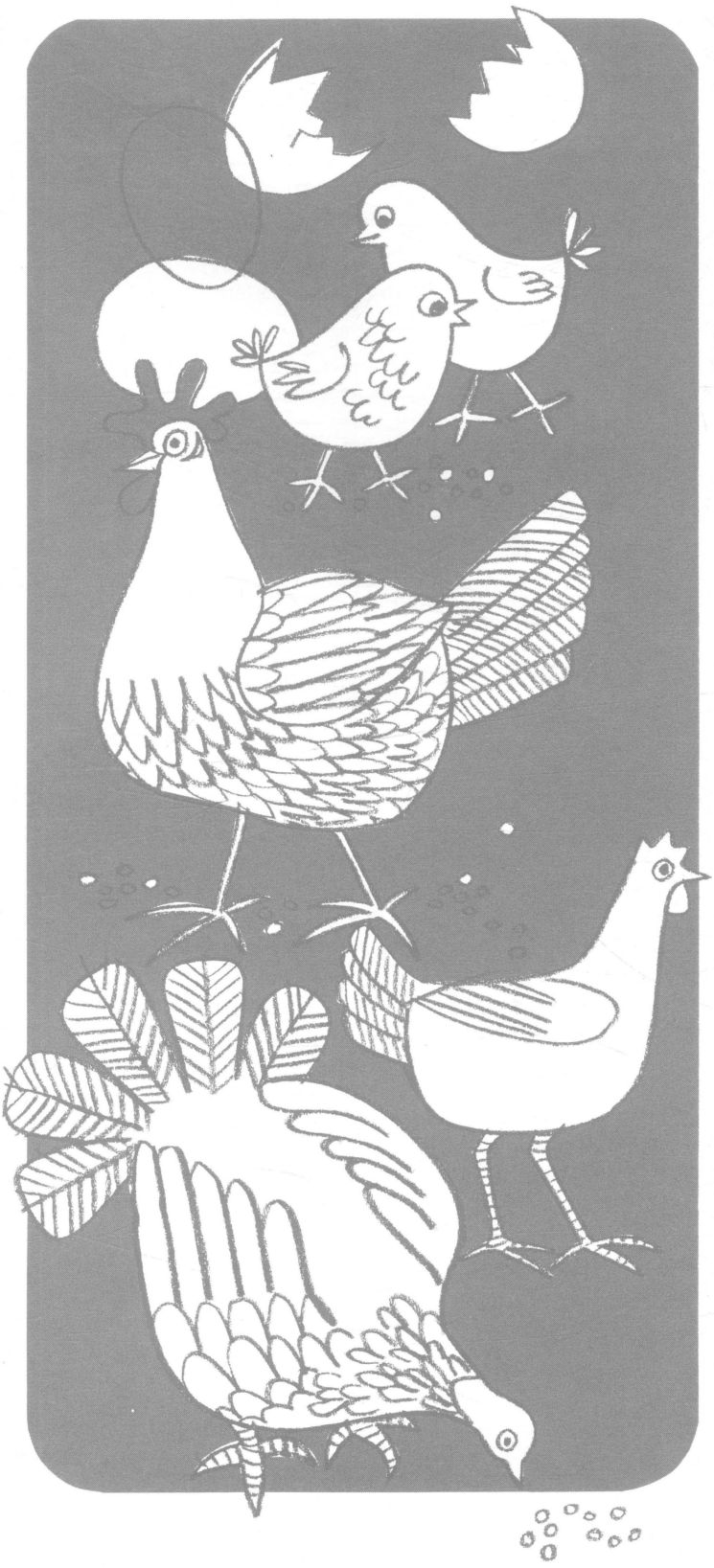
Bulletin 343

OHIO POULTRY RATIONS



COOPERATIVE EXTENSION SERVICE / THE OHIO STATE UNIVERSITY

CONTENTS

Tables

AUTHORS: *The authors are EDWARD C. NABER, Professor of Poultry Science, and SHERMAN P. TOUCHBURN, Professor of Poultry Science, Department of Poultry Science, The Ohio State University.*

OHIO POULTRY RATIONS

NUTRITION IS IMPORTANT

Adequate nutrition is important in maintaining the health, growth, and reproduction of poultry. Each of the nutrients must be supplied to the bird in proper amounts. If one nutrient is lacking or out of balance with the other nutrients, inefficient poultry production will result.

This inefficiency will be reflected in poor growth, low egg production, low hatchability, or poor feed utilization. The final result will be fewer market dollars returned to the poultryman.

FEEDING IS COSTLY

Feed costs constitute from 50 to 70 percent of total poultry production costs. This emphasizes the reasons for the use of economical and efficient feeds. When small savings in feed cost can be made without reducing the nutritive quality of the ration, such savings can mean a profit rather than a loss.

This bulletin has been prepared for poultry producers and feed manufacturers. It gives information on the formulation of efficient rations for various purposes. Read the entire bulletin before trying to prepare any of the rations.

DESIGN OF RATIONS

Modern poultry rations are complex mixtures of feedstuffs designed to meet the nutritive needs of the bird. The amounts and kinds of feed ingredients used in a poultry feed formula are influenced by a number of factors. Among the factors which must be considered are the purpose for which the ration is fed and the characteristics of the feed ingredients. The purpose of feeding and the type of bird being fed will dictate the nutrient levels that are desirable in the finished ration. On the other hand, nutrient content, physical properties, cost, and availability of feed ingredients will dictate the kinds and amounts of feedstuffs used to provide the nutrient content of the ration.

