Balancing the ration

by

Helen Dow Whitaker, Extension Specialist in Poultry

We have been taught the nutritive ratios about -

A. For growing, 1:4.
B. For fattening, 1:8 mature, 1:6 or 7 young stock not full grown.
C. For maintenance, 1:6.
D. For egg production, 1:4 1/2.

The chick or hen uses: Protein and ash for material for growth, protein to repair waste tissue; protein (much less carbohydrates and fat) to make eggs; carbohydrates and fat (much less protein) to furnish energy; carbohydrates and fat (much less protein) to fatten. Note from the above that the carbohydrates and fat are mostly used to supply heat and energy to the growing chick and laying hen and to fatten market poultry, while protein repairs waste tissue and gives growth and eggs.

The elements carbon, hydrogen and oxygen practically make up both the carbohydrates and fats and the difference between them lies largely in the greater amount of carbon in the fat. It has been found by careful laboratory experiments that fat has, due to this greater percentage of carbon in it, $2\frac{1}{2}$ times as much heat and energy value as have the carbohydrates. One pound of fat will generate as much heat and energy as will $2\frac{1}{2}$ pounds of carbohydrates and a chick or hen can use them interchangeably, that is, that either can be made to do the work of the other.

On the other hand, while protein also contains carbon, hydrogen and oxygen it contains a very valuable thing besides, namely, nitrogen; and while it can, in a limited way, do the work of the carbohydrates and fats, this power is limited and we find practically that it is too expensive to use for this purpose. Therefore all feeding formulas are made up according to a comparison of the protein and the carbohydrates plus fat in them.

Shall we give a growing chick one pound of protein to two pounds or five pounds of eight pounds of carbohydrates and fat? Very careful weight and measurements have been made in laboratories to find out what was in a great many different rations; these rations were fed experimentally to different flocks of chicks and their growth carefully recorded; likewise for laying hens, for maintenance and for fattening. In general it has been found that chicks grow best when fed about one pound of digestible protein to four or five pounds of digestible carbohydrates plus fat; that the same ration is about right for laying hens, while to just keep the mature hen in condition without fattening or giving her food out of which to make eggs required about one pound of protein to six pounds of carbohydrates plus fat. For fattening a mature flock one pound of protein to eight pounds of carbohydrates or fats gave best results, while from the still growing youngsters better results were obtained by feeding one pound of protein to from six to seven pounds of carbohydrates plus fat.

If the reader will refer to the table given in Bulletin No. 3 (published by the Extension Service) he will find that in 100 pounds of wheat bran there are 15.4 pounds protein, 53.9 pounds carbohydrates and four pounds of fat. Since the fat has $2\frac{1}{2}$ times the heat and energy value of the carbohydrates, four pounds of fats will do the work of $2\frac{1}{2} \times 4$ pounds, which is nine pounds of carbohydrates. Adding the 9 pounds to 53.9 pounds of carbohydrates, we have a total of 62.9 pounds. Therefore, for every 15.4 pounds of protein there are 62.9 pounds of carbohydrates plus fat in bran. No
and out how many pounds of carbohydrates there are to one pound of protein divided by 6.9 by 15.4, which gives a fraction over 4. We say, the bran has a nutritive ratio of one pound of protein to four pounds of carbohydrates plus fats, or in brief, we write it 1:4. Going back to the ratios given above, we conclude bran is a good feed for growing chicks and laying hens, but not especially good for fattening.

In like manner the value of oats or green clover or half-fir corn can be figured out from the table given in Bulletin No. 3. Every poultryman should be able to figure for himself the value of any of the foods he raises or buys.

We feed to make first the hen, then the egg—that is, the hen appropriates such food as she requires for her own growth and maintenance and applies the surplus to egg production. The six-pound hen is made up approximately of 3 1/3 pounds water, 1/5 pound of ash, 1 3/10 pound protein and 1 pound of fat. An egg weighing 2 1/2 ounces is made up approximately of 1/2 ounces of water, 1/4 ounce each of ash and protein and 1/5 ounce of fat.

If one studies the figures on page 5 of Bulletin No. 3 he will see that is meant by "balancing the ration". To illustrate, suppose you feed your hen nothing but corn. For an egg she needs one-quarter of an ounce of protein to every one-fifth ounce of fat, but in corn she gets nearly eight times the quantity of fat that she does of protein. She will store up fat. Hunt through the table for something to feed her along with the corn that has little of fat and much of protein. Did you decide upon beef scrap? Now see if from the table you can make a combination of foods that will contain water and ash and protein and fat in exactly the same proportion that an egg does. It might seem rather difficult but it would be possible wouldn't it? Then you must take into account exactly the quantity you could prevail upon a hen to eat of each thing. The problem is more complicated than has been stated because the hens, or because too poor, or taken on fat, or is cold in winter, or overheated in summer, or exercises a little more today than she did yesterday, and accordingly the amount she takes of the food to supply her bodily needs differs one day from another and it will be rather difficult for you to determine exactly what is left to make the egg of. But the problem is even more complicated still. We have been assuming that all the hen ate went to make her or her egg, which is not the case at all. A hen does not assimilate all the elements in her food, but throws off a part as waste. The nourishment she gets out of her food depends upon how well her digestive and circulatory systems do their work, and this will differ materially with the different hens in the same flock.

The results of the feeding tests do not all agree. This is due in part to the fact that the result in growth showed not so much what was in the feed as to what the different lots of chicks were able to digest and use of the nourishment in the feed. This will always vary with different birds or not only different breeds, but of the same breed.

Here is a list of things that the reader will readily see will play an important part in the digestibility of food:

1. Amount consumed. Perhaps one flock will eat more dry mash and another more whole grains, or one may pick the cracked corn out of the scratch food and leave the wheat, etc.

2. Frequency of feeding. Fowls will eat more and digest more if fed a little oftener than if offered a large amount once a day.

3. Concentration of the food. For example, hens will digest more of ground barley with hulls removed than of barley with the hulls on, as the crude fiber of the
4. Mechanical condition. Chickens have been found to digest cracked corn more completely than corn meal. It does not follow that corn meal should never replace cracked corn in their ration.

5. Combinations of feed. Some feeds are more digestible when fed with other things than when fed alone; for example, bone meal added to a mash in most cases increases its digestibility.

6. Source — vegetable or animal. Fat in most cases is more digestible when from animal than vegetable sources.


8. Cooking and wetting. Seems to increase palatability, but probably not digestibility.

9. Age and curing. Applies especially to cured green stuffs such as dried clover. The younger plant will be the more digestible unless it is laxative.

10. Age, breed, individuality of bird fed.