Grass eating patterns in the domestic dog, *Canis familiaris*

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Summary

Very little is known about grass eating behaviour in the domestic dog, *Canis familiaris*. This study is the first to investigate grass eating in dogs in a controlled experiment, and attempts to provide an initial understanding of this behaviour by describing the pattern of grass eating during the day and the relationship between grass eating and the ingestion of food. Twelve dogs were presented with both kikuyu and couch grass three times daily for 6 d and grass eating behaviours were observed using an all-occurrences sampling method. The results of this study suggest that grass eating is influenced by satiety and time of day. Dogs spent more time eating grass before ingestion of their kibble meal than after, and the time spent eating grass decreased throughout the day. Grass may be seen as a food source, as the subjects were less likely to eat grass when they were satiated. Couch and kikuyu grasses were equally preferred. We conclude that grass eating is a normal and common behaviour, as all dogs in this study were in good health and readily ate grass. As such, grass-eating should not be seen as a problematic behaviour for most dogs or as indicative of illness.

Keywords: *Canis familiaris*, dog, feeding behaviour, grass eating, satiety

Introduction

It has been suggested that grass eating is a common behaviour in domestic dogs (Houpt, 2005) but there is no known explanation for this behaviour (Lindsay, 2001) and there have been no experimental studies investigating grass eating in this species (Hart, 1985; UC Davis School of Veterinary Medicine Companion Animal Behavior Program, 2005). Dogs have almost no capacity to digest grass (Beaver, 1981). Nonetheless, some researchers contend that grass may influence digestion by acting as an emetic (Fox, 1965; Beaver, 1981; Hart, 1985; de Baïracli Levy, 1992; Thorne, 1995; Lindsay, 2001; Houpt, 2005), a laxative (Hart, 1985), or by providing roughage (McKeown, 1996; Houpt, 2005). There are several products that market grass as a digestive aid or dietary supplement (Organic Pet Grass Kit, ©Wheatgrasskits.com, Springville, UT; Pet Greens® and Pet Grass®, Bell Rock Growers, Inc., San Marcos, CA; Barley Dog®, Green Foods Corporation, CA). However, the claims made for these dietary supplements have not been substantiated (Lindsay, 2001).

While there are no experimental studies, Sueda et al. (2005) performed an owner-completed survey and observed no relationship between plant eating and gender, gonadal status, breed, diet or presence of intestinal parasites. The researchers concluded that plant eating evolved in wild canids and was preserved through the domestication process. While the study of Sueda et al. study provides some preliminary information about grass eating, the scientific value of the study may have been compromised by the subjective nature of its design (information was provided by multiple owners about their individual dog's eating habits). More concrete conclusions may be drawn from controlled scientific experiments.

The current study is the first to scientifically investigate grass eating behaviour in dogs in a controlled experiment. As very little is known about grass eating in dogs, the aim was to provide an initial understanding of the behaviour by determining the pattern of grass eating habits during the day as well as the relationship between grass eating and the ingestion of food.

A preliminary pilot study indicated that dogs eat a few grams of grass per eating episode and prefer to eat grass presented as entire plants growing in pots rather than as cut blades or turf (S.J. Bjone, unpublished data). This preliminary study also illuminated the difficulty of quantifying the amount of grass eaten. As grass blades are light and the pots and soil that contain the grass are heavy in comparison, it was difficult to obtain accurate measurements of the amount of grass eaten. In addition, the dogs often disrupted the grass by urinating or salivating on the grass, digging or tipping the pots. These disruptions further complicated the weighing procedure. Therefore, the method adopted for the current experiment was to measure grass eating behaviours: the amount of time spent eating grass, number of grass interactions, and vomiting events. The current study was devised to explore the following questions:

1. Is grass eating influenced by satiety?
2. Do dogs have a preference for one type of grass over another?
3. Is grass eating influenced by the time of day?

Materials and Methods

Subjects, housing and diet

Twelve mixed-breed dogs which were accustomed to kennel housing, owned by the same owner and known to eat grass (mean age ± standard error (SE) = 6.0 ± 0.3 yr) were housed at the University of New England Dog Research Facility for the duration of the study. The dogs became accustomed to the daily routine and diet during a 7 day habituation period. All dogs were fed a nutritionally complete and balanced diet (Pedigree Advance Adult Chicken®; MasterFoods ANZ, Wodonga, VIC) once daily in amounts calculated to meet maintenance energy requirements and adjusted as necessary to maintain ideal body weight. Fresh water was available *ad libitum*. Dogs were housed in compatible groups according to owner recommendations. Each indoor kennel was outfitted with a trampoline style bed within a secure, centrally-heated facility where dogs slept at night. During the day, dogs were placed in spacious, fully covered, outdoor runs.

