Standard of Chicken Feed in Japan

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Poultry in Japan has rapidly developed in a little over 10 years in the past. The number of chickens in 1970 was 169,277,000 layers and 53,742,000 broilers. In the poultry industry, foreign feeding standard has been adopted, especially in mixing feeds for chickens.

On the other hand, as poultry developed, the demand for concentrated feed increased tremendously, stimulating the development of the feed industry. However, most of the raw material for the feed is being imported at present. It is important, therefore, to study which is the most effective and economical feed, and suitable for the environmental condition.

With these points in mind, studies were made on layers and broilers as to their nutrient requirement in the past 10 years. Table 1 is the result of these investigations, and is the Japanese feeding standard of chicken feed.

Table 1. Feeding standard for chickens in Japan

Nutrients		Layer				Broiler	
		0–4 wks.	4–10 wks.	10–20 wks.	Layer	0–4 wks.	>4 wks.
Crude protein	%	20	17	15	16	20	16
Total digestible nutrients (TDN)	%	69	66	63	66	68	73
Calcium	%	0.83	0.75	1.0	2.75	0.8	0.8
Phosphorus	%	0.6	0.6	0.6	0.75*	0.6	0.5
Sodium chloride	%	0.5	0.5		0.3	0.5	0.5
Manganese	mg/kg	55					
Methionine+cystine	%	0.7				0.7	
Vitamin A	iu/kg	2650			4400		
Vitamin D	icu/kg	200			500		
Thiamine	mg/kg	2.5				1.8	
Riboflavin	〃	5.5			2.2	7.2	
Pantothenic acid	〃	9.3			4.6		
Nicotinic acid	〃	29				37	
Pyridoxine	〃	6.7			2.9	2.9	
Biotine	μg/kg	90					
Folic acid	〃	550			24		
Vitamin B_{12}	〃	9					
Choline	g/kg	1.3				1.3	

* For caged layer. 0.6% may be satisfactory for layer on floor.

Significance of feeding standard

Feeding standard indicates the requirement of kind and quantity of nutrient for chickens, and required amount of energy, crude protein, amino acid, vitamins and inorganic material is shown in the table.

In poultry, since the cost of feed constitutes about 70% of the production cost, it is extremely important to save feed cost. Therefore, it is very significant to establish the standard for nutrient requirement in keeping with the chickens' normal growth and their production.

Unit of nutrient

Energy and protein are two important nutrients of the many components of feeds, and it is these two which are the major material for eggs and chicken meat. Inorganic materials and vitamins play a supplementary role in making effective and smooth production, and only a small amount is required when they are lacking in natural feed. Consequently, strenuous effort was made in studying the requirement of energy and protein in establishing the Japanese feeding standard for chicken feed.

Unit of energy: TDN was used as the unit of energy because this was often used in determining the energy of various feeds in Japan for a considerable period of time. However, calorific value is the most rational unit of energy, and it would be desirably indicate by metabolizable energy in the future. Since the unit of energy of various feeds is not expressed in terms of metabolizable energy in Japan, the approximate value of metabolizable energy is obtained from the TDN content using the following formula:

$Y=0.0385\ X + 0.115$

However,

Y=Kcal of metabolic energy in 1 g of feed

X=TDN %

Unit of protein: Crude protein is used as the unit of protein. This is obtained by multiplying the nitrogen content in the feed by 6.25. Theoretically, for unit of protein, digestible protein should be used also, but in the case of chickens, because of the structure of their digestive organs (both faeces and urine are excreted together), it is difficult to obtain the digestion rate compared with other cattle. Besides, the digestion rate is not necessarily constant, depending upon the composition of the feed. Taking these factors into consideration, crude protein is used as the unit of protein as it is easy to calculate it.

Classification and indication of standard of feed

Japanese feeding standard indicates the nutrient requirement for each of the groups shown in Table 1.

There can be several methods to indicate nutrient requirement: one method would be to indicate the nutrient required per chicken a day, or requirement per day per unit of body weight.

However, in the Japanese feeding standard, nutrient per cent of feed, mg per kg of feed (mg/kg), or international unit (I. μ) was adopted. The advantage is that it is easy for both the manufacturer and users of feed to understand it.

