University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Historical Materials from University of Nebraska-Lincoln Extension

Extension

3-1957

EC57-1411 Formulating Laying Rations

Paul Griminger

Follow this and additional works at: http://digitalcommons.unl.edu/extensionhist

Griminger, Paul, "EC57-1411 Formulating Laying Rations" (1957). *Historical Materials from University of Nebraska-Lincoln Extension*. 3386.
http://digitalcommons.unl.edu/extensionhist/3386

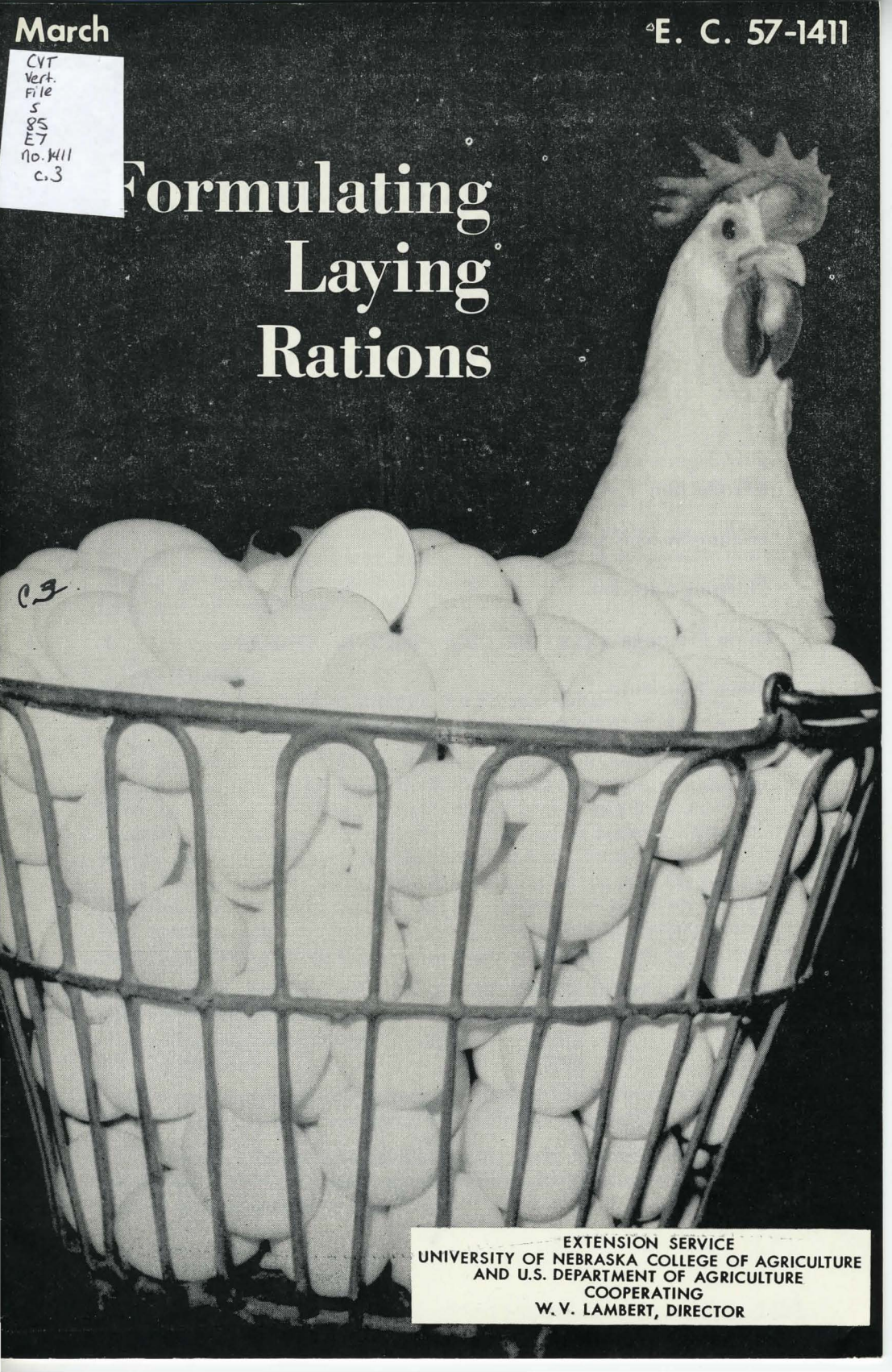
This Article is brought to you for free and open access by the Extension at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Historical Materials from University of Nebraska-Lincoln Extension by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