Materials

Couch (*Cynodon dactylon*) and kikuyu (*Pennisetum clandestinum*) grasses were used in the study because dogs are known to eat couch grass as its "dog grass" nickname indicates (de Baïracli Levy, 1992), and kikuyu was readily available locally. The grasses were grown in 20 cm pots in a greenhouse.

Ethics

All procedures were undertaken in accordance with the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (National Health and Medical Research Council, 1997). All dogs were privately owned, and written permission was obtained from the owner for the inclusion of the animals in the study. Animals received the highest standard of care throughout the study, in accordance with UNE Animal Ethics Committee guidelines. In addition, a veterinarian assessed each dog to ensure it was healthy and fit to participate in the study. All dogs were returned to the owner at the end of the study.

Procedure

Dogs were observed in compatible groups (*n* = 3) during three 10 minute testing sessions (morning, noon and afternoon at approximately 0900, 1200 and 1500 h) per day for 6 d. Groups were presented with two pots of both kikuyu and couch grass and all occurrences of each behaviour (Table 1) were recorded by the experimenter (SB) from the adjoining kennel (Altmann, 1974). A mini-DV camera also recorded each session for further analysis. The daily feeding time was rotated through the testing session time slots every 2 d. Therefore, the dogs were fed during the morning session for the first two consecutive days, the noon session for next 2 d and the afternoon session for the remaining two testing days. During the sessions in which the dogs were fed, two groups were observed before ingestion of food and two groups were observed after their meal. Group order within testing sessions was determined using a balanced Latin-square design.

Table 1. Behaviours recorded during testing sessions and their definitions. Behaviours marked with an asterisk (*) were recorded for both couch and kikuyu grasses.

Behaviour	Definition
Time spent eating grass*.	A dog chewed and swallowed grass .
Number of grass eating events*.	An event encompassed the dog ingesting grass until it stopped chewing, lifted its head or moved to a new position.
Number of grass interactions*.	Any interaction with the grass which did not entail ingestion or urination.
Number of vomiting events.	A dog vomited.

Statistical Analysis

The total number of grass eating events, grass interactions and vomiting events and the total time spent eating grass for each dog was analysed using a within-subjects repeated measures ANOVA (Tabachnick and Fidell, 2001). A 2 × 2 ANOVA was used to analyse the differences in the behaviours for each grass type before and after the ingestion of food and a 2 × 3 ANOVA was used to analyse the differences in the behaviours for each grass type between the morning, noon and afternoon periods. Repeated measures ANOVA was used to analyse behaviours that did not specifically relate to a grass type.

Significance levels were set at α = 0.05 unless otherwise noted. The strength of association was represented by partial eta-squared, pη2 (Tabachnick and Fidell, 2001; Levine and Hullett, 2002). If sphericity could not be assumed for a repeated measures ANOVA, Greenhouse–Geisser values were used and the p-value was labelled with a "G–G" (Tabachnick and Fidell, 2001). There was a severe violation of the homogeneity of variances assumption for the amount of time spent eating grass and a moderate violation for the number of grass eating events for data obtained before and after the ingestion of food. Therefore, more stringent alphas of 0.01 and 0.025, respectively, were chosen rather than interpreting transformed data (Tabachnick and Fidell, 2001).

Results

The results were consistent with a preliminary study of the dogs' normal grass eating habits in their home kennel environment. All dogs were observed eating grass with a total of 709 grass eating events across all 12 dogs and all 18 testing sessions. Each dog spent an average of 1.1 min (SE = 0.06 min) eating grass during an average of 3.3 grass eating events (SE = 0.2) per 10 min testing session, totalling 3.3 min (SE = 0.2 min) spent eating grass during 9.9 grass eating events (SE = 0.6) per d.

Grass Eating and Ingestion of Food

The dogs spent significantly more time (P = 0.001, $p\eta^2$ = 0.67) eating grass before ingestion of the daily kibble meal than after the meal (Table 2; Figure 1). There was no significant difference between the amount of time spent eating the two grasses (P = 0.74) and no significant grass and time interaction (P = 0.30). A small to medium positive Pearson correlation (Cohen, 1988) was present between the amount of time spent eating grass and the number of hours since the last kibble meal ($r_{(214)}$ = 0.23, P = 0.001).

