IS FISH MEAL necessary

By Wm. C. Lockhart, Reece L. Bryant and D. W. Bolin

MOST starting diets for turkeys contain fish meal. Because it must be shipped into this area, it is an expensive feed ingredient and is not always available. Its quality varies greatly due to the kind of fish from which it is made, and with the method of processing.

Meat meal or meat scrap is manufactured in this area as a byproduct of the livestock industry and is cheaper in price per unit of protein than is fish meal. Meat meal is deficient in some of the growth promoting factors found in fish.

This series of experimental trials was set up with three objectives (1) to determine if by supplementing the meat meal with growth promoting factors, a greater use of local products could be achieved; (2) to lower the cost of the starting diet and (3) to gain basal information on which to base further experimental work.

Results of the experiment showed: (1) The addition of 3 percent meat meal protein plus 2 percent dried fish solubles to a diet having high levels of corn and soybean oil meal will support growth and feed efficiency equal to that obtained by the addition of 3 percent of fish meal protein to the same basal diet.

(2) Under usual North Dakota conditions, a saving of approximately $2.00 per ton of feed can be saved by replacing fish meal with meat meal and fish solubles.

(3) To obtain the efficiency advantage, a high quality meat meal seems very desirable. A meat meal containing noticeable quantities of hair and bone parts was inefficient.

(4) Other workers have reported that meat meal contains the fish factor found in dried fish solubles. The experimental results indicate that the meat meals in general are much too low in this factor to support optimum beneficial effects.

The two fish meals used in trial 2 gave better growth response when supplemented with dried fish solubles but the

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for TURKEY poults ?

efficiency of feed utilization was not changed.

Four percent of dried fish solubles seems to support growth and feed efficiency equal to either 3 percent meat meal protein or fish meal protein when either is supplemented with 2 percent of dried fish solubles.

The experiment was divided into three trials. The first two trials were conducted in batteries and the third trial on the floor. For trials 1 and 2 the poults were fed on the same diet for one week and for two weeks in trial 3. At that time, they were weighed individually and divided by weight into the experimental lots so that the average starting weight for all lots in a trial was the same.

Table I gives the composition of the diets fed in the first trial. It will be noted that the calculated protein was approximately 26 percent and the calorie-protein ratio was 46:1. The cellulose and soybean oil in the diet was used to balance the calories and protein at the same level in all diets.

The average gain and the feed conversion for the poults on the several diets are given in table II. This table shows that in this trial the best gains in weight and the smallest amounts of feed per unit of gain were obtained when the basal diet was supplemented with either 3 percent fish meal protein and 2 percent dried fish solubles, 3 percent meat meal protein and 2 percent fish solubles or 4 percent fish solubles (diets 4, 6, 10). The 3 percent meat meal protein and fish solubles, diet 6, produced more gain at less feed per unit of gain than did diet 8 with 6 percent fish meal.

The rations fed in trial 2 are given in table III. These rations were designed to determine whether meat and fish meals from several sources would perform as did those used in trial 1. West Coast and imported fish meals were used. Packing plant meat meals of both 55 and 50 percent protein and one rendering plant meat meal were studied. The protein content of the diets in this trial was approximately 30 percent.

Table IV shows the average gain per poult and the feed efficiency of the diets used in trial 2. The meat meal from the rendering plant supported satis-

