Chapter

Miscanthus Grass as a Nutritional Fiber Source for Monogastric Animals

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Abstract

While fiber is not an indispensable nutrient for monogastric animals, it has benefits such as promoting gastrointestinal motility and production of short chain fatty acids through fermentation. *Miscanthus x giganteus* is a hybrid grass used as an ornamental plant, biomass for energy production, construction material, and as a cellulose source for paper production. More recently Miscanthus grass (dried ground *Miscanthus x giganteus*) was evaluated for its fiber composition and as a fiber source for poultry (broiler chicks) and pets (dogs and cats). As a fiber source, this ingredient is mostly composed of insoluble fiber (78.6%) with an appreciable amount of lignin (13.0%). When added at moderate levels to broiler chick feed (3% inclusion) Miscanthus grass improved dietary energy utilization. However, when fed to dogs at a 10% inclusion Miscanthus grass decreased dry matter, organic matter, and gross energy digestibility, and increased dietary protein digestibility compared to dogs fed diets containing similar concentrations of beet pulp. Comparable results were reported for cats. In addition, when Miscanthus grass was fed to cats to aid in hairball management, it decreased the total hair weight per dry fecal weight. When considering the effects Miscanthus grass has on extruded pet foods, it behaves in a similar manner to cellulose, decreasing radial expansion, and increasing energy to compress the kibbles, likely because of changes in kibble structure. To date, Miscanthus grass has not been evaluated in human foods and supplements though it may have applications similar to those identified for pets.

Keywords: *Miscanthus x giganteus*, fiber nutrition, insoluble fiber, pet nutrition, human nutrition, pet food processing, fiber profile

1. Introduction

Fiber ingredients added to foods for humans and animals are typically co-products from the wood-pulp industry (cellulose), byproducts from cereal (*e.g.*, bran, psyllium), legume seed (pea fiber), and vegetable (*e.g.*, tomato pomace) processing. More deliberate fibers such as inulin, FOS, Chicory root extract and other prebiotics are also common to foods. Unintentional fibers such as those from gums and gelling agents (*e.g.*, carrageenan, guar gum) are used in processed foods. Seldom have the grasses or forages been considered for use in foods as a fiber additive for monogastric animals. This has been the domain of grazing animals and as supplemental feed during confinement for ruminants and hind-gut fermenters (*e.g.*, horses, rabbits), or used as bedding. However, forage grasses may be a viable alternative fiber source for monogastric animals under certain circumstances. Relative to the current options, the grasses would certainly qualify as less processed and could even be considered as a purpose grown, sustainable, low environmental impact ingredient in diets for man and animal. Miscanthus grass is one such novel grass that has been evaluated as a fiber source for broiler chickens, dogs, and cats [1–6]. Other authors have also evaluated this fiber for companion animal applications [7]. For purposes of this review, it is our goal to provide a comprehensive summary regarding the information available to date regarding the use of Miscanthus grass in monogastric animal food products with a nod to human nutrition. Additionally, an overview of existing knowledge regarding how this ingredient impacts food processing will be provided.

2. Materials and methods

The focus of this chapter was Miscanthus grass as a potential fiber source for monogastrics. A literature search was conducted with the aid of Google Scholar using the following search terms: Miscanthus grass, *Miscanthus giganteus*, dog, canine, cat, feline, chicken, poultry, pig, swine, food processing, particle size, and human. Literature published between 1950 and 2021 was selected as potential references to be used in this chapter. Other supporting literature related to the history, biology and agronomy of this crop was obtained from Google Scholar using search terms such as, but not limited to, *Miscanthus giganteus*, origin, cultivation, uses, production, NDF, ADF, ADL, TDF, insoluble fiber, soluble fiber, particle size, flowability. Other reference information available to the authors in the form of other texts, abstracts, and thesis were also considered.

3. *Miscanthus x giganteus* history and general characteristics

Miscanthus x giganteus is a hybrid plant created in Japan, likely by the combination of *M. sinensis* and *M. sacchariflorus* [8]. Presumably it was then brought to Denmark in the mid 1930's and spread throughout Europe and North America as a horticultural plant [8]. The hybrid is sterile; thus, its propagation is through viable rhizome plantings and spread (**Figure 1A**). In the past it was used as forage for animals and for thatching [11]. However, in recent years, it has been considered as a source of cellulose for fuel to produce heat and electricity [12] via ethanol production [9], as well as construction materials, and absorbents [13].

