



POULTRY FEEDING AND NUTRITION

- Satendra Kumar, P. K. Upadhyay, Ramjee Gupta

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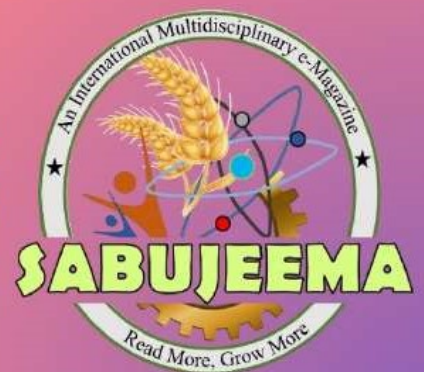
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POULTRY FEEDING AND NUTRITION

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Feed cost represents 65 to 75 percent of total cost of commercial poultry production. Efficiency in feeding therefore is one of the key factors for successful poultry production. More than 40 nutrients are required by the poultry. They can be arranged into six classes according to their chemical nature, functions they perform and the case with which they are chemically determined. These groups of nutrients are:

- Water
- Protein
- Carbohydrates
- Fats
- Minerals and
- Vitamins

Conventional poultry rations usually include many cereals like maize, rice, wheat, oat, barley and a few cereal by-products such as wheat bran, rice polish, animal and vegetable protein sources like fish meal, meat meal, soybean oil meal, groundnut cake, etc. according to their availability. The whole ration is fortified with adequate minerals and vitamins either in chemically pure or through ingredients known to be rich in these nutrients.

With the cost of feed soaring high and the availability of conventional ingredients becoming scarce, intensive and continuous efforts are being made to determine the nutritive value of agro-industrial by-products to replace more costly ingredients in poultry rations.

Problems involved in the feeding of fowls in recent times are:

- ◆ Increased cost of poultry feed.
- ◆ Confinement rearing of poultry.
- ◆ Inclusion of agro-industrial by-products in poultry, and
- ◆ Increase in flock size and high flock density.

The Principle points for consideration of poultry feed formulation:

- ⇒ Poultry birds have no lips or teeth, hence require a more concentrate ration.
- ⇒ Their digestive tract having a simple stomach is comparatively short, digestion is quite rapid. It takes about 2 and half



- hours for feed to go from mouth to cloaca in the laying hen, 10 hours in a non-laying hen. Therefore, the nutritive requirements of poultry are more precise.
- ⇒ Unlike ruminants, where micro-organisms synthesize a sizeable portion of essential Amino acids, Vitamin B-complex, Vitamin K in the stomach, the poultry completely depend upon the dietary source for all such nutrients (all essential amino acids, Vit. B-complex, etc.)
 - ⇒ Poultry birds are fed collectively rather than individually.
 - ⇒ Due to higher rate of metabolism, poultry require a more exact ration.
 - ⇒ Feed must contain all essential nutrients in right amount and proportion required for the purpose for which it fed.
 - ⇒ Chickens of different ages require different level of nutrients, hence only the accepted standards as per age should be followed accordingly.
 - ⇒ Ingredients chosen for preparation of poultry mashes must be palatable.
 - ⇒ While selecting ingredients for poultry mashes, nutritional value of each ingredient should be evaluated vis-à-vis cost.
 - ⇒ Chickens have no teeth to grind grains or oil cakes; hence these ingredients should be crushed into proper sizes in keeping with age of the chicken.
 - ⇒ Macronutrients and non-nutrient feed additives should be carefully chosen and mixed up meticulously for effective results.
 - ⇒ Include agro-industrial by-products to minimize cost and select a variety of ingredients to make good deficiency of one by other.
 - ⇒ While selecting an ingredient care should be exercised to judge its optimum level

- of inclusion as many of the ingredients are likely to be deleterious at higher level.
- ⇒ Fungal infested ingredients should always be avoided.
 - ⇒ Care should be taken to select optimum C/P ration for the purpose for which feeds are compounded.

METHODS OF FEEDINGS:

A well-balanced ration improperly fed will not give the most satisfactory results unless a satisfactory method is followed. Some of the popular methods of feeding are as follows:

1) Whole grain feeding system:

By this method birds are allowed to have their required ingredients kept before them in separate containers. The system through permit birds to balance their ration according to individual needs, however, it appears doubtful. This old and abandoned system offers no particular advantages. While it entails the use of several feed hoppers and a considerable amount of time to keep them filled.

