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A QUANTITATIVE METHOD FOR ESTIMATING THE PERCENTAGE OF POULTRY BY-PRODUCT MEAL IN MIXED FEEDS

E. E. Brown, Assistant State Chemist

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SUMMARY

Poultry by-product meal is a new product which has appeared in the feed industry during the past few years. When properly prepared, its nutritive value is equal to that of meat and bone scraps. Because of similar chemical composition, a chemical analysis will not differentiate among meat and bone scraps, poultry by-product meal and excessive feathers present in the mixture as an adulterant.

A quantitative microscopic method is described by which the amount of poultry by-product meal in a feed mixture can be estimated, and adulteration of the meal with feathers detected and estimated.

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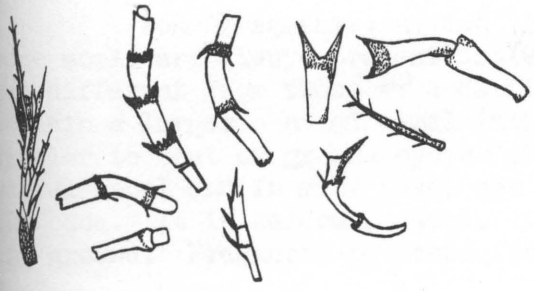
Introduction

Poultry by-product meal, as an ingredient in mixed feeds, appeared on the Texas market in 1953. The few samples of the material collected that year were manufactured out of the state. Use of this ingredient has increased rapidly and a considerable tonnage is now being used by the Texas feed industry. Twelve companies in Texas were registered during 1955-56 to sell a mixture of meat and bone scraps and poultry by-product meal.

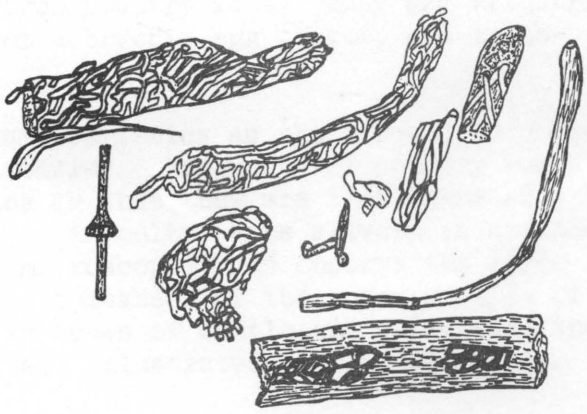
The Association of American Feed Control Officials defines poultry by-product meal as "the non-rendered, clean, wholesome parts of the carcass of slaughtered poultry, such as head, feet, underdeveloped eggs, gizzard, and intestines, exclusive of feathers, gizzard, and intestinal contents."

This definition does not permit feathers except in such traces as might occur unavoidably in good factory practice. Under this practice, picking operations are carried out so that the bulk of the feathers are kept separate from those parts which go into poultry by-product meal. When properly prepared, the meal should contain only a few small feathers which are not removed from near the top of the head. Gizzard content, an objectionable contaminant, also is separated from those parts which go into the meal. The nutritive value of a high quality poultry by-product meal compares favorably with that of a good grade meat and bone scrap.

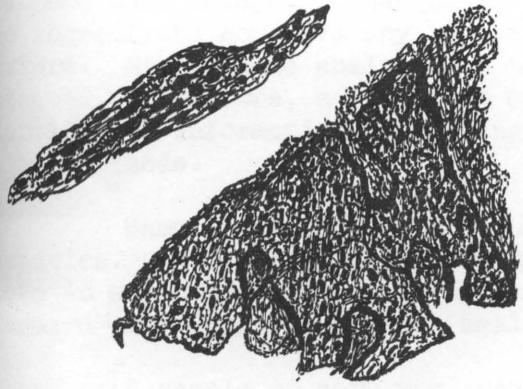
Many tissues which possess different and complex histological structures are put into poultry by-product meal. The original structures may be altered considerably by the manufacturing process. The microscopist has to depend on fragmentary residual structures for identification of the tissue in the mixture. Some fragments will retain the characteristics of the original tissue and can be identified. Structures which may be identified are the finely ground down feathers and the slender hair-like filoplume feathers. Both of these have ring-like nodes on the individual processes (barbules) similar to those shown in A and B of Figure 1, and can be easily and accurately identified.



