

SORGHUM, A KEY TO BUILD OUR FUTURE.





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Sorghum Use in Pet Foods

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12Oct2021

3ème CONGRÈS EUROPÉEN DU SORGHO 2021

Overview

- Pet Food motivation and trends – Superfoods?
- Utility in pet food
 - General nutrition
 - Extra-nutrient potential
 - Food functionality
- Summary and takeaway
- Pet Food Program at K-State





PERCENT OF US HOUSEHOLDS WITH CHILDREN, DOGS OR CATS, 2004-16



Source: Packaged Facts National Pet Owner Survey, December 2016

PERCENT OF PET OWNERS WHO STRONGLY AGREE WITH THE STATEMENT: "I CONSIDER MY PETS TO BE PART OF THE FAMILY," BY AGE BRACKET/ GENERATIONAL COHORT, DECEMBER 2016



Source: Packaged Facts National Pet Owner Survey, December 2016

Paradigm Shift

Population: More than 900 million dogs, 600 million cats worldwide.

Top 10 Dog Populations By Country

COUNTRY	POPULATION
USA	69,929,000
China	27,400,000
Russia	12,520,000
Japan	12,000,000
Philippines	11,600,000
India	10,200,000
Argentina	9,200,000
United Kingdom	9,000,000
France	7,570,000
South Africa	7,400,000

Top 10 Cat Populations By Country

COUNTRY	POPULATION
USA	74,059,000
China	53,100,000
Russia	17,800,000
Brazil	12,466,000
France	11,480,000
Germany	8,200,000
United Kingdom	8,000,000
Italy	7,400,000
Ukraine	7,350,000
Japan	7,300,000

How Many Pets Are In The World & The US? 71+ Pet Stats (simplyinsurance.com)

The World's Top 10 Pet Food Companies

Company	Country	Annual Revenue
Mars Petcare Inc.	United States	\$18,085,000,000
Nestlé Purina PetCare	United States	\$15,422,000,000
J.M. Smucker	United States	\$2,937,500,000
Hill's Pet Nutrition	United States	\$2,525,000,000
General Mills	United States	\$1,694,600,000
Diamond Pet Foods	United States	\$1,500,000,000
<u>Spectrum Brands / United Pet</u> <u>Group</u>	United States	\$951,000,000
Agrolimen SA	Spain	\$900,000,000
<u>Unicharm Corp.</u>	Japan	\$822,000,000
Simmons Pet Food	United States	\$1,000,000,000

US Pet Food and Treat Sales est. \$B 38.4 in 2020 (APPA, 2019)

Actual Sales in U.S. Market 2018 **Total U.S. Pet Industry Expenditures** (Billions of Dollars) **Category Breakdown** \$80 Live Animal Other \$2 Billion \$70 \$6 Billion \$60 \$50 Food Vet Care \$40 \$32 Billion \$19 Billion \$30 \$20 Supplies \$10 \$16 Billion \$0 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 (Est.)

Source: APPA, 2019

Premiumization of Pet Food in US Pet Retail

Key Categories - L52W w/e 10/05/19



Natasha Davis, Strategic Client Partner October 16, 2019



Home > Animal & Veterinary > News & Events > CVM Updates

FDA Investigating Potential Connection Between Diet and Cases of Canine Heart Disease



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July 12, 2018

The U.S. Food and Drug Administration is alerting pet owners and veterinary professionals about reports of canine dilated cardiomyopathy (DCM) in dogs eating certain pet foods containing peas, lentils, other legume seeds, or potatoes as main ingredients. These reports are unusual because DCM is occurring in breeds not typically genetically prone to the disease. The FDA's Center for Veterinary Medicine and the Veterinary Laboratory Investigation and Response Network, a collaboration of government and veterinary diagnostic laboratories, are investigating this potential association.

