

Poultry Husbandry Report for 1947

a brief progress report on research findings by the staff of the Division

The following report was prepared by the staff members of the Division of Poultry Husbandry under the direction of Professor L. W. Taylor, Chairman of the Division of Poultry Husbandry, and Poultry Husbandman in the Experiment Station, Berkeley.

CERTAIN RESEARCH FACILITIES of the Division of Poultry Husbandry were materially improved during 1947.

This was true particularly with respect to the extensive amount of laboratory equipment secured; much of it was of the type not available during the war years. With this equipment it has been possible to start a number of new studies, of which that involving the effect of environment on chickens had long been planned.

Other new work started in 1947 deals with the search for a satisfactory purified diet for turkey poults and with the bacteria and other microorganisms found in shell eggs. Plans have been made also for starting studies on the criteria of freshness in eggs, but failure to secure trained assistance prevented the initiation of the experiments before the end of the year.

During part of the year one member of the staff was on sabbatical leave in Europe collaborating with a nutritional program of the Quartermaster's Office of the United States War Department. He returned in time to instruct classes in the fall semester.

The following are some of the principal research findings of the Division in 1947.

It has been found that the chick requirement for an essential amino acid is increased as the protein level is increased, whether or not feeding the higher protein level affects the growth rate.

It is important to define amino acid requirements in terms of some specific protein level. For chicks it should be approximately 20% protein, since all the established chick amino acid requirements are based on this level; meaningful comparisons of dietary amino acid contents and requirements can at present be made only with reference to this level.

It is possible to correct a slight deficiency of some essential amino acid in a given protein concentrate by feeding a higher protein level. When this is done the efficiency of utilization of all the amino acids, including the specific essential one under consideration, is markedly decreased.

Lysine and tryptophane have been found necessary for egg production and for maintenance of body weight in hens, but quantitative determinations of the re-

quirements have not as yet been completed. It is still too early to estimate the importance of amino acid levels in the practical feeding of laying hens.

A deficiency of glycine, unlike the amino acids lysine and arginine which were studied previously, did not cause a severe reduction in the growth of turkey poults. While there was some retardation of the growth rate, the magnitude of the reduction was not great.

Amino Acid Sources

Mung bean protein was found to be deficient in cystine, while an experimentally prepared wheat protein concentrate proved to be deficient only in lysine.

Lactalbumen proved to be poor as the sole source of protein for the growing chick. Although, analytically, lactalbumen contains little or no glycine, the chief deficiency found was arginine, the addition of which more than doubled the rate of growth of the chicks. Glycine further increased growth, but only slightly. Methionine had no effect. The addition of arginine and glycine promoted growth to an extent a little below that produced with fishmeal, indicating a slight deficiency of still another factor.

In a search for new sources of proteins for poultry feeds, safflower seed protein was tested for its value in meeting the amino acid requirements of growing chicks. Reasonably good growth was obtained with safflower seed protein alone, but growth was improved by additions of arginine, lysine, methionine, glycine, and cystine.

Detrimental Factors in Feedstuffs

Raw soybeans as a source of protein produce very poor growth in chicks. Better results are obtained when the soybeans are heated or when methionine is added to the diet.

With the discovery elsewhere of antitrypsin in raw soybeans, the pancreas of each chick fed the diet was investigated in cooperation with the Division of Physiology of the Medical School on the possibility that this gland might react to the antitrypsin since it secretes the enzyme trypsin.

Two specific effects of the feeding of raw soybeans were found: the pancreas was increased in size, and there was a decrease in the content of another enzyme, amylase, secreted by the pancreas.

Feeding heated soybeans served to bring the size of the pancreas of affected chicks back to normal and caused an increase in the amylase content of the organ. Feeding methionine had no effect on the size of the pancreas but did increase the amylase content.

The growth of chicks is depressed when alfalfa is fed at the level of 20% in the diet. The same level of wheat bran promotes much better growth than alfalfa. Samples of alfalfa have been prepared and stored in different ways, then tested in chick rations.