M. x giganteus is a C4 plant relying on the NADP-malic enzyme pathway [14]. This pathway allows for the continuous photosynthesis even at lower temperatures (8°C) [15]. This is an important characteristic that has allowed this plant to be successfully cultivated in colder climates, such as northern Europe and North America. Moreover, this plant efficiently uses nitrogen and water [16, 17] compared to other crops. Thus, while *M. x giganteus* has not been adapted to produce food, it does grow well in marginal soils which are not suitable for cultivation.

Some authors report that the plant once established can remain productive for 5 to 40 years [11, 18, 19] depending on the region in which it is cultivated and cropping pressure (**Figure 1B**). Thus, *M. x giganteus* is considered a perennial crop. In this state it grows quickly and reaches 2 m in height with a close canopy cover which reduces sun light penetration, limiting weed growth, thus eliminating the need for herbicide administration (**Figure 1B**). Although, weed control is necessary before this stage as the plant is getting established [20]. Nutrient use by *M. x giganteus* is very efficient as it translocates nitrogen, phosphorus, and potassium to

Figure 1.
Miscanthus x giganteus *rhizome (A; from Adams et al. [9]), growth stage approximately 2.5 m (B); dried (C; from Adams et al. [9]); baled (D; from Adams et al. [9]), stored bales (E), and ground (F; from Pontius et al. [10]) with a particle size of 134 ± 93 μm and a 5X magnification.*

the rhizomes at the end of the growing season when the aerial portion of the plant begins to senesce (**Figure 1C**) [16]. This senescence starts with a killing frost during fall [21]. Predation by insects is limited [22]. As a result, this plant has been primarily utilized for biomass production; although, there may be more value for this crop than has been identified to date.

In general, fiber rich ingredients have been gaining more attention. In part because obesity in the pet and human population is a substantial issue [23, 24] and fiber is one possible solution to decrease the energy density of food. It may also increase the volume of the digesta in the gastrointestinal tract, and the fermentation of fiber in the colon to short chain fatty acids like butyrate (a preferred fuel source for the colonocyte) may aid in the prevention of cancer and the reduction in intestinal inflammation [25]. Moreover, food fiber through bulking of digesta can help alleviate constipation [26]. Despite these health benefits, fiber-added foods are usually less preferred than “regular” foods [27, 28]. Part of the changes in the flavor and texture attributes of fibers could be related to the composition of various fiber sources. For example, lignin a phenylpropanoid component of some fiber ingredients is known to have a bitter taste [29]. An alteration to texture is likely an effect of the changes that fiber cause in the product during processing that changes the mouthfeel as the food is consumed [30]. However, acceptance of dietary fiber may be changing as consumers attribute more importance to the health benefits and their palates adjust to the flavor and texture profile of these more fibrous products.

Despite the health benefits and their popularity in some human and pet foods, adding fiber ingredients brings challenges to manufacturing. For example, in extruded expanded products (like breakfast cereals and dry extruded pet foods) fiber ingredient addition decreases product expansion [31] and increases cutting force [32]. However, when considering the diversity of foods in the grocery stores, there are several examples of insoluble and soluble fibers which have been used successfully in select products [33].

4. Chemical and physical characterization

Before detailing the uses and effects of Miscanthus grass as a fiber source for monogastric animals, it is beneficial to gain an understanding regarding how fiber as a nutrient is characterized. While the term "fiber" is commonly used, it relates to a very diverse group of compounds that are not easy to characterize and quantify. To add to the complexity of this food group, differences in raw material composition (plant variety, age at harvest, environmental conditions, and harvest date) and the process in which the plant material was produced can influence the composition and concentration of the fiber nutrient in the final ingredient [26, 34]. Regardless of the challenges to evaluate fiber sources [35], it is important to characterize the fiber content of an ingredient to properly understand its effects on food processing and the possible health benefits it may have.

