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Use of Phytase in Canola-Based Diets and the Digestibility of Adult German Shepherder

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Abstract: Phytases produced by *Aspergillus niger* have improved the digestibility of nutriments in monogastric such as poultry, turkey and swine. However, no published articles were found on the use of the enzyme in the dog feed based in canola as source of protein and fiber. Twelve German Sheepherd adult dogs (mean BW 27 kg and 2-3 years of age) were use to asses the effect of four levels of phytase addition (0, 250, 500 and 1,000 Units) in the consumption and digestibility of canola based commercial feed. The feed was pelleted and the enzyme was added manually at the time of feeding. The dry matter intake tended to be reduced as the phytase level was increased ($p<0.05$). Glucose in blood (mL dL^{-1}) was reduced ($p<0.05$) with the addition of 250 and 500 phytase units. However, nutrient digestibility was augmented ($p<0.05$) on all the levels of the enzyme. In conclusion, the addition of phytase to the dog pelleted feed increased the use of nutrients in the gut.

Key words: German sheepherd, phytase, canola meal

INTRODUCTION

Canine feeding based on vegetables is becoming important specially for pet owners. If it is considered that 37.6% of dogs around the world are used as house pets and its feeding is base on commercial feed, the impact of their droppings to the environment becomes of certain concern. Pet food is mainly based on two seeds, soy bean and canola as source of nutrients[1-4]. The use of canola as a source of nutrients for the single stomached animals is a matter of economy.

Even though canola furnishes protein to the diet, its contribution to the fiber amount is important. The fiber contains chelated minerals (P, Ca, Zn and Fe) which reduces their availability and alters gut fermentation[5,6] and the digestion[4,7], which in turn may affect the stool quality[8] specially of pets.

Little evidence has been found of phytic activity in the gut of monogastric species, which limits the use of fiber and energy. Phytase has been used in poultry and swines, improving the use of nutrients by reducing the phytate[9-15]. Same phenomenon could happen in the dog[1], hence using phytase when canola meal is used in the food could improve the use of energy and fiber. Newkirk and Classen[11] reported in an *in vitro* study that the use of phytase increased the digestibility of canola seed and reduced the anti-nutritional factors. However, no information was found on the use of phytase on canola meal-based diets offered to adult pets like the dog. Therefore the objective of the present study was to assess four different phytase levels on the digestibility of nutrients using German Sheepherd adult dogs fed canola based diets.

MATERIALS AND METHODS

Twelve male German Sheepherder dogs (average weight 27 kg) were used to evaluate the effect of the addition of phytase from *Aspergillus niger* (250, 500 and 1,000 U kg^{-1} de MS), sprayed on the feed Table 1 at the moment of feeding. Animals previous to the start of the study were internally and externally dewormed using a broad spectrum product and after dogs were individually lodged in cages of 1×0.50×0.90 m. Feed intake and faeces production were daily measured. With daily intake and faeces production (kg day^{-1}) the apparent total tract digestibility was calculated. The experiment was designed as a crossover study, with 21 day period, among which 15 were to adapt the animal and the rest to measurements. Faeces were measured, dehydrated and ground. The last

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Table 1: Diet composition

Ingredient	kg/ton
Roled corn	485.65
Canola	155.00
Corn gluten	108.59
Carbonate	60.80
Wheat bran	60.00
Meat meal	40.00
Poultry byproduct meal	40.00
Animal fat	30.00
Cover seas	6.99
Kaolin	4.04
Salt	3.42
Luctamold	3.00
Premix M-7	2.00
Aluminosil	0.50
Chemical analysis, %	
Fat	6.35
Fiber	4.32
Protein	21.00
Lysine	0.65
Calcium	0.60
Total P	0.50

day of the period blood samples were taken *prepandrium* using heparinized vacuntainer tubes for glucose testing. Data were statistically evaluated using the SAS package.

RESULTS AND DISCUSION

Mean Daily Dry Matter Intake (DMI) was 649.74 (SE = 56.26; Table 2) grams. When the phytase level was increased an improvement in DMI was observed ($p<0.05$) oscillating from 554.12 to 774.08 g with 1000 units kg^{-1}. The latter could be a reflection of the enzyme action on the cellular walls and hence on the nutrient availability which improved DMI. On the other hand, the lineal relationship among phytase level and DMI was low ($r = 0.18$). The *in vivo* digestibility of dry matter averaged 79.51% (SE = 2.509). With erratic response of the different phytase level, increasing to 86% with 250 U kg^{-1} feed ($p<0.05$; Table 2). The present data values are higher to those observed previously when soybean meal was used as the protein source. When the phytase level was regressed with the dry matter digestibility the equation was the following: $y = 78.90 + 0.001$ x.

Blood glucose level mean was 58.18 mg dL^{-1} (SE = 1.58), with a small (6%) reduction with the 250 U kg^{-1} treatment ($p<0.05$; Table 2). The observation was slightly lower than the results found in a parallel trial where a value of 62.24 mg dL^{-1} was found using soybean meal as source of protein in the dieta for dogs. In the present study the relationship between blood glucose and the phytase addition to the feed was low ($r = 0.39$, $y = 55.28 + 0.01$ x).

When the dogs were fed the canola-based diets stool humidity increased ($p<0.05$; SE = 76.05) as phytase level in the feed augmented. General fecal consistency was different among treatment ($p<0.05$), being closely associated to the previous parameter, but the relationship with the phytase level in the feed was low ($p<0.05$; $r = 0.33$). Zentek *et al.*[4] using adult Beagles found no effect of the enzyme on the stool characteristics. On the other hand, Diez[1] found no variation of stool quality when enzymes are used in the feed. However, the effect of the enzyme seems to be fiber source related.

Table 2: Effect of phytase level in the feed on the intake and digestibility of the german shepherder dog

	Phytase level (Unit kg^{-1})			
	0	250	500	1000
Dry matter				
Intake, g/day	554.12	695.90	574.87	774.08
Digestibility, %	76.54	84.45	73.05	83.99
Organic matter				
Intake, g day^{-1}	517.83	651.02	538.71	719.12
Digestibility, %	81.13	88.62	78.51	88.27
Neutral detergent fiber				
Intake, g day^{-1}	95.25	84.76	91.98	110.07
Digestibility, %	63.68	71.09	65.27	72.41
Gross energy				
Intake, Cal day^{-1}	1016.82	1391.81	1235.98	1780.38
Digestibility, %	74.58	83.07	81.50	90.08

The maximum intake of organic matter was observed with the 1000 phytase unit level ($p<0.05$). The organic matter digestibility averaged 85.35% and was increased with the phytase use ($p<0.05$; Table 2). On the other hand neutral detergent fiber (NDF) intake mean was 95.51 grams per day and the apparent digestibility was in average 65.62%, which was increased with the phytase utilization ($p<0.05$) with a higher percentage (72.41%) for 1000 U kg^{-1} feed Table 2.

The phytase utilization in the feed increased the energy intake avergaing 1356.25 cal day^{-1} ($p<0.05$; Table 2). Moreover, digestion coefficient for the gross energy was increased from 74.58% for the control (no enzymes added) to 90.08% with the usage of 1000 units of phytase ($p<0.05$; Table 2).

CONCLUSION

The addition of phytase to the dog pelleted feed increased the use of nutrients in the gut and softens the stool.

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