Large quantities of soybeans and corn are grown in Ohio and other midwest states. Thus, soybean meal and ground yellow corn generally are the most economical sources of protein and energy for poultry feeds. Since protein and energy account for 80 to 90 percent of total feed ingredient costs, most poultry rations include as much soybean meal and corn as possible. In this type of ration, limited quantities of amino acids, fish, meat, milk, and fermentation products are used to improve protein quality and supply unidentified growth factors.

Vitamins and minerals are available in highly concentrated forms that are economical to use. This means that many of the crude feedstuffs are no longer required as vitamin carriers and can be replaced by these vitamin concentrates. This leaves extra room in the ration for high energy and protein ingredients which make the rations more efficient.

Antibiotics and arsenicals have been shown to improve growth rates of poultry. Under certain conditions, these additives also improve reproductive performance. Therefore, it is possible to improve poultry rations by including these materials. Antioxidants have also proved useful as feed additives because they preserve vitamins and pigments in the ration. Drugs of various kinds may be added to feed for prevention and control of disease.

WHAT ARE THE POSSIBILITIES?

Prepare Your Own Rations

A large poultry producer or a person in the business of selling feed should consider the possibility of manufacturing feed. This bulletin provides nutrient specifications for formulation of poultry rations, and examples of feed formulas that meet the required nutrient specifications. If maximum economy and flexibility in producing rations is desired, the nutrient specifications should be used to design feed formulas based on availability, nutrient content, cost, and desirability of feed ingredients. The desirability of major feed ingredients is influenced by their physical condition, palatability to the bird, and the presence of toxic factors or substances harmful to product quality. The calculation of feed formulas using this information is best accomplished with the aid of computers using linear programing techniques.

The example feed formulas given in Tables 1 and 2 represent high quality poultry feeds. They may be used directly to prepare rations. The use of the example formulas, however, may not provide the most economical rations, since prices of feed ingredients will change periodically and ingredient costs in one location may differ from those in another location. It is highly desirable to check on the availability and price of feed ingredients in the area. The ingredient cost of the formula can then be calculated. It is important to consider time, labor, grinding, and mixing costs as well as the investment in facilities and equipment. All of these factors need to be considered if an intelligent comparison of alternatives is to be made.

Table 1—POULTRY FEED FORMULAS

Feedstuff or Ingredient	For Broilers			For Replacement Pullets		For Egg Production	
	Broiler Starter 0-5 Weeks	Broiler Grower 5-7 Weeks	Broiler Finisher 7 Weeks-Market	Pullet Starter 0-8 Weeks	Pullet Grower 8-20 Weeks	Light Breed Layers and Breeders	Heavy Breed Layers and Breeders
Major Ingredients							
Ground yellow corn	480	610	700	530	450	630	489
Pulverized oats	0	0	0	0	200	0	100
Soybean meal (44% protein)	340	235	190	180	85	160	120
Wheat middlings or ground wheat	0	0	0	150	150	0	100
Meat and bone scrap (50% protein)	30	30	20	50	50	25	20
Whole fish meal (60% protein)	30	30	20	30	0	25	20
Dried whey or distillers' dried solubles	20	20	10	0	0	25	20
Dehydrated alfalfa meal (17% protein)	20	20	40	50	50	25	50
Defluorinated rock phosphate (13% phos.)	12	6	13	0	0	12	10
Feeding limestone (34 to 38% calcium)	0	4	2	5	10	65	68
Iodized salt	5	5	5	5	5	3	3
Stabilized feed grade fat	63	40	0	0	0	30	0
Total	1000	1000	1000	1000	1000	1000	1000
Minor Ingredient Additives (per 1000 lbs. of ration)							
Vitamin D_3, I. C. units	300,000	240,000	240,000	240,000	240,000	500,000	500,000
Vitamin E, I. units	5,000	2,700	0	0	0	4,300	0
Vitamin K, gm.	0.27	0.27	0.05	0	0	0.23	0
Riboflavin, gm.	1.8	0.9	0.4	1.9	0.5	1.9	1.8
Niacin, gm.	9.1	4.0	0	3.0	0	5.0	1.5
Pyridoxine, gm.	0	0	0	0	0	0.23	0.18
Pantothenic acid, gm.	3.3	3.7	3.8	2.4	2.1	3.5	2.4
Folacin, gm.	0.16	0.12	0.03	0	0	0.02	0
Biotin, mg.	0	0	0	0	0	20	20
Cobalamin (B_{12}), mg.	4.2	2.5	3.4	1.8	0.8	1.9	2.3
Choline, gm.	64	163	120	162	145	56	47
Methionine or hydroxy analog, lbs.	2.4	2.2	2.0	1.8	0	0.9	1.0
Lysine, lbs.	0	0.7	1.4	0	0	0	0
Manganous oxide, gm.	41	41	41	34	32	12	4
Zinc oxide, gm.	32	32	32	20	23	47	40
BHT or Ethoxyquin	+	+	+	+	+	+	+
Antibiotic, gm.	2-5	2-5	?	2-5	—	?	?
Organic arsenical	+	+	—	—	—	?	?
Coccidiostat	+	+	—	+	?	—	—

Use a Concentrate

Some feed manufacturers prepare special concentrates that are meant to be mixed with ground grains to produce a balanced poultry ration. These concentrates contain high levels of protein and other nutrients and are designed to make up for the deficiencies in the grains. This system is particularly advantageous when home grown or local grains are available.

Most commercial concentrates contain from 32 to 44 percent protein. Specific mixing instructions are generally furnished with the concentrate. These instructions should be followed closely. Only the manufacturer knows what ingredients should be added to his concentrate to make a complete ration.