Similarly, there were significantly more grass eating events before than after the kibble meal (P = 0.001, $p\eta^2$ = 0.63; Table 2, Figure 2). There was no significant difference between the types of grass (P = 0.11) and no significant interaction effect (P = 0.58). There were also no significant differences in the number of interactions before or after the meal (P = 0.953) or for grass type (P = 0.422) and there was no significant interaction effect (P = 0.180).

Although vomiting has been linked with the ingestion of grass, there were only five vomiting events involving three dogs across all 18 testing sessions. All of the vomiting events occurred during testing sessions in which dogs were also fed, and all events were by dogs presented with grass before ingesting the kibble diet. Three of the events occurred in the morning and two occurred in the afternoon.

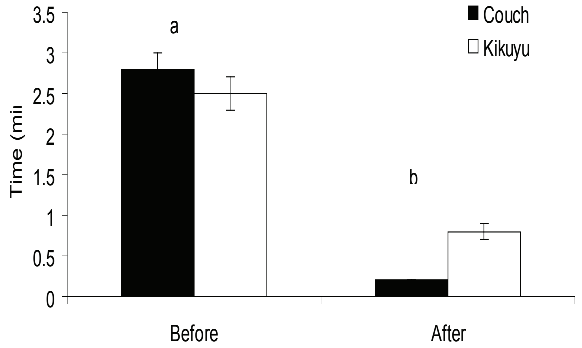

Figure 1. The time spent eating couch and kikuyu grass before and after the ingestion of the kibble meal. Different superscript letters indicate significant differences.

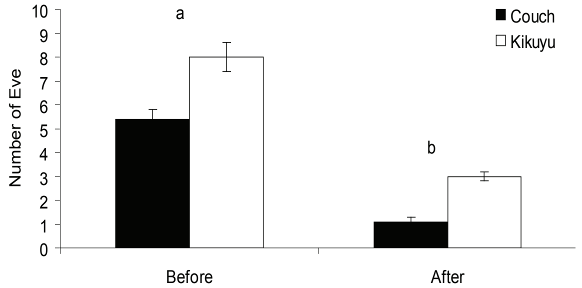

Figure 2. The number of couch and kikuyu eating events before and after the ingestion of the kibble meal. Different superscript letters indicate significant differences.

Table 2. Mean and standard error values for significant statistics. *Grass* represents the total of the couch and kikuyu grasses. Different superscript letters indicate significant differences.

Behaviour	Test statistics	Before meal	After meal				
Time spent eating grass (min)	F(1,11) = 22.71 P = 0.001; pη2=0.67	2.67 ± 0.53[a]	0.53 ± 0.14[b]				
Number of grass eating events	F(1,11) = 18.45 P = 0.001; pη2=0.63	6.68 ± 1.42[a]	2.04 ± 0.57[b]				
		Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**
Time spent eating grass (min)	F(5,55) = 2.48; P = 0.042; pη2 = 0.18	4.14 ± 0.23[a]	3.65 ± 0.25[ab]	2.32 ± 0.20[b]	2.46 ± 0.19[ab]	3.00 ± 0.26[ab]	4.13 ± 0.28[a]
		Morning	**Noon**	**Afternoon**			
Time spent eating grass (min)	F(2,22) = 9.17; G–G P = 0.006; pη2 = 0.46	4.45 ± 0.91[a]	3.26 ± 0.72[a]	2.15 ± 0.53[b]			
Number of grass eating events	F(2,22) = 12.84 G–G P = 0.002; pη2 = 0.54	13.73 ± 2.94[a]	8.92 ± 1.83[b]	6.92 ± 1.60[b]			

Daily Pattern of Grass Eating

The dogs spent significantly less time (G–G P = 0.006, $p\eta^2 = 0.46$) eating grass during the afternoon than the morning and noon testing sessions (Table 2, Figure 3), and there was no significant difference between the two grasses (P = 0.49) and no significant grass-by-time interaction (P = 0.30). The amount of time spent eating grass did differ slightly across the six testing days (P = 0.042, $p\eta^2 = 0.18$): the dogs spent more time eating grass on Days 1 and 6, the first and last days of testing, compared to Day 3 (Table **2**). There was no significant difference between grass types (P = 0.49) and no significant day-by-grass interaction (G–G P = 0.56).

The number of grass eating events followed a similar pattern to that for grass eating time; there was a difference between the time of day (G–G P = 0.002, $p\eta^2 = 0.54$), and there was no difference between the grasses (P = 0.40) and no significant interaction effect (G–G P = 0.19). However, there were significantly more grass eating events during the morning testing sessions than during the noon and afternoon sessions (Table 2, Figure 4).