Drying methods used were: (1) a commercial dehydrator; (2) at 100° F; (3) blanched and dried at 100° F; and (4) frozen with carbon dioxide and dried at low temperature. Storing methods used were: (1) in a cold room; (2) at laboratory room temperature; and (3) at room temperature after reducing the moisture content to 2 to 3 per cent.

No consistent differences have so far been found among any of the treatments, and all samples depress growth.

Other Nutritional Studies

In a continuation of the study of the vitamin requirements of turkeys, it was found that a deficiency of pantothenic acid in poults resulted in slow growth, dermatitis, and high mortality. Approximately 10.5 milligrams of pantothenic acid per kilogram of ration was required to produce optimum growth and prevent the other symptoms of the deficiency.

Watergrass, a weed which grows in the rice fields, produces a seed which can be used interchangeably with other grains as a carbohydrate source for growth. It ranks above barley, along with wheat and corn, for broiler rations.

Care of Turkey Hatching Eggs

The hatchability of turkey eggs held more than one week prior to incubation deteriorates with age. The reduction in hatchability for each day the eggs were

held prior to incubation was, after the first week, about 1%. Apparent fertility decreased after eggs were held three weeks, indicating that some of the embryos died before the eggs were placed in the incubator.

The results of the test point to the need for prompt handling of eggs that are shipped and the desirability of setting eggs immediately on arrival.

Dirty eggs were washed or cleaned with steel wool and then incubated. Such eggs did not hatch so well as clean eggs from the same farms. Excessive aging of the dirty eggs may account for a part of the reduction in hatchability but would not have been expected to cause all of the reduction observed.

Since washing as such was found to have no effect on clean eggs, the results indicate that it is important to prevent turkey eggs from becoming muddy or otherwise dirty.

Environmental Studies

When hens were exposed to an environmental temperature of 90° F or over, their bodies were unable to eliminate the extra heat satisfactorily and their body temperature rose. Room temperatures as low as 105° F were found to be fatal to some birds. Feed consumption decreased with temperatures over 70°, while water consumption increased.

The light tests with turkey breeders have been continued. These tests have shown that turkey hens need bright light—about two foot candles or more on the roots—for about 14 hours of natural and artificial light.

Last year, seven-month-old hens given up to 15 hours of natural and artificial light failed to respond normally. They should have started to lay when about eight months old, but took considerably longer, apparently because of insufficient light during the day caused by continuous foggy weather.

A New Lethal Gene in Chickens

Breeding stock producing some chicks showing doubling of the feet, with six or more toes per leg, changed shape of the wings, and shortened upper beaks was obtained from a commercial breeding flock in 1942. Only about 2% of the deformed chicks were able to hatch and they were so crippled that they died soon after hatching. This condition, termed diplopodia, was found to be inherited as a simple recessive character.

Egg Production Studies

The progress in egg production of the University production-bred flock was analyzed for the years 1933 to 1944. Based on the heritability of egg produc-

tion characters, the selection differentials in production between the selected breeding birds and the average of the flock from which they came, and the length of time between generations, calculations made indicated that an average yearly increase in egg production of 5.28 eggs should have been obtained in the 12-year period. Actually, the increase obtained was 5.6 eggs per year.

By use of these methods of calculation, data have been obtained indicating that even a more rapid rate of improvement should have been possible, but it would necessitate the use of pullets as the major part of the breeding females, the rest being progeny-tested hens.

Part-year records of progeny can be used effectively in the selection of superior breeding birds. In such selection, the production totals to January 1 of spring-hatched pullets have about 1.7 times the value of the record for the remainder of the first laying year. These results indicate the possibility of using pullets as breeding females and the progeny testing of these birds by part-records of their daughters in time for mating as two-year-old hens.

Improvement of a Fryer Strain

The following characters were studied in a strain of New Hampshires: body weight, shank length, keel length, and breast width.

All of the characters proved to be highly heritable; body weight and shank length being relatively less influenced by environmental conditions than keel length and breast width. Breast width had little or no relation to the other characters and seemed independent in its inheritance.

