

Poultry Husbandry Report

brief progress report of advances in poultry research conducted during 1950 by the staff of the division

The following report was prepared by the members of the staff of the Division of Poultry Husbandry under the chairmanship of Dr. Lewis W. Taylor, Professor of Poultry Husbandry and Poultry Husbandman in the Experiment Station.

Heritability of egg size is approximately 60%—a very high value compared to the heritability of most other economic characters—and indicates that individual selection for egg size is to be preferred to family selection.

A further simplification of the problem of changing the egg size of a flock by breeding selection is possible as a result of a study of genetic correlations between the weights of eggs laid at different times of the year. It was found that the weighing of several consecutively laid eggs in the first November of a spring-hatched pullet's life provides a sufficiently accurate measure of a bird's genotype for spring maximum egg weight. Thus it becomes possible to modify egg size by selection very rapidly since individual pullet—rather than hen family—selection is effective for this purpose.

Shell Thickness

An extensive study on the inheritance of shell thickness indicates that the heritability of this trait is between 15% and 30%. In addition, another 10% of the variation in this character appears to be due to non-chromosomal maternal effects. Among other findings in this study several points emerge: 1, shell thickness and shell smoothness are independent, except that very rough shells tend to be thin; 2, while the shell thickness of eggs laid by a given bird declines in the summer and fall of the second year of life, there is a high correlation between shell thickness of eggs produced at different times of the year by the same bird; 3, White Leghorn hens laying creamy eggs tend to produce thicker shells than their sisters laying white eggs; and 4, specific gravity of fresh eggs was found to be a highly accurate measure of shell thickness.

Respiratory Diseases

An outbreak of an obscure respiratory disease, tentatively diagnosed as atypical coryza, in the Leghorn flock of pullets permitted an investigation of genetic differences in resistance to this disease between different lines of birds.

In spite of a lack of previous exposure for at least 17 years to any respiratory infection, it was found that such genetic differences did exist. The line selected for

a high incidence of blood-spotting happened, presumably by chance, to be the most resistant one, while crosses between inbred lines were found to be more resistant—though not necessarily so, statistically—than the inbred lines themselves.

The effect of atypical coryza upon reproduction was studied. Following recovery from the disease, a very high proportion of waste and low quality eggs were obtained from some pullets which later returned to normal rates of production, while many others never returned to a normal rate of egg production. Despite a very low mortality attributable to the disease, the hen-housed production index for the production strain for the year was only 117.7 eggs as against 224.7 eggs the previous year.

The effect on hatchability was also disastrous. The percentage of total eggs set that hatched from a typical pen was 29.0 for the hatching season. When infertile and broken eggs were taken into account, the hatchability of fertile intact eggs was 37.5%. Eggs from pullets that failed to pause during the disease outbreak hatched 59.9% of all eggs set, while those that paused hatched 20.0%. These data provide further support to the evidence for variation in resistance to the disease.

Gains from Selection

Studies on the response to selection pressure for several characters were continued. In one experiment, selection was continued to its ultimate point until the line selected—for incidence of crooked toes—has, in the past year, produced a 100% incidence of the defect.

In other instances gains in response to selection are still being obtained, as in the case of selection for the blood-spotting tendency. Here in the selected line about 23% of all eggs contained blood spots detectable under a commercial candler, compared to 1% in the production-bred flock and 7.5% in a limited number of crosses between the two lines.

In still other instances gains from selection have either slowed down or have at least temporarily ceased altogether. The selection experiment for shank length falls into that category. After continuing responses for seven generations, four further generations of selection failed to increase shank length in the selected lines.

The reasons for failure of selection were investigated, and it was found that the major reason—though not necessarily the only one—lies in the poorer reproductive rate of the extremely long-shanked birds. Eggs laid by them did not hatch as well as those laid by their shorter-shanked contemporaries. Similarly, the viability of chicks from the dams falling into the extreme class with respect to shank length was lower than that from shorter-shanked birds. This finding may have far-ranging significance in selection studies, since it suggests that artificial selection for a particular trait, if carried on long enough, may interfere with a flock's optimum reproductive performance.

Egg Production in Turkeys

Unlighted turkey hens lay about 60% of their eggs in the afternoon, while unlighted chicken hens lay about 60% in the morning. Time of day when the eggs were laid did not influence the fertility or hatchability of the turkey eggs obtained.

The fact that there was no relation between time of day that the eggs were laid and their hatchability is of interest since all-night lights—which may be expected to cause some changes in the time when eggs are laid—cause an increase in waste eggs as compared with morning light only. These waste eggs included all eggs unfit for hatching such as broken or cracked and obviously thin shelled as well as double yolked and dwarfed eggs.

It is likely that the apparent effect of all-night light on shell quality may account for some of the unfavorable effects of all-night lights on hatchability which have been reported. Because of the unfavorable effect of all-night light on egg quality without a compensating increase in total egg production, all-night lights should not be used on breeding turkeys.

Antibiotics

An intensive research program on the mode of action of antibiotics as growth stimulators has been undertaken in collaboration with the Division of Bacteriology at Davis. Certain types of yeasts seem to be encouraged to develop in the intestinal tract when antibiotics are fed. Cul-

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tures of these yeasts are being studied to determine what role they play in the growth stimulation by antibiotics.

Protein Concentrates

Expeller-produced cottonseed meal has been found to be a good protein concentrate for chicks. The suspected lysine and methionine deficiencies were not found when the meal was fed to chicks at levels providing most of the protein of the diet.