Different methods are used across industries to quantify the fiber content of ingredients and foods. Historically, the method initially developed was "crude fiber" (Thaer, 1809 and Hennenburg and Stohmann, 1860 and 1864 in [36]). In this method the sample is digested in a strong acid and then in a base with the residue remaining considered as fiber. In this procedure, all the soluble fibers are washed away; thus, underestimating the total fiber content of the sample. However, this is the method required on the pet food labels by state feed control officials as outlined by Model Bill within the Official Publication for the American Association of Feed Control Officials [37]. Other methods have been developed to measure fiber in forages [38–40] and are common for the beef, dairy, swine, and poultry industries. These procedures boil the forage in neutral or acid detergent solutions and measure the resulting residue. Like the crude fiber method, several of the soluble components of the sample are washed away and not accounted in the measure of fiber. In an attempt to recover the soluble fibers, the total dietary fiber method (TDF) [41] was developed to capture all the fibrous fractions. It was revised a few years later to include the analysis for the insoluble and soluble fractions [42]. This procedure is based on an enzymatic digestion to remove the proteins and starches from the sample. This method is commonly used by the human foods and nutrition industry, as some of its results are correlated with some health benefit. Since some fibers are not recovered by the TDF analysis, other methods have been developed to quantify the fiber content of a given sample; however, they are not standardized and variation in the procedures and results are known to occur [35]. **Table 1** provides a summary of the methods and what fiber component is or not recovered by them. For the sake of this review, fiber composition will be classified by its solubility in water (soluble vs. insoluble) and fermentability (fermentable vs. non-fermentable). We have evaluated the composition of Miscanthus grass as an ingredient for pet food production and its composition is shown on **Table 1**. From the values reported, clearly Miscanthus grass is a source rich in insoluble fibers with some meaningful amount of lignin consistent with most forages.

Method	Fraction Recovered	Unrecovered Fraction	Industry user	Miscanthus grass, %	Wheat bran, %
Crude fiber	Most of the cellulose Some lignin	Soluble fibers, hemicellulose, most of the lignin, and some cellulose	Pet food and Animal feed	45.2	7.5–10.1[1]
Neutral detergent fiber	Cellulose, hemicellulose, lignin	soluble fibers	Animal feed	73.8	23.1–26.5[2]
Acid detergent fiber	Cellulose and lignin	Soluble fibers, hemicellulose	Animal feed	53.7	6.5–8.1[2]
Acid detergent lignin	Lignin	Soluble fibers, cellulose, hemicellulose	Animal feed	13.0	2.4–2.6[2]
Total dietary fiber	Insoluble fibers and most of soluble fibers	Oligosaccharides	Human foods	85.5	33.4–63.0[3]
Insoluble fiber*	Insoluble fibers	Soluble fibers	Human foods	78.6	28.4–58.0
Soluble fiber*	Most soluble fibers	Insoluble fibers, oligosaccharides	Human foods	6.9	5.0[4]

**As part of the total dietary fiber method.*
[1]From Food and Agriculture Organization [43].
[2]From Hossain et al. [44].
[3]From Curti et al. [45].
[4]From Babu et al. [46].

Table 1.
Methods commonly used to analyze fiber content of ingredients and values for Miscanthus grass and wheat bran from research referenced in this review.

On the physical side of fiber analysis, the most common analytical method used to characterize ingredients for the production of animal foods is particle size and its distribution. This is usually done with the standard method described by the American Society of Agriculture and Biological Engineers ([47], method S319.4) which consists of stacked sieves in a shaker tapping device. In the procedure a sample is placed on the top sieve and after 10 min on the shaker the content remaining in each subsequent sieve below is weighed and the geometric mean diameter of the particle is calculated from the sieve hole size and residual weight. This is not a characterization of the ingredient as a whole, but rather the specific batch and grinding equipment, as the grind size can be adjusted as needed (**Figure 1F**). For example, in the work of [1] they used a fine (108.57 ± 66.25 μm) and a coarse particle size (294.10 ± 253.22 μm) Miscanthus grass to evaluate the possible effects of particle size in broiler chicken performance and digestibility. This laboratory group has also reported use of a similar fine particle size Miscanthus grass used in a feeding study with cats. In this experiment the particle size of the Miscanthus grass was 103.46 ± 76.39 μm [5] and had positive effects. Pontius et al. [10] reported the exploration of Miscanthus grass as a potential premix carrier. In this work the average particle size was 134 ± 93 μm. They also evaluated flowability and angle of repose (a measure of resistance to flow) of powdered ingredients considered in a manufacturing setting for their ability to move out of bin-bottoms and through transfer pipes [48]. The angle of repose is estimated after a certain amount of the powdered ingredient has been poured onto a level bench top. The lower the angle, the easier the material will flow. The flowability index (FlowDex) is measured by adding a known amount of the powdered ingredient into a cylindrical hopper with a fitted disk of known orifice diameter. The minimum diameter for the material to flow freely is determined after 3 successful tests. From the evaluation of [10] they were unable to determine the flowability index of Miscanthus grass since the ingredient did not flow through the biggest diameter disk (34 mm diameter). Additionally, angle of repose for MG was 47.8° which compared unfavorably to all other tested fibers. These characteristics indicate that Miscanthus grass in a simple ground form may have poor flowability. Though that might be modified with alternative processing steps as has been applied to other fiber carriers and excipients from other sources (*e.g.*, cellulose).

