

## Introduction

The US has approximately 85.8 million pet cats in approximately 43 million US households (APPA, 2015). Cats usually need less daily care and management compared to dogs. This can make them more suitable for life in an apartment lifestyle. At the same time, felines have some nutritional related issues (urinary tract disease, dermatitis, and hairballs) which present challenges to their ownership. Pet food companies address these issues with special formulations.

Hairballs are formed by the accumulation of groomed hair in the cat stomach that are regurgitated. Some diets are specially formulated with a higher content of insoluble fiber to force hair masses into the intestine. Cellulose is the main fiber source used for this purpose. *Miscanthus giganteus* is a new fibrous ingredient with a similar composition to cellulose that can be an alternative fiber for use in hairball diets. We have evaluated this ingredient for its food value in dogs, cats and chicks. However, there is no published work describing the effects of Miscanthus grass in hairball management in cats.

The objective of this study was to determine the effects of Miscanthus grass on hairball passage in cats.

## Materials & Methods

Experimental diets were made from 90% a basal ration (low ash chicken by-product meal, rice flour, corn, wheat, corn gluten meal, chicken fat, minerals and vitamins; Fairview Mills, Seneca, KS) and 10% of either Miscanthus grass (Renew Biomass, Springfield, MO) or rice flour (Fairview Mills, Seneca, KS; Table 1). Diets were extruded (E525 extruder, Extru-Tech, Inc., Sabetha, KS) and dried in a convection oven (140°C) until moisture level was lower than 10%. Dried kibbles were coated with chicken fat and dry powdered flavor. Diets (Table 1) were analyzed for proximate composition.

**Table 1. The nutrient composition of experimental cat diets, in DMB.**

Composition	Miscanthus	Control
	%	
Dry matter	94.55	95.21
Crude protein	32.50	33.10
Fat	7.90	10.70
Ash	6.36	6.96
Crude fiber	5.21	0.41
Total dietary fiber	14.20	5.40
Insoluble fiber	11.80	4.00
Soluble fiber	2.40	1.40



Figure 1. Experimental diets. Left – Miscanthus grass diet; Right – rice flour diet.

The animal feeding trial was approved by the Institutional Animal Care and Use Committee at Kansas State University Research Compliance Office. Animals were fed twice daily in a replicated 2x2 Latin square design with water available throughout the experimental period. Cats (12 American shorthair) were group housed, but fed individually in cages during 16 days adaptation and kept individually housed and fed for 5 days of total fecal collection (TFC). At the beginning and end of each experimental period, all cats were brushed (100 strokes) to remove any loose hair and provide a hair base line at the start of each experimental period. After each collection period, a fecal sample was analyzed for dry matter. Hair masses were washed out from feces with tap water, counted and weighed to calculate total fecal hair. Hair masses were sorted by their length and diameter (extra small: <10.0 mm x <5.0 mm, small: 10.0 - 20.0 mm x 3.5 - 6.5 mm, medium: 20.0 - 30.0 mm x 4.0 - 7.0 mm, large: 30.0 - 40.0 mm x 4.5 - 8.5 mm, and extra-large >40.0 mm x >5.0 mm). Data were analyzed using statistical software (SAS v9.4) using the GLM procedure.



Figure 2. Hairball measurement.



Figure 3. Hairball measurement.

## Results and Discussion

All cats maintained body weight throughout the duration of the study. One cat refused the food and was removed from the study.

Fecal dry mater, total dry fecal weight, defecation frequency, average fecal score, fecal hairball count, fecal hairball incidents per day, average fecal hairball size, average fecal hairball weight, total fecal hairball weight, total fecal hair, total fecal hair mass per gram of dry feces, fecal hairball count per gram of dry feces, and total fecal hairball weight per gram of dry feces were not affected ( $P>0.05$ ) by the addition of fiber. There was a tendency for less total fecal hair mass per gram of dry feces ( $P=0.0712$ ), and fewer fecal hairball counts per gram of dry feces ( $P=0.1082$ ) for cats fed Miscanthus diet. An important observation is that the cats used for this trial were not predisposed to hairballs, therefore, the tendencies noticed are an encouraging response.

**Table 2. Fecal traits of cats fed diets containing 10% Miscanthus grass or rice flour (Control).**

	Miscanthus	Control	STD*	P-value
Number of cats	11	12		
Total wet fecal weight, g	235.49 <sup>b</sup>	143.87 <sup>a</sup>	45.09	<0.0001
Fecal dry matter, %	49.06	47.42	0.090	0.6676
Defecation frequency, #*day <sup>-1</sup>	1.36	1.05	0.453	0.1123
Average fecal score	3.84	3.21	1.187	0.2187

<sup>ab</sup> Means with different superscripts differ,  $P<0.05$ .

\*STD is the standard error.

**Table 3. Hairball characteristics of cats fed diets containing 10% Miscanthus grass or a control with rice flour.**

	Miscanthus	Control	STD*	P-value
Number of cats	11	12		
Fecal hairball count, #	13	12	7.823	0.6103
Fecal hairball incidents per day	2.65	2.31	1.565	0.6103
Average fecal hairball size	1.83	2.21	0.760	0.2431
Average hairball weight, mg	36.43	32.58	21.05	0.6656

\* STD is the standard error.