Canine DCM is a disease of a dog's heart muscle and results in an enlarged heart. As the heart and its chambers become dilated, it becomes harder for the heart to pump, and heart valves may leak, leading to a buildup of fluids in the chest and

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Google



Perfectus Ancient Grai...

petfoodindustry.com



Ancient Grains Nulo MedalSe...

petsmart.com · In stock

ancient grain pet food



Grass-Fed Beef & Ancient Gr... openfarmpet.com · In stock

the Wild with Ancient Grains | Taste of ... tasteofthewildpetfood.com

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Heirloom Ancient Grain...

drtims.com · In stock



tasteofthewildpetfood.com

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GRAIN



:::

Open Farm Grass-Fed Bee... amazon.com



Ancient Grains for Your Dog and You ... mypitbullfriend.com

Merrick Classic Lamb ...

HOUND GATOS

petsense.com · In stock





petsmart.com · In stock



openfarmpet.com · In stock





issuewire.com









Nulo packs animal-based protein ... petfoodprocessing.net



Whitefish & Ancient Grains D... openfarmpet.com · In stock





Ancient Grains in Pet Food: What's All ... thehonestkitchen.com







taste of the wild ancient prairie



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Ancient Grain Recipe D... chewy.com · In stock













Ancient Grain Recipe D... chewy.com · In stock

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Trending

https://www.petbusiness.com/archives/the-renaissance-of-grain/article_bd08de6a-4725-56ba-8642-dad12b3657cf.html

The Renaissance of Grain

Grain-inclusive diets can fill the nutritional voids in a pet's diet.

Kelly Lindenau Jan 6, 2020

https://www.petproductnews.com/trends/are-grain-in-dog-foods-the-answer-to-the-dcm-debate/article_60c09b0a-2650-5eaa-939e-6e08c95bafbe.html

Are Grain-in Dog Foods the Answer to the DCM Debate?

Grain-inclusive and legume-free dog foods aren't new, but the U.S. Food & Drug Administration's investigation of potential links between diet and canine heart disease has brought them to the forefront in new ways.

Sandy Chebat Feb 5, 2020

Ancient/Heirloom/Heritage Grains

- Not a regulatory description
- Some describe as "heirloom" or "heritage" grains
- Generally described by producers, academics, and merchants as a group of seeds that are little changed over time
- They lack traits that could be exploited for increased production, were difficult to breed, or lacked consistent traits that were considered beneficial at the time





Does Sorghum Have a Fit in Pet Foods?

- Utilized by 15 brands in US
 - >> 130 product lines
 - <u>https://www.sorghumcheckoff.co</u> <u>m/petfood</u>

Nutrient Composition

- Starch the largest portion (around 75%).
 - Amylopectin (70-80%).
- Protein content slightly higher than corn at or above 9%
 - Gluten free alcohol soluble prolamin: Kafirins slow to digest
 - Lysine and threonine first and second limiting amino acids.
- Fat content about 3% which lowers metabolizable energy.
 - Linoleic acid (C18:2n6) greater than half the total fatty acids
 - Omega-3 linolenic acid (C18:3n3) less than 3% of total FA.
- Crude fiber 2-3% primarily insoluble.
- Minerals (ash 1-2%) and vitamin similar to other cereals



Utility in Pet Food and Extra-nutrient Potential

- The extent of starch digestibility similar to that of other grains like corn or rice (Carciofi et al., 2004; Twomey et al., 2002; Murray et al., 1999).
- Rate of starch digestion might be slower due to the composition of the sorghum starch (*in vitro;* Murray et al., 2001).
- Postprandial glucose lower, time to peak longer, and insulin response curve dampened (Intravenous glucose tolerance tests)
 - Dogs (Carciofi et al., 2004; Sunvold and Bouchard, 1998)
 - Cats (Bouchard and Sunvold, 2000)

Seed Coat: Challenge or Opportunity?

