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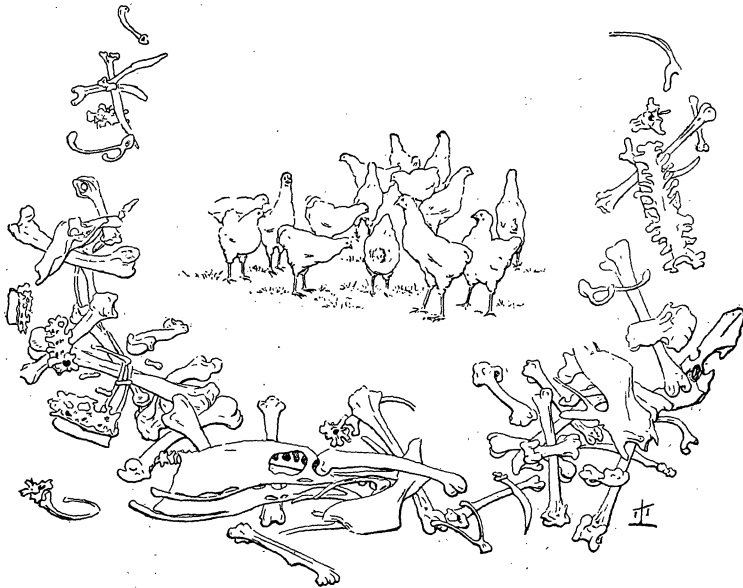
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ASH AND GRIT FOR GROWING CHICKS.

F. H. HALL AND W. P. WHEELER.

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POPULAR EDITION*

OF

BULLETIN No. 242.

ASH AND GRIT FOR GROWING CHICKS.

F. H. HALL.

**Rapid
bone
making.**

The growing chick on the ordinary farm or the village lot is left quite largely to its own efforts in obtaining food;—and wisely so. Aided by a few days' instruction from its busy, scratching mother, and guided by Nature's voice, as expressed in the demands of its rapidly-growing body, the young bird selects a varied and abundant diet and becomes a vigorous fowl.

We easily see that grains make up a large part of the diet; but we too often fail to realize that grains cannot supply all the bird's needs, and pass over unnoticed many important elements of poultry diet.

Great have been the demands made by the developing bodies, diverse the materials the chicks have gathered to meet these demands, and astonishing the kinds and quantities of ingredients which must pass through the digestive and circulatory systems of the active bird organism to insure perfect development. We fall short in kinds of food, if not in amounts, when we confine the birds to contracted houses and feed them mainly on grains.

Think what the chick or duckling does during the first three months of its growth! Man, in 15, 18, or more years, may

*This is a brief review of Bulletin No. 242 of this Station on The Importance of Mineral Matter and the Value of Grit for Chicks, by W. P. Wheeler. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals as investigations are completed; not monthly.

multiply his birth-weight by 20; the calf weighing from 50 to 75 pounds may in three years become the cow, bull or steer of from 900 to 1200 pounds; but the chick in 10 weeks often shows a gain of 1500 per ct. and ducklings may add from 50 to 100 per ct. to their weight weekly. And this growth is not of flesh, fat, or soft tissue merely; for the extensive, strong, bony framework must be formed with equal rapidity. With the largest breeds like the Cochins or Brahmas, the body of the unfattened young fowl is largely bones, with just enough flesh to hold these together and to keep them moving in the growing fowl's incessant search for food. Something like 10 per ct. of the body of an average fowl would be made up of inorganic (mineral) bone elements or "ash;" and the percentage must be much greater in these lean, immature birds.

Grains deficient in ash. Can not the bird secure from grains the ash elements needed to supply the demand for bone material? If 10 per ct. of the daily increase in weight is made up of ash, then the fowl must either consume foods which contain somewhere near this percentage, must store up a very large proportion of what enters the body, or must consume excessive quantities of food to secure the necessary mineral elements.

The ordinary grains will not supply this ash in any such proportion. Corn contains only $1\frac{1}{2}$ per ct. of ash, wheat less than 2 per ct., wheat screenings or oats 3 per ct., middlings $3\frac{1}{3}$ per ct., and bran, which is richest in this element of grains or grain refuses commonly used, carries less than 6 per ct. In digestion experiments with other animals, ash is usually less completely digested than the other nutrients, so it would not be safe to assume that fowls store up so much more of the ash than of the food as a whole—although a portion of the other constituents is used in supplying the energy expended and does not add directly to the bird's weight.

Thus we must force the fowl to eat large quantities of food in order to get the amount of ash needed; or we must provide some richer source of mineral elements than grains. If the bone-making material is not abundant one of two things will happen: The bones will be large, soft and weak, resulting in

lameness or deformity ; or the development of the bird will be governed by the mineral elements and will thus be retarded, making growth slow and unsatisfactory. Such a check in growth can rarely be overcome ; just as it is almost impossible to restore the full flow of milk in a cow that has been starved to a marked shrinkage of production.

