Legumes in the Avian Diet

by Joanne Abramson
Raintree Macaws
Fort Bragg, California

Legumes, by definition, are plants that have edible seeds enclosed inside a pod. They include beans, peas, lentils and peanuts. They contain a rich source of incomplete protein, iron, thiamin, riboflavin, and niacin. Once sprouted, some legumes have an excellent source of vitamin C. Combined with rice (especially brown or wild rice) they provide a more complete protein source. Both brown rice and wild rice have significant amounts of vitamins and minerals compared to white rice. Rice can be sprouted with the legumes, utilizing the same technique.

In the early 1980's, several well known people began experimenting with legumes in parrot diets; most notably John and Pat Stoodley, Raymond Kray, D.V.M. and Greg Harrison, D.V.M. Since that time, several feed distributors have created and marketed packaged mixes in eight ounces pet size to fifty pound breeder mixes. Some of these mixes have added colored pasta, rice and other treats to entice birds to eat them.

Legumes have the advantage over many other commonly offered parrot diets due to their availability. Virtually every country has access to an assortment of legumes. Because they are a dried seed product, the movement of them across international borders is permitted. Most legumes are cultivated both inside and outside of the United States.

Bean nomenclature varies regionally. The Broadbean is known as Faba Bean. Chick Peas are called Garbanzo Beans and Ceci Beans. Cow Peas are known as Black eyed Peas or Crowder peas. Peanuts (actually a legume) are called groundnuts in some countries. People will frequently use the name pea or bean indiscriminately.

Raw legumes are normally not eaten because they contain toxic factors, such as hemaglutinins and trypsin factors. The usual method of cooking removes or inactivates these toxic factors. Cooking also makes them softer and, therefore, more palatable [U.S.D.A., 1986]. The sprouting process described in this article increases the ascorbic acid (vitamin C) and vitamin A of the beans.

Four species of Lupin were combined in the analysis because of a limited amount of data. White Lupin *(Lupinus albus)* from America and the Mediterranean, Blue Lupin *(Lupinus angustifolius)* from northern Europe, Yellow Lupin *(Lupinus luteus)* from southern Europe and the Mediterranean, and Tarwi or Pearl Lupin *(Lupinus mutabilis)* from South America. All seeds from the Lupin family should be soaked, then cooked before eating.

The 18 legumes analyzed on the following chart are not your only choices. Virtually any of the seeds you are currently feeding could be sprouted. Hulled raw sunflower, peanuts, pumpkin, squash and even raw, shelled almonds can be used. Almonds will not sprout, but will swell up and become softer and possibly more palatable for some birds.

Nutritional Analysis of Selected Legumes (per 100 gram weight)