March

E. C. 57-1411

CVT
Vert.
File
S
85
E7
no. 1411
c.3

Formulating Laying Rations



c3

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
AND U.S. DEPARTMENT OF AGRICULTURE
COOPERATING
W. V. LAMBERT, DIRECTOR

Formulating Laying Rations

By Paul Griminger

Department of Poultry Husbandry

INTRODUCTION

A wide variety of feedstuffs can be used in formulating laying rations. Next to nutrient values, availability and current prices will be important factors in choosing the most economical ingredients. It should be realized that there is no one best ration for all conditions. Economic considerations, the type of stock used, management, and climate all have to be considered when formulating a ration for a specific set of conditions.

FEEDING SYSTEMS AND NUTRIENTS

(A) All mash.
(B) Mash and grain at definite proportions (usually ½ and ½).
(C) Free choice (usually a 26% protein concentrate and grain).

A large number of different nutrients have to be provided for laying hens in order to keep the birds healthy and in good production. Fortunately, many of these nutrients are present in sufficient amounts in most combinations of feedstuffs used in laying rations. The following nutrients, however, should receive special attention:

1) *Protein:* Grains do not contain enough protein, and the protein provided does not have the amino-acid composition necessary to support optimum egg production; therefore, the addition of concentrated sources of protein is required. Important sources of protein:

Soybean oil meal, solvent extracted,		44-45%	protein
Soybean oil meal, dehulled		50-51%	"
Meat and bone scraps	approx.	50%	"
Fish meal	"	60%	"

For an example of replacement of part of the soybean meal of a ration with meat meal, see ration C, Table IV, footnote 2.

2) *Energy:* Main sources are grains, their by-products, and inedible fats. Table I permits comparison of different sources (in calories of productive energy per pound):

Table I

	Cals./lb.	% Fiber	% Protein
Yellow corn	1150	2.0	8.8
Milo	1110	2.2	10.7
Wheat	1020	2.5	15
Barley	810	6.0	12
Oats	760	11.0	12
Wheat shorts (brown or gray)	500-700	7.5–5.6	15–17
Wheat bran	480	9.0	16
Animal fat	2900	....	....

3) *Vitamins:* Those requiring special attention are fat-soluble vitamins A and D; water-soluble vitamins riboflavin, niacin, cyanocobalamine (B_{12}), pantothenic acid, and choline.

Good sources of *vitamin A* are dehydrated alfalfa leaf meal (approx. 80,000 I. U./lb.), yellow corn (1500 I. U./lb.), A & D feeding oils and dry vitamin A concentrates (potency as indicated by manufacturer).

Warning: prolonged storage reduces vitamin A content of corn and alfalfa meal.

Vitamin D: A and D feeding oils, dry vitamin D concentrates. This vitamin in the form of D_3 has to be added to all laying rations. The form of vitamin D found in plant materials (D_2) as in alfalfa meal, cannot be utilized by the chicken.

Riboflavin: Butyl fermentation solubles, liver meal, dried brewers yeast, dried milk products (whey). Many rations will contain sufficient riboflavin for egg production, but will require supplementation when used for breeding flocks.

Niacin: Dried brewers yeast, fish solubles, wheat bran and middlings.

Pantothenic acid: Dried brewers yeast, liver meal.

Choline: 25% dry choline mixtures, liver meal, brewers yeast.

Note: Most feedstuffs contain fair amounts of the water-soluble vitamins mentioned above, but the total is generally not sufficient for optimum production. These vitamins can be obtained from various sources in pure or diluted form. Many manufacturers also produce vitamin mixes containing the four vitamins listed above.