A. Feather fragments - poultry

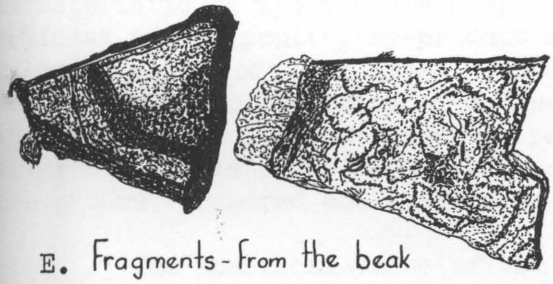


B. Feather fragments - poultry



C. Bone fragments - poultry

D. Poultry claw - nail



E. Fragments - from the beak

F. Scale fragment - from leg

Figure 1

Fragments from other tissues usually are present. These include scale-like structures resembling shrimp hulls, and toenails resembling horn meal from cattle. Both of these structures originate from poultry feet. They are illustrated in D and F of Figure 1. Yolk and albumen from embryonic egg tissue, and a substantial amount of sand usually are present.

Bone fragments, having the same characteristics as those found in poultry bone meal, are always present and easily identified. Fragments of poultry bones are different from those from cattle and swine in that they are less dense and contain a larger central canal (neural canal). A poultry bone slivers in a manner similar to that of ground oyster shell. The microscopist can observe the large neural canal and in many cases can measure the thickness of the outer portion of the bone. It is seldom possible to do this in bones of cattle and swine when they are ground. Fragments of bones from poultry are illustrated in C of Figure 1.

Experimental Procedure

The proximate analysis of poultry by-product meal is similar to that of meat and bone scraps. Consequently, chemical analysis will not differentiate the two ingredients nor give any information concerning the proportions of each in a mixture. Microscopic analysis is the only means by which this information can be obtained. Therefore, a study was made to develop a procedure which would give quantitative information concerning the percentage of by-product meal in a number of mixed feeds.

Samples of high grade poultry by-product meal were obtained from several companies. They were mixed thoroughly, and 10 grams were ground through a 40-mesh sieve in an intermediate Wiley mill. This material was reserved as a reference standard of poultry by-product meal.

A sample of corn meal was prepared in a similar manner. Mixtures of poultry by-product meal and corn meal were prepared. One mixture contained 1 percent of poultry by-product meal, one contained 2 percent and a third contained 5 percent. After each was mixed thoroughly and finely ground, 10 milligrams of the sample were placed on a ruled microscopic slide, and spread out evenly over the 25 x 25 mm area using three drops of a mounting medium composed of equal amounts of water, chloral hydrate and glycerine. Three slides of each mixture were prepared.

Using the low power of a compound microscope, the number of particles characteristic of the poultry by-product meal in the ruled area was determined. Particles of the poultry by-product meal were counted in each of the 289 separate fields of the 25 x 25 mm area. The average number of particles for each mixture was calculated to the basis of a 1 percent mixture. Under the conditions of this experiment, this average number of particles was 79. This average was used as a factor to calculate the amount of poultry by-product meal in unknown mixtures which were ground, prepared and counted in the same way.

The numerical value of the factor may vary slightly under different laboratory conditions and should be determined in each laboratory. With a correct evaluation of the factor, this procedure will give an accurate estimate of the amount of poultry by-product meal in any mixture.

Detection and Estimation of Excess Feathers

A good poultry by-product meal contains no more raw feathers than is consistent with good mill practice. Feathers contain about the same percentage of nitrogen as good poultry by-product meal or meat and bone scraps, but the nitrogenous compounds in raw feathers cannot be digested and utilized by animals. For this reason, it is important that an excess quantity of feathers in a mixed feed be detected and estimated. Here again the usual chemical analysis for crude protein (total nitrogen times 6.25) is of little value and microscopic procedures must be used. This can be done readily by estimating the proportion of particles of raw feathers (A of Figure 1) to particles of other tissues and structures found in good poultry by-product meal in the procedure outlined above.

Raw feather particles may be differentiated easily from particles of "hydrolized feathers," because the treatment of the latter greatly alters the appearance of the particles.

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