Cottonseed meal should not be used in diets for laying hens because of its detrimental effects upon egg quality.

Studies on raw unprocessed soybeans have shown the presence of a diuretic effect which can be destroyed if the beans are heated. The feces of birds fed raw soybeans contain a methionine-rich complex, indicating a poor digestion of the protein in the beans.

Alfalfa Meal Studies

Research has been continued on the use of chick rations containing high levels of alfalfa meal. The diets employed contained 20% alfalfa meal, which is about four to five times the amount ordinarily used in chick rations. This high level produces a marked depression in growth. If a mixture of sterols and a vegetable oil is added to the diet the growth-depressing effect can be overcome. Effective sterols which have been used are cholesterol and purified soybean sterols.

Inexpensive crude sources of sterols have been investigated and some of these give promise of usefulness. Studies are being continued on the feasibility of using high levels of alfalfa meal when sterols and vegetable oils are added to the ration.

Tryptophane Requirements

The tryptophane requirement of turkey poults for optimum early growth is approximately 0.25% of the ration. No symptoms other than poor growth were noted in tryptophane deficient poults.

Miscellaneous Feedstuffs

Coconut meal and molasses have been studied as feedstuffs for chicks with the view of determining in what way high levels of these feedstuffs might be used when they are inexpensive. Levels of coconut meal as high as 20% and molasses levels as high as 15% have been used experimentally with good growth results.

Raisins were fed to turkeys in the late growing period at 10% and 30% of the grain mixture with no marked adverse effect on body weight gains, efficiency of gain and market quality. Turkeys were reluctant to eat raisins when first given them, but after becoming accustomed to

the raisins the turkeys consumed them to the extent of 16% of the entire ration.

Ground carob pod and bean caused some depression in growth when fed at 5% of the ration and caused marked growth depression and high mortality in chicks when fed at 40% of the ration.

Decorticated—dehulled—safflower oil meal was found to be deficient in lysine and methionine when used in a practical chick starter. It could be used satisfactorily in combination with soybean oil meal and fishmeal but not soybean oil meal alone.

Slipped Tendon

Manganese-deficient and normally fed chicks were weighted down by strapping small pieces of lead to their backs. These treated chicks were found to have a higher incidence of slipped tendon—perosis—than unweighted chicks. This observation suggests that weight itself, rather than more rapid growth rate, is the explanation for the greater incidence of perosis among the largest birds of a flock.

Fly Control

In response to inquiries from poultrymen, feed containing zinc oxide was studied as a possible fly control agent for poultry manure. Even feed levels of zinc oxide high enough to result in growth depression did not cause a significant decrease in the fly population when the manure was used as a fly breeding medium. This work was done in collaboration with the Division of Entomology in Berkeley.

Sour Egg Infections

Egg spoilage due to infection with a fluorescent *Pseudomonas* species is detected with difficulty by ordinary candling but may be detected readily by candling with ultraviolet light. Factors affecting the frequency and rate of development of this type of spoilage include the following among others:

1. Concentration of organisms in the infecting medium: increasing cell numbers from 10 to 10⁶ per milliliter in water suspensions progressively increased the numbers of spoiled eggs obtained when eggs were immersed for short periods in these suspensions.

2. Temperature differential between eggs and suspension: infection occurs most readily if the suspension is colder than the eggs and increases with increasing difference up to a differential of 37.8° F at least.

3. Subsequent storage temperature: spoilage develops most rapidly at 59° F. Slower development of spoilage may be observed down to 32° F and at higher temperatures, but spoilage due to this or-

ganism is almost completely inhibited at 86° F due to the peculiar chemistry of egg albumen.

Fumigation Studies

Preliminary results indicate that ethylene oxide gas may be effective in preventing *Pseudomonas* spoilage in eggs if applied as a fumigant within four days from the time the eggs are infected. Practical utilization of this fumigant presents some problems now being studied.

Chicken Flavor

In a study of the flavor constituents in chicken meat, methods have been developed to obtain volatile components released by steam distillation of the meat. These volatiles have proved to be composed of separable parts, one having a meat flavor and the other a typical chicken flavor. It is the latter which gives chicken meat its characteristic odor.

Cooling and Shade

Investigations were made on the skin temperature of birds for the purpose of getting an objective measurement of comfort in the hen. Radiometer readings and touch thermocouples were used to make the measurements. The results show a high correlation between skin temperature and rectal temperature. Further work is needed to determine the significance of this finding.

The shade requirement of growing turkeys was investigated. Four groups of turkeys were used in a test. The amounts of shade given per bird were 1, 1½, 2, 2½ square feet. No differences were observed in the growth of the birds to the end of 26 weeks. The amount of water consumed and rectal temperature was inversely related to the amount of shade. A short term test to show the effect of water consumption on the incidence of pendulous crop was inconclusive.

Shipping Boxes

Studies on chick shipping box temperatures and ventilation were continued. The lethal temperature of chicks inside a filled chick box was found to be about 106° F. When the chick box was sealed and the room temperature raised to 100° F the temperature inside the box rose to a lethal temperature. A room temperature of 90° F was found to be about the critical temperature as far as removing plugs in the box for ventilation to remove excess heat was concerned. Such factors as diurnal variation in temperature, regional temperatures to which the chick would be exposed, sunshine, radiators and cold winds complicate the problem of providing comfort to chicks in shipping boxes.