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# Protein Content of Concentrates for Turkeys

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The feeding of mash mixtures containing relatively high percentages of protein in conjunction with hopper-fed grains, all free choice, is here referred to as concentrate feeding. This method of feeding has been advocated for feeding turkeys from the time they are 4 to 12 weeks of age until they are marketed. This investigation was designed to determine (1) the most satisfactory protein level for a concentrate mixture for growing turkeys, and (2) the comparative costs of producing turkeys fed concentrates containing different percentages of protein.

## THE PROTEIN PROBLEM

The war has caused a shortage of protein concentrates for feeding poultry and other livestock. Therefore, substitutes must be found and it is highly desirable that the proportion of protein used be reduced to the minimum that will give efficient returns. Any information contributing to a solution of the protein problem should be particularly helpful at this time.

Mussehl and Ackerson (1936) fed turkeys rations, including mash and grain, containing different percentages of protein. They found with turkeys from 22 to 28 weeks of age that a ration with a crude protein content of 14.54 per cent was as efficient as rations containing 16.24, 18.30 or 21.04 per cent protein. They concluded that there appeared no advantage in using mash mixtures with more than 17.5 per cent protein for the finishing period.

Asmundson and Jukes (1939) reported results which indicated that the most satisfactory protein levels in rations for starting and growing turkeys were 1-6 weeks, 24 per cent protein; 7-12 weeks, 20 per cent protein; and continuing from 13 weeks to maturity to go lower until the total ration contained about 15 per cent protein.

Hammond and Marsden (1939) showed that as the protein content of the mash was increased the relative amount of mash consumed decreased. Their work showed that less protein was consumed per pound of gain when mashes containing 18 and 20 per cent protein were fed than when higher levels were used.

Milby, Jaap and Thompson (1939) reported results obtained by growing turkeys to 28 weeks of age on rations containing the following protein levels: 15.6, 19.8, 22.4 and 26.3. They concluded that the 26.3 per cent level produced the best turkeys but that the cost of production was less with the ration containing 22.4 per cent protein. Their results showed that the feed consumed per pound

of gain was the same (4.3 lbs.) for the lots fed rations containing 19.8, 22.4 and 26.3 per cent protein.

Barrett, Card and Berridge (1940) reported the results of feeding experiments with turkeys in confinement which showed that the use of a concentrate containing 31.0 per cent protein as compared to a mash containing 27.2 per cent protein did not increase growth or grain consumption nor reduce the feed consumed per pound of gain.

Roberts (1940) reported results which showed that it was more economical with turkeys from 12 to 24 weeks of age to feed corn with a mash containing 20.8 per cent protein than to feed the same mash alone.

Robertson and Wilhelm (1940) reported that by hopper feeding Broad Breasted Bronze turkeys a concentrate containing 39.5 per cent protein plus corn, wheat, oats, and barley, free choice, the growth of toms was increased, feed was utilized more efficiently and feed costs per pound of gain were reduced. They found that the toms fed the concentrate mixture consumed more protein than was needed for maximum growth.

Robertson and Carver (1941) reported the results of feeding turkeys concentrate mixture containing 39.1 per cent protein. They concluded that by using the concentrate mixtures more rapid growth resulted, relatively more grain was consumed and less feed was required per pound of gain.

### EXPERIMENTAL

In 1941 Bronze poults were hatched May 2 and the males and females grown together until 16 weeks of age when the sexes were separated. Beltsville Small White turkeys hatched May 30, were also used in this experiment. This is a small-type turkey developed by the United States Department of Agriculture. For the first 8 weeks all turkeys were fed an all-mash ration that contained 23 per cent protein. They were then divided into four groups and the respective lots were fed, in hoppers, concentrate mixtures containing 40, 36, 32 and 27 per cent protein plus whole yellow corn and whole oats.

In 1942, the poults were hatched February 27. They were fed a starting mash containing 22 per cent protein until the end of their 8th week when they were divided into four groups which were fed concentrate mixtures containing 22, 27, 31 and 39 per cent protein, respectively.

#### Rations

In 1941 the poults were fed for the first eight weeks the following starting mash:

Yellow corn meal .....	1000 Lbs.
Wheat bran .....	250
Wheat shorts .....	300
Dehydrated alfalfa leaf meal .....	150
Meat scrap (55%) .....	300
Soybean oil meal .....	300
Dried buttermilk .....	150
Salt .....	9
Cod liver oil .....	6
(400D unit Nopco XX)	
Manganese sulfate .....	150 Gms.
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	2465 Lbs.

Beginning the 9th week, concentrate mixtures plus whole yellow corn and whole oats were kept in separate hoppers before the respective lots of turkeys.