NUTRIENTS: (gr)	Alfalfa Seeds S, R	Black Beans C	Broad Beans C	Chick Peas C	Cow Peas C	Kidney Beans S, C	Lentils S, C	Lima Beans C	Lupins C	Mung Beans S, C	Navy Beans S, C	Peanuts C	Peas S, C	Pigeon Peas C	Pinto Beans S, C	Soy Beans S, C	Split Peas C	White Beans C
Calories	29	132	110	164	116	33	101	115	119	21	78	318	118	121	22	81	118	139
Protein	3.99	8.86	7.60	8.86	7.73	4.83	8.80	7.80	15.57	2.03	7.07	13.50	7.05	6.76	1.86	8.47	8.34	9.73
Carbohydrates	3.78	23.71	19.65	27.41	20.77	4.72	21.25	20.89	9.88	4.19	15.01	21.26	21.86	23.25	4.10	6.53	21.11	25.10
Total Fat	.69	.54	.40	2.59	.53	.58	.45	.38	2.92	.09	.81	22.01	.51	.38	.32	4.45	.39	.35
Saturated	.069	.139	.066	.269	.138	.083	.053	.089	.346	.025	.098	3.055	.090	.083	.039	.483	.054	.091
Monounsaturated	.056	.047	.079	.583	.044	.045	.095	.034	1.180	.012	.060	10.921	.045	.003	.024	.500	.081	.031
Polyunsaturated	.409	.231	.164	1.156	.225	.318	.201	.171	.730	.032	.468	6.956	.240	.205	.185	2.467	.165	.152
Cholesterol (mg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phytosterols (mg)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Fiber	1.64	2.03	.95	2.50	2.31	—	1.10	3.09	.67	.52	2.88	1.96	3.3	1.10	.95	1.95	1.97	2.49
Water	91.14	65.74	71.54	60.21	70.04	89.30	68.70	69.79	71.08	93.39	76.02	41.78	74.37	68.55	93.39	79.45	69.49	63.08
Ash	.40	1.15	.81	.92	.94	.58	.80	1.15	.55	.30	1.09	1.45	.99	1.06	.34	1.10	.68	1.75
MINERALS: (mg)																		
Calcium	32	27	36	49	24	19	14	17	51	12	16	55	26	43	15	59	14	90
Iron	.96	2.10	1.50	2.89	2.51	.89	3.10	2.39	1.20	.65	2.11	1.01	1.67	1.11	.66	1.31	1.29	3.70
Magnesium	27	70	43	48	53	23	35	43	54	14	111	102	41	46	18	60	36	63
Phosphorus	70	140	125	168	156	38	153	111	128	28	103	198	24	119	30	135	99	113
Potassium	79	355	268	291	278	194	284	508	245	101	317	180	268	384	98	355	362	561
Sodium	6	1	5	7	4	—	—	2	4	10	—	751	3	5	51	10	2	6
Zinc	.92	1.12	1.01	1.53	1.29	—	1.60	.95	1.38	.47	—	1.83	.78	.90	.17	1.04	1.0	1.38
Copper	.157	.209	.259	.352	.268	—	.337	.235	.231	.122	—	.499	.020	.269	—	.330	.181	.287
Manganese	.188	.444	.421	1.030	.475	—	.502	.516	—	.140	—	1.023	.325	.501	—	.710	.396	.636
VITAMINS: (mg)																		
Ascorbic Acid	8.2	—	.3	1.3	.4	35.6	12.6	—	—	11.4	17.3	0	6.6	0	6.1	8.3	.4	0
Thiamin	.076	.244	.097	.116	.202	.362	.220	.161	.134	.050	.381	.259	.216	.146	.067	.205	.190	.118
Riboflavin	.126	.059	.089	.063	.055	.273	.090	.055	.053	.102	.235	.063	.285	.059	.059	.053	.056	.046
Niacin	.481	.505	.711	.526	.495	3.024	1.200	.421	.495	.817	1.263	5.259	1.972	.781	.725	1.092	.890	.140
Pantothenic Acid	.563	.242	.157	.286	.411	—	.571	.422	—	.243	—	.825	.683	.319	—	.743	.595	.229
Vitamin B6	.034	.069	.072	.139	.100	—	—	.161	—	—	—	.152	.128	.050	—	—	.048	.093
Folicin (mcg)	36.0	148.8	104.1	172.0	207.9	—	—	83.1	—	—	—	74.6	36.3	110.8	—	—	64.9	80.7
Vitamin A IU	155	6	15	27	15	2	41	0	—	14	4	0	107	3	1	11	7	0
AMINO ACIDS: (gr)																		
Tryptophan	—	.105	.072	.085	.095	.050	—	.092	.125	.028	.074	.131	—	.066	.019	.194	.093	.115
Threonine	.134	.373	.270	.329	.294	.203	.322	.337	.573	.058	.297	.462	.240	.239	.078	.491	.296	.409
Isoleucin	.143	.391	.306	.380	.314	.214	.320	.411	.695	.098	.314	.475	.221	.245	.082	.423	.344	.429
Leucine	.267	.708	.572	.631	.592	.347	.617	.673	1.181	.130	.508	.875	.473	.483	.133	.711	.598	.776
Lysine	.214	.608	.486	.593	.523	.275	.698	.523	.832	.123	.403	.485	.497	.474	.106	.592	.602	.668
Methionine	—	.133	.062	.116	.110	.050	.103	.099	.110	.025	.074	.166	.089	.076	.019	.095	.085	.146
Cystine	—	.096	.097	.119	.085	.055	.328	.086	.192	.012	.080	.173	.200	.078	.021	.045	.127	.106
Phenylalanine	—	.479	.321	.475	.451	.243	.434	.449	.618	.086	.357	.700	.325	.579	.094	.339	.384	.526
Tyrosine	—	.250	.241	.220	.250	.166	.248	.276	.585	.038	.243	.549	.164	.168	.064	.279	.242	.274
Valine	.145	.464	.338	.372	.368	.248	.391	.469	.650	.097	.363	.566	.285	.292	.095	.474	.394	.509
Arginine	—	.549	.702	.835	.535	.263	.600	.478	1.669	.146	.385	1.615	.627	.405	.101	.407	.744	.602
Histidine	—	.247	.193	.244	.240	.135	.252	.238	.443	.052	.198	.341	.217	.241	.052	.228	.203	.271
Alanine	—	.372	.311	.380	.352	.200	.349	.398	.558	.073	.293	.537	.317	.303	.077	.397	.367	.408
Aspartic Acid	—	1.072	.849	1.042	.933	.628	1.407	1.006	1.669	.355	.919	1.647	.849	.669	.241	1.228	.984	1.176
Glutamic Acid	—	1.351	1.291	1.550	1.463	.589	1.235	1.104	3.739	.120	.863	2.822	1.317	1.568	.226	1.202	1.426	1.483
Glycine	—	.346	.319	.369	.319	.166	.313	.329	.663	.046	.243	.814	.270	.250	.064	.329	.371	.380
Proline	—	.376	.320	.366	.347	.195	.349	.354	.635	—	.285	.596	.359	.298	.075	—	.344	.412
Serine	—	.482	.348	.447	.387	.258	.486	.519	.805	.024	.378	.665	.386	.320	.099	.634	.367	.529