By using the concentrate system, problems associated with mixing small quantities of vitamin and mineral ingredients may be avoided. Since these minor ingredients will be blended into the concentrate, the mixing problems will be simplified.

A further modification of the concentrate system involves the use of super concentrates for preparing

Table 2—POULTRY FEED FORMULAS

Feedstuff or Ingredient	Age Fed, Weeks	Turkey Growers 1	2	3	4	5	6	Turkey Breeder
	Toms	0-3	3-8	8-14	14-18	18-22	22-	—
	Hens	0-3	3-8	8-12	12-15	15-18	18-	—
Major Ingredients (lbs.)								
Ground yellow corn		360	422	518	620	664	722	625
Soybean meal (44% protein)		0	0	0	0	145	84	100
Soybean meal (49% protein)		375	325	244	145	0	0	0
Wheat middlings or ground wheat		50	50	50	50	25	25	50
Meat and bone scrap (50% protein)		50	50	50	50	50	50	25
Whole fish meal (60% protein)		25	25	25	25	0	0	50
Dried whey or distillers' dried solubles		25	25	25	25	25	25	20
Dehydrated alfalfa meal (17% protein)		50	50	50	50	50	50	50
Defluorinated rock phosphate (13% phos.)		10	10	9	6	7	5	18
Feeding limestone (34 to 38% calcium)		5	2	1	0	0	0	38
Iodized salt		4	4	4	4	4	4	4
Stabilized feedgrade fat		31	22	24	25	30	35	10
Dried fish solubles		15	15	0	0	0	0	10
Total		1000	1000	1000	1000	1000	1000	1000
Minor Ingredient Additives								
(per 1000 lbs. of ration)								
Vitamin D_3, I. C. units		820,000	820,000	600,000	600,000	600,000	600,000	820,000
Vitamin E, I. units		900	800	0	0	0	0	13,800
Vitamin K, gm.		0.45	0.45	0.23	0.23	0	0	0.45
Riboflavin, gm.		1.3	1.3	1.6	1.7	1.2	0.8	1.6
Niacin, gm.		34.0	34.0	20.0	20.0	12.3	9.0	5.8
Pyridoxine, gm.		0	0	0	0	0	0	0
Pantothenic acid, gm.		2.1	2.3	2.5	2.9	2.0	2.3	7.0
Folacin, gm.		0.34	0.35	0.12	0.09	0.06	0.07	0.23
Biotin, mg.		80	90	10	32	0	0	30
Cobalamin (B_{12}), mg.		0	0	2.8	2.8	2.7	2.7	0
Choline, gm.		184	182	221	213	152	114	124
Methionine or hydroxy analog, lbs.		0.6	0.4	0.8	0.6	0.5	0.4	0
Lysine, lbs.		0	0	0	0.25	0.75	1.1	0
Manganous oxide, gm.		32	32	29	33	16	18	10
Zinc oxide, gm.		45	45	13	14	12	12	35
BHT or Ethoxyquin		+	+	+	+	+	+	+
Antibiotic, gm.		2-5	2-5	2-5	2.5	—	—	?
Organic arsenical		+	+	+	+	—	—	—
Coccidiostat		+	+	—	—	—	—	—
Histomonastat		—	—	+	+	+	+	—

complete rations. Super concentrates are designed to contain most or all of the ingredients needed to prepare a complete feed. Use of this system requires mixing the super concentrate with soybean meal and grains. The amount of super concentrate used will depend on the feeding purpose and formulation, but usually will be between 100 and 400 pounds per ton of finished complete feed. As with the concentrate system, instructions of the manufacturer must be followed exactly, and a good job of mixing is essential.

Purchase Commercial Feed

The commercial feed industry makes available a wide variety of poultry rations. These rations represent the skill of this industry in formulating and blending. After comparing the cost of mixing rations and the cost of using concentrate with local grain, investigate the cost of buying a complete commercial ration.

Make cost comparisons only among rations designed for the same feeding purpose. Rations higher

in their content of protein and other nutrients cost more than those containing less nutrients. For example, if a ration having a protein content of 20 percent is compared with another having 22 percent, you can expect the 22 percent protein ration to cost more.

Commercial feed companies can produce poultry feeds in mash, pellet, or granular form. While the pellet or granular forms cost slightly more, these feed forms are preferred by some poultrymen. They improve performance of the birds under some conditions and reduce feed wastage. These feed forms cannot be produced without the aid of highly specialized equipment.

Many commercial feed concerns maintain laboratories that constantly check the quality of the ingredients going into their feeds. They also make adjustments in their formulas to take advantage of the changes in the market price of ingredients. Savings from such adjustments are usually passed on to the feed purchaser.

PREPARATION OF RATIONS

A baby chick consumes only a small amount of feed during the first few days of its life. All of the nutrients must be present in this small amount of feed, if the chick is to develop and grow. For this reason, the ingredients of the poultry ration must be thoroughly mixed.

Mixing Must Be Thorough

Proper feed mixing involves care and attention to details. Each ingredient must be weighed accurately. Unwise substitution of ingredients or omission of certain ingredients can result in a seriously inadequate feed.

Any ingredients that constitute less than 2 or 3 percent of the final mixing volume should be premixed to assure a uniform final mixture. Premixing can be done by blending the minor ingredients with a quantity of one of the major ingredients such as soybean meal. For best results, use a small mechanical mixer. Such premixes should be made shortly before use and should not be stored for extended periods. This is of utmost importance in premixes that combine both vitamin and mineral ingredients.