2) Grain and mash method:

This method is slightly better than the previous one. It involves feeding of grain mixture along with balanced mash. By this, one can increase or decrease the protein level as desired. Unless the poultry man is exceptionally skilled, the method will lead to bad performances.

3) All mash method:

In this method of feeding, all the feed ingredients are ground, mixed in required proportion and fed as a single balanced mixture. This method is desirable for all types of poultry grown under litter and cage system. By this, birds can't have the

opportunity to have selective eating and moreover the qualities of eggs produced are of uniform quality. However, retain their nutritive value so well as ungrounded feeds.

4) Pellets methods:

Pellets are made of dry mash under high pressure. These are quite hard and cylindrical shape and are being extensively used in western countries. The greatest advantages in using pellets are that there is little waste in feeding. The disadvantages is that pellets are expensive (about 10% more expensive than that of feeds not pelleted)

5) Restricted or controlled feeding:

The method involves restrictions of feeding pellets during 6 - 20 weeks of age instead of ad libitum feeding as is practiced at present in most poultry farm. Reduction in feed cost, delayed sexual maturity but improved egg production curve, and along with a reduction in the number of small eggs laid is some of the advantages of this system.

Feed restriction to birds can be made by number of ways:

- ◆ Skips a day programme.
- ◆ Alternate day feeding.
- ◆ Restriction of feeding time.

NUTRIENTS REQUIREMENT OF POULTRY:

Chickens of different ages require different levels of nutrients, according to NRC, C.P and metabolic energy requirements of chickens are as follows:

A protein percentage between 22 to 24 is fed to broilers for the first 5 - 6 weeks to obtain rapid early growth. These ration are called **“Broiler starter ration”**. After this period, broilers are fed with a different type of ration having relatively less protein and more energy for fattening, such a feed is known as finisher ration, which contain 20 % protein and 3200 K cal ME / Kg.

FORMULATION OF POULTRY RATION

Feed formulation involves the judicious use of feed ingredients to supply in adequate amounts and proportions the nutrients required by poultry. While choosing the feed ingredients a consideration is also given to their current price to formulate least cost diets. Following information needed for feed formulation

1. Nutrient requirements for chicken feeds
2. Information on feed ingredients

Nutrient requirements of chicken depend upon the species; breed and its genetic make up, age, production statue and environmental conditions. The available feeding standards are "poultry nutrients requirements by Bureau of Indian standards (1992) Nutrients requirements of poultry (194) by the NRC of the National Academy of Sciences (USA) and similar requirement proposed by the ARC (UK). The accurate way to express the nutrients is in amount per day per animal. Poultry are fed in groups. It is, therefore, not practicable to express the requirements in

Group	Age	C.P.	ME (Kcal / Kg.)	Remarks
Starting chicks	Up to 8 wks.	20	2675	Starting poultry feed
Growing chicks	8 to 20 wks.	16	2410	Growing poultry feed
Laying hens	20 to onwards	15	2830	Laying poultry feed
Breeding hens	20 to onwards	15	2830	Laying poultry feed

amounts per day per animal. For optimum growth of young chickens, they should be fed diets containing all the necessary nutrients in the right amounts.

REQUIREMENTS FOR CHICKEN

Layers: the BIS (1992) recognize only two phases during the growing period of the chickens, 1. Chick phase (0-8 weeks), 2. Grower phase (8-20 weeks). On the basis of their growth rate and the accompanying nutrient requirements, the growing period of

