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Effect of feeding diet with graded levels of energy on digestibility and dry matter intake in adult medium sized nondescript dogs

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Abstract

An experiment was conducted for 120 days with the objective to study the effect of feeding diet containing graded levels of energy on the digestibility and dry matter (DM) intake in adult medium sized (12 – 18kg body weight) nondescript dogs. Fifteen dogs were randomly allotted to the dietary treatments T1, T2 and T3 so as to have five replicate for each treatment. The experimental feeds contained graded levels of energy and was isonitrogenous for the entire feeding trial period. The three experimental diets were T1- (Control ration with 18 per cent crude protein (CP) and 3000 kcal/kg ME), T2 (Feed containing 18 per cent CP and 2700 kcal/kg ME) and T3 (Feed containing 18 per cent CP and 2400 kcal/kg ME). A digestibility trial was conducted at the end of feeding trial. The data on daily dry matter intake and digestibility trial were recorded. The average daily DM intake per kg body weight was 14.44, 15.22 and 16.91g, respectively for dogs in T1, T2 and T3 groups. The results showed that dogs belonging to T3 group was having higher (P<0.01) DM intake than those of T1 and T2 groups due to the consumption of low energy diet. Based on the results obtained in this study, diets T2 and T3 recorded reduced digestibility of DM and CP which was compensated with higher DM intake. Ether extract (EE) digestibility reduced in T3 (2400kcal ME/kg feed) diet compared with T1 (3000kcal ME/kg feed) and T2 (2700kcal ME/kg feed) diets. The digestibility variation of crude fibre (CF) was non-significant (P>0.05) among three feeds. It can be concluded that the digestibility of CF was not affected even at the level of 6.35 per cent.

Key words: *Graded levels of energy, Digestibility, Dogs*

The increasing pet-human bond has led to a high demand on the commercial pet foods for maintaining a healthy and balanced diet, especially for dogs. The pet food industry is

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maintaining a strong and steady growth and has been relatively resistant to recession for last few decades. Appropriate amount of food with adequate nutrition is essential to avoid ill health of dogs and improve their longevity (Deng and Swanson, 2015). The use of animal based and human grade products in pet foods has increased over the years. Overfeeding of pets and the resultant obesity crisis has also been observed. The energy component of the food is crucial as the food intake is mainly controlled by its energy density. Therefore, all the other nutrients in the food should be relative to the energy content. Dogs require energy for support of metabolism during maintenance, growth, reproduction, lactation and physical activity. In the absence of adequate energy, animal performance will be suboptimal, with depletion of energy and nutrient stores. High energy intake reduces the other nutrients intake and feed intake, causes obesity and other metabolic disorders and increases the feed cost. The recommended (NRC, 2006) dietary nutrient requirement of adult dogs for maintenance with sedentary activity is 95 kcal ME/kg $BW^{0.75}$, 21 per cent protein, 5.5 per cent fat, while as per Indian recommendation (ICAR, 2013), the protein (18 per cent) and fat (5 per cent) levels are lower. This work has been conducted to assess the dry matter intake and the digestibility of nutrients in the diet of medium sized adult dogs fed with diet containing graded levels of energy.

Materials and Methods

A feeding trial was conducted at Animal Nutrition and Production (ANP) shed, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy for a period of four months. Fifteen medium sized healthy adult nondescript dogs of about one to four years of age and body weight around 12 to 18 kg were selected locally. Dogs were housed individually in well ventilated, clean and dry kennel with facilities for feeding and watering. All the animals were housed under uniform management conditions. The experiment was conducted as per completely randomized design (CRD) model. The dogs were randomly allotted and fed with one of experimental feed containing graded levels of energy and isonitrogenous for the entire feeding period of four months. The data regarding chemical composition of experimental rations on dry matter basis are given in Table 1. All the animals were fed once daily *ad libitum* for twenty minutes and the feed leftover, if any, was collected and weighed after each feeding and their moisture content was analysed to calculate the dry matter intake. Individual data on quantities of feed consumed daily were recorded. A digestibility trial was conducted during the last three days of feeding trial by total collection method. The stool was collected manually as and when it was voided, uncontaminated with urine and dirt and weighed. Representative sample of faeces

Table 1: Chemical composition (DM basis)* of experimental rations, %

Parameters	Treatments		
	T1	T2	T3
Dry matter	38.23 ± 0.05	38.12 ± 0.10	37.39 ± 0.05
Crude protein	18.37 ± 0.10	18.20 ± 0.11	18.17 ± 0.03
Crude fibre	4.70 ± 0.07	5.15 ± 0.04	6.35 ± 0.10
Ether extract	12.31 ± 0.04	8.73 ± 0.14	4.06 ± 0.10
Total ash	6.36 ± 0.03	8.59 ± 0.04	9.56 ± 0.14
Nitrogen free extract	58.25 ± 0.22	59.34 ± 0.20	61.86 ± 0.14
Acid insoluble ash	1.45 ± 0.09	1.50 ± 0.03	1.67 ± 0.02
Metabolizable energy** (kcal/kg feed)	3021	2697	2358