Concentrate Mixtures Used in 1941				
Protein content of concentrates	40%	36%	32%	27%
Relative amount of the 40 per cent protein mixture used .....	100	85	70	55
Relative amount of the grain products mixture used .....	0	15	30	45

40 Per Cent Protein Mixture	
Wheat shorts .....	200 Lbs.
Alfalfa leaf meal .....	400
Meat scrap .....	800
Soybean oil meal .....	800
Dried buttermilk .....	400
Salt .....	25
Cod liver oil .....	15
(400D unit Nopco XX)	
Manganese sulfate .....	400 Grams
	<hr/>
	2640 Lbs.

Grain Products Mixture	
Yellow corn meal .....	480 Lbs.
Wheat bran .....	120
Wheat shorts .....	120
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	720 Lbs.

In 1942 the starting mash contained the following ingredients:	
Yellow corn meal .....	43 Lbs.
Bran .....	10
Shorts .....	10
Alfalfa leaf meal .....	10
Meat scrap .....	8
Soybean oil meal .....	9
Fish meal .....	8
Salt .....	1
Cod liver oil .....	1
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	100 Lbs.

Beginning the 9th week the following concentrate mixtures plus whole yellow corn and whole oats were hopper fed:

Concentrate Mixtures Used in 1942				
Protein content of concentrates	39%	31%	27%	22%
Relative amount of the 39 per cent protein mixture used .....	100	70	55	This was the 1942 starting mash.
Relative amount of the grain products mixture used .....	0	30	45	

#### 39 Per Cent Protein Mixture

Wheat shorts .....	200 Lbs.
Alfalfa meal .....	500
Meat and bone scrap .....	800
Soybean oil meal .....	1000
Fish meal .....	100
Salt .....	25
400 D unit fish oil .....	15

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2640 Lbs.

#### Grain Products Mixture

Yellow corn meal .....	600 Lbs.
Wheat bran .....	150
Wheat shorts .....	150

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900 Lbs.

Each year an effort was made to keep conditions other than the rations similar. The poults were started in batteries and moved to colony brooder houses at 4 weeks of age. They were confined to 10' x 12' colony brooder houses until 8 weeks old, after which they had access to 8' x 12' sun porches connected to the brooder houses. In 1941 only one sun porch was attached to each brooder house but in 1942 two sun porches were attached to each house and the number of turkeys increased in these lots.

## RESULTS

The results obtained are summarized under the headings of: growth, feed consumption, efficiency of growth, utilization of nutrients, and cost of production.

### Growth

Growth was determined by calculating the gains made during 2-week and 4-week intervals from hatching until the conclusion of the experiments, which, in 1941, was 30 weeks of age for the Bronze and 24 weeks of age for the Beltsville Small White and in 1942 was 32 weeks of age.

In 1941, the largest toms were produced by feeding concentrate mixtures containing 27 and 32 per cent protein while the largest hens were produced by concentrate mixtures containing 36 and 40 per cent protein (Table 1).

TABLE 1. AVERAGE LIVE WEIGHT (LBS.) OF MALE AND FEMALE BRONZE TURKEYS FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED MAY 2, 1941

Age in Weeks	27% Protein		32% Protein		36% Protein		40% Protein	
	Males	Females	Males	Females	Males	Females	Males	Females
16	10.8	7.1	10.6	7.7	9.5	8.0	9.7	7.6
18	12.2	7.6	11.9	8.4	10.7	8.7	10.6	8.2
20	14.9	9.2	15.0	9.9	12.9	10.2	13.2	9.8
22	16.8	10.4	16.8	11.2	15.2	11.3	15.1	11.2
24	19.1	11.6	18.6	12.2	16.8	12.7	16.8	12.4
26	21.5	12.8	20.8	13.4	19.3	13.9	18.8	14.0
28	24.1	14.3	23.4	14.7	20.7	15.4	21.2	15.4
30	26.4	15.4	25.8	15.9	22.6	16.1	23.4	16.6
Num- ber	10	12	8	14	11	12	9	10

In 1942, all lots were very similar in size, the average weight of the hens in the four lots at 32 weeks of age varying from 14.7 to 15.3 pounds and the males varying from 24.0 to 24.8 (Table 2). From these data it was evident that growth in these turkeys was not stimulated by using concentrates containing high percentages of protein.

TABLE 2. AVERAGE LIVE WEIGHT (LBS.) OF MALE AND FEMALE BRONZE TURKEYS FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED FEB. 27, 1942.