The number of interactions were not significantly different across time of day (P = 0.72) or grass type (P = 0.72) and there was no significant interaction effect (P = 0.81).

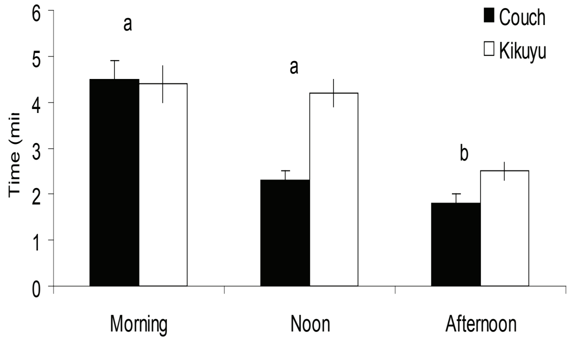

Figure 3. The time spent eating couch and kikuyu grass during the morning, noon and afternoon sessions. Different superscript letters indicate significant differences.

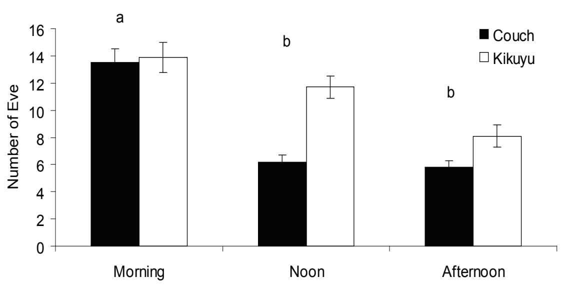

Figure 4. The number of couch and kikuyu eating events during the morning, noon and afternoon sessions. Different superscript letters indicate significant differences.

Discussion

While there are few references to grass eating in domestic dogs in the literature, anecdotal information suggests that couch grass is the grass of choice for dogs (de Baïracli Levy, 1992; Engel, 2002). However, the results of the current study do not support this theory: the dogs did not demonstrate a statistically significant preference for eating either couch or kikuyu grass. This was evident at all levels of the study: around mealtime, throughout the day and across the six testing days.

Many of the theories about grass eating involve digestion (Hart, 1985; de Baïracli Levy, 1992; Overall, 1997; Lindsay, 2001; Engel, 2002). All dogs participating in the current study passed a veterinary health check, and all dogs were dewormed and did not have any known digestive problems. However, in spite of the prevalent digestion theories, all of the subjects ate grass, spending an average of 3.3 min (SE = 0.2 min) eating grass per day. The current study also deflates the theory that dogs eat grass as an emetic as there were only five vomiting events for 709 grass eating events across all 12 dogs and all 18 testing sessions (similar to the results of Sueda et al., 2005).

Grass eating was influenced by time of day. The amount of time spent eating grass decreased throughout the day with less time spent eating grass in the afternoon than morning or noon. It is unlikely that the decrease in grass eating as the day progressed was related to an overall habituation effect as the dogs spent similar amounts of time eating grass at the beginning and end of the trial.

However, satiety may have influenced this grass eating pattern. Possibly, by the afternoon testing session the dogs had their fill of grass and were no longer interested in eating more. As the dogs had already ingested their kibble diet before the afternoon session for 4 of the 6 testing days, they may not have been hungry during these later sessions.

Further support for the effects of satiety on grass eating is evident from results showing that the dogs spent significantly more time eating grass before they ingested their kibble meal than after the meal. Similarly, the correlation between the amounts of time spent eating grass and the number of hours since the last kibble meal also supports the concept that the longer the time sincethe last kibble meal, i.e., the hungrier the dogs are, the more time they will spend eating grass.

The current study endeavoured to provide an initial understanding of grass eating behaviour in dogs by determining the pattern of grass eating during the day and the relationship between grass eating and the ingestion of food. Further studies are currently underway to investigate other aspects of grass eating behaviour in dogs such as its relationship with worm burdens and the development of the behaviour in puppies.

Conclusions

The results of this study suggest that grass eating is influenced by satiety and time of day. As the day progressed, the dogs spent less time eating grass. While the dogs showed no preference for couch or kikuyu grasses, dogs may see grass as a food source and are more likely to eat grass if they are hungry, i.e., before ingesting their regular diet. Grass eating is a normal and common behaviour and should not be seen as a problematic behaviour for most dogs.

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