Frequently, synthetic compounds supply the water-soluble vitamins just as cheaply as any other source. It should also be noted that synthetic vitamins are just as potent and effective as those supplied from natural sources.

Cyanocobalamine (B_{12}): In animal products, B_{12}-concentrates, and together with an antibiotic in B_{12}-antibiotic supplements.

Note: Rations containing appreciable amounts of feed from animal origin (fish, meat, milk) generally do not require supplementation with B_{12}. If soybean oil meal is used as the sole protein concen-

trate, supplementation with B_{12} is necessary. If low levels of feeds of animal origin are included, supplementation is advisable.

4) *Minerals:* Calcium, phosphorus, manganese, iodine, salt. Di-calcium phosphate, steamed bone meal, meat and bone scrap, and fish meal are good sources of calcium and phosphorus. Limestone and oyster shell provide only calcium. Manganese is frequently added in the form of feed-grade manganese sulfate; iodine as stabilized potassium iodide, or by using iodized salt. Trace-mineral mixes contain manganese and iodine, small amounts of iron, copper, cobalt, zinc, magnesium, and other minerals. If such mixtures are used, no addition of manganese or iodine is required.

CHOOSING A RATION

It is never economical to use a poor ration, deficient in one of the important nutrients. Neither is it necessarily economical to use a first class ration unless in combinations with a very good strain of chicks and excellent equipment and management practices. An average farm flock can be kept in good production with relatively simple rations. Such rations contain all the important nutrients, but offer less variety of feedstuffs and do not contain some of the sources of unidentified factors believed to be beneficial.

The term "average farm flock," as used in this discussion, would apply to flocks containing more than half of the hen-population of the state of Nebraska. By way of illustration, it might be added that it is of questionable value to use an expensive feed that could support a flock averaging 300 eggs a year for a flock that has not been bred to lay more than 200 eggs a year.

Following is an example of such a simple ration:

Table II

Ingredient	Ration A
Ground yellow corn	369
Pulverized oats	200
Alfalfa meal, dehydrated (17%)[1]	100
Soybean oil meal (44%)	190
Meat and bone scrap (50%)	100
Limestone	20
Steamed bone meal	10
Iodized salt	10
Dry vitamin D_3 (1500 I. C. U./gm.)	1
Manganese sulfate, feed grade	0.3
	1000.3 lb.

[1] Percentages in parentheses refer to per cent protein.

This ration contains 20.5% protein, and should be fed with equal amounts of grain, preferably a mixture of two or more grains. **Note: 100 pounds of wheat shorts can replace 100 pounds of pulverized oats in this ration. Di-calcium phosphate can be used instead of bone**

meal. Vitamin A and D feeding oil, supplying the same amount of vitamin D, can replace the dry vitamin D_3.

Following is an example of a simple all-mash ration for laying and breeding flocks, using soybean oil meal as the sole protein supplement.

Table III

Ingredient	Ration B
Ground yellow corn	435.7
Pulverized oats	135
Wheat shorts	135
Soybean oil meal (44%)[1]	180
Alfalfa meal, dehydrated (17%)	50
Bone meal, steamed	30
Limestone	20
Iodized salt	5
Butyl fermentation solubles (containing 0.5 mg. riboflavin/gram)	5
B_{12}-antibiotic supplement	2.5
A & D feeding oil (2000 A & 600 D/gm.)	1.5
Manganese sulfate, feed grade	0.3
	1000.0 lb.

[1] Percentages in parentheses refer to per cent protein.

Up to 200 pounds of the corn can be replaced by milo. The 180.0 pounds of 44% protein soybean meal could be replaced by 160 pounds of dehulled (50% protein) soybean oil meal and 20.0 pounds of corn. This ration will provide 16.5% protein, and should be fed without any added grain.

Ration C (Table IV) is a more refined laying and breeding mash, containing 22% protein and sources of unidentified factors, and employing trace mineral and vitamin premixes. Ration D (Table IV) is a 26% protein concentrate.

