Role of Grazing Cattle on Seed Dispersal of Plants in a Hill Pasture 2. Effects of Ruminal Digestion on Seed Germinability of Five Plant Species

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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

Role of grazing cattle on seed dispersal of plants in a hill pasture 2 . effects of ruminal digestion on seed germinability of five plant species

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Key words : abomasum , digestion , microbial attachment , rumen , seed dispersal

Introduction Plant seeds , after ingested by grazing herbivores , are exposed to gastro-intestinal digestion . While there have been reports on the change of germination rate of plant seeds by passage in the alimentary tract (*e .g* . , Ocumpaugh and Swakon , 1993) , there is still scarce information on the effects of ruminal (microbial) and abomasum (enzymatic) digestion on seed germinability of herbaceous plants . The aim of this study was to examine how the ruminal and abomasal digestion affect seed germinability of 5 major plant species common to Japanese hill pastures .

Materials and methods A hundred mature seeds of *Dactylis glomerata* , *Trifolium repens* , *Zoysia japonica* , *Anthoxanthum odoratum* and *Carex albata* were exposed to a two-stage *in vitro* digestion technique (Tilley and Terry , 1963) . To simulate ruminal digestion (step I) , the seeds were incubated with grass hay in dilute ruminal inoculum (20% of strained ruminal fluid collected from a single dairy cattle fed grass silage and 80% of mineral buffer solution) under anaerobic condition for 24 or 48 hrs . To simulate post-ruminal digestion (step II) seeds were incubated for 8 hrs in 0 .2% Pepsin-HCl solution . After these treatments , germination rate of control and treated seeds were measured according to methods described in the previous study (Obara *et al* . , 2008) . Seed surface characteristics were observed by using a scanning electronic microscopy (SEM) .

Results and discussion Germination rate of *D . glomerata* , *Z . japonica* , *A . odoratum* and *T . repens* significantly decreased by the combination of step I and II , and 48 hrs incubation at step I ($P<0.05$) (Figure 1) . In contrast , significantly greater germination rates were observed for longer incubation times in *C . albata* seeds . There may be some factors which promote the germinability of *C . albata* seeds in the rumen and abomasums , such as acidic and enzymatic seed sacrification . From SEM we observed few ruminal bacteria attached to the surface of *C . albata* seeds whereas attachments to the surface of the other 4 plant seeds were numerous . This indicates that seed surface of *C . albata* is resistant to microbial digestion while post-ruminal digestion may contribute to increasing germinability .

Conclusions Our results indicate that ruminal and abomasal retention promotes germinability of *C . albata* seeds . Seed surface characteristics that inhibit microbial attachment in the rumen probably have a important role promoting ruminant dispersal of *C . albata* seeds via the gastro-intestinal tract .

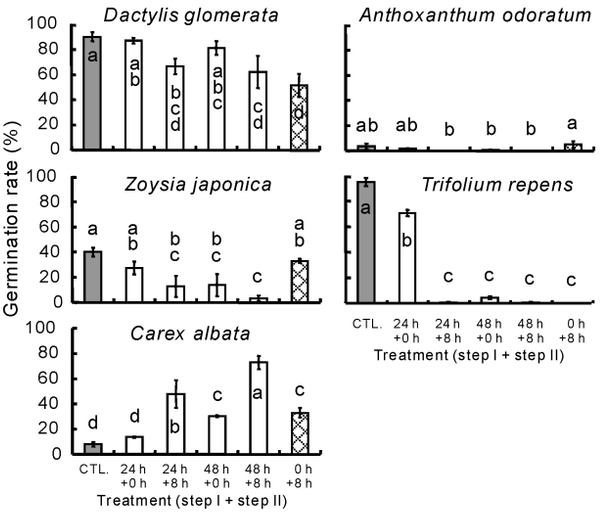

Figure 1 *Germination rate of the seed from 5 plant species post* in vitro *ruminal (step I) and pepsin/HCl (step II) digestion .*
Mean values with different letters differ ($P<0.05$, Tukey's test) .

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