On the other hand, body weight and shank length were closely correlated. This fact indicates the futility of selecting in the same stock for increased body weight and decreased shank length. Selection indexes involving all four characters were up to 14% more efficient than selection for a single character alone.

Bloodspotting Tendency

Bloodspotting tendency is not simply transmitted through the egg. Eggs containing blood spots were hatched and the performance of the female progeny was studied with respect to bloodspotting. It was found that in groups of full sisters, those from bloodspotted eggs showed no greater tendency to produce blood spots than their sisters having hatched from eggs containing no visible blood spots when candled.

This study provides evidence that simple transmission of a cause for bloodspotting in the egg is not the reason for production of bloodspotted eggs by the offspring. The principal cause for the pro-

duction of bloodspotted eggs is an inherited tendency for hemorrhages into the egg during its formation.

Egg Microbiology

This project has recently been started in cooperation with the Division of Bacteriology at Davis. Microorganisms are being isolated and identified from various types of spoiled eggs obtained from field sources, and the means by which these causes of deterioration gain entrance to the egg will be investigated.

Specific microorganisms responsible for several types of egg spoilage, including the important and hard to handle condition that produces so-called "sour eggs," have been isolated. Application of the findings to methods of cleaning eggs will constitute an important part of this project.

Estrogens

Studies on the use of estrogens for fattening poultry are being continued. Several brands of diethylstilbestrol pellets for this purpose are now available through the veterinary profession. The cost of some brands is high, but tests have shown that the most expensive brands are not necessarily the best.

Recent experiments have suggested that a full six-week treatment period for chickens is superior to the shorter periods previously recommended. In a series of field trials an attempt to improve the market grade of turkeys with the use of estrogen pellets has recently been made. Although some increase in fat deposition was obtained, the results were disappointing because the improvement was not sufficient to warrant the expense of treatment.

Turkeys appear to be more resistant to estrogen treatment than chickens, and definite recommendations for the former must await the results of further experiments.

Fertility

Continued studies with turkeys have confirmed the value of artificial insemination. High levels of fertility—better than 90%—may be maintained by inseminating hens every three or four weeks with as little as 0.02 cubic centimeters of undiluted semen.

Since good breeding males should yield 0.2 cc. to 0.5 cc. of semen every other day during the breeding season, a single male can be used to maintain fertility in many more hens by this method than by natural mating.

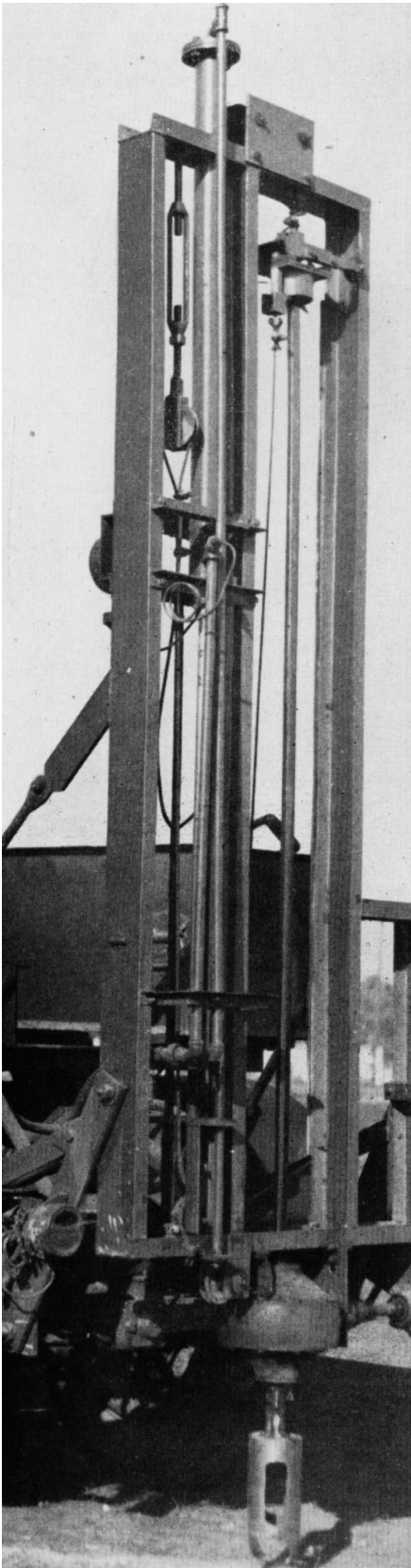
Important precautions include using fresh semen—within a few minutes if possible after drawing—keeping the semen