S.N	Characteristic	Requirements for					
		Broiler starter	Broiler finisher	Chick feed	Growing chicken feed	Laying chicken feed	Breeder layer feed
1	Moisture percent by mass, Max.	11	11	11	11	11	11
2	Crude protein (Nx6.25), percent by mass, Min.	23	20	20	16	18	18
3	Crude fibre, present by mass, Max.	6	6	7	8	8	8
4	Acid insoluble ash, percent by mass, Max.	3.0	3.0	4.0	4.0	4.0	4.0
5	Salt (as NaCl), percent by mass, Max.	0.6	0.6	0.6	0.6	0.6	0.6
6	Calcium percent by mass, Min.	1.2	1.2	1.0	1.0	3.0	3.0
7	Available phosphorus by mass, Min.	0.5	0.5	0.5	0.5	0.5	0.5
8	Lysine, percent by mass, Min.	1.2	1.0	0.9	0.6	0.65	0.65
9	Methionine, percent by mass, Min.	0.50	0.35	0.3	0.25	0.30	0.30
10	Metabolizable energy (Kcal/kg), Min.	2800	2900	2600	2500	2600	2600
11	Manganese, mg/kg	90	90	90	50	55	90
12	Iodine, mg/kg	1	1	1	1	1	1
13	Iron, mg/kg	120	120	120	90	75	90
14	Zinc, mg/kg	60	60	60	50	75	100
15	Copper, mg/kg	12	12	12	9	9	12
16	VitaminA, IU/kg	6000	6000	6000	6000	8000	8000
17	VitaminD, IU/kg	600	600	600	600	1200	1200
18	Thiamin, mg/kg	5	5	5	3	3	3
19	Riboflavin, mg/kg	6	6	6	5	5	8
20	Pantothenic acid, mg/kg	15	15	15	15	15	15
21	Nicotinic acid, mg/kg	40	40	40	15	15	15
22	Biotin, mg/kg	0.2	0.2	0.2	0.15	0.15	0.2
23	VitaminB ₁₂ , mg/kg	0.015	0.015	0.015	0.01	0.01	0.01
24	Folic acid, mg/kg	1.0	1.0	1.0	0.5	0.5	0.5
25	Choline, mg/kg	1400	1000	1300	900	900	800
26	VitaminE, mg/kg	15	15	15	10	10	15
27	VitaminK, mg/kg	1.0	1.0	1.0	1.0	1.0	1.0
28	Pyridoxine, mg/kg	5	5	5	5	5	8
29	Linoleic acid, g/100g	1	1	1	1	1	1
30	Methionin+cystine, g/100g	0.9	0.7	0.6	0.5	0.55	0.55

FEEDS

Broiler: The Bureau of Indian standards (1992) recognizes only two phases in the broilers from day old to marketable age of 8 weeks, that is broiler starter phase (0-5 weeks) and broiler finisher phase (5-8 weeks) while NRC (1994) divided the period into 0-3 weeks, 3-6 weeks and 6-8 weeks since the requirements for nutrients of growing chickens depend upon their rate of growth.

chickens has been divided into 0-6 weeks (starter phase), 6-12 weeks (grower phase), 12-18 weeks (puller developer phase) and 18 weeks to first egg (NRC, 1994).

Essential amino acids for poultry certain amino acids can be produced from others by process of transamination, but a number cannot be effectively synthesized in the animal body and these are referred to as essential amino acid. Arginine, Histidine,

Isoleucine, Leucine, Lysine, Methionine, Phynylalanine, Threonine, Tryptophan and Valine are essential amino acid for poultry. Methionine and lysine are limiting amino acid.

Calorie/protein ratio: It is defined as the metabolizable energy (Kcal) per kilogram divided by the percentage of crude protein in the ration. The ratio varies with the age of the bird. Calorie protein ratios are:

Type	Calorie-protein ratio
Broiler starter feed	122
Broiler finisher feed	145
Chick feed	130
Grower feed	156
Laying chicken feed	144

INFORMATION ON FEED INGREDIENT

Maximum level of inclusion of feed ingredients: Each ingredient has its maximum level of inclusion in the diet to obtain optimum performance. This is dictated

by the presence of antinutritional/toxic factors, cost of the ingredient, difficulty in feed formulation, proper storage and shelf life of the feed, its capacity to induce imbalance of nutrients and reduce the performance of birds.