Mixing equipment must be used properly to obtain a uniform blend of feed ingredients. When using a batch mixer, be sure that all ingredients that comprise less than 5 percent of the formula are added after the mixer is one-third full and before two-thirds of the total weight of ingredients have been added. Most mixers work best when used at their rated capacity. Follow the mixing time recommended by the manufacturer of the mixing equipment. It is not possible to determine the adequacy of a mixing procedure by visual examination of the blend.

Purchasing Feed Ingredients

Good quality grains and other feedstuffs are required for the production of poultry rations. Do not use high moisture grains in poultry feeds. Dry but do not overheat grains in the process of drying them. Do not use moldy grains or grains contaminated with pesticide residues. High protein feedstuffs made from seeds, beans, or animal by-products must be properly processed to destroy or remove toxic substances and improve their nutritive value. All feedstuffs containing fats, carotene and other fat soluble factors should contain antioxidants to improve their stability. Purchase all feed ingredients from dependable and consistent suppliers of quality materials.

The formulas for the rations in this bulletin list certain vitamins and other additives among the minor ingredients. The small mixer will generally find it better to buy vitamin mixtures instead of attempting to buy individual vitamins. Information about commercial vitamin mixtures is available from local county agricultural agents and managers of local feed outlets or suppliers who can be contacted through advertisements in trade journals and papers.

Commercially available vitamin mixtures may not be of the same composition as the vitamins listed for addition to the rations in this bulletin. If you use a commercial vitamin mixture, add it to supply at least those quantities of vitamins listed for addition to each ration. In practice, it will be best to buy a vitamin mixture that contains vitamins in amounts similar to those listed. Reasonable excesses of vitamins will not be harmful to poultry. Avoid vitamin levels below those suggested.

Stability of Mixed Feeds

Most nutrients are reasonably stable in mixed feeds if certain precautions are taken to insure stability. The use of butylated hydroxytoluene or ethoxyquin, as suggested in the example formulas, will help to prevent oxidation of vital nutrients. Avoid long storage of mixed feeds. It is a good practice to prepare only the amount of feed needed for one or two weeks of feeding. It is also important to avoid prolonged exposure of feeds to heat, moisture, or light. Premixes should not combine vitamin and mineral ingredients and should be used within two weeks after preparation.

Antibiotics and Drugs

It is desirable that some poultry feeds contain certain antibiotics or drugs to promote growth, increase egg production, and aid in disease prevention or control. The use of these substances depends on the purpose for which poultry is being fed and the local need for these substances as an aid in disease management. The use of antibiotics and drugs and

the levels of these substances in rations are restricted by state and federal law. Some of the antibiotics and drugs can be used for growth stimulation at one dietary level, while higher levels of the same substance may be used for disease prevention and control. The mixing and sale of feed mixtures containing antibiotics or drugs is regulated and licensed by the State Department of Agriculture and the Food and Drug Administration of the United States Government.

FEEDING SUGGESTIONS

Feed

Chicks and poults will begin to eat as soon as they are placed in the brooder house. During the first few days, keep the hoppers filled completely to encourage feed consumption. After this time, keep the hoppers not more than half full. This will avoid feed wastage. On the other hand, the feeders should never be allowed to remain empty; to do so defeats the purpose of providing plenty of feeder space.

Inspect tube-type feeders regularly to see that feed is flowing down the tube properly. A heavy flow of feed will result in wastage, whereas, a light flow will restrict consumption. When you use mechanical feeders, check the feed distribution to the flock regularly. This management practice assures that feed does not pile up at certain points and that all areas of the house receive adequate amounts of feed.

Water

Poultry will consume about one quart of water for each pound of feed eaten. In hot weather, water consumption will be double this amount. It is most important to provide a constant supply of clean water for the flock. In cold weather, it is necessary to prevent freezing of the water supply.

Calcium

Laying and breeding chickens or turkeys require large amounts of calcium. These calcium requirements have been incorporated into the feed formulas given in this bulletin. Oyster shell, high calcium feeding limestone, or calcite can be used as calcium sources. Avoid the use of dolomitic limestone because it contains excessive amounts of magnesium. Feeding of supplementary calcium in addition to that shown in the formulas is generally undesirable.

Grit

Keep insoluble grit of proper size available to birds of all ages when they are fed whole grains, or when they have access to pasture. Gizzard impaction in young birds may be avoided by grit feeding under circumstances where litter consumption occurs.

NUTRIENT SPECIFICATIONS FOR POULTRY RATIONS

Some poultry producers and most feed manufacturers prepare poultry rations to minimize formula costs and yet provide all the essential nutrients required for their feeding purposes. Under these conditions, formulas that dictate the amount of each feedstuff to be used in the preparation of a ration are not very useful. What is needed is a good set of specifications for the nutrient allowances that must be provided in a poultry feed formula to give optimum productivity. Tables 3 and 4 provide a rather complete set of nutrient specifications for poultry feeds. These specifications can be used to design feed formulas that will be most economical for local circumstances of feedstuff availability, and price.

The tables contain a range of metabolizable and productive energy values for formulation. Rations are generally formulated to the minimum energy values during warm or hot weather and formulated to maximum energy values during cool or cold weather. Hence, the feed formulas can be adjusted for the season of the year to compensate for varying energy intake of the bird stimulated by the changing weather conditions.

Most of the specification values in the tables were calculated from data on the nutrient requirements of the bird for each purpose indicated, and include safety factors. These safety factors make allowances for variation in the nutrient content of feedstuffs, variation in the nutrient requirements of individual animals, instability of some nutrients, and unfavorable mixing conditions.