Age in Weeks	22% Protein		27% Protein		31% Protein		39% Protein	
	Males	Females	Males	Females	Males	Females	Males	Females
12	6.0	4.9	6.3	4.9	6.3	5.1	6.1	4.9
16	9.5	7.4	10.0	7.6	10.1	7.9	9.7	7.5
20	12.6	9.3	13.5	9.7	13.8	10.1	13.3	9.7
24	16.0	11.0	16.8	11.1	16.8	11.5	15.9	10.7
28	19.2	12.7	20.1	12.8	20.1	13.3	19.8	12.5
32	24.8	14.9	24.1	14.7	24.0	15.3	24.2	15.0
Number	18	29	16	25	21	25	22	23

### Feed Consumption

The feeding of high-protein concentrates decreased the consumption of mash and increased the consumption of the grains (Table 3).

TABLE 3. MASH CONSUMPTION OF MALE AND FEMALE BRONZE TURKEYS FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED FEB. 27, 1942

Period (Weeks)	22% Protein		27% Protein		31% Protein		39% Protein	
	% of all		% of all		% of all		% of all	
	Pounds	feed	Pounds	feed	Pounds	feed	Pounds	feed
0 - 4	1.61	100						
5 - 8	6.12	100						
9 - 12	7.12	68	7.34	74	7.15	66	7.05	69
13 - 16	8.00	72	7.40	60	7.16	58	7.06	55
17 - 20	6.57	57	6.09	46	5.68	42	7.02	44
21 - 24	7.47	48	6.65	38	6.20	38	5.15	31
25 - 28	5.28	32	4.23	28	4.35	26	3.25	19
29 - 32	5.93	29	4.17	22	4.54	22	3.40	16
9 - 32	41.4		35.9		35.1		32.9	

The turkeys apparently attempted to balance their rations when they had an opportunity to choose their feedstuffs. However, when fed mashes containing high percentages of protein, they did not succeed in reducing the protein required per unit of gain as low as they did when fed mashes containing less protein.

### Efficiency of Gains

The amount of feed required by turkeys to produce a pound of gain was not reduced by feeding concentrates containing high percentages (27 to 40 per cent) of protein. (Tables 4, 5, and 6.) In 1941, from the 17th to 30th week, Bronze turkeys fed concentrates containing 40, 36, 32 and 27 per cent protein required for each pound of gain for the respective groups for males 6.1, 6.2, 5.7 and 5.5, and for females 7.1, 6.8, 6.9 and 6.8 pounds of feed. During the same

TABLE 4. EFFICIENCY OF GAINS (LBS. FEED PER LB. GAIN) MADE BY MALE AND FEMALE BRONZE TURKEYS WHEN FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED MAY 2, 1941

Period (Weeks)	27% Protein		32% Protein		36% Protein		40% Protein	
	Males	Females	Males	Females	Males	Females	Males	Females
9 - 12	3.24		2.96		3.22		3.09	
13 - 16	3.46		3.90		3.74		3.93	
17 - 18	5.63	7.89	5.80	7.60	5.94	7.69	6.82	9.58
19 - 20	2.99	4.81	3.23	4.68	4.45	5.12	4.49	5.91
21 - 22	6.04	6.71	6.77	5.83	4.82	6.67	5.91	6.39
23 - 24	5.59	7.37	7.03	8.36	8.12	6.60	6.72	8.31
25 - 26	5.75	7.20	6.50	7.29	5.13	6.80	7.16	6.50
27 - 28	5.89	6.97	5.91	7.65	9.84	6.96	5.39	8.59
29 - 30	6.86	8.19	6.22	8.21	7.12	9.67	6.93	6.23
17 - 30	5.45	6.84	5.73	6.91	6.19	6.80	6.97	7.10

These turkeys grew slowly during the 17th and 18th weeks and therefore consumed relatively large quantities of feed per pound of gain whereas during the 19th and 20th week they grew rapidly and made efficient gains.

TABLE 5. EFFICIENCY OF GAINS (LBS. FEED PER LB. GAIN) MADE BY BELTSVILLE SMALL WHITE TURKEYS WHEN FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED MAY 30, 1941

Period (Weeks)	23% Protein	32% Protein	36% Protein	40% Protein
9 - 12	3.54	3.04	3.29	3.14
13 - 16	4.48	4.39	4.17	4.72
17 - 20	5.17	5.35	6.10	5.66
21 - 24	6.96	6.13	6.27	6.39
9 - 24	5.10	4.82	4.97	5.05
0 - 24	4.66	4.54	4.63	4.75
No. Males	4	18	13	15
No. Females	21	6	11	8



