 0.5h after feeding fresh pasture was much higher than that of clarified rumen fluid from the 20h-fasted twin.

Further paired-feeding experiments showed that lipase activity was higher in protozoa-free rumen fluid from the pasture-fed than from the hay-fed cow. In both treatments the highest levels of lipolytic activity were observed in the rumen samples removed 0.5h after feeding and there was a steady decline in activity over the sampling periods.

Nevertheless, there was appreciable activity in the rumen samples obtained from the hay-fed animal which is consistent with the presence of lipase activity in the extracts of dried grass.

Multiple forms of plant esterases and phosphatases were present in the soluble fraction of rumen fluid several hours after feeding.

It is concluded that the rapid release of fatty acids which follows the ingestion of pasture is due mainly to the activity of plant lipases and that rumen microorganisms have a subsidiary role in hydrolysing ingested lipid in a pasture-fed ruminant.

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