Ration C should be fed with equal parts of grain. Due to its high protein content, a low-protein grain like corn or a corn-milo combination could be used with this ration without reducing the overall protein level below 15%.

Grain mixtures for 26%-protein concentrates are discussed on page 9. Pelleted 26% protein concentrates, fed free choice with whole grains, have been used successfully in some poultry enterprises.

Table IV

Ingredient	Ration C	Ration D
Ground yellow corn	363	208.5
Pulverized oats	100	100
Soybean oil meal (44%)[2]	340	450
Alfalfa meal, dehydr. (17%)	55	65
Condensed fish solubles (35%)	25	30

Table IV—(Continued)

Ingredients	Ration C	Ration D
Dried distillers solubles	25	30
Dried whey	25	30
Limestone	30	35
Di-calcium phosphate	25	35
Salt	7.5	10
Dry vitamin A (3000 I. U./gm.)	1.5	2
Dry vitamin D_3 (1500 I. C. U./gm.)	1.0	1.5
Vitamin-antibiotic supplement[3]	1.0	1.5
Trace mineral mixture[4]	1.0	1.5
	1000.0 lb.	1000.0 lb.
Protein, per cent	22	26
Calcium, per cent	2.2	2.8
Total phosphorus, per cent	0.93	1.18
Available phosphorus, per cent[5]	0.67	0.89

[2] When prices per unit of protein make the use of meat and bone scrap advisable, the following changes should be made:

Add meat and bone scrap (50%)	100
Increase ground yellow corn by	35
	135 lb.
Reduce soybean oil meal by	110
Reduce di-calcium phosphate by	15
Reduce limestone by	10
	135 lb.

[3] Vitamin-antibiotic supplement to contain per pound:

Choline chloride	30 gm.	Riboflavin	1 gm.
Ca-pantothenate	1 gm.	Penicillin	2 gm.
Niacin	5 gm.	Cyanocobalamine (B_{12})	5 mg.

2 gm. Penicillin can be replaced by 10 gm. of either Aureomycin, Bacitracin, or Terramycin, or a combination of antibiotics.

[4] To contain not less than 0.3 lb. of manganese sulfate (or equivalent) per pound.
[5] Estimated by calculating total phosphorus from animal and mineral sources, plus one-third of phosphorus from plant sources.

Table V, page 8, shows two laying mashes, well adapted for commercial poultry enterprises and above average farm flocks, and their calculated analyses.

GRAIN MIXTURES

A variety of grain mixtures can be used. For comparative protein and energy values of grains, see table on page 4.

Some additional facts:

1) Corn and milo are low in the amino acid tryptophan, which also functions as a precursor of the vitamin niacin. Rations containing corn and milo as the only grain frequently have to be fortified with niacin (5-10 gm./1000 lb.).

2) Corn is a good source of vitamin A, while milo is a very poor source of this vitamin. If corn is relied upon to furnish part of the vitamin A requirement, an additional source of vitamin A has to be added when milo replaces corn in appreciable amounts.

3) Due to the various amino acid and vitamin deficiencies of grains and their by-products, variety is of help in all cases where exact calculations cannot be made.

4) Chickens do not utilize fiber. Savings through extensive feeding of high-fiber feedstuffs like bran, shorts and oats are frequently more apparent than real.