5. Effects on the animal's nutrition and health

As mentioned previously, fiber is not considered an essential nutrient for animals. Although its consumption can be beneficial for reducing energy intake, promoting satiety, supporting gut health, and hairball management [26, 49–55].

Fiber can be of particular interest for the health and wellbeing of cats as they are known to suffer from hairballs. Hairballs, also known as trichobezoars, are hair masses formed in the cat's stomach due to the extensive period of time they groom themselves [54, 56, 57] and some anatomical [57, 58] and physiological adaptations [59]. As a result of these idiosyncrasies, cats can accumulate hair in the stomach and regurgitate it when the mass is too big to pass to the duodenum. In addition, there are reports of intestinal blockages caused by trichobezoars [60]. It is believed that the addition of fiber in the diet can decrease or eliminate this issue. For example, [61] patented (patent number US 7,425,343 B2) the use of high fiber concentrations in the diet for the purpose of improving gastric motility in an effort to pass the trichobezoars to the small intestine and(or) increase the gastrointestinal passage rate. Other fibers have been evaluated as well [5, 54, 62, 63] with variable success. Their inconsistent results may be related to different methodologies used for evaluation of animal responses and the types of fiber used. Clearly, any comparison between studies must be approached with caution and more studies are needed to determine the effects of fiber in hairball management in cats. Miscanthus grass was evaluated as a fiber source to aid in hairball management in cats [5]. In this research trial, 12 American short-hair cats were fed a control diet and a test diet in which Miscanthus grass was added at 10% in exchange of rice flour. The cats were fed the diets for 21 days (16 adaptation days plus 5 days of total fecal collection) with fresh water available throughout the duration of the trial. In addition, cats were brushed prior to the start of each feeding period of a switch-back study design to remove loose hair. It was observed that less hair clumps and total hair weight were excreted per gram of dry feces in cats fed the Miscanthus grass diet. While these results were somewhat expected, because more dry feces was evacuated by cats fed Miscanthus grass, it also provided an indication that fibers (in this case Miscanthus grass) could be used in hairball management in cats as a matter of hair dilution and (or) separation to avoid aggregation. However, it is crucial to state some of the limitations of this trial, such as the use of cats that did not have a history of hairballs and had short hair. Future studies should consider evaluation by cats that have a history of hairballs, have longer hair, and the feeding period should be longer (since regurgitation frequency of a hairball could be monthly) in order to gain a true assessment of hairball elimination.

In similar fashion, weight management, food acceptance, digestibility, fecal consistency and defecation frequency, and colonic fermentation are also affected by the type of fiber. A variety of fiber ingredients are currently used in food production or for supplements intended for both humans and their pets. In general, it is known that obesity can lead to major chronic health issues for humans and pets [53, 64–68]. In theory weight loss by calorie restriction or alternatively an increase in energy expenditure is a simple principle, but in practice it is much more complicated as evidenced by the growing numbers of obese individuals [24] and pets [23]. Dietary fiber ingredients can contribute to caloric restriction and increase the perception of satiety [49, 69]. Unfortunately, dietary fiber addition is also known to decrease acceptance or palatability of a food [27, 70, 71] which contributes to the relatively low success of weight loss/management programs.

Other benefits of fiber in the diet are related to the production of fermentation products in the colon that promote health through the production of post-biotics, especially the short chain fatty acid butyrate. The benefits of butyrate for human health have been extensively reviewed elsewhere [25, 72]; however, there is still the need to verify most of these benefits for pets. The rate of fermentation and the amount of each SCFA is dependent on the fiber source [51, 52, 73, 74]. Thus, if the fiber source is concentrated in soluble and fermentable fibers rather than insoluble and non-fermentable fibers, more SCFA will be produced [75–77]. Miscanthus grass has been evaluated in an in vitro fermentation model using canine feces as an inoculum [3] and its fermentation was comparable to cellulose, an insoluble and non-fermentable fiber source. As a result, Miscanthus grass may not be an effective prebiotic in companion animal diets. Finet et al. analyzed total phenols and indoles, short- and branched-chain fatty acids, and ammonia in fecal samples of cats after they were fed a diet containing 9% Miscanthus grass for 21 days. The authors reported that cats fed Miscanthus grass diet had a higher excretion of indoles compared to cats fed either beet pulp (11% inclusion) or cellulose (7% inclusion). Additionally, acetate and propionate fecal concentrations were also lower compared to cats fed the beet pulp diet; however, no changes in butyrate, branched-chain fatty acids, and ammonia were reported [7]. The addition of Miscanthus grass to feline diet at 9% increased alpha diversity compared to beet pulp supplemented diet when considering Faith's phylogeny and Shannon entropy index [7]. This suggests that while not as substantially fermented compared to other fiber sources, there may be some soluble and fermentable substrate in Miscanthus grass that could benefit the animal if provided at a sufficient dose.