TABLE I.—**Ingredients of the Rations Fed in Trial 1.**

Ingredients	Rations 1 %	2 %	3 %	4 %	5 %	6 %	7 %	8 %	9 %	10 %
Ground yellow corn	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
Soybean meal 45% protein	50.50	48.25	44.00	44.00	41.50	41.50	37.25	37.00	37.00	45.75
Soybean oil	1.25	1.25	1.50	1.40	1.75	1.50	1.75	2.00	1.75	1.40
Cellulose	1.50	1.75	4.00	4.40	4.00	4.80	6.55	6.50	6.60	2.10
Dried fish solubles	.....	2.00	.....	.....	2.00	2.00	.....	.....	.....	4.00
Fish meal 60% protein (West Coast)	.....	.....	5.00	.....	5.00	.....	5.00	10.00	.....	.....
Meat meal 55% protein (Packing Plant)	.....	.....	.....	5.45	.....	5.45	5.45	.....	10.90	.....
Salt (trace mineral)	.25	.25	.25	.....	.25	.....	.....	.....	.25	.25
Calcium carbonate	2.50	2.50	2.00	2.00	2.25	2.00	2.00	2.25	1.50	2.50
Di-calcium phosphate	3.00	3.00	2.25	1.75	2.25	1.75	1.00	1.25	1.00	3.00
Vitamin premix*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Crude protein (calculated)	26.15	26.19	26.20	26.15	26.15	26.18	26 15	26.10	26.10	26.16
Calorie-protein ratio	46·1	46:1	46:1	46:1	46:1	46:1	46:1	46:1	46:1	46:1

*Vitamin Premix

Addition per pound of ration

Vitamin A	4000 U.S.P. Units	Niacin	40 mg.
Vitamin D^3	600 U.S.P. Units	Folic Acid	.5 mg.
Vitamin E	6 mg.	Vitamin B^{12}	1.5 mcg.
Vitamin K	.09 mg.	Choline Chlorine	.400 mg.
Riboflavin	4 mg	Pyridoxine	1.5 mg.
Calcium Pantothenate	16 mg.	Thiamine	1.0 mg.

TABLE II.—**Average Initial Poult Weight, Average Poult Gain and Feed Per Unit of Gain in Trial 1.**

Diet	Initial Average Poult wt. (lbs.)	Average Gain per Poult (lbs.)	**Feed** Gain
1. Basal	.22	.81	1.88
2. Basal + 2% fish solubles	.22	.86	1.86
3. Basal + 3% fish meal protein*	.22	.80	1.87
4. Basal + 3% meat meal protein**	.22	.74	1.88
5. Basal + 3% fish meal protein + 2% fish solubles	.22	.91	1.75
6. Basal + 3% meat meal protein + 2% fish solubles	.22	.89	1.72
7. Basal + 3% fish meal protein + 3% meat meal protein	.22	.79	1.85
8. Basal + 6% fish meal protein	.22	.84	1.76
9. Basal + 6% meat meal protein	.22	.82	1.84
10. Basal + 4% fish solubles	.22	.89	1.72

*West Coast fish meal 60% protein.
**Packing Plant meat meal 55% protein.

TABLE III.—**Ingredients of the Rations Fed in Trial 2*.**

Ingredients	RATIONS 1 %	2 %	3 %	4 %	5 %	6 %	7 %	8 %
Ground yellow corn	33.25	33.25	33.25	33.25	33.25	33.25	33.25	33.25
Soybean meal 50% protein	51.00	45.00	45.00	45.00	47.15	45.00	47.15	45.00
Soybean oil	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Cellulose	0.00	2.30	1.75	1.75	2.10	2.25	2.10	2.25
Alfalfa leafmeal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Dried whey	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Dried Fish soluble	2.00	2.00	2.00	2.00	.....	2.00	.....	2.00
Fish meal 60% protein (West Coast)	.....	.....	.....	.....	5.00	5.00	.....	.....
Fish meal 60% protein (imported)	.....	.....	.....	.....	.....	.....	5.00	5.00
Meat meal 55% protein (packing plant)	.....	5.45	.....	.....	.....	.....	.....	.....
Meat meal 50% protein (packing plant)	.....	.....	6.00	.....	.....	.....	.....	.....
Meat meal 50% protein (rendering plant)	.....	.....	.....	6.00	.....	.....	.....	.....
Salt (trace mineral)	.25	.25	.25	.25	.25	.25	.25	.25
Calcium carbonate	2.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Di-calcium phosphate	3.00	1.75	1.75	1.75	2.25	2.25	2.25	2.25
Vitamin premix*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent protein (calculated)	30.08	30.08	30.08	30.08	30.07	30.08	30.07	30.08
Calorie-protein ratio**	42:1	42:1	42:1	42:1	42:1	42:1	42:1	42:1

*Vitamin premix similar to that used in trial 1.
**Calories of metabolizable energy per each percent of protein in each pound of diet.

