SELECTION OF FEEDSTUFFS
for
POULTRY
In mixing poultry rations as much care should be taken in assuring high-quality ingredients as in choosing adequate formulas and in careful mixing and weighing. The condition of the feed, the type of raw material used, the process and method of manufacture, and the age and storage conditions all have an important effect on nutritive value and palatability. The directions given in this bulletin for selecting feedstuffs are the result of much scientific research and practical observation.

**Feed Ingredients**

All feed ingredients should be fresh, sweet, and clean. Ground feeds should be uniform in particle size, not too fine and not too coarse. Moldy or badly caked feedstuffs never should be used.

**Water**

Water is the most essential nutrient. It makes up over one-half of the bird's body and two-thirds of the egg. Fresh, pure water suitable for human beings should be available to poultry at all times. Ditch, barnyard, or seep water are all dangerous as sources of infection or alkali. Special precautions must be taken in the summer to keep the water sweet and cool, and in the winter to prevent water from freezing.

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*Proper Feeding Promotes Profits*
Ration

Ration is the total feed consumed and usually consists of mash or concentrate, grain, grit, and any green feed or liquid milk.

Grains

Grains constitute most of the feed given poultry and are valuable as sources of carbohydrates (starches, sugars, fiber) and vitamins B and E, as well as other nutrients in a lesser degree. However, they are particularly deficient in protein quantity and quality (amino acid assortment), in calcium, phosphorus, manganese, sodium, chlorine, and possibly iodine, and in vitamins A (except yellow corn), D, and G.

Grains should approximate standard weight, or better, in most cases. Shrunken wheat can be used if not otherwise damaged. Yellow corn is the only grain with appreciable vitamin-A potency. It is, therefore, a very valuable poultry feed. New grain is satisfactory for chicks or turkeys if it has been properly dried. Improperly cured grain heats and becomes moldy. This may cause the fat to become rancid and may destroy some of the vitamin content. It also may injure the protein quality. If there is some poor grain to be used up, it should be tried out first on a few culls for several weeks. New grain does not cause any known disease.

Mashes

Mashes are designed to remedy the deficiencies in grains by incorporating protein, mineral, and vitamin supplements. They usually contain cereal by-products and some ground grains to improve palatability.

Concentrates or Supplement Mixtures

Concentrates or supplement mixtures are mixtures of protein, mineral, and vitamin supplements with no ground grains, and often little or no cereal by-products. They are designed to supplement grains, and are usually mixed with ground, home-grown grain to form a mash. When fed without ground grain, they may be pelleted to improve palatability.

Protein Supplements.

Meat and bonescrap and meatscrap are by-products from the packing and rendering industry remaining after dry-cooking and pressing the fat from waste trimmings and bone. The meat and bone-scrap usually available is guaranteed to contain at least 50 percent protein. That material running 55 percent protein or more constitutes meatscrap. Meat and bonescrap is more available generally.
These feedstuffs are rich in bone, a material that aggravates the occurrence of perosis (slipped tendons and enlarged hocks) in chicks and in poultis when fed in excess. The amount of meat and bone-scrap and of meatscrap incorporated in chick and poult starting mashes must be limited by the use of other protein supplements containing little or no bone.

Meat by-products should have an appetizing odor. Those samples with offensive, sour, or rancid odor, particularly noticeable when moistened, or containing a considerable quantity of hair, should be avoided.

Fish meal is a by-product from the canning of fish and from the manufacture of fish oil. Most commonly available kinds in Colorado are sardine meal and herring meal. The protein of good fish meal is equal to that of milk and is, therefore, of superior quality. It is highly desirable in rations for growing chicks and poults.

Fish meal should be appetizing in odor. It should not smell strongly or objectionably fishy or have a tainted, rancid, or scorched odor. It should be uniformly finely ground.

Soybean oilmeal is the residue from the extraction of oil from cooked soybeans. The protein of soybean oilmeal approaches that of milk in nutritive value for poultry and, therefore, is a highly desirable feed. This is particularly true in rations for chicks and poults, since it can replace a large portion of the meatscrap and fish meal, thereby reducing the amount of bone which aggravates the occurrence of perosis. In addition, it is rich in choline and possibly other materials which are necessary in addition to manganese to prevent perosis.

Soybean oilmeal should not have any raw or beany flavor. Raw beans are not well utilized by poultry and are not recommended.

Corn gluten meal is a by-product from the manufacture of corn starch. When it is used the ration should contain at least 30 percent of a mixture of wheat shorts, bran, and oats, and some alfalfa meal and milk. This product is particularly valuable in turkey, capon, and broiler rations because it somewhat improves the finish (fleshing).

Corn gluten meal should have a deep golden-yellow color. It then has appreciable vitamin-A activity.

Cottonseed meal is a good vegetable protein supplement of high nutritive value for chicks. It is the residue from the cooking and pressing of cottonseed to remove the oil. It should not be used in amounts exceeding 5 percent in the laying mash because larger
amounts cause egg yolks to turn olive-green and the whites pink when the eggs are stored.

Vitamin Supplements.

**Dried milk products** are used chiefly as sources of vitamin G. Dried buttermilk and skimmilk have about 33 percent protein and are rich in vitamin G, the dried buttermilk being considerably richer. The vitamin-G content of dried whey lies between that of dried buttermilk and that of dried skimmilk. It contains about 12 percent of protein. These feedstuffs should show no signs of severe scorching or rancidity.

**Liquid milk products**, such as liquid buttermilk and skimmilk contain about 3½ percent protein, and whey contains about 1 percent. All are rich in vitamin G. When used to replace dried milk or whey or protein supplements in the mash, these products should be fed constantly without any omissions. The containers should be kept clean and sweet by frequent scouring and disinfecting. Large amounts of milk will cause more loose or watery droppings and litter must be changed more often. It is preferable to feed skimmilk in the sour form. Liquid milk products should not have a rotten odor and should be palatable.