The nutrient specifications for laying and breeding chickens are given for a generalized formula suitable for feeding throughout the laying year when one and only one feed formula is to be used. If tailored or phase feeding is to be practiced, the nutrient specifications shown should be upgraded by 10 to 15 percent when pullets are in high rates of egg production and consuming minimum quantities of feed. In a similar manner, the nutrient specifications can be downgraded by 10 to 15 percent when feeding involves old hens that are in low rates of egg production and consuming normal or large quantities of ration.

Feed formulas made from this set of specifications are suitable for cage rearing of birds.

Feeds for egg-type layers and breeders are generally formulated to maximum energy specifications. On the other hand, feeds for broiler-type layers and breeders are generally formulated to minimum energy specifications. This practice seems advisable since broiler-type hens have a tendency to overeat. The tendency to overeat will be increased by the use of high energy rations. The nutrient specification tables are intended to be of value in the formulation of poultry rations. They will also serve as a guide to check the nutrient adequacy of formulas presently in use.

The specifications for turkey growing rations are given for toms and hens at different ages. This time schedule for use of the individual rations can be adjusted to insure optimum growth rates. Under hot weather conditions, the shifts would be delayed about one week, while under cold weather conditions, shifts could be made one week earlier.

USE OF OHIO POULTRY FORMULAS

Broiler Starter

This ration will produce rapid growth when fed to broiler-type chicks. No additional feeds or supplements are desirable or necessary. When the chicks reach 5 weeks of age, they should be switched to the broiler grower ration. If cockerels and pullets are housed separately, the pullets can be switched to the grower ration at 4½ weeks of age while the cockerels should not be switched to the grower ration until they reach 5½ weeks of age.

Provide two linear inches of feeder space per broiler chick. Use one waterer for each 100 chicks. As the birds grow, you may use automatic cups or troughs. The capacity of these automatic devices is variable, and the manufacturer's suggestions should be followed.

Drugs for the prevention of coccidiosis may be added to the broiler starter, pullet starter, and turkey starter rations when desired. These drugs should be premixed thoroughly before addition to the final mash mixture.

Broiler Grower

Feed this ration to broiler chicks from 4½, 5 or 5½ weeks to 6 or 7 weeks of age. This ration contains less protein than the starter and about the same energy level as the starter. Provide three linear inches of feeder space per bird.

Broiler Finisher

Feed broilers from 6 or 7 weeks of age to market the broiler finisher. It provides pigmentation factors needed for a good yellow carcass finish. Feeder space as outlined for the broiler grower is adequate. Note that this ration should not contain an organic arsenical or other drugs used in broiler starter and grower feeds that must be withdrawn prior to slaughter.

Pullet Starter

Feed this ration to flock replacement pullet chicks until they are 8 weeks of age. Do not use other feeds to supplement this ration. Provide 1 to 2 linear inches of feeder space per chick (a feeder 36 inches long and accessible from both sides has 72 linear inches of feeder space). Provide one waterer of 2- or 3-gallon capacity for each 100 chicks.

Pullet Grower

This ration is suitable for rearing replacement stock between 8 weeks of age and sexual maturity. It is suitable for confinement rearing. If good green pasture is available to the birds continuously during the growing period, you can simplify this ration by the omission of the dehydrated alfalfa meal and the minor ingredient additives, except manganese sulfate. If home-grown grains are available, they can be fed with this ration by reducing the amount of grain in the mixture by the amount of whole grain that is to be fed.

Provide 2 or 3 linear inches of feeder space for each growing bird. Also provide one waterer of 5-gallon capacity for each 100 birds.

When feeding broiler breeder pullets, restrict the ration to 70 percent of full feed to limit body-weight gains and development. When controlled feeding is used, double the amount of feeder space suggested above to insure that all birds will have an opportunity to eat.

Light Breed Egg Production Ration

This ration is designed for the efficient production of market or hatching eggs. Feed it only to egg-production type chickens. Do not feed additional grain. This feed is suitable for cage layers.

When market-egg production is the only objective, this ration can be simplified by replacing the fish meal and dried whey in the formula with additional meat and bone scrap. The pantothenic acid and vitamin B_{12} can also be omitted from the minor ingredient additives.

Provide feeder space equivalent to 3 or 4 linear inches per bird. For floor-housed birds, make one waterer of 6- or 8-gallon capacity available for each 100 hens. One automatic cup or pan type waterer will serve up to 150 hens.

Heavy Breed Egg Production Ration

Feed this formula to heavy or meat-type laying and breeding chickens. Do not use additional grain. Suggestions for feed and water space and simplification of the ration for market-egg production are the same as for the light breed ration.

It may be desirable to restrict the quantity of this ration to 85 percent of full feed to prevent overconsumption and resultant obesity, which usually increases breeder flock mortality. The net effect of controlled feeding of meat-type breeders is to increase the efficiency of hatching egg production.

