

Nutrition Guide

For Bobwhite Quail Production

Cooperative Extension Service
The University of Georgia College of Agricultural and Environmental Sciences



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Nutrition Guide for Bobwhite Quail Production

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Bobwhite quail need proper nutrition for growth, bone formation, feather development and health. Nutritionally adequate diets have a composite of ingredients that supply the bird with six essential nutrient classes. These nutrients include water, protein, carbohydrate, fats, minerals and vitamins. Each nutrient serves specific functions and must be provided by the diet in an adequate amount to promote tissue growth and maintenance.

Nutrients

Water

The most important nutrient is water. Bobwhite quail need water for temperature regulation, waste removal, digestion of nutrients, and lubrication of joints. Water deprivation can cause weight loss, dehydration and, ultimately, death. A good rule of thumb to consider is that birds drink about twice the amount of water compared with feed on a weight basis. During times of high environmental temperatures, however, water intake may be four times greater than feed consumption. Not only is adequate water paramount, but the quality of the water source is also of great importance. Water quality guidelines are in Table 1.

Protein

Proteins are used for the formation of meat, feathers, eggs, blood, hormones and immune response. They consist of small compounds referred to as *amino acids*. Amino acids contain nitrogen, hydrogen, carbon and oxygen; some have sulfur. Quail use 20 different amino acids to maintain physiological functions, but the body can produce only 10 of these amino acids. The other 10 must be supplied by the diet to support adequate growth and development. Dietary protein sources typically used to meet amino acid/protein requirements are soy-

bean meal, corn-gluten meal, meat and bone meal, poultry by-product meal and canola meal.

Carbohydrates

Carbohydrates are classified as sugars, starch, cellulose and gums. They supply the bird with a source of starch and simple sugars. Some grain sorghum varieties, however, contain anti-nutritional factors such as tannins, which reduce the utilization of protein. Avoid varieties of grains that contain anti-nutritional factors.

Another grain receiving considerable attention is pearl millet. Information is limited on pearl millet, but it certainly appears to have promise as an energy source feed ingredient. Bobwhites prefer millet to other grains.

Table 1. Water quality recommendations^A

Item	Average Level	Maximum Level
Total bacteria	0/ml	100/ml
Coliform bacteria	0/ml	50/ml
pH	6.8-7.5	...
Chloride	14 mg/l	250 mg/l
Copper	0.002 mg/l	0.60 mg/l
Iron	0.2 mg/l	0.3 mg/l
Lead	...	0.02 mg/l
Nitrate	10 mg/l	25 mg/l
Nitrite	0.4 mg/l	4 mg/l
Sodium	32 mg/l	...
Sulfate	125 mg/l	250 mg/l
Zinc	...	1.50 mg/l

^AAdapted from *Drinking Water Quality for Poultry*. North Carolina Agricultural Extension Service, PS & T Guide No. 42.

Fats

Fats have a higher concentration of energy than carbohydrates and are also needed for absorption of fat-soluble vitamins. Fat sources have a tendency to undergo oxidation, become rancid, and destroy the activity of vitamins. Add an antioxidant to the fat source to minimize the occurrence of fat oxidation.

Minerals

Minerals are the inorganic elements remaining when a feedstuff is burned. The animal's body consists of approximately 3-5 percent ash on a dry basis. Calcium and phosphorus account for about 75 percent of the total mineral content of ash. Mineral deficiency symptoms in quail include bone disorders, decreased egg production, thin-shelled eggs, reduced growth, poor feather development, and anemia. The essential minerals needed for growth and production are classified as either macro or micro, based on the amount required in the diet. Macro minerals include calcium, phosphorus, sodium, chloride, potassium and magnesium, which are needed in relatively large amounts. The micro minerals include manganese, zinc, iron, copper, iodine, molybdenum and selenium.