TABLE 6. EFFICIENCY OF GAINS (LBS. FEED PER LB. GAIN)  
MADE BY MALE AND FEMALE BRONZE TURKEYS FED  
CONCENTRATES CONTAINING DIFFERENT PERCENTAGE  
OF PROTEIN. HATCHED FEBRUARY 27, 1942

Period (Weeks)	22% Protein	27% Protein	31% Protein	39% Protein
0 - 4	2.68			
5 - 8	3.25			
9 - 12	3.78	3.36	3.60	3.53
13 - 16	3.73	3.91	3.75	4.15
17 - 20	4.92	4.54	5.08	5.65
21 - 24	6.84	8.72	7.75	8.97
25 - 28	6.63	6.61	6.64	5.50
29 - 32	6.58	7.66	7.64	7.76
9 - 32	5.37	5.59	5.48	5.69

season Beltsville Small White turkeys were raised on concentrates containing 40, 36, 32 and 23 per cent protein and the respective amounts of feed required to produce a pound of gain from hatching to 24 weeks of age were 4.8, 4.6, 4.5, and 4.7 pounds. These results indicated that within these limits (23 to 40 per cent protein) efficiency of gains were not related to the protein content of the concentrate fed.

The experiment was repeated in 1942 with concentrates similar to those used in 1941. The results obtained (Table 6) confirmed those of 1941. The amount of feed required to produce a pound of gain from 9 to 32 weeks was: 39 per cent protein, 5.7 pounds; 31 per cent protein, 5.5 pounds; 27 per cent protein, 5.6 pounds; and 22 per cent protein, 5.4 pounds.

From the two years results it is evident that the use of concentrates containing relatively high percentages of protein does not reduce the amount of feed required by turkeys to produce a unit of gain.

#### Utilization of Nutrients

One measure of the value of a feeding system is the utilization of the nutrients contained in the ration which is consumed. The data given in Tables 7, 8, 9 and 10 were calculated from tables of composition of feedstuffs as given by Henry and Morrison. In 1941 the pounds of protein consumed by Bronze turkeys per pound of gain made, from 17 to 30 weeks of age, was for the lots fed 27, 32, 36 and 40 per cent protein; for males, .86, 1.01, 1.24 and 1.21 pounds and for females, 1.07, 1.17, 1.23 and 1.41 pounds, respectively (Table 7). This experiment indicated a decided waste of protein when turkeys were fed concentrates containing relatively high percentages of protein. The results for 1942 confirmed those obtained in 1941 (Table 8). The amount of protein required to produce a pound of gain to 32 weeks of age was for turkeys fed concentrates containing 22

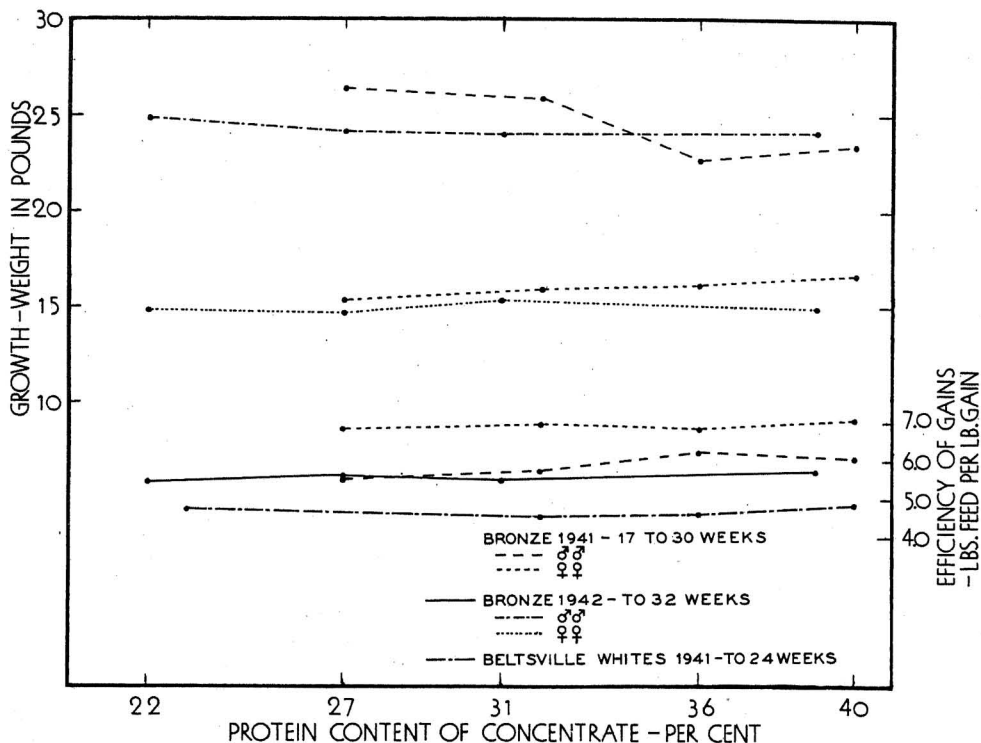


Fig. 1.—Relation of the protein content of the concentrate to growth and efficiency of gains.

