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## Role of grazing cattle on seed dispersal of plants in a hill pasture 1 . Effect of sward structure on grass seed ingestion by cattle

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**Key words :** germinability , grazing cattle , seed dispersal , seed ingestion , sward structure

**Introduction** Seed dispersal by defecation of grazing herbivores is one of the significant factors in vegetational change ( e . g . , Janzen , 1984 ; Archer and Pyke , 1991 ) . It is well known that the seeds of certain plant species are ingested by grazing herbivores and disseminated through the digestive tract . Recent studies conducted in Japanese hill pastures have shown that grazing cattle dispersed majority of seeds of monocotyledons such as *Carex albata* ( Watanabe *et al.* , 2000 ; Obara *et al.* , 2005 ) . In this paper , we examined factors affecting seed ingestion by cattle using a sward-based measurement to learn timing of seed ingestion by cattle relative to seed maturity .

### Materials and methods

**Relationship between seed maturity and the timing of seed ingestion by cattle** A hill pasture grazed by 10 beef cattle was used in our study . Fifty seedheads of three grass species (*Anthoxanthum odoratum* , *Poa pratensis* and *C. albata*) were tagged during late spring and the frequency of defoliation by cattle were recorded at 2-5 day intervals until late June . Seed germinability ( 30 days incubation in 15°C/12 hr light and 25°C/12 hr light ) of the 3 species was also investigated by sampling of 30 seeds on each day measurements were obtained .

### Sward canopy structure of 4 monocotyledon species in their reproductive stage

Plots ( 20 cm × 20 cm each ) were located in vegetation patches where *A. odoratum* , *Agrostis alba* , *C. albata* and *P. pratensis* were dominant in the pasture , on the first day of the study . Mean height of leaf mass and seedheads were measured at 10-37 day intervals during the grazing season .

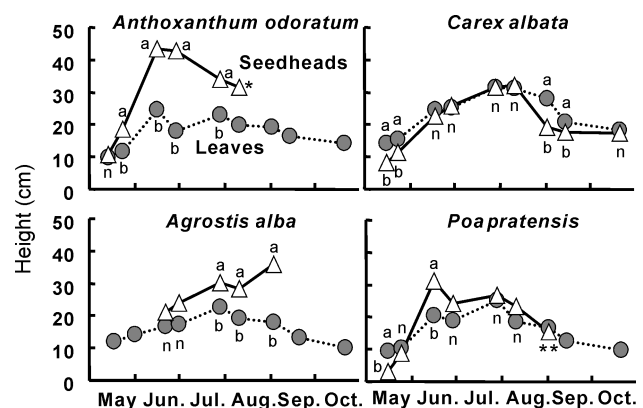
**Results and discussion** *A. odoratum* seeds were defoliated by cattle in mid-to late May , whereas in June when the seeds matured no seed consumption by cattle was observed . In contrast , the seeds of *P. pratensis* and *C. albata* were grazed after seeds were mature .

Measurements in sward canopy structure showed that , while the height of seedheads in *A. odoratum* and *A. alba* was significantly higher than that of leaves , the height of seedheads in *C. albata* and *P. pratensis* was almost same as that of leaves ( Figure 1 ) . The results suggest that it is difficult for grazing cattle to choose leaf mass over seedheads from the sward canopy structure in which both leaves and seeds are contained within a same grazing horizon , particularly if the density of tillers having seedheads is high .

**Conclusions** Plant architecture with the height of seedheads equivalent to vegetative tillers is an effective strategy for *C. albata* and *P. pratensis* to disperse the seeds via grazing animals , because the frequency of defoliation of matured seeds by animals increases .

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**Figure 1** Mean height of leaves and seedheads in the 4 monocotyledons . Values with different letter in each date represent significant difference ( Tukey's test ,  $P < 0.05$  ) . n : not significant . \* : n = 1 , \*\* : n = 2 ( seedhead data ) .