Vitamins

Vitamins are organic compounds required in low concentrations for growth and reproduction. Vitamin deficiency symptoms observed include reduced bone formation, decreased egg production and hatchability, fatty liver and kidney degeneration. Vitamins are classified as either being fat-soluble or water-soluble. The fat-soluble vitamins include vitamins A, D, E and K; the B vitamins, choline and vitamin C are water-soluble vitamins.

Diet Formulation

Plantation customers demand well-feathered, lean and flighty Bobwhite quail. Nutrition can impact these essential characteristics. The Bobwhite quail doubles its weight every four days during the first couple of weeks, and the chick needs nutrients for feather formation, bone development and tissue growth. Proper feather development is dependent on adequate protein consumption,

because feathers are primarily composed of protein. Therefore, a protein deficiency in the feed can cause poor feather development. Hot temperatures can decrease feed consumption by 20 percent, which can lead to poor feather development, increased disease susceptibility and poor growth rate if feed does not contain an adequate amount of nutrients.

During the summer months, a protein deficiency is more likely to occur because high environmental temperatures often decrease feed consumption. Other production factors such as high pen density and infectious diseases can also limit feed consumption. One strategy to compensate for reduced consumption is to feed high protein diets, so when a reduction of feed intake occurs, adequate protein consumption is maintained. Marketing lean birds is also paramount to game bird producers; overweight quail are often lethargic. Providing a diet rich in protein relative to energy can help minimize obesity.

Unfortunately, experimental data are limited on the nutrient requirements for Bobwhite quail. Field experiences, however, have provided valuable information with regard to nutrition. Researchers from North Carolina State University have determined that providing Bobwhite quail a starter feed containing between 28-30 percent protein should be adequate to maintain proper feather development, livability and body weight gain.

Feeding Bobwhite quail a starter feed formulated to contain higher than 30 percent protein is not necessary unless the birds are experiencing a significant reduction in feed consumption. A feed containing 30 percent protein is usually adequate, and more than 30 percent protein is not used by the bird. As a general rule, feed cost can be directly proportional to protein content. So feeding high protein feeds that exceed the birds protein/amino acid requirements can be costly.

Ingredient and nutrient composition of six suggested diets for Bobwhite quail from hatching until marketing is provided in Table 2, page 5. These diets are intended to be higher in crude protein and methionine than typical commercial Bobwhite quail diets in order to minimize inadequate protein consumption as well as to compensate for nutrient variation in feed ingredients. Game bird producers

Table 2. Composition of diets recommended for Bobwhite quail reared for game-release

INGREDIENTS, % "AS-IS"	Starter (1)	Starter (2)	Grower (1)	Grower (2)	Finisher (1)	Finisher (2)
Corn, 8.5% CP	34.59	39.86	44.78	49.73	54.66	59.62
Soybean meal, 48.5% CP	59.45	54.40	49.47	44.47	39.62	34.61
Limestone	1.88	1.63	1.64	1.65	1.70	1.71
Biofos (Dicalcium Phosphate)	1.49	1.52	1.55	1.58	1.52	1.55
Fat	1.00	1.00	1.00	1.00	1.00	1.00
Vitamin & trace-mineral premix ^A	0.50	0.50	0.50	0.50	0.50	0.50
Dynamate (Potassium Chloride)	0.40	0.40	0.40	0.40	0.40	0.40
Salt	0.40	0.40	0.40	0.40	0.40	0.40
DL-Methionine	0.18	0.18	0.15	0.16	0.09	0.10
Coccidostat	0.06	0.06	0.06	0.06	0.06	0.06
Copper sulfate	0.05	0.05	0.05	0.05	0.05	0.05
Total	100.00	100.00	100.00	100.00	100.00	100.00
CALCULATED ANALYSIS						
Metabolizable energy, kcal/lb	1,232	1,259	1,281	1,303	1,327	1,349
Crude protein, %	32.00	30.00	28.00	26.00	24.00	22.00
Arginine, %	2.42	2.26	2.09	1.93	1.77	1.60
Methionine, %	0.68	0.65	0.60	0.58	0.48	0.46
Methionine + cystine, %	1.16	1.10	1.02	0.97	0.85	0.80
Calcium, %	1.10	1.00	1.00	1.00	1.00	1.00
Available phosphorus, %	0.52	0.52	0.52	0.52	0.50	0.50
Sodium, %	0.16	0.16	0.16	0.16	0.16	0.16