TABLE IV.—**Average Initial Poult Weight, Average Poult Gain and Feed Per Unit of Gain in Trial 2.**

Diets	Initial Average Poult wt. (lbs.)	Average Gain per Poult (lbs.)	**Feed** Gain
1. Basal + fish solubles	.20	.90	1.70
2. Basal + fish solubles + packers meat meal 55% protein	.20	.98	1.62
3. Basal + fish solubles + packers meat meal 50% protein	.20	1.01	1.64
4. Basal + fish solubles + renderers meat meal 50% protein	.20	1.02	1.68
5. Basal + west coast fish meal 60% protein	.20	.95	1.62
6. Basal + west coast fish meal + fish solubles	.20	1.01	1.62
7. Basal + imported fish meal 60% protein	.20	.92	1.63
8. Basal + imported fish meal + fish solubles	.20	1.03	1.63

TABLE V.—**Ingredients of the Rations Fed in Trial 3.***

Ingredients	Rations 1 %	2 %
Ground yellow corn	43.00	43.50
Soybean meal 50% protein	40.00	42.00
Fish meal 60% protein (West Coast)	.....	5.00
Meat meal 55% protein (Packing Plant)	5.50	.....
Dried fish solubles	2.00	.....
Dried whey	2.00	2.00
Alfalfa leafmeal	2.00	2.00
Salt (trace mineral)	.25	.25
Calcium carbonate	2.00	2.00
Di-calcium phosphate	2.25	2.25
Vitamin premix*	1.00	1.00
Crude protein (calculated)	28.32	28.28
Calorie-protein ratio**	42:1	43:1

*Vitamin premix similar to that used in trial 1.
**Metabolizable calorie values as given by Titus, 1956, were used in making caloric evaluation.

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factory growth but required more feed per unit of gain. One possible explanation for the lower efficiency is that the meal contained quite a lot of animal hair. As in trial 1, the packing plant meat meals supplemented with fish solubles were equal to either of the fish meals in feed efficiency and superior in growth promoting value. The supplemented meat gave the same feed efficiency and about the same growth as the supplemented fish meal of either source.

Trial 3 was conducted to test fish meal and meat meal supplemented with fish solubles after the pre-starting period to 12 weeks of age. The trial was run in duplicate in two separate pens. Broad Breast Bronze and Broad Whites were divided by weight at two weeks into the four pens. The diets are shown in table V.

Table VI shows the average poult gain and table VII gives the numbers and sex of each breed in each pen and their average weights.

The average weights for either sex fed diets 1 and 2 are in close agreement. For some reasons, the Broad White females in one pen fed the meat meal-fish soluble diet dropped considerably below the average weight of the Broad White females in the replicate pen. However, by observing the growth data of the Broad White females in its replicate pen and those fed diet 2, it would seem that there are no treatment effects involved. These data indicate that the meat meal and fish solubles will support growth equal to that of fish meal.

The feed per gain data indicate that the two diets had approximately the same efficiency rating throughout the trial. The

TABLE VI.—**Average Initial Poult Weight, Average Poult Gain and Feed Per Unit of Gain in Trial 3.**

