Folia Zool. – 52(1): 36–38 (2003)

Homogeneity of individual pellets in pellet groups: an important condition in herbivores' diet analyses

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Received 5 March 2002; Accepted 12 September 2002

A b s t r a c t . Differences in weight, nitrogen content and diaminopimelic acid (DAPA) content between individual pellets within pellet groups were assessed in red-deer (*Cervus elaphus*) faeces. Mean pellet weight in winter varied between pellet groups in 82% of cases. A 10 pellet subsample movided a 100% likelihood of getting a representative sample whereas 5 pellet subsample a 99.75% likelihood. Between pellet variations in nitrogen content, within a pellet group were smaller and not greater than experimental error. However, DAPA content varied greatly within pellet groups.

Key words: deer, faeces, faecal indicators, faecal nitrogen, DAPA

Introduction

Faecal remains are important and often the only material available for examining the food of free-ranging ruminants. Using the faeces, it is possible to identify population densities (D o b i á š et al. 1996), diet composition (B e i e r 1987, d e J o n g et al. 1995) and, if selected indicators are applied, even to estimate the nutritive value of the food (L e s l i e & S t a r k e y 1985, L e s l i e et al. 1989, H o d g m a n et al. 1996). Because of the limited availability of fresh faeces samples as well as the costs and time needed to analyse them, researchers resort to using a limited number of mixed samples to address these issues. One pellet is as a rule taken from each pellet group; the mixed sample from more pellet groups is then homogenised and analysed. However, such a method of preparing samples can lead to quantitative and qualitative bias in the results (individual pellets may have different weights and there may be a different nutrient content in the pellets from one pellet group). J e n k s et al. (1989) studied these issues by examining the differences in nitrogen content in the faeces of white-tailed deer (*Odocoileus virginianus*) between mixed samples and the mean for the individual analyses. Their results proved the similarity of the results of analyses of individual samples and analyses of mixed samples. The aim of the present study to find whether there are any differences in weight and in the levels of nitrogen and DAPA (diaminopimelic acid) in different pellets within one pellet group in red-deer faeces.

Material and Methods

Pellet weight was examined only in the winter season when the faeces had a solid consistence and were stable in terms of shape. We took 50 pellets from each of ten pellet groups. They were dried to a constant dry matter level and the individual pellets were weighed. We tested the differences in the average weight of one pellet within one pellet group and within 5 and/or

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10 subgroups under each of the pellet groups. For DAPA and nitrogen content analyses, 5 pellet groups of fresh faeces were collected during the growing season and 5 in winter. From each pellet group, we selected 5 pellets and dried them in a ventilated drier at 60 °C. The dried samples were ground through a 1 mm mesh size. N content was determined by the standard Kjeldahl method, and DAPA content was measured, after hydrolysis at 145 °C for 4 hours in HCl (c = 6 mol/l), using the AAA 400 automated amino acid analyser (INGOS Praha). A control set comprised 10 samples where N and DAPA were each determined twice.

Variations in N and DAPA levels in individual pellets within a pellet group (10 combinations) were examined. The differences between the two values of parallel determination for the control were treated as casual (ascribed to homogenisation and to the tolerance of the instrument) and we used them as a measure for assessing the variability of the values within individual pellet groups.

Variation in mean weight and in mean N and DAPA content were tested using one-way analysis of variance (ANOVA) and then using the Bonferroni or Games-Howell post hoc tests, depending on the Levenes statistics (homogeneity). Differences in the weight of pellets between the individual pellet groups and between groups of 10 samples from one pellet group were tested by ANOVA and the Bonferroni post hoc test, respectively (the data were homogeneous). Pellet weight data distribution was not ideal and was therefore transformed ($y=ln(x)$).

Results and Discussion

In all pellet groups, the weight of individual pellets ranged from 0.26 to 0.85 g. Within a pellet group, the standard deviation was 6.8–12.5% of the mean (Fig. 1). Between individual pellet groups (n=10), pellet weight varied significantly ($P<0.05$) in 36 cases of the 45 combinations compared.

The variance of the weight pellet within each of 5 sub-sample with 10 pellets was found to be homogenous ($P>0.05$). No differences were found in the mean weight of pellets for the 100 sub-sample combinations compared ($P>0.05$). Within D 10 sub-samples with 5 pellets, the homogeneity in data of pellet weight ($P>0.05$) was recorded in 7 cases of 10. Of the 450 combinations compared, mean values for the pellets were significant in one case only.

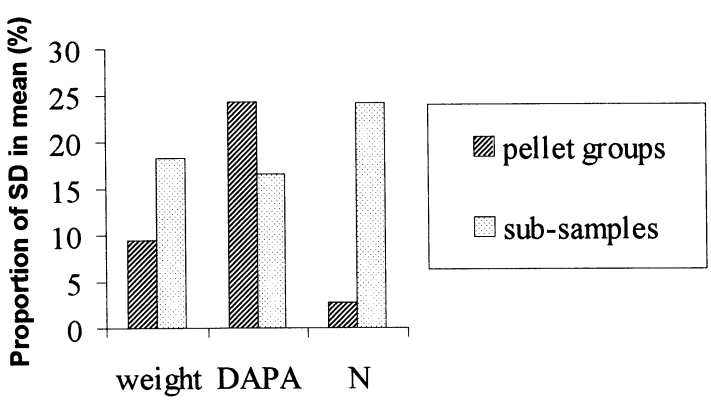

Fig. 1. Variability expresed by mean percentage of the standard deviation in the mean value of weight, DAPA and N within the pellet groups (N=10) and within sub-samples (N=50).

Mean variations in nitrogen content in individual pellets within pellet groups did not differ ($P>0.05$) from variations in the control set, except in one pellet group, where the mean variance was even smaller than in the control set ($P<0.05$). The variance among the pellets in the individual pellet groups ranged between 0.56 and 5.54% of the mean, or 0.66% in the control sample.

The mean variations in DAPA content between the individual pellets within pellet groups (SD 12–41% of the mean) were greater in all samples ($P<0.05$) than the mean variance within the control sample (SD 18% of the mean). Variability between the pellets within one pellet group was in one case even greater than that between different pellet groups (SD 17.32%). Mixed samples for food analyses cannot be based on pellet number but in terms of weight. Nitrogen content does not require a mixed sample within pellet groups, but analysis for DAPA does. It is necessary even within individual pellet groups to prepare mixed samples in order that objective results can be achieved.

A c k n o w l e d g e m e n t s

This study was supported by the Grant Agency of the Czech Republic, Grant No. 206/99/D053, and Academy of Sciences of the Czech Republic, Grant No. S 6093003.

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