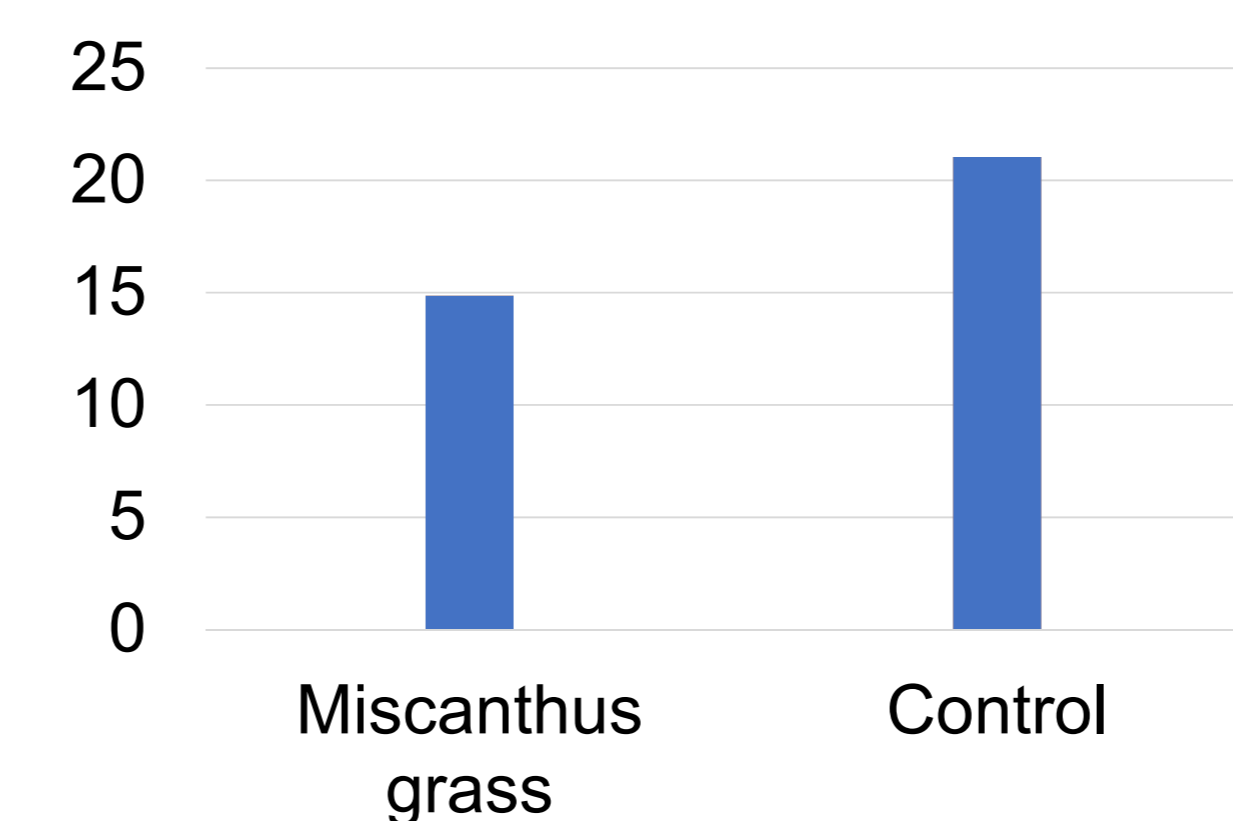


Figure 4. Fecal hair mass per fecal weight, in mg/g.