TABLE 7. COST OF GAINS (LBS. PROTEIN PER LB. GAIN) MADE BY MALE AND FEMALE BRONZE TURKEYS RAISED ON DIFFERENT PROTEIN CONCENTRATE MIXTURES. HATCHED MAY 2, 1941

Period (Weeks)	27% Protein		32% Protein		36% Protein		40% Protein	
	Males	Females	Males	Females	Males	Females	Males	Females
17 - 18	1.17	1.42	1.45	1.89	1.71	1.98	1.98	2.50
19 - 20	.52	.93	.74	1.07	1.17	1.31	1.28	1.60
21 - 22	1.13	1.20	1.37	1.13	1.18	1.50	1.35	1.57
23 - 24	.90	1.24	1.28	1.42	1.68	1.18	1.33	1.83
25 - 26	.84	1.03	1.02	1.06	.93	1.06	1.28	1.11
27 - 28	.81	.92	.88	1.00	1.51	.87	.93	1.11
29 - 30	.87	.99	.76	1.04	.90	1.17	.88	.96
17 - 30	.86	1.07	1.01	1.17	1.24	1.23	1.21	1.41

The males in the lot receiving 36% protein suffered an attack of, Blackhead during the 27 and 28-week period and made very slow growth and inefficient gains.

per cent protein, .84 pounds; 27 per cent protein, .94 pounds; 31 per cent protein, .98 pounds; and 39 per cent protein, 1.11 pounds of

TABLE 8. UTILIZATION OF PROTEIN (LBS. CONSUMED PER LB. LIVE WEIGHT AND EDIBLE MEAT) BY MALE AND FEMALE BRONZE TURKEYS FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED FEB. 27, 1942

To Age in Weeks	22% Protein		27% Protein		31% Protein		39% Protein	
	Live Weight	Edible Meat	Live Weight	Edible Meat	Live Weight	Edible Meat	Live Weight	Edible Meat
12	.67		.75		.80		.92	
16	.69	1.31	.74	1.40	.80	1.51	.95	1.79
20	.72	1.35	.78	1.44	.83	1.52	1.04	1.92
24	.79	1.39	.89	1.54	.92	1.59	1.14	1.98
28	.82	1.35	.91	1.48	.95	1.54	1.10	1.79
32	.84	1.34	.94	1.48	.98	1.54	1.11	1.76

TABLE 9. ANIMAL PROTEIN WASTED BY FEEDING HIGH PROTEIN CONCENTRATES TO TURKEYS. 1942

To Age in Weeks	Pounds of Animal Protein Consumed Per Pound of Gain and the Percentage Waste When Turkeys Were Fed Concentrates Containing -							
	22% Protein		27% Protein		31% Protein		39% Protein	
	lbs.	Waste (%)	lbs.	Waste (%)	lbs.	Waste (%)	lbs.	Waste (%)
16	.25	.27	8	.33	32	.48	.92	
20	.25	.26	4	.31	24	.48	.92	
24	.26	.27	4	.32	23	.48	.85	
28	.25	.26	4	.31	24	.43	.72	
32	.24	.25	4	.30	25	.40	.67	