^A Supplied per lb of diet: vitamin A - 5,000 IU; vitamin D - 1,000 ICU; vitamin E - 6.25 IU; vitamin B₁₂ - 0.004 mg; riboflavin - 2.50 mg; niacin - 17.50 mg; biotin - 0.025 mg; d-pantothenic acid - 7.50 mg; choline - 200 mg; menadione - 1.25 mg; folic acid - 0.25 mg; pyridoxine - 1.50 mg; thiamine - 1.5 mg; iodine - 1 mg; copper - 1.15 mg; zinc - 25 mg; iron - 11.25 mg; manganese - 25 mg; selenium - 0.023 mg.

should feed a sequence of these six diets during production.

For example, birds may be fed a 30 percent crude protein diet for the first 6 weeks, a 26 percent crude protein diet from 7 to 12 weeks, then a 22 percent crude protein diet during the last few weeks. Factors such as environmental temperature and disease outbreak may warrant the need for feeding a regimen having a starter feed of 32 percent crude protein, grower feed of 28 percent crude protein, and final feed consisting of 24 percent crude protein. Using a feeding program consisting of more than three feeds will allow a grower to reduce feed costs but may not be practical from the standpoint of labor demands with mixing feed or having an adequate amount of storage.

Diets are also presented for breeders for the purpose of producing hatching eggs (Table 3, page 6). These diets were formulated to contain either sufficient (24 percent) or high (28 percent) crude protein content. During situations of reduced feed intake, the diet containing 28 percent crude protein would be more appropriate to avoid reductions in fertility and hatchability.

Pre-Mix

Mixing feed on the farm may be an option for producers who want to reduce feed cost, but it requires specific equipment and additional labor. One approach would be to mix a certain amount of corn and soybean meal with a commercial premix

Table 3. Composition of diets suggested for Bobwhite quail breeders

INGREDIENTS, % "AS-IS"	Breeder Diet (1)	Breeder Diet (2)
Corn, 8.5% CP	39.15	49.07
Soybean meal, 48.5% CP	50.49	40.48
Limestone	6.31	6.33
Biofos (Dicalcium Phosphate)	1.56	1.63
Fat	1.00	1.00
Vitamin & trace-mineral premix ^A	0.50	0.50
Dynamate (Potassium Chloride)	0.40	0.40
Salt	0.40	0.40
DL-Methionine	0.14	0.15
Copper sulfate	0.05	0.05
Total	100.00	100.00
CALCULATED ANALYSIS		
Metabolizable energy, kcal/lb	1,205	1,249
Crude protein, %	28.00	24.00
Arginine, %	2.11	1.77
Methionine, %	0.58	0.54
Methionine + cystine, %	1.00	0.90
Calcium, %	2.80	2.80
Available phosphorus, %	0.52	0.52
Sodium, %	0.17	0.17

^A Supplied per lb of diet: vitamin A - 5,000 IU; vitamin D - 1,000 ICU; vitamin E - 6.25 IU; vitamin B₁₂ - 0.004 mg; riboflavin - 2.50 mg; niacin - 17.50 mg; biotin - 0.025 mg; d-pantothenic acid - 7.50 mg; choline - 200 mg; menadione - 1.25 mg; folic acid - 0.25 mg; pyridoxine - 1.50 mg; thiamine - 1.5 mg; iodine - 1 mg; copper - 1.15 mg; zinc - 25 mg; iron - 11.25 mg; manganese - 25 mg; selenium - 0.023 mg.

rather than attempting to mix a vitamin premix and mineral premix separately due to the small volume of the micro ingredients needed. If a producer chooses to mix feed at the farm, the commercial premix must contain an adequate amount of minerals and vitamins for optimum growth and health. Premix recommendations are presented in Table 4 (page 7).