**Condensed milk** (semi-solid, etc.) contains about 11 percent protein and about one-third as much vitamin G as the dried form. Three pounds of condensed milk (semi-solid) are, therefore, equivalent to 1 pound of the dried form.

**Alfalfa leaf meal** is one of the chief sources of vitamins A and G in poultry rations. It should be a bright, deep-green color and should contain at least 20 percent protein, and less than 18 percent fiber. Straw-colored meals or any showing a considerable proportion of straw-colored particles, are low in vitamin value. The value is in the green leaves. If locally grown alfalfa hay is obtainable, cut in the bud or early stage (not full bloom), high in percentage of leafy material and well cured, retaining its deep-green color, it will make an excellent meal when ground. A good third-cutting alfalfa generally meets these requirements. The dehydrated meal is usually richer in vitamins, especially in carotene, the plant form of vitamin A.

**Green range** of the proper type furnishes one of the cheapest forms of all the vitamins except D and is rich in protein and minerals. It must be succulent, tender, and leafy, as well as green. Ranges meet these requirements only in the spring or when alfalfa, clover, rye, wheat, or other grain pastures are kept mowed short and are well irrigated. Alfalfa and clover should not be allowed to grow over 9 inches high or they become too coarse for consumption by poultry.
Growing birds should be allowed to range freely in the green feed and should not be fed heavily in the morning. Feed hoppers should, therefore, be scattered around the range, and they should be moved frequently to avoid killing off the grass or allowing mass infection of disease and worms. Grass range can be kept in ideal condition if sufficient sheep are pastured on it to keep the grass short, providing the sheep are free of erysipelas. This disease is transmitted to turkeys. Feed hoppers must be kept in creeps to keep the sheep out.

When birds are consuming plenty of green feed, the mash fed to the birds will not need any milk products or alfalfa meal, and the amount of yellow corn can be reduced. Fresh, green feeds cause deep orange yolks. For commercial egg production, the consumption of fresh greens must be limited to avoid too dark yolks. This can be accomplished by not letting the birds out to range until late afternoon.

Sprouted grains are fairly rich in vitamins. They must be sweet and clean and not soured. When fed, they should be deep green. They then make excellent green feed. If birds are given all they will consume in 5 to 10 minutes daily, the alfalfa meal and dried milk products in mashes can be reduced by about half, possibly more.

Cod liver oil or sardine oil, or A and D feeding oil, must be fed as a source of vitamin D when birds are not out in direct sunlight. These oils also supply important amounts of vitamin A. Sunlight through window glass is of no value as a source of vitamin D. The oil must be biologically tested and guaranteed. An untested, unguaranteed oil may have little or no vitamin-D potency. The amount to be used will depend upon the guarantee on the container as follows:

<table>
<thead>
<tr>
<th>Guaranteed A. O. A. C. units of D per gram</th>
<th>Laying Hens</th>
<th>Chicks</th>
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<tbody>
<tr>
<td>Concentrate</td>
<td>Grain-mash</td>
<td>Semi-confined*</td>
</tr>
<tr>
<td>85—Standard</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>200—</td>
<td>1 1/2</td>
<td>1</td>
</tr>
<tr>
<td>400—Re-enforced</td>
<td>3</td>
<td>1 1/2</td>
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*“Confined” refers to the total confinement of birds out of direct sunlight.
“Semi-confined” is when the birds get a moderate amount of direct winter sunlight; for instance, the curtain fronts and windows of poultry houses are open and allow winter sunlight to pour in the house and on the birds. Birds getting direct sunlight in the spring, summer, and fall require no fish oil.

The vitamin D in the oil loses its potency slowly when stored in feed. More oil must, therefore, be added in the mash if it is allowed to stand unused for more than two months.
Vitamin mixtures are rather complicated and expensive mixtures of various vitamin supplements. It is usually cheaper and more satisfactory to use the natural sources mentioned previously in this discussion. Vitamins added beyond required amounts will not give additional results and are wasted.

**Mineral Supplements.**

Grit is not essential for chicks. If used, it should be insoluble, such as granite or quartz, and should be very resistant to pulverizing. Soluble grit (limestone) upsets the mineral balance in chick rations and may lead to rickets (low phosphorus-high calcium type) or to perosis. For hens or pullets, crushed oystershell or limestone grit serves satisfactorily for grit, as well as providing calcium for shells.

Steamed bonemeal is used as a source of phosphorus for bone formation. It should be finely ground and clean, with a mild, bland odor.

Limestone is a source of calcium for bone and shell formation. It must contain at least 95 percent calcium carbonate and may be amorphous (limestone) or crystalline (calcite).

Oystershell is also a commonly used source of calcium. It should be clean smelling, practically free of sand, and uniform in size, whether crushed or pulverized.

Manganese sulfate is a concentrated source of manganese. It should be at least 90 percent pure anhydrous powder and nearly entirely soluble in water. To help prevent perosis it is used at the rate of 4 ounces per ton of starting mash for chicks or poults in batteries or on wire floors. Since manganese is also required for good production and hatchability, it is usually recommended that it be added to breeding mash at the rate of 8 ounces per ton of mash.

Mineral mixtures are more or less complex mixtures of the aforementioned minerals with others. They are nearly always high priced, are not necessary for properly formulated rations, and are detrimental if added to such rations.

Tonics and patent remedies are advertised as the panacea for all ills, real or imagined. They are unnecessary. If the birds are not doing as they should, the trouble is in breeding, feeding, housing, incubation, sanitation, disease, or management, and must be corrected there. Treatments for disease control are described in bulletin 369-A, "Controlling Diseases and Parasites of Poultry."