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WHEAT

as a feed
for poultry



Cooperative Extension Service
South Dakota State University
and U. S. Department of Agriculture
in Cooperation with
the South Dakota Wheat Commission

Wheat as a Feed for Poultry

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Wheat is especially palatable to poultry—given a choice, they usually prefer this grain. When its cost makes it an economic choice, wheat should be considered for use in poultry diets.

The fowl's needs for essential nutrients are somewhat more critical than for many animals. Energy and certain amino acids supplied by grains are particularly important.

As indicated in Table 1, wheat ranks just below corn in energy available to poultry and is equal to milo. There could be samples that are even higher in energy content (this is not necessarily related to bushel weight).

Protein content varies considerably, irrespective of weight—from 11% to as high as 19%. However, higher test weights are usually accompanied by lower protein content. For total energy and protein, wheat ranks very high as a valuable feed grain.

Protein Quality

None of the grains provide adequate amounts of all the amino acids listed in Table 1, even for lay-

ing hens. Wheat could be used to meet the cystine and tryptophane requirements, but would be limiting in leucine, lysine, methionine, and threonine, in that order. A protein supplement such as soybean meal could be used with any of the grains, but a blend should be used, including soybean meal, fish meal, and meat scraps or other ingredients.

Considering the requirements for the laying hen, a diet that consists largely of wheat would need a supplement of about 0.04% threonine, 0.06% methionine, 0.05% lysine and 0.35% leucine. Soybean meal contains about 3.8% leucine, thus a 10% level would be needed to meet the leucine requirement. In so doing, the other amino acid requirements would be met, since the 10% soybean meal also would supply .06% methionine as well as 0.19% threonine and 0.3% lysine.

A diet of this type would be lacking in amino acid balance in that a response from further methionine supplements is frequently obtained—at least to the extent of improving feed conversion.

Table 1. Nutrient Composition of Grains and Requirements for Poultry*

Grain	Metabolizable energy Cal/Kg	Protein %	Amino acids											
			Arginine %	Cystine %	Histidine %	Isoleucine %	Leucine %	Lysine %	Methionine %	Phenylalanine %	Threonine %	Tryptophane %	Valine %	Linoleic acid %
Wheat	3250	14.0	.72	.25	.27	.54	.90	.45	.20	.63	.36	.18	.54	.82
Yellow corn, No. 2	3430	8.7	.43	.18	.17	.43	1.10	.20	.18	.43	.34	.10	.43	1.77
Oats, Midwest	2620	12.0	.71	.22	.18	.53	.90	.50	.18	.62	.36	.16	.62	1.49
Milo	3250	11.0	.36	.15	.27	.53	1.40	.20	.13	.45	.27	.12	.53	1.11
Barley	2840	11.5	.53	.18	.27	.53	.80	.53	.18	.62	.36	.18	.62	.78
Requirements for:														
Starting chicks	2700-3000	21	1.3	.30	.40	.75	1.40	1.2	.45	1.3	.70	.20	.85	1.0
Growing pullets	1500-1800	12-16	0.6-0.9	.15-20	?	?	?	.7-9	.27-.35	?	?	.12-.15	?	?
Laying hens	2700-3000	16	0.5	.15	?	.50	1.25	.5	.26	?	0.4	.15	?	1.25

*In part from Scott, *et al.*, (1969), *Nutrition of the Chicken*, also Merck and Co. (1961), Tech. Service Bulletin, and N.R.C. (1966), *Nutrient Requirements of Poultry*.

Wheat in the Ration

Examples of how wheat could be used to advantage for different ages of chickens are given in Table 2.

Starter Diet. The starter diet requires the most protein, consequently a rather large amount of soybean meal is used, together with fish meal, meat scraps, blood meal and dried whey. These materials will also supply the so-called unidentified growth factors needed for maximum performance. If wheat had made up two-thirds of the diet, as some might suggest, the diet would not be adequate. To simply supply the crude protein requirements of the chick is not enough, the amino acid balance must be considered. For the chick, such a diet would be deficient in leucine, lysine and phenylalanine.

By going to the diet presented in Table 2, these deficiencies are largely corrected. For this balanced formula, only 30% wheat could be used. The protein level is a bit high, but the soybean meal and blood meal are particularly important in supplying the critical amino acids.

Grower Diet. Over three-fourths of the grower diet can be wheat and still meet the known requirements for the developing pullet. The ranges of probable requirements for the amino acids, as given in Table 1, are rather wide, and it is no problem to meet those tolerances. We don't have adequate information to even suggest a requirement level for several of the amino acids.