- Sorghum is classified into several groups based primarily on the seed coat (pericarp) color.
- Simple interpretation:
 - "tannin" (brown)
 - White
 - Incremental combinations
- The "tannins" not actually tannic acid
- Proanthocyanidins or "condensed tannins"



Fig. 1. Fluorescence photomicrograph of cross-sections of a non-tannin (left) and a tannin sorghum kernel (right). Al, aleurone; CW, cell wall; E, endosperm; En, endocarp; Ep, epicarp; M, mesocarp; T, pigmented testa (Adapted from Awika and Rooney (2004)).



Photos courtesy of Texas A&M University

Condensed Tannins

- All sorghums contain these condensed tannins some more than others.
 - Condensed tannins are a variety of different poly-phenolic compounds produced as secondary metabolites by the plant.
 - They support the plant's natural defense system against insect predation and mold infestation.
 - Some sorghum varieties have been selected to better exploit these benefits (i.e. brown "bird resistant milo").
 - Condensed tannin sub-fractions precipitate proteins, inhibit digestive enzymes (amylase inhibitor, trypsin inhibitor), and bind (chelate) trace minerals.
 - Some consider condensed tannins as anti-nutritional factors to avoid, especially the "tannin" (brown) sorghums.

Sorghum Milling

• Sorghum can be milled into flour which can be used as a major ingredient for many food applications



Objectives

To determine the effects of sorghum fractions on milling yield and composition, pet food processing, sensory analysis, and diet utilization by dogs





Processing

- Red sorghum locally sourced then milled at the Hal Ross Flour mill
- Yield of flour 70%, bran, tailings, and germ collected into "mill feed" fraction



Project Support: US Sorghum Checkoff

Digestibility of Control, Whole Red Sorghum, Sorghum Flour and Sorghum Mill-Feed Diets by Dogs Alvarenga & Aldrich, 2016



Alvarenga & Aldrich, 2015

Oxygen radical absorbance capacity (ORAC) of plasma collected from dogs at the end of each period fed diets based on various sorghum fractions



Alvarenga & Aldrich, 2015

Would Sorghum Be Effective in Dog Treats?

- Extruded sorghum flour may provide health benefits (Arbex *et al.,* 2018)
- Development of extruded sorghum crisp
 - <u>New market Currently Sorghum NOT used in treats</u>
- Limited information
 - Sorghum milling (Alvarenga *et al.*, 2018; Moraes *et al.*, 2015)
 - Extrusion of sorghum flour





Experimental Outline



¹Differential Scanning calorimetry ²Rapid Visco Analyzer

Producing Sorghum Based Granola Bars

Cereal bar production

- Dry ingredients
 - Rice crisps
 - Oatmeal
 - Coconut flakes
 - Dried fruits
- Binder
 - Sugar syrup
 - Not perceived as healthy



Soluble Animal Based Proteins



- Hydrocolloid properties
- Egg white protein in rice-based gluten free muffin (Matos *et al.,* 2014).
- Bovine plasma in gluten-free bread (Furlan *et al.*, 2015), pork sausage (Kim *et al.*, 2017), and ingredient for the feed industry (Dijk *et al.*, 2001).
- Gelatin and albumin in gluten-free bread (Ziobro *et al.*, 2013), pharmatheucitcal and cosmetics industry.

MATERIALS AND METHODS





Project support: FSMIP-KDA

Granola Bars with Sorghum Crisps



Project support: FSMIP-KDA

How Does Sorghum Perform in Rotary Molded Treats?





Takeaway

- Sorghum is a Superfood!
 - Sustainable and environmentally friendly
 - Non-GMO
 - Rich in antioxidants
 - Low glycemic
 - Gluten Free



- Measurable dietary fiber mostly insoluble
- Carries a meaningful amount of minerals
- Quality proteins when complemented with sources rich in lysine
- Processes well into pet food applications
- Potential "Heirloom Grain" in pet foods and treats

KSU Grain Science & Industry Pet Food Program