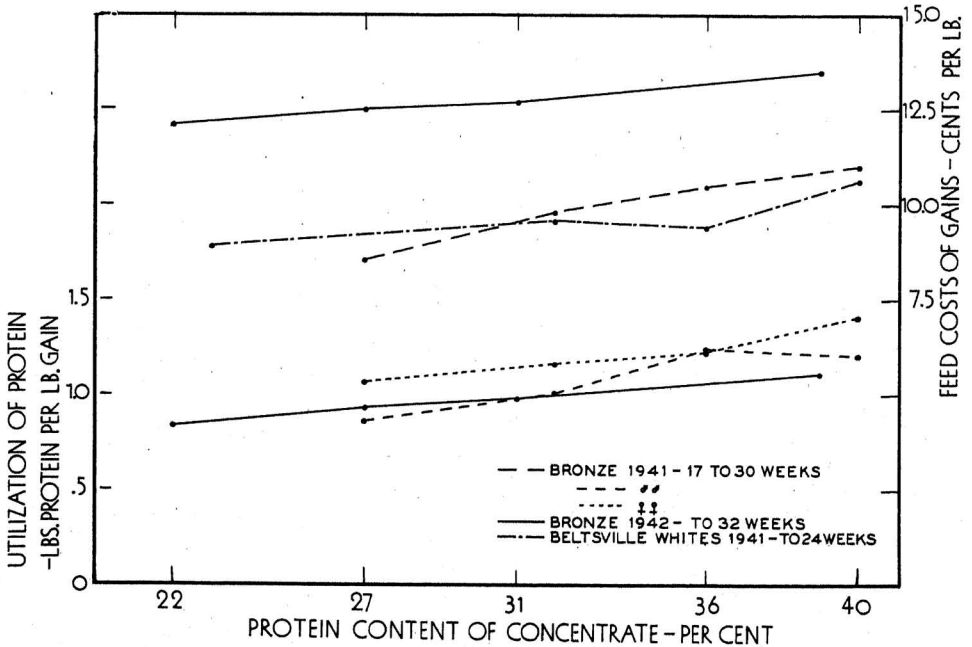


Fig. 2.—Relation of the protein content of the concentrate to the utilization of protein and costs of gains.

protein. Calculated in terms of waste of animal protein it will be observed by reference to Table 9 that to the age of 32 weeks turkeys fed a 39 per cent concentrate wasted 67 per cent of the animal protein as compared to turkeys fed a mash containing 22 per cent protein.

From these results it appears that turkeys hopper fed mashes containing high percentages of protein in conjunction with whole yellow corn and oats may waste considerable protein. Protein supplements are generally the most expensive parts of the turkey ration and sometimes they are scarce. From these results it appears that the feeding of mashes containing high percentages of protein to turkeys is conducive to inefficiency and therefore should be discouraged.

TABLE 10. COST OF GAINS (CARBOHYDRATES + FAT X 2.25 PER LB. GAIN) MADE BY MALE AND FEMALE BRONZE TURKEYS RAISED ON DIFFERENT PROTEIN CONCENTRATE MIXTURES. HATCHED MAY 2, 1941

Period	27% Protein		32% Protein		36% Protein		40% Protein	
	Males	Females	Males	Females	Males	Females	Males	Females
17 - 18	3.47	5.19	3.45	4.54	3.26	4.46	3.70	5.49
19 - 20	1.99	3.07	1.98	2.86	2.55	2.99	2.44	3.28
21 - 22	3.89	4.41	4.31	3.79	2.85	4.09	3.58	3.76
23 - 24	3.80	4.96	4.69	5.67	5.18	4.41	4.32	5.16
25 - 26	4.00	5.08	4.51	5.17	3.40	4.73	4.77	4.39
27 - 28	4.23	5.04	4.17	5.59	6.90	5.16	3.64	6.32
29 - 30	4.99	6.02	4.54	6.03	5.12	7.11	5.02	4.35
17 - 30	3.75	4.72	3.85	4.72	4.00	4.53	3.88	4.56

Another measure of a feeding system is the utilization of the carbonaceous portion of the ration. The amounts of carbonaceous material consumed per pound of gain made in 1941 by Bronze turkeys fed concentrate containing 27, 32, 36 and 40 per cent protein were, for males, 3.8, 3.9, 4.0 and 3.9 pounds and for females 4.7, 4.7, 4.5 and 4.6 pounds, respectively (Table 10). Evidently the utilization of the carbonaceous portion of the ration was not related to the protein content of the concentrate. It would appear that the consumption of excessive amounts of protein by the lots receiving concentrates containing relatively high percentages of protein did not have a sparing effect on the carbonaceous portion of the ration.

### Costs of Production

The producer is vitally interested in the monetary costs involved in raising turkeys. While the actual costs apply only to the seasons when these experiments were conducted, the relationship of the costs for the different groups should remain fairly constant and be applicable to any period. The feed prices used for calculating these costs were the feed store prices which prevailed in 1941 and 1942.