Non-Nutrient Feed Additives

Anti-microbial agents are compounds given in relatively low concentrations that suppress the growth of pathogenic microorganisms. This class of compounds includes antibiotics and coccidiostats. Antibiotics are naturally occurring substances produced by yeast, molds and other microorganisms; coccidiostats are a group of chemical compounds

used to prevent coccidiosis (an infection caused by intestinal parasites).

Only two anti-microbial agents have been approved for Bobwhite quail (Table 5, page 7). Monensin is the most commonly used coccidiostat. In addition to the anti-microbials, the addition of a probiotic or Direct-Fed Microbial (DFM) appears to be promising in improving health status. DFMs are naturally occurring microbials. These organisms enhance the population of beneficial microorganisms in the intestinal tract. Research from North Carolina State University has indicated that supplementing Bobwhite quail diets with PrimaLac, a DFM, reduced mortality, increased body weight gain, and improved feed efficiency. Another feed additive that can be advantageous in reducing pathogenic microbial populations is copper sulfate. This is a dietary source of copper that, when

Table 4. Composition of mineral and vitamin premix for Bobwhite quail

Nutrient	Unit	Potency/lb	Source
Vitamin A	I.U.	1,000,000	Vitamin A Acetate
Vitamin D	I.U.	200,000	Vitamin D ₃
Vitamin E	I.U.	1,250	dl-Alpha Tocopheryl Acetate
Vitamin B ₁₂	mg	0.80	Vitamin B ₁₂
Riboflavin	mg	500	Riboflavin
Niacin	mg	3,500	Niacin
d-Pantothenic Acid	mg	1,500	Calcium Pantothenate
Choline	mg	40,000	Choline Chloride
Menadione	mg	250	Menadione Dimethylpyrimidinol Bisulfite
Folic Acid	mg	50	Folic Acid
Thiamine	mg	300	Thiamine Mononitrate
Pyridoxine	mg	300	Pyridoxine Hydrochloride
d-Biotin	mg	5.0	d-Biotin
Selenium	mg	4.54	Sodium Selenite
Manganese	g	5.00	Manganese Sulfate
Iron	g	2.25	Ferrous Sulfate
Copper	g	0.23	Copper Sulfate
Iodine	g	0.20	Calcium Iodate
Zinc	g	5.00	Zinc Sulfate

Table 5. Suggested feed additives for Bobwhite quail^A

Trade Name	Drug	Dietary Inclusion Rate	Comments
BMD 50	Bacitracin Methylene Disalicylate	0.02%	Give until 5 weeks of age for growth rate and feed efficiency.
Coban-60	Monesium	0.06%	For the prevention of coccidiosis.
Primalac	Probiotic	0.1%	For growth rate, feed efficiency; to minimize mortality.

^A Suggested recommendations based upon the 1999 Feed Additive Compendium. Check the most current edition for modifications with drug usage and product approval.

present in high concentrations, is known to have anti-microbial activity.

Ingredient Quality

Feed storage time and temperature can influence the quality of mixed feed. Vitamin oxidation can occur with feed stored for long periods of time, so use feed within a three- to four-week period.

High grain moisture coupled with warm conditions can stimulate mold production. Corn raised under stress conditions (drought) is prone to mold growth. Some molds can produce a class of compounds referred to as *mycotoxins*. These can adversely affect growth of poultry and are known to be toxic. Send grain samples suspected to contain a high content (>20 ppb) of aflatoxin – a mycotoxin –

to a Georgia Diagnostic Laboratory for aflatoxin determination before mixing feed. If samples exceed 20 ppb aflatoxin, use another source of grain.

Summary

1. Proper nutrition is one of the most important factors in producing high quality flight birds.
2. Feed represents the majority of the cost for producing flight-ready quail.
3. Compromising the amount of nutrients in the diet can be a costly mistake, leading to poorly feathered birds, increased disease susceptibility and poor flight characteristics when birds are either overweight or under nourished.



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