However, its demerit is that the nutrient intake is subject to change, relying upon the environmental conditions, especially temperature conditions, and also feed intake is influenced depending upon the types of chicken.

How to obtain nutrient requirement

1) Layer

During growing-up period (0-about 20 weeks): This is the period when chickens grow up and start laying eggs. In the case of normal growth, when the rate of accumulation of nutrients such as crude protein and energy, etc. in the given feed is high, the nutrient content in the effective feed is regarded as the required amount of nutrient.[1)]

Therefore, in the period of rapid growth,

0~4 weeks, crude protein and energy content in the given feed are kept high, and in the period covering 10~20 weeks when growth becomes slower, the nutrient content of the feed is kept low so that feed efficiency would become high, and loss of nutrient will be low.

Layers: The weight of layers is considered to be kept at an approximately constant weight. Therefore, the required amount of such nutrients as crude protein and TDN is indicated as the amount of nutrient necessary to maintain health plus nutrient necessary for production of eggs.

The relationship between the ratio of egg production and TDN requirement of layers can be obtained from the following formula:

$Y=0.37X+48.4$

However,

Y=TDN requirement per chick per day in grams

X=egg production %

48.4=TDN in grams necessary to maintain life

Thus, by changing the value of X (egg production ratio), the TDN amount, in keeping with any egg output ratio, can be obtained.

The relationship between the egg production rate and crude protein requirement of layers can be obtained from the following formula:

$$Pr=\frac{1.1^{(1)}\times Bw+0.12^{(2)}\times Ew\times Ep}{0.8^{(3)}\times 0.6^{(4)}}$$

Pr: protein requirement (g/day)
Bw: body weight (2 kg)
Ew: weight of an egg (60 g)
Ep: rate of egg production (%)
(1): protein requirement for maintenance per 1 kg body weight.
(2): crude protein content in 1 g of an egg (g).
(3): average digestibility of protein in feed for laying hens (80 %).
(4): average protein efficiency of feed for laying hens (60 %).

In this case, both body weight and egg weight can be set at will, and by the varying egg production rate from 10 to 100%, protein requirement in keeping with any egg production rate can be obtained.

Since the nutrient requirement corresponding to the respective egg production ratio can be procured in this way, the feeding standard for layers can be set from the relationship between this requirement and the feed intake per hen per day.[2)]

2) Broiler

Body weight increase is the most important factor in broilers. This is influenced by the nutrient content in the feed. In this case,

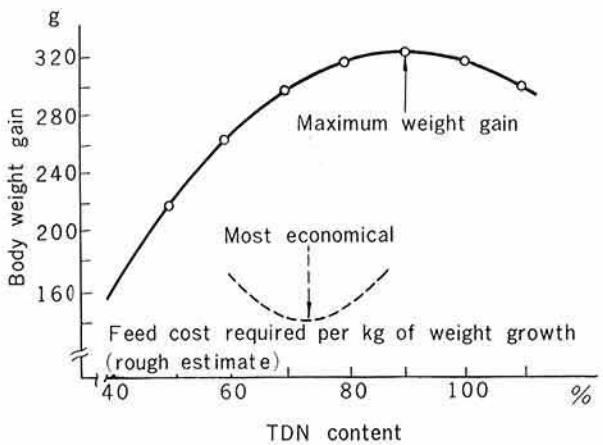

Fig. 1. Energy content of feed vs. chicken growth.

there is considerable difference in the nutrient content between the feed which would maximize the body weight increase per 1 kg of feed, and the feed with minimum cost per 1 kg of body weight increase.

For instance, the relationship between the TDN content in the feed, body weight increase, and the cost of feed per 1 kg of body weight increase is shown in Fig. 1; i.e., it is necessary to increase the TDN content in the feed up to 91% in order to maximize body weight increase.

However, the cost of the feed per 1 kg of body weight increase varies as shown in the broken line in the figure, and the TDN content which would minimize the cost of feed would have about 73% TDN content only, a very low level.

From this relationship, nutrient requirement for broilers can be obtained, so that the cost of feed required to get 1 kg increase in body weight would become minimum, and not the nutrient content in the feed which would maximize the body weight increase.[3),4)]

References

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