By definition fiber escapes upper gastrointestinal tract digestion and would be available for fermentation in the colon. With more fiber in the diet, dry matter, organic matter, and energy digestibility of foods would decrease [78]. This contributes to dietary energy dilution, especially for insoluble fibers. Dogs [2] and cats [5] fed diets containing 10% Miscanthus grass each had decreased dry matter, organic matter and total dietary fiber digestibility compared to animals fed diets containing a similar level of beet pulp. That [7] did not see an effect of Miscanthus grass (9% inclusion) on dry matter, organic matter, and energy digestibility of dried cat foods compared to those fed diets containing beet pulp is a bit of a mystery. When diets containing 3% Miscanthus grass were fed to broiler chicks, gross energy and apparent metabolizable energy digestibility were lower compared to chickens fed beet pulp diets [1] without changes in dry matter and organic matter digestibility reported. A summary of the digestibility studies published in which Miscanthus grass was a primary fiber source for monogastric animals can be found in **Table 2**.

While this is expected, for some animal industries (*e.g.*, swine and poultry) the addition of fiber is considered to be a nutrient dilution which is undesirable and kept to a minimum. However, there is some indication that addition of fiber ingredients could be beneficial for poultry production and might decrease or replace the use of antibiotics as growth promoters by stimulating the growth of beneficial gut bacteria [80–82]. Further, Miscanthus grass might not qualify as a prebiotic, but its coarse physical characteristics in the feed provided to chicks may stimulate gizzard

Parameter	Chick[1]	Dog[2]	Cat[3]	Cat[4]
Miscanthus grass inclusion, % as is	3.00	10.00	10.00	9.00
Excreta/Feces Dry matter, %	45.25	38.70	34.33	45.93
Defecation frequency, no/day/animal	n/a	2.98	1.25	n/a
Fecal score[5]	n/a	3.64	3.32	3.20
		Digestibility, %		
Dry matter	78.83	78.20	76.20	78.30
Organic matter	79.74	82.10	80.50	81.80
Gross energy	80.52	82.30	81.70	n/a
Crude protein	n/a	87.90	85.80	84.60
Crude fat	n/a	90.70	85.00	91.70
Total dietary fiber	n/a	46.10	20.80	19.10

[1]*From Donadelli et al. [1]; values are averages of tested life stages and the two different tested Miscanthus grass particle sizes.*
[2]*From Donadelli and Aldrich [2].*
[3]*From Donadelli and Aldrich [5].*
[4]*From Finet et al. [7]; fecal scores converted to a similar scale to the other studies.*
[5]*According to Carciofi et al. [79]; 1 = liquid diarrhea, 5 = hard pellets.*
n/a: not available.

Table 2.
Summary of digestibility and stool quality animal studies with Miscanthus grass as a dietary fiber source.

contractions which is known to stimulate digestive secretions. This may improve nutrient digestibility and limit bacterial growth in the proventriculus with hydrochloric acid release [82].

Fiber ingredients can aid fecal consistency and defecation frequency; however, their effects are source and dose dependent [26, 83, 84]. When fed to dogs and cats, the addition of dietary Miscanthus grass did not affect defecation frequency; however, fecal dry matter was higher for animals fed Miscanthus grass [2, 5] compared to pet fed beet pulp. Moreover, feces of dogs and cats fed Miscanthus grass were harder than animals fed beet pulp.

One benefit that Miscanthus grass could have in human health is the control of cholesterol levels. Lignin was shown to have hypocholesterolemic effects in mice [85]. While Miscanthus grass still needs to be evaluated in humans, this could be another use of this fiber source.

