

SEPARATING FACT FROM FICTION

PLANT-BASED INGREDIENTS FOR CATS



Cats are obligate carnivores implying their primary food source should be meat and other animal-derived ingredients due to the simplicity of their digestive tract and their dietary taurine requirement. However, recently published research refutes this dogma by showing cats can effectively use various plant- and yeast-based ingredients to supply required amino acids. The use of plant-based ingredients in commercial cat foods and treats is generally limited, but now pet food manufacturers can leverage these findings to expand their ingredient options when formulating cat foods and treats.

Research recently reported by Hill's Pet Nutrition, Inc. demonstrates cats can efficiently digest increasing dietary levels of plant-based ingredients (Golder et al., 2020). This retrospective study showed protein digestibility was not impacted when dietary protein contributions from whole corn, rice protein concentrate or soybean meal increased from 0 to 50%. In contrast, protein digestibility increased as the dietary protein contribution increased from 0 to 50% when supplied as corn gluten meal ($P < 0.001$) or soy protein isolate ($P = 0.17$) but decreased ($P < 0.05$) with whole rice. These findings clearly demonstrate cats are capable of digesting plant-based ingredients despite their simple digestive tract.

The recent publication of ADM-sponsored research at the University of Illinois also highlights the biological availability of essential amino acids from various plant- and yeast-based ingredients (Reilly et al., 2020a; 2020b). The evaluated ingredients included select pulse proteins (whole yellow peas, garbanzo beans, green lentils, black bean grits and navy bean powder), protein concentrates (pea protein, potato protein, soy protein concentrate, dried yeast and faba bean protein) and protein byproducts (soybean meal, soy flakes, corn gluten meal and peanut flour). The precision-fed cecectomized rooster assay was used to measure amino acid digestibility. This model involves the surgical removal of ceca to minimize the effects of hind gut bacterial fermentation. It provides a more accurate assessment of protein digestibility and amino acid bio-availability. A digestible indispensable amino acid score (DIAAS) is calculated for each essential amino acid based on its initial composition and corresponding digestibility when referenced against the individual AAFCO amino acid recommendations for adult cats at maintenance. By referencing AAFCO, DIAAS calculations are used to identify limiting amino acids in a protein source while categorizing the quality of each protein as high ($> 100\%$), moderate ($> 50\%$ to $< 100\%$) or low ($< 50\%$). DIAAS is comparable to protein digestibility-corrected amino acid scores (PDCAAS) but provides a more accurate assessment of high-quality proteins.

Pulse Proteins: All DIAAS were greater than 100% for whole yellow peas, garbanzo beans, black bean grits and navy bean powder, demonstrating that each is considered a high-quality protein source for adult cats with no limiting amino acids. For green lentils, tryptophan is first limiting (53%) and methionine is second limiting (73%) for adult cat foods. Using green lentils requires the use of a complementary protein or supplemental methionine and tryptophan to meet the cat's requirements.

Pulse Proteins					
DIAAS (%) Adult Cat	Yellow Peas	Garbanzo Beans	Black Bean Grits	Navy Bean Powder	Green Lentils
ARG	192	242	123	128	170
HIS	188	192	201	222	160
ILE	205	197	217	228	191
LEU	138	132	147	156	126
LYS	222	181	191	201	184
MET	107	155	123	116	73
PHE	278	326	328	336	265
THR	123	106	134	138	103
TRP	108	123	158	183	53
VAL	193	170	209	223	175

Protein Concentrates: With the exception of faba bean protein, all protein concentrates are classified as high-quality for adult cats as all DIAAS exceed 100%. This also indicates there are no limiting amino acids for adult cats. Methionine is first limiting in faba bean protein (82%) and its use in adult cat foods requires additional methionine. Overall, adult cat foods formulated with these plant and dried yeast protein sources will supply all essential amino acids based on the AAFCO recommendations for adult cats at maintenance.

Protein Concentrates					
DIAAS (%) Adult Cat	Pea Protein	Potato Protein	Soy Protein Concentrate	Dried Yeast	Faba Bean
ARG	214	122	178	101	223
HIS	194	177	211	165	196
ILE	216	283	236	239	208
LEU	146	208	154	207	145
LYS	223	236	191	159	180
MET	102	284	178	240	82
PHE	291	387	300	301	251
THR	114	188	125	126	103
TRP	132	141	193	148	124
VAL	196	287	208	229	186

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Protein Byproducts: Soybean meal is categorized as high quality for adult cats with all DIAAS exceeding 100%. Soy flakes are similar except for a moderate threonine value (93%). Lysine is first limiting in corn gluten meal (47%) and peanut flour (28%) for adult cats while the second limiting amino acids are arginine in corn gluten meal (81%) and threonine in peanut flour (64%). Tryptophan is also slightly limiting in corn gluten meal (98%). Overall, these protein byproducts are appropriate for adult cats recognizing supplemental amino acids or a complementary protein is required when formulating adult cat foods with soy flakes, corn gluten meal and peanut flour.

Protein By-Products				
DIAAS (%) Adult Cat	Soybean Meal	Soy Flakes	Corn Gluten Meal	Peanut Flour
ARG	175	154	81	228
HIS	207	173	166	153
ILE	227	187	206	150
LEU	150	121	334	115
LYS	188	154	47	28
MET	169	131	325	107
PHE	291	249	378	280
THR	127	93	107	64
TRP	217	185	98	169
VAL	201	159	192	155

Developing commercial pet foods can be challenging when sourcing ingredients that are palatable and nutritious. The recently published research demonstrates plant- and yeast-based protein sources are nutritious alternatives that can be used effectively by adult cats. This research separates fact from fiction by showing cats are not obligated to meat and other animal-derived ingredients only. These findings allow manufacturers to expand their pantry of potential ingredients when formulating adult cat foods and treats. This expanded pantry is also beneficial as it alleviates pressure on the supply of meat and other animal-based ingredients used in today's adult cat foods. Thus, it is always important to separate fact from fiction even when feeding cats.

Publications:

Golder et al. 2020. *Animals*. 10(3):541. <https://doi.org/10.3390/ani10030541>.
 Reilly et al. 2020a. *J. Anim. Sci.* 98(6):1-8. <https://doi.org/10.1093/jas/skaa173>.
 Reilly et al. 2020b. *Trans. Anim. Sci.* 4(4). <https://doi.org/10.1093/tas/txaa133>.



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