Rations	Two Weeks Initial Wt. Per Poult lbs.	Six Weeks Poult Gain lbs.	Six Weeks Feed Per Gain lbs.	Eight Weeks Poult Gain lbs.	Eight Weeks Feed Per Gain lbs.	Ten Weeks Poult Gain lbs.	Ten Weeks Feed Per Gain lbs.	Twelve Weeks Poult Gain lbs.	Twelve Weeks Feed Per Gain lbs.	Total Wt. Gain 2-12 Wks. lbs.	Total Feed Consumed 2-12 Wks. lbs.	Feed Per Gain 2-12 Wks. lbs.
1. Meat meal + fish solubles.												
Pen 1 House 1	.93	1.19	1.98	1.93	1.97	1.83	2.64	1.92	3.48	226.55	566.40	2.50
Pen 2 House 2	.93	1.37	1.86	1.91	2.20	1.85	2.79	1.89	3.46	239.45	608.05	2.54
Average of 2 Pens	.93	1.28	1.92	1.92	2.08	1.84	2.71	1.90	3.47	233.00	587.20	2.52
2. Fish meal												
Pen 1 House 1	.93	1.27	1.96	1.85	2.20	1.87	2.68	2.02	3.33	236.25	584.60	2.48
Pen 2 House 1	.93	1.20	1.90	2.00	2.14	1.85	2.74	1.95	3.45	238.15	607.00	2.55
Average of 2 Pens	.93	1.23	1.93	1.92	2.17	1.86	2.71	1.98	3.39	237.20	595.80	2.51

accumulative results give the same picture. In observing the 12-week data, the diet containing fish meal was slightly more efficient than the meat meal and fish soluble diet for the 10 to 12 weeks of age period of growth.

Taking into account the distribution of sex, as shown in table VII, the fish meal diet is slightly favored with a greater percentage of males and lower percentage of females than is the meat meal and fish soluble diet.

Diet 2 is also slightly favored in having a slightly greater preponderance of the Broad Breast Bronze than Broad Whites. If the faster growing Broad Breast Bronze poults were more efficient in feed utilization per unit of gain this would also slightly favor the greater efficiency with which this diet was utilized.

Nopco Chemical Company, Harrison, New Jersey, and Distillation Products Industries — Division of Eastman Kodak Company, Rochester, New York, contributed materials used in this feeding trial.

TABLE VII.—**Average Sexed Poult Weight at Twelve Weeks of Age.**

	Ration I					Ration II			
	Males		Females			Males		Females	
	No.	Av. Wt.	No.	Av. Wt.		No.	Av. Wt.	No.	Av. Wt.
House I Pen 1					House I Pen 2				
B.B.B.[1]	7	9.89	7	7.64	B.B.B.	7	10.19	10	7.76
B.W.[2]	9	9.09	6	7.38	B.W.	10	8.93	3	7.43
Houst II Pen 2					House II Pen 1				
B.B.B.	9	10.01	6	7.81	B.B.B.	12	9.87	4	7.59[3]
B.W.	10	9.12	5	6.93	B.W.	9	8.75	4	7.31
Variety sex and weight									
B.B.B.	16	9.95	13	7.73	B.B.B.	19	10.03	14	7.67
B.W.	19	9.10	11	7.15	B.W.	19	8.84	7	7.37
Sex per treatment	35		24			38		21	

[1]B.B.B.—Broad Breast Bronze.
[2]B.W.—Broad Whites.
[3]One poult not counted in average due to abnormal small size.

Malting Qualities

of North Dakota Barley Varieties

By O. J. Banasik

IN the July-August 1957 issue of the Bimonthly Bulletin the factors involved in the evalution of barley quality were discussed. The procedures are tedious and time consuming but yield an approximate concept of what may be expected when a variety is processed in the brewery.

The present report is a summary and interpretation of experimental malting tests on the 1954, 1955 and 1956 barley crops. The samples were grown at six North Dakota locations on 1/60 acre plots. The varieties were Kindred, Traill, Montcalm, Vantage, Tregal and Husky.

Malting procedures (2) developed by this laboratory were employed in the malting of the grain while standard analytical methods (3) were used for the final analysis. Included also in this report are some preliminary results from malting and brewing tests published by the Malt Research Institute (4). Although not conclusive, these indicate what can be expected from the five barley varieties Traill, Fox, U.M. 570, Husky and Parkland.

As Kindred barley is generally regarded as the standard in malting quality we will compare the quality characteristics of the different varieties with Kindred.

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