(Blank spaces indicate a lack of data) S = Sprouted R = Raw C = Cooked

Photos by Joanne Abramson

In order for the legumes to sprout, they are first soaked for 12 to 24 hours, then drained.

John and Pat Stoodley [Parrot Production, 1983] suggest using at least a dozen different peas and beans in order to provide a wide mineral coverage. John recommends soaking them overnight, straining, then boiling in fresh water. After letting them cool, he uses the legumes in their cooking water as a base. To this base he adds many varieties of vegetables and fruits. In addition to legumes, the Stoodleys add alfalfa, kelp and germinating wheat. The Stoodley diet is such a masterpiece of daily variety that the only way to give it justice is to read the entire diet chapter.

The legumes are then placed on sprouting trays and rinsed frequently to avoid bacterial contamination. This photo was taken in AFA members' Cindy Smiley and Ross Anderson, D.V.M.'s sprouting room, which maintains a constant 70°F temperature.

Stoodley notes, "Where climatic conditions make it possible to feed soaked grain and pulses, a diet containing these will be much more beneficial since they are living, growing foods and nutritionally are far superior to dead foods like pellets.' [Species Amazonia, 1990]

Cindy Smiley and Ross Anderson, D.V.M. of Salt Lake City, Utah have chosen an uncooked method of preparing their legume mix. They mix Buckwheat, Safflower, Sunflower, Wheat: Hard Red, Soft White and Spring. Corn, Barley, Oats, Canadian Peas, Lentils, Black-eyed Peas, Great

Northern Beans, and Pinto Beans. Because of the toxins in raw soybeans, these are not used. The mix is soaked in a bucket of water (enough water to cover beans even after they expand) for 24 hours. Calcium Propionate (1/4 cup per 24 cups of seed) is used to retard bacterial growth. These are then placed on trays to sprout for approximately 55 hours and sprayed down three times a day with clear water. After the 55 hour sprouting time, the green sprouts are under one inch long. They are fed raw to the birds with bone meal, calcium, oyster shell, vitamins and salt added. The sprouting room is kept at a constant 70°F and has a circulating fan.

Twice a week, the birds are fed two alternating mixes in addition to the sprouted diet; the first is a mix of fruit and vegetables, and the second is a mix of cooked brown rice, sweet potatoes and wheat germ. This diet is fed year around. Parents feed this same mixture to their young while on the nest.

