Chemical composition and dry matter degradability coefficients of Fennel seed

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Introduction Fennel (*Foeniculum vulgare*), is a plant species in the genus *Foeniculum* (treated as the sole species in the genus by most botanists). It is a member of the family *Apiaceae* (formerly the *Umbelliferae*). It is a hardy, perennial, umbelliferous herb, with yellow flowers and feathery leaves. Fennel is widely cultivated, both in its native range and elsewhere, for its edible, strongly-flavoured leaves and seeds. Its aniseed flavor comes from anethole, an aromatic compound also found in anise and star anise, and its taste and aroma are similar to theirs, though usually not as strong. Seeds of the fennel plant are widely used in many of the culinary traditions of the world. There are historical anecdotes that fennel is a galactogogue improving the milk supply of a breastfeeding mother (Crellin *et al*., 1989). This use, although not supported by direct evidence, is sometimes justified by the fact that fennel is a source of phytoestrogens, which promote growth of breast tissue (Mark, 2000). The effects in animals is unclear, thus determination of these effects will be important for animals especially ruminants. The objective of this experiment was determination of DM degradability and chemical composition of Fennel seeds.

Materials and methods Samples of Fennel seed were obtained from Golchekan-Zamani factory in the Razavi Khorasan district. The samples were analyzed for dry matter (DM), crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and organic matter based on procedure described in AOAC methods (2000). Measurements of *in situ* DM were performed in 3 rumen fistulated bull cows (fed at maintenance) using the nylon bag technique (Krskov and McDonald, 1979). Nylon bags which were approximately (9×18 cm) containing 5 g (2mm screen) were incubated in the rumen of fistulated bull cows for 2, 4 ,8, 16, 24, 48, 72, 96 and 120 h. There were 4 replications per treatment. The rate and extent of DM degradation were estimated according to the equation: $P = a + b (1 - e^{-ct})$. Effective degradability (ED) was calculated according to equation: $ED = a + (b \times c)/(c + k)$, assuming an outflow rate (k) of 0.02 h-1. The data were analyzed using the ANOVA procedure of SAS (SAS Institute, 2002).

Results Degradable coefficients and ruminal disappearance of DM are summarized in Table 1. The chemical composition of fennel seed is shown in Table 2.

Table 1 *In situ* degradability coefficients disappearance (Mean with SEM) of DM of Fennel seed.

Fennel seed	
Degradation parameters	
a[1]	0.32±0.01
b[2]	0.46±0.01
c[3]	0.037±0.003
a+b[4]	0.58±0.02
Effective degradability	
k=0.02	0.62±0.03
k=0.03	0.58±0.03

[1,2,3,4] constants in the equation $P = a + b (1-e^{-ct})$ where P = level of degradation at time t; a=readily soluble fraction; b=insoluble fraction but degradable in rumen; c=rate of degradation of b per hour and a+b = potentially degradable fraction.

Table 2 Chemical composition(g/kg) of Fennel seed

	Fennel seed
Composition (%)	
DM	914±4
ADF	382±13
NDF	421±15
CP	182±11
ASH	117±2

Conclusions The crude protein and Ash contents of fennel seed, evaluated in the present study, were almost high. Rapidly and slowly degradable fractions of fennel seed for DM indicated that more than 0.58 of this feed could be digested in the rumen. High digestibility of fennel seed and high nutritional value of it shows that it can supply intermediate protein for animals.

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