**Sources
of
ash.**

It has been shown by previous tests that ducklings must have animal food to quite an extent to do their best, and the same was thought to be true of chicks as well, when the first series of tests was concluded. In subsequent tests it was shown that most of the advantage of the animal food, in the case of the chicks, was due to the large amount of ash elements the meat meal contained ; for when bone ash was added to purely grain rations, made palatable by great variety and regular changes, the chicks did as well as upon rations with animal food. The *ash* element was the essential factor in the case of the chicks. Ducklings, however, need the animal protein ; for they never do so well when that is lacking, even if the ash-elements are liberally provided.

The mature hen requires large quantities of lime for egg-making, but can obtain it from oyster shells and similar inorganic material. Is the same thing true of growing chicks which need lime to build bone ? Phosphorus also is required in bone-making and the grains do not furnish enough of it for rapid growth. Can this be obtained from minerals direct, as well as from the ground bone, bone ash or meat meal ? If minerals are eaten by the chicks, does any part of them become soluble and serve as true nutrients, or do the minute particles of the minerals merely act as grit in the crop and aid mechanically in digesting the food ?

**Station
tests.**

These are some of the questions which the Station has sought to solve, in part, by a series of tests extending over several years and including 19 lots of Leghorn chicks. The separate lots were composed of from 24 to 76 chicks, contrasted lots being always alike, and were fed from 10 to 12 weeks, beginning with chicks from one to three weeks old.

The rations for some lots were made up without animal food and for others with animal food; and the materials were so combined that under rations of each general class certain ones should be lower than usual in ash, others higher than usual and still others of medium ash content. Then to the rations thus made up, there were added varying percentages of glass sand, of fine ground Florida rock phosphate, of ground oyster shell, of bone ash, of sand and Florida rock, of sand and oyster shell, or of bone ash and oyster shell.

In various tests, from $\frac{1}{4}$ to $\frac{3}{8}$ as much sand (grit) was used as of other dry matter fed, and from $\frac{1}{8}$ to $\frac{3}{8}$ as much of the mineral as of the other dry matter. In some rations in which these two classes were combined the added ash elements weighed $\frac{1}{8}$ as much as the other dry matter of the rations and the average amount was about $\frac{1}{6}$. By these combinations very careful comparisons could be made of the effect of the several substances upon the health and growth of the chicks.

Sand alone, both in a ration without animal food
Results. and in one containing animal food with bone,
 contributed to a more efficient use of the food.

The increase in weight was not much greater, but the chicks were healthier, more vigorous, and apparently better prepared than those without sand in their food, to make profitable later growth. This was true even in cases where the chicks were running upon sanded floors and so were free to pick up sand as they required it. This emphasizes the necessity of looking carefully after the supply of grit, but it does not imply that it is best to buy poultry foods in which sand has been mixed. Sand or grit can be obtained more cheaply and added to the food as required.

The ground Florida rock phosphate proved of more value as an addition to rations than did sand. When used without sand in two grain rations, better results followed, in both efficient use of food and in rate of growth, than when sand alone was added to similar rations. When used with sand in one ration containing animal food but somewhat low in ash and in another ration without animal food, the chicks grew more rapidly and required less food for equal growth than when sand only was mixed with the same foods.

Oyster shell, on the other hand, proved an undesirable component of rations for chicks. Whether the ration contained animal food or was composed of grains alone, the health of the chicks was not so good nor was the food used so efficiently when oyster shells were included as when sand alone was added to the rations; and the comparison was still less favorable between the oyster shells and the ground rock phosphate. Oyster shells mixed with bone ash gave better results than oyster shells alone; in one case this combination was more efficient than sand and in another case nearly as efficient, but there was plainly some injurious action of the oyster shells. Though it is not certain that such is the case, it is probable that the powdered shells neutralize too completely and continuously, or too rapidly, some of the digestive juices and thus interfere with the proper digestion of some of the other foods.

These experiments show plainly the advantage of **Conclusions.** a plentiful supply of ash for growing fowls and, by themselves, indicate that even the tiny chicks can make profitable use of such uncommon elements of poultry diet as sand and rock phosphate. The tests must not, however, be regarded as revolutionizing poultry feeding or considered as recommendations for the use of all such materials in ordinary practice. They are, rather, of scientific interest as establishing the necessity for certain elements in the food of poultry. Those elements can be obtained easier, in better combination and in more palatable form in materials already recommended by our most successful feeders,—fine raw or cooked bone. Of these, of some animal meal, of green vegetables, clover or alfalfa, and of good, clean grit, every grower of young chicks should make careful and constant use.