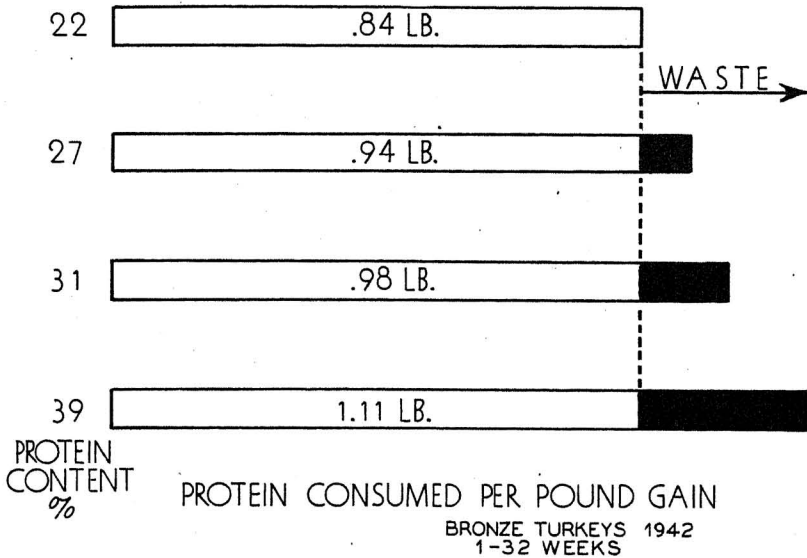


Fig. 3.—Relation of the protein content of the concentrate to the waste of protein by turkeys fed concentrates containing high percentages of protein.

TABLE 11. FEED COST (CENTS PER LB.) OF GAINS MADE BY MALE AND FEMALE BRONZE TURKEYS RAISED ON DIFFERENT CONCENTRATE MIXTURES HATCHED MAY 2, 1941

Period (Weeks)	27% Protein		32% Protein		36% Protein		40% Protein	
	Males	Females	Males	Females	Males	Females	Males	Females
5 - 8	5.5		5.5		5.5		5.5	
9 - 12	7.5		7.5		8.7		9.0	
13 - 16	5.3		9.4		9.7		10.5	
17 - 18	11.9	15.0	13.0	17.1	14.6	17.5	16.7	21.9
19 - 20	5.6	9.6	6.8	9.9	10.3	11.6	10.9	13.9
21 - 22	11.8	12.7	13.1	11.0	10.6	13.8	12.4	14.0
23 - 24	9.8	13.4	12.8	14.6	15.9	11.8	12.7	16.9
25 - 26	9.5	11.8	10.9	11.7	9.3	11.3	12.9	11.3
27 - 28	9.5	10.9	9.6	11.6	16.2	10.3	9.5	13.0
29 - 30	10.3	12.0	9.0	12.2	10.6	14.0	10.3	10.3
17 - 30	9.5	11.8	10.2	12.1	11.9	12.3	11.7	13.7
5 - 30	8.6		9.6		10.5		11.0	

In 1941 the feed costs for producing a pound of gain with Bronze turkeys from the 5th to 30th week were, for the lots fed concentrates containing 27, 32, 36 and 40 per cent protein, 8.6, 9.6, 10.5, and 11.0 cents per pound, respectively (Table 11). The Beltsville Small White turkeys fed concentrates containing 23, 32, 36 and 40 per cent protein produced gains to 24 weeks of age for feed costs of 8.9, 9.6, 9.4 and 10.6 cents per pound (Table 12).

TABLE 12. FEED COST (CENTS PER LB.) OF GAINS MADE BY BELTSVILLE SMALL WHITE TURKEYS RAISED ON DIFFERENT PROTEIN CONCENTRATES HATCHED MAY 30, 1941

Period (Weeks)	23% Protein		32% Protein		36% Protein		40% Protein	
	Cost per lb.	Accumu- lated cost per lb.	Cost per lb.	Accumu- lated cost per lb.	Cost per lb.	Accumu- lated cost per lb.	Cost per lb.	Accumu- lated Cost per lb.
0 - 4							6.44	6.44
5 - 8			All lots together				5.85	6.01
9 - 12	7.41	6.71	7.40	6.85	8.66	7.60	8.77	7.66
13 - 16	9.16	7.52	10.34	8.13	9.91	8.35	12.22	9.40
17 - 20	10.02	8.26	11.34	9.10	10.65	8.99	12.58	10.36
21 - 24	11.39	8.92	11.06	9.58	10.74	9.37	11.31	10.58
No. Males	4		18		13		15	
No. Females	21		6		11		8	

TABLE 13. FEED COST IN CENTS PER POUND OF GAIN MADE BY BRONZE TURKEYS WHEN FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED FEBRUARY 27, 1942

Age in Weeks	22% Protein	27% Protein	31% Protein	39% Protein
1 - 4	6.2	6.7	6.7	6.7
5 - 8	7.7	8.3	8.3	8.3
9 - 12	8.7	8.1	9.0	9.8
13 - 16	8.7	8.9	9.0	10.6
17 - 20	10.8	9.9	11.3	13.5
21 - 24	14.7	18.3	16.6	20.0
25 - 28	13.3	13.2	13.6	11.2
29 - 32	12.9	14.8	15.0	15.2
1 - 32	12.1	12.5	12.7	13.5