Layer Diet. Several factors limit the extent to which wheat can be used on a practical basis for laying hens and still take advantage of the higher protein content of wheat. Wheat could be used at a higher level, but one would need to retain the soybean and meat protein such that an 18-19% protein diet would result. This would be inefficient use of protein, but it could be tolerated if economically feasible.

Table 2. Composition of Diets for Chickens Using Wheat

Ingredient	Starter %	Grower %	Layer %
Wheat, ground	30.0	77.45	39.03
Corn, ground	34.0		
Milo, ground			37.0
Oats, ground		10.0	
Soybean meal (47%)	17.46	5.0	10.0
Meat scraps (50%)	5.0	3.0	3.0
Blood meal	4.0		
Fish meal	2.0		
Dried whey	2.0		
Alfalfa meal (17%)	2.0	2.0	2.0
Yellow grease	1.0		2.0
Dicalcium phosphate	1.0	1.0	1.4
Limestone	1.0	1.0	5.0
Salt*	0.5	0.5	0.5
Methionine	0.04	.05	0.07
Vitamin premix†	+	+	+
Total percent	100.00	100.00	100.00
Calculated Analysis, %			
Protein	22.9	16.3	16.5
Essential Amino Acids			
Arginine	1.41	.95	.91
Glycine	1.44	.89	.79
Cystine	.29	.21	.22
Isoleucine	1.04	.68	.76
Leucine	1.90	.96	1.30
Histidine	.60	.32	.36
Lysine	1.30	.68	.73
Phenylalanine	1.13	.73	.72
Methionine	.40	.26	.26
Threonine	.87	.47	.49
Tryptophane	.28	.20	.17
Valine	1.24	.70	.76
Minerals			
Calcium	1.22	.94	2.60
Phosphorus	.71	.64	.67
Fat			
Linoleic acid	1.49	.94	1.32

* Containing, in percent: manganese 0.45, zinc 0.50, iodine 0.01, cobalt 0.01, iron 0.17, copper 0.05, sulfur 0.30, and sodium chloride 97.0.

† See Table 3 for composition.

The formula given in Table 2 for a layer diet includes milo to balance the marked deficiency of leucine in wheat (milo contains twice the leucine content of wheat). The methionine level had to be increased also to 0.07% to supply adequate amounts of this amino acid. In addition, the yellow grease level was set at 2% in order to supply the supplemented linoleic acid needed for maximum early egg size.

Where economics permits the use of wheat in a poultry diet, you can replace corn or other grains to the extent indicated above. Although corn is slightly higher in energy than wheat, the higher protein content of wheat makes up for this difference, so that wheat could be rated about equal to corn under some conditions.

Table 3. Vitamin and Antibiotic Supplement

Ingredient		Amount in 10 Pounds			
		Starter	Grower	Layer	Breeder
Vitamin A	I.U.	2,000,000	2,000,000	4,000,000	4,000,000
Vitamin D ₃	I.C.U.	500,000	500,000	1,000,000	2,000,000
Vitamin E	I.U.	5,000	5,000	5,000	10,000
Menadione (Sodium Bisulfite)	gm.	1	1	1	1
Riboflavin*	gm.	5	4	4	6
Pantothenic Acid*	gm.	10	8	8	12
Choline	gm.	150	100	100	100
Niacin*	gm.	30	24	24	24
Cobalamine (B ₁₂)	mg.	12	6	6	12
Santoquin (or BHT)	gm.	100	100	100	100
Antibacterial Agent ^{1,2,3*}		+1,2,3.	±1,2	±1,2	±1,2

*Only ingredients needed in grower rations if outside range and ample green forage are provided.

¹This could be any one of the following, per 10 lbs. of supplement: (Check for F.D.A. approval) 10-25 gm. Aureomycin, Terramycin, Tylosin, Bacitracin or furazolidone (nf-180), or penicillin-streptomycin or penicillin-bacitracin mixture, 2-4 gm. Oleandomycin or Erythromycin, 45 gm. 3-nitro, 4-hydroxyphenylarsonic acid (30 gm. for broiler or breeder), or 90 gm. arsenilic acid (60 gm. for broiler or breeder).

²For therapeutic treatments, 50 to 200 gm. of Aureomycin, Terramycin, Tylosin, Bacitracin, furazolidone (nf-180), or penicillin mixtures could be used.

³A coccidiostat should be used in starter diets according to the manufacturer's directions.



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