Level of inclusion of some common poultry feed ingredients

Feed Ingredient	Chicks	Grower/layers
Maize	60	60
Rice bran	10	20
Wheat	50	50
DORB	20	20
Rice polish	40	40
Wheat bran	10	15
Molasses	5	10
Sunflower cake	15	20
SBM	40	40
GNC-SE	40	40
GNC-Exp	20	20
Rapeseed cake	10	10
Fish meal	15	10
Meat meal	5	10
Oil or fat	10	5

Chemical composition and nutritive value of common poultry feed ingredient

INGREDIENT	DM%	ME (KCAL/KG)	CP	CF	EE	CA	P	LYSINE	METHIONINE
Maize	89	3340	9	2.2	3.8	0.02	0.28	0.22	0.18
Broken rice	89	2900	8.5	10.6	1.9	0.08	0.39	0.24	0.16
Wheat	89	3000	10	2.4	1.8	0.05	0.31	0.30	0.16
DORB	91	200	13.5	14.0	0.6	0.07	1.5	0.6	0.25
Rice polish	90	3300	12	8	15.1	0.08	1.30	0.50	0.22
Wheat bran	90	1300	15.7	11	3	0.14	1.15	0.59	0.23
Molasses	74	2300	3.0	-	-	1.10	0.12	-	-
Sunflower cake	93	1900	27	28	1.1	0.37	1.0	1.13	0.58
SBM	89	2300	45	6.6	0.8	0.29	0.65	2.7	0.65
GNC-SE	92	2400	42	13	1.0	0.2	0.63	1.6	0.45
GNC-Exp	90	2600	40	13	7.3	0.16	0.56	1.5	0.42
Rapeseed cake	92	2300	35	11	1.4	0.72	1.12	1.70	0.65
Fish meal	91	2400	42	1.0	5.0	3.73	2.43	3.2	1.1
Meat meal	92	2400	45	8.7	7.1	8.27	4.1	2.5	0.65
Oil or fat	-	8000	-	-	-	-	-	-	-

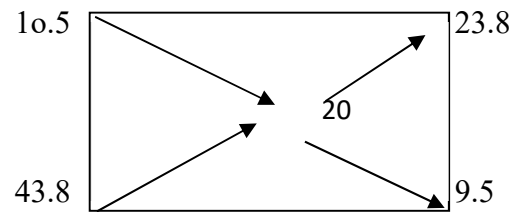
Formulation of feed mixture by the use of the square method

It is necessary to blend two or more feed together into a mixture containing a certain definite percentage of some major nutritive factors. For this purpose a procedure generally referred to as the square method may be used.

Steps in the use of the square method to balance the protein in the diet of poultry finisher ration are as follows:

- Draw a square at the left side of the page.
- Insert the % crude protein desired in the final mixture (20%) in the middle of the square.
- Group the ingredient as protein source containing higher percentage of protein at upper left corner and energy source containing lower percentage of protein at the lower left corner. (For this method to work, one feed or source must be above the desired level of nutrient and the other below).
- Subtract the subtract the nutrient in the energy source from the nutrient desired in the mix, and place the difference on the corner of the square diagonally opposite from the energy source. Here, maize, rice polish and DORB taken as energy source.
- Subtract the subtract the nutrient in the protein source from the nutrient desired in the mix, and place the difference on the corner of the square diagonally opposite from the protein source. Here fish meal, SBM and GNC taken as protein source.
- The above remainders represent the proportions of these feeds, which will provide a mix containing the desired % of nutrient. The amounts are then converted to a percentage or a per hundredweight basis and then to other weight bases as desired for mixing purposes.

Energy source



Protein source

33.3

Energy source

Ingredient	CP%	Part
Maize	9	3
Rice polish	12	1
DORB	13.5	1
Total		5
Average protein		10.5
Fish meal	45	1
SBM	45	2
GNC	42	2
Total		5
Average protein		43.8

Calculation for energy source (maize, rice polish and DORB)

$$23.8/33.3 \times 100 = 71.47$$

$$71.47/5 = 14.29$$

$$\text{Maize } 14.29 \times 3 = 42.89$$

$$\text{RP} = 14.29$$

$$\text{DORP} = 14.29$$

Calculation for protein source (fish meal, SBM and GNC)

$$9.5/33.3 \times 100 = 28.53$$

$$28.53/5 = 5.71$$

$$\text{Fish meal} = 5.71$$

$$\text{SBM} = 5.71 \times 2 = 11.41$$

$$\text{GNC} = 5.71 \times 2 = 11.41$$

Check the balance of nutrient

Ingredient	CP content
Maize	3.86
RP	1.72
DORB	1.93
SBM	5.13
GNC	4.79
Fish meal	2.57
Total	20