TABLE 14. COST (CENTS PER POUND)\* OF PRODUCING TURKEY MEAT WITH MALE AND FEMALE BRONZE TURKEYS FED CONCENTRATES CONTAINING DIFFERENT PERCENTAGES OF PROTEIN. HATCHED FEBRUARY 27, 1942

To age in weeks	22% Protein		27% Protein		31% Protein		39% Protein	
	Live weight	Edible meat	Live weight	Edible meat	Live weight	Edible meat	Live weight	Edible meat
16	20.4	38.5	19.9	37.5	20.0	37.7	21.6	40.8
20	18.4	33.9	17.6	32.5	17.6	32.5	19.7	36.3
24	17.7	30.7	17.8	30.8	17.5	30.3	19.7	34.1
28	17.0	27.7	17.1	27.9	16.9	27.5	18.1	29.5
32	16.2	25.6	16.8	26.5	16.6	26.2	17.7	28.0

\*Actual feed costs which prevailed in 1942 plus \$1.00 per head for poult and other costs exclusive of labor.

In 1942 the feed cost per pound of gain made by Bronze turkeys from hatching to 32 weeks of age was, for the lots fed concentrates containing 22 per cent protein, 12.1 cents; 27 per cent protein, 12.5 cents; 31 per cent protein, 12.7 cents; and 39 per cent protein, 13.5 cents per pound (Table 13). The total costs of producing a pound of gain by Bronze turkeys in 1942 was calculated for both live weight and edible meat (Table 14). The total costs, assuming costs other than feed and labor at \$1.00 per head, were to 32 weeks of age per pound of live weight for the lots fed 22 per cent protein, 16.2 cents; 27 per cent protein, 16.8 cents; 31 per cent protein, 16.6 cents; and 39 per cent protein, 17.7 cents per pound. Calculated on the basis of edible meat on turkeys 32 weeks of age, these costs were for the respective lots, 25.6 cents, 26.5 cents, 26.2 cents and 28.0 cents per pound. In these experiments the cost of producing turkeys was increased by feeding concentrates containing the higher percentages of protein.

#### SUMMARY

Under the conditions which prevailed in these experiments for the years 1941 and 1942 as described in this publication, the feeding of high-protein concentrates to turkeys raised in complete confinement failed to increase growth, increased somewhat the relative consumption of the grains, reduced the utilization of protein without increasing the utilization of the carbonaceous portion of the ration, and increased the monetary costs of production.

From these results it may be concluded that the use of concentrates containing high percentages of protein is not to be recommended for raising turkeys under conditions such as prevailed in these experiments.

The results reported here generally agree with results reported by other investigators except those of the Washington Agricultural Experiment Station. A plausible explanation of this inconsistency may be made on the basis of climate. Turkeys raised in Missouri and other warm climates consume relatively small amounts of grain until cool weather arrives. Therefore, turkeys fed high protein concentrates under such conditions waste protein because they will not shift to grains sufficiently to balance their ration. Turkeys raised in cooler climates and fed high protein concentrates may consume sufficient grains to balance their rations.

## REFERENCES

- Asmundson, V., and Jukes, T. H. *Turkey Production in California*. Cal. Agr. Ext. Service Cir. 110:60. March, 1939.
- Barrett, F. N., Card, C. G., and Berridge, Ashley. *Feeding and Confinement Rearing Experiment With Turkeys During 1939*. Mich. Agr. Expt. Sta. Quarterly Bul. 23:85-92. November, 1940.
- Hammond, J. C., and Marsden, S. J. *The Effect of the Level of the Protein Intake on the Growth and Feed Utilization of Turkeys*. Poultry Sci. 18:11-18. 1939.
- Milby, T. T., Jaap, R. G., and Thompson, R. B. *Turkey Production*. Okla. Sta. Bul. 236. 1939.
- Mussehl, F. E., and Ackerson, C. W. *Protein Requirements for Finishing Turkeys*. Nebraska Sta. Bul. 298. 1936.
- Roberts, R. E., 1940. *Levels of Protein in Rations for Young Turkeys*. Purdue Sta. Bul. 448.
- Robertson, E. I., and Carver, J. S., 1941. *Concentrate Feeding of Turkeys*. Wash. Agri. Exp. Sta. Bul. 402.
- Robertson, E. I., and Wilhelm, L. A. *Concentrate Feeding of Broad-Breasted Bronze Turkeys*. U. S. Egg and Poultry Magazine 46:597-600, 639-640, October, 1940.