All utensils are washed with a Clorox bleach solution (one cup per gallon) daily. (This is a strong solution and should only be used in a well ventilated room. Bleach can create toxic gases when mixed with other cleaning solutions and should only be mixed with water.)

There are three standard methods for incorporating legumes in bird diets.

The soak and cook Stoodley method: The legumes are cleaned and sorted as above, then soaked overnight and cooked the following morning just prior to feeding to the birds.

The non-cooked Smiley-Anderson method: Takes full advantage of the natural sprouting technique. Chlorophyll, the same nutrient found in green leaves, is created in the sprouting process. Softening the legumes over several days using multiple fresh water changes and then sprouting in a constant 70°F room. Do not let the tender sprouts dry out. Sprouting takes two to four days depending on the type of seed used. Both soybeans and lupins contain toxins that can only be eliminated by cooking. If you are planning to feed soybeans or lupins, they must be cooked before adding to the non-cooked beans. You will need to keep the soybeans or lupins separated from the other sprouting legumes.

The sprout, then cook method; combines the other two methods by sprouting for two or more days and then cooking briefly. The legumes are then softened and become more easily digestible.

Some hints for sprouting: buy only peas, beans and seeds meant for food. Feed stores commonly carry seeds for planting and these should not be used. They have usually been treated with chemicals to help when you plant them in the ground. Peas must be whole (not split) in order to sprout. Remove damaged, broken, wrinkled or split beans or peas. Likewise, remove any stones or debris which might have failed to be removed before packaging. Cover the legumes with several inches of water which the seeds will soak up and expand in. [Robertson, L. 1986]

Heat and humidity both play a factor in how quickly the seeds will sprout. The hotter the temperature the more often they will need to be rinsed. Indirect light, moisture, adequate drainage and air circulation are critical to maintaining the proper environment for them to grow without spoiling.

Sprouts can be grown in three simple ways. For small amounts you can use a quart canning jar. There are ones that are specially made with wire or plastic insets that can be turned over to drain and refilled without opening the lid. For larger amounts there are sprouting trays. Two sizes are commonly available; 24" x 24" and 2" deep and 10" x 14" x 2" deep. Plastic trays with small drainage holes are best so that you can rinse and drain without moving the legumes. [Wigmore, A. 1986]

A third method requires two buckets. One slightly smaller bucket (which contains the legumes) fits inside a second larger bucket that is filled with water. This smaller bucket has multiple holes drilled in it creating a colander. The bean filled, colander bucket can be lifted out of the water bucket. The water bucket is then drained and fresh water can be added with the bean bucket lowered back into the water. After 48 hours the beans are then removed for sprouting. Remember to cover with ample water as the dried legumes will soak up the water quickly.

The newest evolution of the legume diet has been created by Greg Harrison, D.V.M. Utilizing certified organic ingredients, he has created an extruded pellet containing several grains, four legumes (lentils, green peas, soybeans and peanuts), sunflower seeds and vitamin supplements. The legumes are cooked during the extruded process. This provides an edible product needing no further preparation. Dr. Harrison came to the conclusion that a diet of this nature was desirable after seeing the results that legumes in the psittacine diet provided. Having traveled to John Stoodley's facility in England, he became acutely aware of the benefits this type of diet provided. However, he also noticed that many people were having difficulty complying with the legume diet over a long period of time.

This last of four articles dealing with avian nutrition hopes to have introduced aviculturists to the exceedingly wide variety of options that are available to our captive birds. All of the analyses are done using 100 gram weight of the food. This allows the reader to analyze all the food using the same amount. For this chart there are three new symbols under the heading of each legume; S for sprouted, R for raw and C for cooked. This lets the reader know the method of preparation used to determine the nutrients. All those marked "cooked" can be sprouted before cooking with an increase of nutrients. A sprouted legume analysis was unfortunately not available for all. Whenever possible, the author sought out the sprouted then cooked analysis.

In case you missed any of the other *AFA Watchbird* articles, they are as follows: Fruit in the Avian Diet, (Oct/Nov 1990), Nutritional Analysis of Selected Nuts and Seeds (June/July 1991), Vegetables in the Avian Diet (Oct/Nov 1991). Copies are available through the AFA Home Office.

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