6. Effects on food processing and texture

In addition to health, nutrition, and palatability effects, dietary fiber inclusion brings challenges to food processing and texture. As the health food segments expanded in retail stores, so has the number of fiber-added foods and supplements. Common examples of foods that are enriched with fiber include breakfast cereals, bakery goods, pet foods and treats. The two main processes used to manufacture these products are extrusion and baking. In the case of extrusion, fibrous ingredients impact product expansion negatively. Expansion occurs at the end of the die as material is exiting the extruder barrel. At this point there is a pressure difference (inside extruder barrel vs. ambient) which causes the superheated water droplets contained within the starchy matrix to vaporize. This pushes out on the starch matrix which quickly expands to form a foam-like structure. This attribute has been extensively discussed in other publications [31, 86, 87]. During this expansion process there are three key effects fibers have on expansion in these products. First, more dietary fiber means less starch in the formula – starch is the component responsible for the formation of the continuous matrix that expands and creates the product structure. Second, fibrous ingredients may compete with starch for water and limit its [starch] hydration. Third, fibers can disrupt the continuous melt formation (in the case of insoluble fibers) or create weaker melts (when soluble fibers are present). Regardless of the type of fiber, expansion will be impaired as the bubbles formed will prematurely burst [88–90]. As confirmation of this phenomenon, the addition of Miscanthus grass (an insoluble fiber source) decreased radial expansion and increased longitudinal expansion compared to beet pulp (a more soluble fiber source). These differences in how the kibble expanded also impacted sectional expansion ratio index, which was higher for beet pulp diet compared with Miscanthus grass containing food. As the structure is altered due to differences in expansion, Miscanthus grass kibbles required more energy to compress compared to beet pulp kibbles; however, hardness was similar [4]. For the cat foods addition of Miscanthus grass had no effects on tested extrusion parameters or kibble traits [6] compared to cellulose and beet pulp. Conversely, dog foods with Miscanthus grass required less mechanical energy to process compared to beet pulp supplementation [4].

Various fiber sources have been used in human foods at different inclusion levels and for different purposes [91–93]; however, to our knowledge, Miscanthus grass has not been tested for human foods or supplements as of this date.

7. Other Gramineae

Gramineae, or Poaceae, is a family of plants that includes most of the cereal grains (*e.g.*, wheat, rice, corn, sorghum, barley, millet, rye, triticale), bamboos, grasses used for pastures and lawns, and sugarcane for sugar and ethanol production. This is a very diverse family with several uses for humans and animals. Since most of the cereals and the grasses for pastures and lawns are well studied, we will not cover those uses in this chapter. While some bamboo species are used in North America and Europe as an ornamental plant, in Asia, it is a commonly used construction material [94]; however, those uses are beyond the scope of this chapter.

From a nutrition perspective, cereals are an important food source for humans and other monogastric animals. Most commonly, the grains and their various components are used to produce foods for humans and animals. The stalks of the plant are usually left in the fields or burned to produce energy. Another Gramineae largely used by humans is sugarcane. Most of it for the production of sugar and ethanol. Other than these mainstream products limited research is available describing their use in monogastric animals. Specifically, [32] evaluated the use of sugarcane fiber (a co-product of the extraction of the sugarcane juice) as a fiber source for dogs. Compared to wheat bran, sugarcane fiber addition (9% inclusion) decreased the specific mechanical energy necessary to produce the food and increased the cutting force necessary to cut the kibble. When this diet with sugarcane fiber was fed to dogs they preferred the control (no fiber added) diet [27]. As noted previously, this was expected since addition of fiber ingredients generally reduce food palatability.

8. Conclusions and future

As described by different authors, *Miscanthus x giganteus* is a perennial with great potential to be cultivated in cold climates and has good biomass yields. From this crop, Miscanthus grass is produced by simply grinding the dried canes into a powder. This fibrous food ingredient is mostly composed of insoluble fibers with appreciable amounts of lignin, has poor flowability properties, which could bring challenges to a food production facility. Miscanthus grass has been evaluated as a fiber source for dogs, cats, and chicks. There are some benefits to its use through improved chick performance and feed energy utilization. For dogs and cats, it could be used in weight control diets and in hairball management cat foods. Like other fibers, during processing it decreased the expansion of extruded pet foods which may require minor process modifications to effectively achieve product specifications. Based on these findings Miscanthus grass is one of the first forage grasses that have been evaluated as a viable form of supplemental fiber for monogastric animal diets. Whether it will serve a similar purpose in human diets remains to be evaluated, but the potential exists that it might be a viable alternative compared to other fibers currently utilized in the market. What the future holds for Miscanthus grass is uncertain; however, more research is needed to better understand the potential this crop has since its widespread use in animal and human foods could aid in improving health through diet energy dilution, hairball management, and weight management and thereby improve health and wellbeing of animals and people through a well-established and structured supply chain.

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