Tailoring Rations for Egg Production

Flexibility in feeding egg-production-type layers may be desired to permit maximum economy in meeting the nutrient needs of layers. To obtain this flexibility an egg-production concentrate can be formulated by omitting the ground yellow corn from the light-breed egg-production formula shown in

(Continued on page 11)

Table 3—RECOMMENDED NUTRIENT SPECIFICATIONS FOR POULTRY RATIONS
Broiler and Egg Production Feeds

Nutrient or Additive	Broiler Starter 0-4 wks.	Broiler Grower 4-7 wks.	Broiler Finisher 7 wks.-market	Pullet Starter 0-8 wks.	Pullet-Grower Developer 8-20 wks.	Complete Layer	Complete Breeder
Crude Protein, %	22-24	20	18	20	16	16	16
Metabolizable Energy, kilocalories/lb.	1360 to 1440	1340 to 1400	1280 to 1350	1120 to 1240	1050 to 1220	1120 to 1320	1120 to 1320
Productive Energy, kilocalories/lb.	980 to 1040	970 to 1020	920 to 980	840 to 900	800 to 880	820 to 960	820 to 960
Amino Acids, %							
Arginine	1.44	1.26	1.14	1.20	0.96	0.84	0.84
Lysine	1.32	1.16	1.04	1.10	0.88	0.53	0.53
Histidine	0.48	0.42	0.38	0.40	0.32	0.22	0.22
Methionine	0.48	0.42	0.38	0.40	0.32	0.29	0.29
Methionine + Cystine	0.90	0.79	0.71	0.75	0.60	0.56	0.56
Tryptophan	0.24	0.21	0.19	0.20	0.16	0.16	0.16
Glycine	1.20	1.05	0.95	1.00	0.80	0.60	0.60
Phenylalanine	0.84	0.74	0.66	0.70	0.56	0.50	0.50
Phenylalanine + Tyrosine	1.56	1.37	1.23	1.30	1.04	1.00	1.00
Leucine	1.68	1.47	1.33	1.40	1.12	1.26	1.26
Isoleucine	0.90	0.79	0.71	0.75	0.60	0.53	0.53
Threonine	0.84	0.74	0.66	0.70	0.56	0.42	0.42
Valine	1.02	0.90	0.80	0.85	0.68	0.60	0.60
Additives							
Xanthophyll, mg./lb.	5	7	8	—	—	8	8
Antioxidant	+	+	+	+	+	+	+
Antibiotic	+	+	+	+	—	?	?
Coccidiostat	+	+	—	+	?	—	—
Vitamins							
Vitamin A, U.S.P. units/lb.	3000	2400	2000	2400	2000	4000	4000
Vitamin D_3, I.C. units/lb.	300	240	240	240	240	500	500
Vitamin E, I.U./lb.	9.0	7.0	5.0	9.0	5.0	5.0	9.0
Vitamin K, mg./lb.	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Thiamine, mg./lb.	1.5	1.5	1.5	1.5	1.5	1.0	1.0
Riboflavin, mg./lb.	3.0	2.0	1.5	3.0	1.5	1.5	3.0
Pantothenic acid, mg./lb.	7.5	7.5	7.5	7.0	7.0	1.5	7.0
Niacin, mg./lb.	20.0	15.0	10.0	20.0	10.0	10.0	15.0
Pyridoxine, mg./lb.	2.2	2.0	2.0	2.0	2.0	2.0	3.0
Biotin, mg./lb.	0.07	0.07	0.07	0.07	0.07	0.05	0.10
Choline, mg./lb.	700	700	600	700	600	500	500
Folacin, mg./lb.	0.40	0.35	0.30	0.35	0.30	0.20	0.25
Cobalamin (B_{12}), mcg./lb.	7.0	5.0	5.0	5.0	3.0	2.0	4.0
Minerals							
Calcium, %	1.0	0.9	0.9	1.0	1.0	3.0	3.0
Phosphorous, %	0.77	0.66	0.66	0.66	0.66	0.66	0.66
Sodium, %	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Potassium, %	0.22	0.18	0.18	0.22	0.18	0.2	0.2
Manganese, mg./lb.	40.0	40.0	40.0	40.0	40.0	25.0	25.0
Iodine, mg./lb.	0.25	0.25	0.25	0.25	0.25	0.2	0.2
Magnesium, mg./lb.	250	250	250	250	250	200	200
Iron, mg./lb.	55.0	55.0	55.0	55.0	55.0	10.0	10.0
Copper, mg./lb.	2.7	2.7	2.7	2.7	2.7	1.0	1.0
Zinc, mg./lb.	34.0	34.0	34.0	34.0	34.0	45.0	45.0
Molybdenum, mg./lb.	2.0	2.0	2.0	2.0	2.0	—	—
Selenium, mg./lb.	0.1	0.1	0.1	0.1	0.1	—	—

Table 4—RECOMMENDED NUTRIENT SPECIFICATIONS FOR POULTRY RATIONS
Turkey Grower and Breeder Feeds

