

THE FUNCTION OF GRIT IN THE GIZZARD OF THE FOWL¹

By B. F. KAUPP

Poultry Investigator and Pathologist, North Carolina Agricultural Experiment Station

INTRODUCTION

As a preliminary step in the study of the nutrition of fowls, it is necessary to determine the function of grit in the gizzard and the length of time that it will remain there and serve a useful purpose. A review of the literature of the subject discloses no record of experiments made to discover these facts.

THE PROBLEM

It is a matter of common knowledge that, since the fowl has no teeth with which to grind its food, the muscular walls of the gizzard contract upon its contents and reduce the food to fineness. The object of this investigation was to discover how long such grit is useful in the gizzard, how often it must be replenished, whether a hen constantly consumes more grit than she requires, and if so, whether the surplus is kept in the gizzard.

EXPERIMENTAL METHODS

Barred Plymouth Rock hens 2 or 3 years old were used in the experiment. They were kept in coops 18 inches square. The coops were provided with 1-inch mesh wire bottoms so that the excreta would pass through to a second floor as soon as voided. A possible reconsumption of any grit passed in the excreta was thus prevented. Hens were killed at different periods and the gizzard content examined for the grit which still remained.

Analyses of the intake and outgo of the feed and the weight of the birds were made to determine whether or not the grit content of the gizzard was sufficient for the normal physiological processes of that organ.

The feed for 365 days, the duration of the test, consisted of the regular scratch feed and dry mash used at the Station plant. The following tabulation offers a comparative study of the amount of grit contained in the gizzards of hens killed at different intervals of time. This information is differently presented in Plate 1.

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TABLE I.—Grit remaining in the gizzards of fowls at the end of different periods

Hen No.	Number of days without grit.	Weight of hen at beginning of experiment.	Weight of hen when killed.	Weight of grit in gizzard.	Remarks.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Gm.</i>	
1	14	5.2	5.4	9.5012	Killed.
2	14	6.4	6.3	13.1136	Do.
3	21	4.5	4.8	8.3126	Do.
4	21	5.3	5.8	16.9326	Do.
5	28	4.6	4.9	11.8763	Do.
6	28	7.0	7.3	22.6531	Do.
7	36	4.8	5.7	16.4389	Do.
8	36	2.7	4.0	5.0378	Do.
9	42	7.0	4.2	8.4531	Died of sarcoma.
10	79	4.6	4.7	6.3700	Killed.
11	93	3.6	3.2	11.6341	Do.
12	120	3.8	6.2	4.9643	Do.
13	124	5.8	6.1	5.6321	Do.
14	133	5.6	4.9	4.5632	Killed by mites.
15	134	7.0	5.8	4.7532	Killed.
16	144	5.7	5.7	9.5920	Killed by mites.
17	153	7.1	5.6	6.5120	Do.
18	154	6.5	5.5	5.9633	Killed.
19	156	6.8	5.8	14.0326	Killed by mites.
20	170	(?)	(?)	9.8670	Died. ^a
21	248	6.2	6.1	2.5200	Killed.
22	270	6.3	6.6	5.0000	Do.
23	300	5.7	5.9	3.9525	Do.
24	330	5.1	6.1	1.9530	Do.
25	365	6.2	5.2	2.5610	Do.
26	395	6.7	7.1	5.8915	Do.

^aThis was a cockerel affected with partial paralysis from which it never entirely recovered. It was sent to the laboratory when it weighed about 2 pounds, and remained in the coop until it died, 170 days later.

DISCUSSION

The feed records show that the appetite of the birds having no exercise kept up fairly well.

From the experiments herein recorded it is apparent that a bird may go 365 days without grit being fed to it and still have enough remaining in its gizzard to grind its food. The grit that remained in the gizzard for 365 days appeared just as sharp as that found at the beginning of the experiment. In fact, the writer does not believe that the grinding in the gizzard of the fowl is a sharp-cutting process. Rather it appears that the food soaks more or less in the crop, depending on the length of time it remains there. It then passes from the crop through the second portion of the esophagus to the proventriculus, where it lies in an acid secretion. From the proventriculus it passes into the gizzard and there the muscles of the walls contract, forcing the soaked grain among the particles of grit and by a squeezing rotary motion reduces it to fineness. The action is like that of a ball mill. Birds hold their weight and remain perfectly healthy on either sharp or dull grit.