Table V

Ingredients	Ration E	Ration F
Ground yellow corn	259.2	348.2
Ground milo	150	150
Pulverized oats	100	50
Wheat shorts	100	50
Soybean oil meal (44%)	210	....
Soybean oil meal (50%)	....	200
Alfalfa meal, dehydrated (17%)	50	40
Fish meal (60%)	25	25
Meat and bone scrap (50%)	25	40
Dried whey	25	25
Animal fat, stabilized	....	20
Limestone	30	27.5
Di-calcium phosphate	15	12.5
Iodized salt	7.5	7.5
Manganese sulfate, feed grade	0.3	0.3
Dry vitamin A (3000 I. U./gm.)	2.0	2.0
Dry vitamin D_3 (1500 I. C. U./gm.)	1.0	1.0
Choline-chloride, 25%	....	1.0
Riboflavin 1 gm./1000 lb.[6]	+	+
Vitamin B_{12} 1.5 mg./1000 lb.[6]	+	+
Antibiotic 2-10 gm./1000 lb.	+	+
Niacin 2 gm./1000 lb.[6]	....	+
Ca-Pantothenate 1 gm./1000 lb.[6]	....	+
Total	1000 lb.	1000 lb.
Protein, per cent	20	20.7
Productive energy, cals.	780	890
Calcium, per cent	2.2	2.2
Total phosphorus, per cent	0.92	0.90
Available phosphorus, per cent[7]	0.66	0.67
Vitamin A, I. U./lb.	7100	6450
Vitamin D, I. C. U./lb.	680	680
Riboflavin, mg./lb.	2.3	2.4
Niacin, mg./lb.	15.6	16.1
Pantothenic acid, mg./lb.	5.3	5.6
Choline, mg./lb.	544	603

[6] Can be added in form of concentrates or vitamin mixtures.
[7] See footnote 5.

Ration F would be better adapted for the winter months, when higher levels of energy are required for optimum egg production. Both rations should be fed with equal amounts of grain.

For examples of grain supplementation of a protein concentrate containing 26% protein see Table VI.

Table VI

	I	II	III
	Lbs.	Lbs.	Lbs.
Concentrate (26% protein)	350	350	350
Corn	325	250	200
Milo	325	250	200
Oats	.....	150	100
Wheat	.....	.....	150
Total	1000 lb.	1000 lb.	1000 lb.
% Protein	15.4	15.8	16.4

The first mixture is slightly higher in energy than the second or third, which, however, provide a higher level of protein and more variety.

Corn-oats-milo and corn-wheat-milo are good mixtures for use with a 20%-protein laying mash. A good commercial laying mash contains enough of all nutrients to permit supplementation with any kind of grain or grain-mixture, except if stated otherwise by the manufacturer.

OTHER NUTRIENTS

1) Water: A bird consumes about twice as much water, by weight, as feed. Water should be available at all times.

2) Oyster shell: Laying hens should have access to ground oyster shell or an equivalent source of calcium at all times. The average laying ration does not provide enough calcium for optimum egg production.

3) Grit: Though not a nutrient in the strict sense of the word, insoluble grit is believed to help in the digestion of the feed and should be offered free choice.

CAGED BIRDS

Resricted movement reduces the energy-requirement of the hen, and, therefore, reduces the feed-intake. Thus, slightly higher levels of protein, vitamins and minerals might be required for optimum egg production. A higher level of calcium (2.3% of the total feed) is necessary if oyster shells cannot be provided free choice. Grit may be sprinkled over the feed in modest amounts once a week.

In conclusion, it is only proper to mention some of the disadvantages of mixing your own feed:

1) Difficulty of quality control of feedstuffs.

2) Disadvantage of buying small amounts of feedstuffs.

With small flocks, or if not enough time and attention can be given to details, it will frequently be simpler and safer to purchase a good laying concentrate and dilute it with grain (see "grain mixtures"), or to buy a complete laying mash.

APPENDIX

A) Abbreviations and Measures:

I. U. = International Units (a measure of vitamin A potency).

I. C. U. = International Chick Units (A measure of vitamin D_3 potency).

Gm. = gram (1000 mg.).

Mg. = milligram.

1 ounce approximates 28 grams (28,000 milligrams).

1 pound approximates 454 grams (454,000 milligrams).

B) Feed consumption of laying hens:

The following formula can be used to estimate the total feed requirement of laying hens weighing between 4 and 8 pounds:

$$\text{Feed} = 25 + 8 \times \text{live weight} + \frac{\text{yearly egg production}}{7}$$

Example: Average live weight of hen = 5 pounds.

Average yearly egg production = 210

Feed required per year per hen =

$$25 + 8 \times 5 + \frac{210}{7} = 95 \text{ lbs.}$$