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Soil Sampler

power-operated and mobile, new device speeds up soil surveying

Rodney J. Arkley



Power-operated Soil Sampler

formulating soil management procedures for their clients.

Soil analysis finds increasing use each day as a research tool, but the time is far away when it can be used generally as a guide to fertilizer practice.

A POWER-OPERATED soil sampler now does the drudgery in soil surveying—the mechanical job of extracting soil samples which are required by the thousands for an adequate map of a survey area.

The machine is mounted on the rear of a war-surplus weapons carrier, similar to a 1½-ton truck, equipped with four-wheel drive and a power take-off. It consists of three elements.

1. A gear and chain driving mechanism which utilizes power from the truck to rotate a long shaft to which soil sampling bits of various kinds can be attached.

2. An hydraulic mechanism which forces the rotating barrel bit into the soil and removes it when full, operating at pressures up to 2,500 pounds.

3. An hydraulic mechanism which unfolds the device from highway travel position to operating position.

The soil sampler is most advantageous on dry, hard soils.

In comparison of samplings made on the well-known Fresno Alkali hardpan soil it required 6½ minutes of concentrated effort with a pick, shovel, steel bar, and hand auger to obtain a sample 22 inches in depth. Further penetration was effectively stopped by the hardpan.

The power-driven sampler reached the same depth in 1½ minutes; it penetrated the hardpan easily, and a complete soil profile to a depth of five feet was sampled in only four minutes.

Similar results were obtained on the still more dense San Joaquin hardpan soil.

By hand, 11 minutes were required to reach the surface of the hardpan which occurred at 24 inches depth.

The power tool obtained samples to a five-foot depth in only seven minutes.

The mechanical sampler was thus able to furnish important information on the

thickness and density of the hardpan which could not have been obtained at all by hand methods.

On dry hard clay soils a five-foot sampling required 20 to 30 minutes of hard hand work, while the power sampler did the job easily in only seven minutes.

No Advantage on Certain Soils

On damp soft soils such as Honcut loam the advantage of the power auger was found to be negligible, as the samples were obtained just as quickly by hand. Moreover the mobility of the machine was considerably restricted by the irrigation ditches and fences which prevail on most soils of this kind.

On Corning gravelly loam, several hours of hand labor were required for obtaining a profile. The power sampler furnished the complete section in 15 to 20 minutes; but where large cobbles were encountered the auger had to yield, often with a broken bit as a result.

The power auger was unable to penetrate the gravelly, concretelike hardpan of the Redding series. Heavier equipment and large heavy worm-type bits are indicated on such extreme soils.

The savings in time and physical energy accomplished with the power auger make it possible for the soil surveyor to devote more attention to studying and recording of the soil characteristics than to digging holes. In addition the areal density of borings is increased many fold.

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The power-operated soil sampler was constructed by C. C. Crothus of Richmond, California, to meet specifications of the Division of Soils.

POULTRY HUSBANDRY

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warm until used, keeping it uncontaminated with fecal material, and using the proper technique in inseminating. During insemination the syringe should be inserted well into the oviduct—not merely into the cloaca—and the pressure on the hen necessary to expose the oviduct should be relaxed before the semen is injected to prevent its being immediately forced out again.

For the present, there is no substitute for observing plant responses to fertilizers under controlled conditions, such as those found in test plots conducted by the Agricultural Experiment Station or Agricultural Extension Service.

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