Turkeys

This is the tenth article in a series of brief progress reports on the application of the science of genetics to commercial agriculture.

selective breeding for control of heritable characteristics

V. S. Asmundson

Differences in rate of growth, body weight, conformation, egg production, hatchability, and other characteristics of turkeys are of practical importance to the turkey grower and to the turkey breeder.

There is a good deal of evidence to show that such characteristics are inherited and that selection in a breeding program is effective in improving turkeys with respect to any of these characteristics.

It is also known that heritable characteristics are influenced by environmental factors.

It is not always easy to separate these hereditary and environmental factors, but the action of genes or hereditary factors on the characteristics of turkeys may be illustrated by examples:

Plumage Colors

While the characteristics listed in the first paragraph are recognized as being of economic importance, there is less agreement about some others. For example, plumage color.

Plumage color does not have much influence on the market value of turkeys. There is no discrimination against any particular plumage color. Most turkey breeders would consider the occurrence of a few off-color poults in the flock as of only minor importance.

If off-color poults occur among the progeny from pedigree matings, however, they will be of considerable economic importance to the particular breeder because they cannot be sold or used in his breeding program. If they occur in large numbers, they may very well ruin his reputation as a breeder of—for instance—Bronze turkeys. Consequently off-color poults may cause the breeder a loss of thousands of dollars.

Most off-color poults can be eliminated from a flock by using the known principles of genetics and the available information about inheritance.

If an unexpected plumage color is dominant and has arisen by a sudden change or mutation in the germ plasm, the color characteristic can be eliminated by discarding the off-color birds. Such mutations rarely occur, whereas it is not uncommon for recessive—subordinate—genes to segregate out—form a new combination—which accounts for the appearance of a few white, recessive slate, black winged bronze—the Crimson Dawn—and Palm poults, which are not identical with the Royal Palm in plumage color, to appear in Bronze flocks, although all of the parents used have the bronze plumage.

These colors are all determined by non-sexlinked genes that are known to be recessive to the corresponding genes that produce bronze plumage. The reason for their appearance in flocks of Bronze turkeys may be illustrated by the following:

If the capital letter *P* is used as a symbol for one of the number of pairs of dominant genes controlling the color of the plumage in Bronze turkeys, and the small letter *p* is a symbol for the recessive gene which would effect a different color—in this case, Palm—should they segregate out, the parent stock of nontrue breeding or heterozygous Bronze turkeys could be represented by the letters *Pp*. Then, if a Bronze male with the non-sexlinked genes —*Pp*—is mated with a Bronze hen also of the *Pp* type, there will be a joining of the gametes—the sex cells—in the production of the progeny. Then, with mathematical certainty, three Bronze progeny—one homozygous, *PP*, and two heterozygous, *Pp* and *Pp*—can be expected to one recessive—*pp*—or Palm poult.

Since such recessive genes may cause great economic loss to the pedigree breeder, it becomes necessary to eliminate them from the pedigree matings, and eventually from the entire flock.

The procedure is relatively simple. It is merely necessary to keep some of the Palm poults and to use them for testing the Bronze birds that are to be used in the pedigree matings for homozygosity or purity, with respect to the particular hereditary factor.

The Bronze males could be tested by mating them to a few Palm hens, and the Bronze hens could be tested by mating them to Palm males. In each case about 10 or 12 progeny should be obtained from each individual. If the Bronze tested are homozygous, the progeny will all be Bronze. If they are heterozygous—do not breed true—for this gene, about half of the progeny will be Palm color.

All the Bronze that prove to be heterozygous should be discarded and only the homozygous used. From these homozygous birds the entire pedigree flock should be rebuilt and this flock should be used to replace the entire breeding flock. By testing early, it would be possible to do the testing and make the regular matings in the same season.

About four weeks should be allowed to elapse after the removal of the Palm males before the eggs are saved from the Bronze hens for the regular pedigree breeding program.

Pendulous Crops

Another example of the influence of heredity is furnished by the appearance of pendulous crops in turkey flocks. These occur in varying numbers in most commercial flocks of turkeys, and the number tends to vary somewhat from year to year. In small flocks the proportion is sometimes quite high.

The inheritance of pendulous crops was investigated at Davis by taking birds with pendulous crops, operating on them and removing the crop, or most of it. These birds were later mated, and it was found that the matings produced progeny of which 50% to 100% had pendulous crops.

Since it seemed probable that environmental factors had some influence, a test was made by raising some of the progeny from these pendulous crop matings at Davis and some near Tomales on the coast.

Fully 67% of the birds raised at Davis had pendulous crops, whereas none of those raised at Tomales had this abnormality. Results indicate distinctly that climatic factors are important.

It was found, with birds raised at Davis, that no pendulous crop progeny occur in some families and strains, but in others the incidence is fairly high.

It was found also that birds that recover from pendulous crops have nearly as many pendulous crop progeny as birds that had—and did not recover from—the abnormality.

Because of the complexity of the inheritance of the pendulous crop, it may not be feasible to eliminate pendulous crop birds completely, but the importance of eliminating all birds that ever have pendulous crop from the breeding flock is obvious.

These results also show why birds from stock raised under relatively cool climatic conditions may show more pendulous crops when raised in hotter climates. If the parents are kept in a cool climate, there is obviously less selection against pendulous crop, and therefore the progeny are from a less severely selected population.

That heredity plays a definite role is beyond question and should be taken into account by the turkey breeder.

V. S. Asmundson is Professor of Poultry Husbandry and Poultry Husbandman in the Experiment Station, Davis.