There is a tendency on the part of fowls to eat more grit than is essential for grinding their food. In another series of experiments the writer has found that the amount of mineral given off for the first twelve days was much greater than that taken in. Further experiments showed that this was due to the grit passed off from the gizzard. While

there is a tendency to pass off the excess grit and to keep a residual amount, the amount retained varies greatly in different individuals.

At the end of 365 days the gizzard of one hen contained 5.89 gm. of grit—as much as was found in a hen killed for examination on the thirty-sixth day of the experiment. A hen that died on the one hundred and fifty-sixth day had 14.03 gm. of grit, or more than that contained in three of the four gizzards of those killed on the fourteenth and twenty-first days, respectively. The healthy condition of the birds which were kept until the end of the experiment indicates that a fowl may go longer than a year without replenishing its grit.

PLATE I

The amount of grit recovered from the gizzards of the fowls at the end of the experimental periods:

- 1.—Hen killed 14th day; weight of gizzard, 13 gm.; weight of grit, 9.50 gm.
- 2.—Hen killed 14th day; weight of gizzard, 21 gm.; weight of grit, 13.11 gm.
- 3.—Hen killed 21st day; weight of gizzard, 12.01 gm.; weight of grit, 8.31 gm.
- 4.—Hen killed 21st day; weight of gizzard, 19.03 gm.; weight of grit, 16.93 gm.
- 5.—Hen killed 28th day; weight of gizzard, 13.46 gm.; weight of grit, 11.87 gm.
- 6.—Hen killed 28th day; weight of gizzard, 28.19 gm.; weight of grit, 22.65 gm.
- 7.—Hen killed 36th day; weight of gizzard, 19 gm.; weight of grit, 16.43 gm.
- 8.—Hen killed 36th day; weight of gizzard, 7.10 gm.; weight of grit, 5.03 gm.
- 9.—Hen killed 42d day; weight of gizzard, 14.13 gm.; weight of grit, 8.46 gm.
- 10.—Hen killed 79th day; weight of gizzard 20.76 gm.; weight of grit, 6.37 gm.
- 11.—Hen killed 93d day; weight of gizzard, 15.43 gm.; weight of grit, 11.63 gm.
- 12.—Hen killed 120th day; weight of gizzard, 9.63 gm.; weight of grit, 4.96 gm.
- 13.—Hen killed 124th day; weight of gizzard, 14.13 gm.; weight of grit, 5.63 gm.
- 14.—Hen killed 133d day; weight of gizzard, 7.45 gm.; weight of grit, 4.56 gm.
- 15.—Hen killed 143d day; weight of gizzard, 9.86 gm.; weight of grit, 4.75 gm.
- 16.—Hen killed 144th day; weight of gizzard, 13.23 gm.; weight of grit, 9.59 gm.
- 17.—Hen killed 153d day; weight of gizzard, 11.96 gm.; weight of grit, 6.51 gm.
- 18.—Hen killed 154th day; weight of gizzard, 11.76 gm.; weight of grit, 5.96 gm.
- 19.—Hen killed 156th day; weight of gizzard 17.36 gm.; weight of grit, 14.03 gm.
- 20.—Hen killed 170th day; weight of gizzard, 14.93 gm.; weight of grit, 9.86 gm.
- 21.—Hen killed 248th day; weight of gizzard, 4.51 gm.; weight of grit, 2.52 gm.
- 22.—Hen killed 270th day; weight of gizzard, 10.46 gm.; weight of grit, 5 gm.
- 23.—Hen killed 300th day; weight of gizzard, 10.09 gm.; weight of grit, 3.95 gm.
- 24.—Hen killed 330th day; weight of gizzard, 6.53 gm.; weight of grit, 1.93 gm.
- 25.—Hen killed 365th day; weight of gizzard, 7.10 gm.; weight of grit, 2.56 gm.
- 26.—Hen killed 365th day; weight of gizzard, 9.97 gm.; weight of grit, 5.89 gm.