Nutrient or Additive	Age Fed, Weeks	Grower 1	2	3	4	5	6	Breeder
	Toms	0-3	3-8	8-14	14-18	18-22	22-	—
	Hens	0-3	3-8	8-12	12-15	15-18	18-	—
Crude Protein, %		29.4	27.3	23.1	18.9	16.8	14.5	17.0
Metabolizable Energy, kilocalories/lb.		1260 to 1350	1280 to 1365	1315 to 1390	1320 to 1400	1340 to 1420	1360 to 1440	1260 to 1320
Productive Energy, kilocalories/lb.		910 to 970	920 to 980	945 to 1000	950 to 1010	960 to 1020	960 to 1040	900 to 950
Amino Acids, %								
Arginine		1.68	1.56	1.32	1.08	0.94	0.80	0.97
Lysine		1.58	1.47	1.24	1.02	0.88	0.75	0.91
Histidine		0.59	0.55	0.46	0.38	0.33	0.28	0.34
Methionine		0.55	0.51	0.43	0.35	0.31	0.26	0.32
Methionine + Cystine		0.92	0.85	0.72	0.59	0.51	0.44	0.53
Tryptophan		0.28	0.26	0.22	0.18	0.16	0.13	0.16
Glycine		1.05	0.98	0.82	0.68	0.59	0.50	0.60
Phenylalanine		1.00	0.93	0.79	0.64	0.56	0.48	0.58
Phenylalanine + Tyrosine		1.90	1.76	1.49	1.22	1.06	0.90	1.10
Leucine		2.00	1.86	1.57	1.29	1.12	0.95	1.16
Isoleucine		0.88	0.82	0.69	0.57	0.49	0.42	0.51
Threonine		1.00	0.93	0.79	0.64	0.56	0.48	0.58
Valine		1.25	1.16	0.98	0.80	0.70	0.60	0.72
Additives								
Antioxidant		+	+	+	+	+	+	+
Antibiotic		+	+	+	+	—	—	—
Coccidiostat		+	+	—	—	—	—	—
Histomonastat		—	—	+	+	+	+	—
Vitamins								
Vitamin A, U.S.P. units/lb.		4500	4500	3600	3600	3600	3600	4500
Vitamin D_3, I.C. units/lb.		820	820	600	600	600	600	820
Vitamin E, I.U./lb.		9.0	9.0	7.0	7.0	5.0	5.0	23.0
Vitamin K, mg./lb.		1.0	1.0	0.8	0.8	0.5	0.5	1.0
Thiamine, mg./lb.		1.5	1.5	1.5	1.5	1.0	1.0	1.5
Riboflavin, mg./lb.		3.0	3.0	3.0	3.0	2.5	2.0	3.0
Pantothenic acid, mg./lb.		7.5	7.5	7.0	7.0	6.0	6.0	11.0
Niacin, mg./lb.		48.0	48.0	32.0	32.0	24.0	20.0	20.0
Pyridoxine, mg./lb.		2.2	2.2	1.6	1.6	1.4	1.4	2.0
Biotin, mg./lb.		0.20	0.20	0.10	0.10	0.05	0.05	0.10
Choline, mg./lb.		950	900	800	700	600	500	600
Folacin, mg./lb.		0.70	0.70	0.45	0.40	0.35	0.30	0.55
Cobalamin (B_{12}), mcg./lb.		7.0	7.0	6.0	6.0	5.0	5.0	5.5
Minerals								
Calcium, %		1.32	1.24	1.12	0.98	0.90	0.80	2.48
Phosphorus, %		0.88	0.86	0.82	0.74	0.68	0.64	0.83
Sodium, %		0.17	0.17	0.15	0.15	0.13	0.10	0.17
Potassium, %		0.44	0.44	0.40	0.35	0.30	0.25	0.44
Manganese, mg./lb.		40	40	35	35	20	20	25
Iodine, mg./lb.		0.25	0.25	0.20	0.20	0.15	0.15	0.4
Magnesium, mg./lb.		250	250	230	230	200	200	250
Iron, mg./lb.		40	40	28	28	20	20	40
Copper, mg./lb.		4	4	3	3	2	2	4
Zinc, mg./lb.		50	50	23	23	18	18	40
Molybdenum, mg./lb.		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Selenium, mg./lb.		0.1	0.1	0.1	0.1	0.1	0.1	0.1

Table 1. This concentrate can then be used to produce complete rations as shown in Table 5. The important advantage of this concentrate is that, through its use, complete rations can be tailored to the level of egg production in the flock and the season of the year.

These tailored rations can be mixed on the farm with simplified equipment to meet individual flock needs. Note that Table 5 is constructed for rations applicable for the months of November through April. During the period from May through October, the complete rations should contain an additional 25 to 50 pounds of concentrate and less corn.

Turkey Grower Rations

These are complete feeds designed to meet the changing nutrient needs of the growing turkey from day-old to market age. They are presented in this bulletin simply as turkey grower rations 1 to 6. It is recommended that the feeds be pelleted; rations 1 and 2 should be fed as crumbles.

To derive maximum benefit from any feeding system for turkeys, it is necessary to feed males and females on different schedules. Females grow at a slower rate, mature at an earlier age than males, and require more energy and less protein in their diets. To maximize profits, market the females at least two weeks earlier than the males. The savings in feed cost thus realized will more than offset the cost of sexing and maintaining separate male and female flocks. In the feed formulas (Table 2) and the recommended nutrient specifications (Table 4), the suggested age intervals for feeding the different ration to the toms and hens are indicated.

Note the several differences in the formulations of the turkey grower rations presented in Table 2. Rations 1 to 4 contain 49 percent protein soybean meal whereas 5 and 6 contain 44 percent protein soybean meal. Fish products which might impart off flavors to the meat are omitted from the last two grower feeds. Dried fish solubles are added to the first two grower rations as a source of an unidentified growth factor. Vitamin E is likewise added to grower rations 1 and 2 to insure maximum early growth.

Addition of an antibiotic at the growth promotion level is recommended for grower rations 1 to 4. An organic arsenical may also be added as a growth stimulant in grower rations 1 to 4. A coccidiostat is normally included in grower rations 1 and 2 only. A histomonastat should be added to grower rations 3 to 6 for prevention of blackhead disease, but may be included earlier if warranted by the incidence of the disease. Always follow recommendations of the manufacturers for the use of drugs.

Make fresh, clean water available to the birds at all times. Provide one to 2 linear inches of feeder space per poult. Each 100 poults need a water capacity of 2 gallons at the start. Increase this capacity as the poults grow. Replace feeders and waterers with larger ones as the poults grow, to prevent feed wastage and to keep a constant supply of feed and water before the birds at all times.

Following the brooding period, you will need 2 to 3 linear inches of feeder space or ½ inch on the pan circumference of the round-type feeders per bird. Water consumption during the growing and finishing period will vary from 5 to 20 gallons per day per 100 turkeys depending upon age, sex and weather conditions.

