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TRANSACTIONS

Effect of Feeding Vegetable Protein on Copulation and Fertilization in the Fowl.

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Since there has been no literature to my knowledge, dealing with the effect of feeding on copulation in the fowl, as well as that on the ability of the cock in the fertilization-tests hitherto undertaken, the work reported in this paper has been done to ascertain the influence of food upon the number of copulations, the effect of the difference in food given to the cock on the length of time and number of fertile eggs produced by the mated hen, and the sex-ratio of chicks.

Feeds. To ascertain the influence of feeding on copulation in the fowl, soy bean cake (vegetable protein) was given as the source of protein to the test lot, while fish meal (animal protein) was supplied to the control lot. Both rations were composed so as to contain the same amount of protein and other nutrients. Birds used for the experiment were selected from the respective flocks raised for four generations under similar rations, to minimize the possible effects from previous feeding.

The two rations and their components are as follows:—

<i>Ration (parts by weight)</i>		
	Test lot (%)	Control lot (%)
Yellow corn.....	45	45
Rice bran.....	15	15
Rice refuse	17	17
Fish meal		20
Soy bean cake.....	30	
Mineral mixture	3	3

The mineral mixture is composed of steamed bone meal 6 parts, calcium carbonate 2 parts, and sodium chloride 2 parts.

Composition.

	Test lot (%)	Control lot (%)
Moisture	11.7	11.8
Protein.....	20.5	21.8
Fat	6.7	7.7
Fibre	3.1	1.9
Ash	3.9	5.0
Nitrogen free extract	54.1	51.8

The Fowl used in the experiments.— The single-combed White Leghorns (two or three years old) of the same condition were selected from the above mentioned flocks to make the two lots, special attention being given in the selection of cocks, as they play an important role.

INDIVIDUAL TEST

A hen, which was isolated from cock for fifty days and tested for infertility, was mated to the specified cock but once. The cock was then removed immediately, and the eggs laid by that hen henceforth were placed in an incubator to be examined for fertility and other items.

As to the behaviour of copulation, no marked difference was observed between these two lots, except a certain tendency to be later in hours (more often in the afternoon) in the birds of test lot. The results of incubation tests are as follows, the figures showing average.

Group	Male	Female	Days during which fertilized eggs were produced	Hours from mating to the first fertilized egg laid	No. of fertilized eggs
I	Animal protein	Animal protein	12.6	61.0	7.5
II	Animal protein	Vegetable protein	10.4	44.5	7.2
III	Vegetable protein	Animal protein	10.6	62.0	6.8
IV	Vegetable protein	Vegetable protein	10.1	54.8	6.6

Generally speaking, the above results are similar with the various literatures in which the nature of food was not stated. But it may be remarked that the fertilization period of the group I in the control lot is rather longer and accordingly shows more fertility than the group IV. There were some hens in each group which produced unfertile eggs (1–3) in succession, which are not counted in the above table.

As regards the sex-ratio, no difference has been recognized between the two lots.

GROUP EXPERIMENT

In this experiment each cock was placed in a pen containing from seven

to eleven hens, and the number of copulations in one day was recorded. The results are the following:

Average number of copulations (cock).

Group	Male	Female	Daylight about (5.30 A. M.) to Noon	Noon to Dark- ness (6.30 P. M.)	Total
I	Animal protein	Animal protein	5	13	18
II	Animal protein	Vegetable protein	8	11	19
III	Vegetable protein	Animal protein	6	11	17
IV	Vegetable protein	Vegetable protein	3	6	9

According to Upp, the number of copulations of a cock was twenty times in a day, which must have been observed under normal feeding with animal protein, though it was not mentioned. In this experiment, in cases of mating in which one or both cock and hen were fed with animal protein, the number of copulations of the cock may be considered to be normal. On the other hand, that of group IV which fell to nine, i. e. about half of the other cases, ought perhaps to be attributed to the vegetable protein in the ration.

FERTILIZATION EXPERIMENT

Each cock from the two lots was mated alternately to eight flocks, each consisting of about ten hens from those two different lots, and the eggs produced were tested for fertility. The incubation-test shows that there is no difference at all in the percentage of fertilized eggs produced by the same hen, without regard to which lot the mated cock belongs.

SUMMARY

In order to ascertain whether the feed influences copulation in the fowl, soy bean cake (vegetable protein) was given as the source of protein to a test flock raised for four generations subjected to identical feeding. Their average number of copulations was found to be nine times a day, which was about half of that in other flocks supplied with animal protein, the ration being otherwise the same.

In the vegetable protein lot, the length of time during which the fertilized eggs are laid by a hen after one mating is shorter by 2-1/2 day and the number of fertilized eggs is less by 0.9 than in the animal protein lot. As to the sex-ratio, no deviation was recognized in both lots.

As no marked difference in respect of the fertility can be noticed, so far as the practical mating is concerned, between the two lots, it can be conclu-

ded that the use of vegetable protein as the single source of protein for the production of hatching eggs is not objectionable, when only a few hens are mated with one cock. But, when hens are numerous in a pen, it should be better to supply them with animal protein.

Biochemical Studies on "Miso", Fermented Soy-bean Paste. Part III.

On the Effect of Cystine upon the Nutritive Value of "Miso-protein" when fed to Albino Rats as a Supplement to Rice.

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INTRODUCTION

In the previous feeding experiments⁽¹⁾ it has been shown that "miso-protein" when added to rice diet has a high supplementary value, and compared with other proteins it is higher than "kōridōfu" (frozen soy-bean curd), though it is somewhat lower than fish protein. Thus it is evident that "miso" plays an important rôle in the nutrition of the Japanese people.

It is to be mentioned, however, that the cystine content of "miso-protein" is too low to permit the growth of rats when given as the sole source of protein in diet. The question naturally arises whether or not the supplementary value may be increased by the addition of cystine.

According to R. Takata⁽²⁾ white rats fed on a diet consisting of 92.6 "miso", 57.0 dextrine, 5.0 soy-bean oil, 0.15 NaCl, 2.0 inorganic salts, 3.0 cod-liver oil and 2.0% dry yeast, failed to grow or to sustain life for a long time, but by supplementing 0.5% cystine to the above diet, the rats showed a good growth. The same kind of experiment has been carried out by S. Nakayama⁽³⁾ with young rats weighing 30~70 g.

The diets used consisted of:

	Diet No. 3 "Red-miso"	Diet No. 4 "Hatchōmiso"
Polished rice	85.8 g.	90.0 g.
"Miso"	34.0	16.0
Dextrine	—	9.7
Calcium lactate	1.0	1.0
Dry yeast	2.0	2.0
Protein in %	10.02	10.18
NaCl in %	1.4	1.6