*Mean of six values with SE, **calculated value

Table 2: Mean daily DM intake* of dogs maintained on three experimental diets, g

Treatment groups	DM intake/kg body weight Mean ± SE	DM intake/kg$^{0.75}$ body weight Mean ± SE
T1	14.44 ± 0.32	28.64 ± 0.64
T2	15.22 ±0.33	30.06 ± 0.64
T3	16.91 ± 0.56	32.51 ± 1.07

* Mean of seventeen values with SE

Table 3: Apparent digestibility coefficient of nutrients of the three experimental diets, %

Parameters	Treatments[1]			P value
	T1	T2	T3	
Dry matter	72.93±1.61^{a}	65.72±1.56^{b}	65.84±2.53^{b}	0.035*
Crude protein	79.98±1.61^{a}	72.63±1.79^{b}	73.86±1.04^{b}	0.011*
Crude fibre	30.81±4.39	26.25±3.31	33.10±4.57	0.509^{ns}
Ether extract	96.47±0.28^{a}	94.73±0.21^{a}	88.13±1.16^{b}	<0.001*
Nitrogen free extract	75.36±0.85	70.36±1.80	71.31±2.35	0.149^{ns}

[1]Mean of five values with SE, means with common superscript in rows do not differ significantly at 5% level, ns- Non significant (P>0.05), *significant (P<0.05)

was taken daily for three days after thorough mixing and placed in a double lined polythene bags, labelled and kept in deep freezer (-20°C) for further analysis. The representative samples of feed offered was also taken daily during the collection period. The feed and faecal samples collected for three days from each animal during digestibility trial were pooled, mixed thoroughly and subsamples were taken for analysis. Chemical compositions of feed and faecal sample were analysed as per methods described in Association of Official Analytical Chemists (AOAC, 2016). Digestibility coefficient of nutrients was calculated based on digestion trial data. Data obtained on different parameters during the course of experiment were subjected to statistical analysis using analysis of variance (ANOVA) (Snedecor and Cochran, 1994). Means were compared by Duncan Multiple Range Test (DMRT) using Statistical Package for Social Studies software (Version 24).

Results and Discussion

The data on the average daily dry DM intake of seventeen weeks of five animals in each group is given in Table 2. Mean DM intake per kg body weight were 14.44, 15.22 and 16.91g for T1, T2 and T3 group respectively. Mean DM intake per kg metabolic body weight were 28.64, 30.06 and 32.51g for T1, T2 and T3 group respectively. DM intake was increased in second and third group than first group animals due to low energy levels in their diet. The result obtained in this study is in agreement with Carciofi *et al.* (2009) and Sa *et al.* (2013) who observed a DMI of 16g/kg body weight in adult Beagles fed a diet containing 94 per cent DM. Tortola *et al.* (2013) reported DMI of 13.5 g per kg body weight in adult dogs consuming diet with 4897 kcal of GE/kg which was lower than the result obtained in this study.

Apparent digestibility coefficient of nutrients of the three experimental diets are given in the Table 3. There is no significant difference (P>0.05) between the three diets with regard to the digestibility of crude fibre and nitrogen free extract. The digestibility of DM and CP for the diets T2 and T3 are lower than T1. The lower ether extract digestibility for diet in T3 than T1 and T2 might be due to high fibre content in the diet. Madhusudhan *et al*. (2007) observed the mean nutrient digestibility values of 87.10 per cent for dry matter, 90.60 per cent for organic matter, 84.0 per cent for crude protein

and 94.7 per cent for ether extract in adult dogs fed with commercial diet. In agreement to the results of the present study, Forster *et al.* (2012) reported apparent digestibilities of 68.89 and 79.49 per cent for DM and CP respectively in adult dogs fed with a diet containing 14.50 per cent wheat grain and 14.83 per cent meat and bone meal. Sa *et al.* (2013) observed apparent DM and CP digestibility of 76.1 and 83.4 per cent respectively, in adult dogs fed with 20.4 per cent maize and 23.7 per cent poultry by-product meal containing diet.

Conclusion

The digestibility of DM and CP have reduced in T2 and T3 diets which was compensated with higher DM intake. Similarly, EE digestibility reduced in T3 (2400kcal ME/kg feed) diet compared with T1 (3000kcal ME/kg feed) and T2 (2700kcal ME/kg feed) diets. The digestibility variation of CF is non-significant (P>0.05) among three diets. It can be concluded that the digestibility of CF is not affected even at the level of 6.35 per cent.

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