Turkey broilers or fryer roasters can be fed the turkey grower rations 1 to 4 or possibly 1 to 5, but the age intervals fed must be reduced in proportion to the shorter growing period. The performance figures in Table 6 show toms and hens reared separately. For flocks containing both sexes, use the averages of the values for toms and hens.

Table 5—USE OF EGG-PRODUCTION CONCENTRATE TO PROVIDE COMPLETE RATIONS FOR LIGHT BREED LAYERS TAILORED TO EGG OUTPUT AND SEASON*

Rate of Production	Composition of Complete Rations (lbs. per 1000 lbs.)		Protein Level of Complete Ration (%)
	Egg-Production Concentrate	Ground Yellow Corn	
Below 50%	260	740	14.2
51–60%	300	700	15.0
61–70%	350	650	16.0
71–80%	390	610	16.8
Above 80%	420	580	17.6

* These are "winter" rations applicable from November through April. "Summer" rations should contain 25 to 50 pounds more concentrate and 25 to 50 pounds less corn. Use the 25-pound substitution during warm weather and the 50-pound substitution during hot weather in the months of May through October.

Turkey Breeder Ration

Start feeding the turkey breeder ration about one month before the birds come into egg production. Provide four linear inches of feeder space per bird. Also provide 10 gallons of waterer capacity for 100 breeders.

The breeder feed should contain dried fish solubles and dried whey or distillers' dried solubles as sources of unidentified factors required for maximum hatchability and early growth of the progeny. Vitamin E is also important for maximum reproductive performance. An antibiotic may also prove benefical under less-than-ideal conditions of health and management.

Reliance on artificial insemination for the large-type turkey and maintaining the toms separately from the hens create an opportunity to feed a specific ration to the toms. Assuming that their needs for protein and calcium would be lower than those of hens producing eggs, formulate the tom breeder diet to contain 15 to 16 percent protein and 0.7 to 0.9 percent calcium.

Table 6—GROWTH, FEED CONSUMPTION AND FEED CONVERSION RATES EXPECTED FROM POULTRY FED OHIO POULTRY RATIONS

Type of Poultry, Age and Ration	Average Weight (lbs.)	Per Bird Feed Consumption (lbs.)	Feed Conversion* Rate
Growing Broiler Cockerel to 8 weeks of age fed Broiler Starter, Grower, and Finisher....	4.1–4.4	7.9– 8.6	1.8– 2.1
Growing Broiler Pullet to 8 weeks of age fed Broiler Starter, Grower, and Finisher.....	3.3–3.5	7.3– 7.9	2.1– 2.4
Growing Egg Production Type Pullet to 8 weeks of age fed Pullet Starter.....	1.2–1.6	3.2– 4.0	2.5– 2.8
Growing Egg Production Type Pullet from 8 to 20 weeks of age fed Pullet Grower.....	3.1–3.6	13.5–15.0	4.0– 5.0
Growing Broiler Pullet Fed Chick Starter to 4 weeks of age and restricted amounts of Chick Grower to 24 weeks of age.....	5.1–5.6	22– 28	4.0– 4.3
Laying Hen of Egg Production Type Fed Light Breed Layer Ration during a 12-month period with an average of 70 percent hen-day egg production.....	3.6–4.0	80– 90	3.8– 4 2
Breeding Hen of Meat Type Fed Heavy Breed Layer Ration during a 9-month period with an average of 60 percent hen-day egg production.....	6.0–7.5	96–104	7.1– 7.6
Growing Large Type Tom Turkey			
Fed Turkey Grower Feeds 1 to 6 to 22 weeks of age.....	24–26	78– 82	3.0– 3.4
24 weeks of age.....	27–29	93– 98	3.2– 3.6
26 weeks of age.....	30–32	109–114	3.4– 3.8
Growing Large Type Hen Turkey			
Fed Turkey Grower Feeds 1 to 6 to 18 weeks of age.....	13–15	42	2.8– 3.2
20 weeks of age.....	14–16	51– 58	3.0– 3.4
22 weeks of age.....	16–18	58	3.2– 3.6
Large Type Turkey Breeder Hen:			
Fed Turkey Grower Feed No. 6			
During Holding Period 20 to 32 weeks of age.....	20	40– 50	.....
Fed Turkey Breeder Feed			
During a 150-day Laying Period Producing 75 eggs.....	23–25	70– 80	11.2–12.8
Large Type Turkey Breeder Tom:			
Fed Turkey Grower Feed No. 6			
During Holding Period 20-30 weeks of age.....	30	70– 80	.....
Fed Turkey Breeder Feed			
During a 164-day Breeding Period.....	37–41	164–180	.....
Growing Medium Type Turkey Tom to 12 weeks of age fed Turkey Grower Feeds 1-4.....	9.0–9.4	20– 22	2.1– 2.4
Growing Medium Type Turkey Hens to 16 weeks of age fed Turkey Grower Feeds 1-4.....	8.8–9.2	22– 25	2.4– 2.8

* Pounds of feed consumed per pound of body weight or pounds of feed consumed per dozen eggs produced.

PERFORMANCE OF POULTRY FED OHIO POULTRY RATIONS

Growth, feed consumption, and feed conversion rates that can be expected from poultry fed rations made from formulas given in this bulletin are found in Table 6. This information provides guidelines on performance that can be expected under conditions of adequate to excellent management. Remember that growth, egg production, and consequent feed consumption can all be affected by breeding, housing conditions, disease, and management in addition to the nature of the ration and feeding system employed.