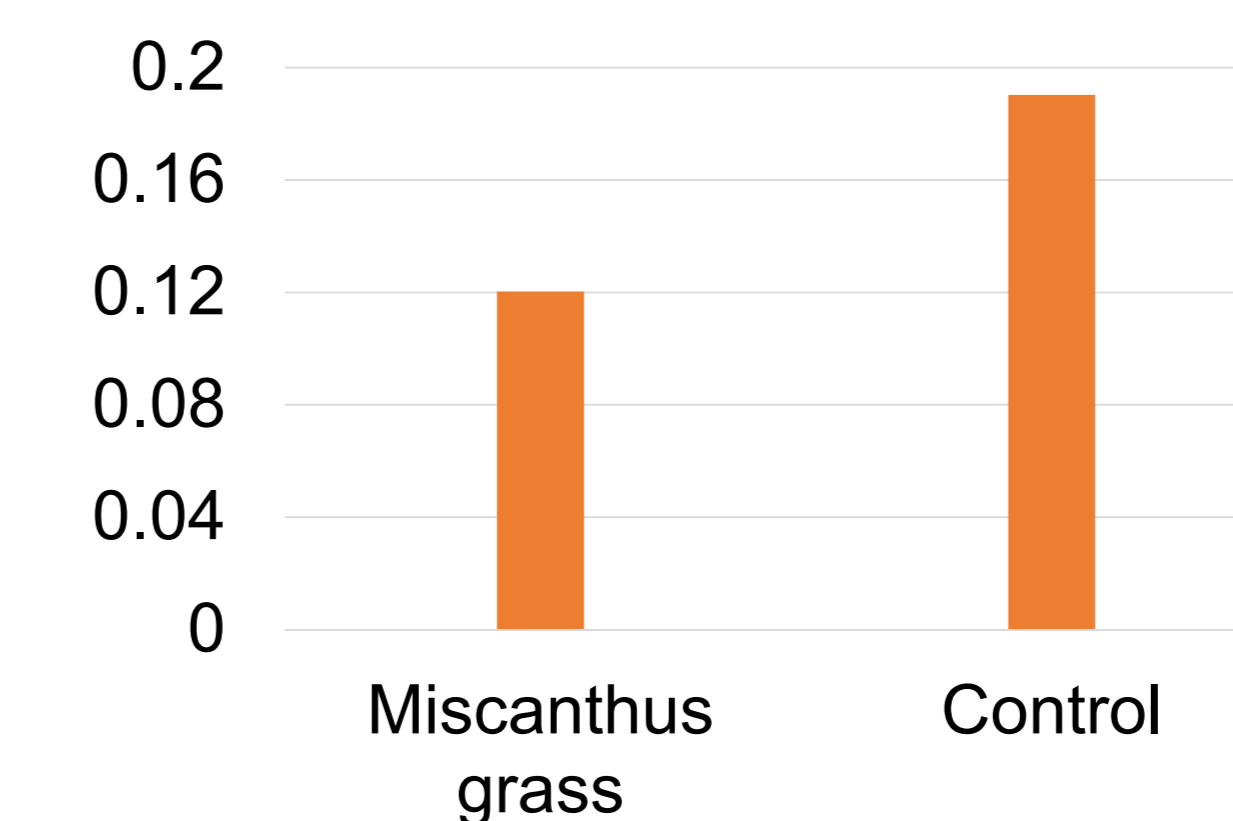


Figure 5. Hairball count per fecal weight, in #/g.



Figure 2. Hairball in the feces.

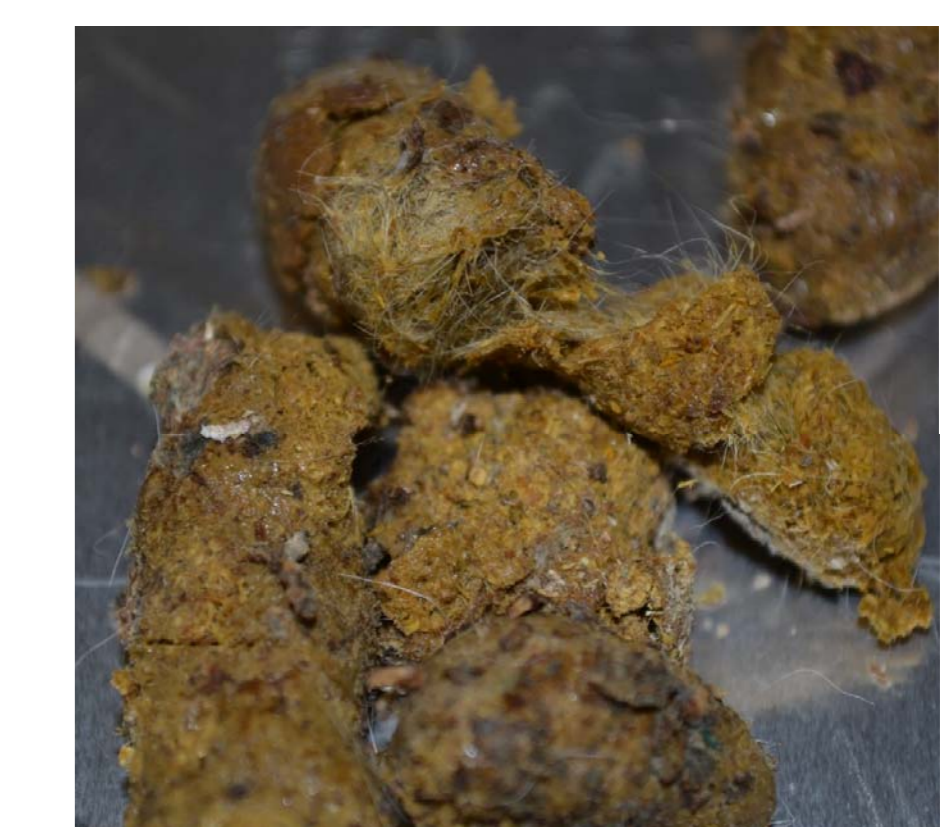


Figure 3. Hair in the feces.

## Conclusions

The method used to measure the hairballs was sensitive enough to detect tendencies. Miscanthus grass decreased hairball size and total fecal hair mass per gram of feces to some extent. The use of a bigger number of cats that have longer hair and are predisposed to hairballs fed in a home setting should be considered for future studies.

## References

References available upon request.

## Acknowledgments

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