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MARCH 1948

MULTIPLE VITAMIN CONCENTRATES IN TURKEY BREEDING RATIONS

UNIVERSITY OF WYOMING
AGRICULTURAL EXPERIMENT STATION

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MULTIPLE VITAMIN
CONCENTRATES IN TURKEY
BREEDING RATIONS

LAWRENCE MORRIS*
University of Wyoming

It is a recognized fact that hatchability of chicken and turkey eggs is greatly reduced at high elevations. North (unpublished data) concluded from a survey, which he conducted, that with each 1000 feet increase in elevation, over 4000 feet, hatchability was lowered from five to 10 per cent.

Research studies on incubation have failed to establish the real cause for this reduced hatchability, although recent results at the Wyoming Experiment Station indicate it might be due to an oxygen starvation. The influence of vitamin E, as found in Alpha-tocopherol Acetate, was studied by North and Morris at the Wyoming Experiment Station, with negative results.

Recent nutritional and hatchability studies indicate a close inter-relationship and interdependency between the vitamins, minerals, and amino acids. It was to follow through on this phase that the study, reported here, was undertaken.

A turkey breeder mash was formulated which appeared adequate in every respect. Dry skim milk was used in one instance to supply the added riboflavin, B-complex vitamins, and quality protein. The milk was replaced in a second ration by Vitamelk,† a commercial concentrate, while a third ration contained neither Vitamelk or dry milk. The above rations were used for two years with slight variations. The formulas as used are shown in Table I.

Broad Breasted Bronze turkeys were used in these trials. They were not from pedigreed stock or from selective breeding, but

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*Dr. Morris has since joined the staff of Utah State Agricultural College, Logan.

†Dawe's Manufacturing Company of Chicago, Illinois, established a fellowship fund at the University of Wyoming and furnished the multiple vitamin and trace mineral concentrate (Vitamelk) for this study. Vitamelk contains 34 per cent protein.
they were all of the same common ancestry. The management for all lots was as nearly alike as possible, and the toms were rotated twice weekly to avoid preferential mating. Mash was kept before the hens at all times as was whole dry oats. A mixture of barley and yellow corn was fed night and morning. Morning lights were used, starting early in January and permitting about 13 hours of light each day.

Records were kept of beginning and ending body weights, feed consumption, and egg production, but greatest attention was focused on fertility and hatchability. Numerous workers have shown that it is possible to secure good egg production and still have very poor hatches. The only records kept of eggs produced were of those that were suitable for hatching purposes. Eggs were set over an eight week period during February, March, and April. The hens that received the Vitamelk produced more hatching eggs than either of the other rations. Incubation results are shown in Table II.

### TABLE I
TURKEY BREEDER RATIONS

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>1946</th>
<th>1947</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Ground Corn</td>
<td>18.5</td>
<td>18.5</td>
</tr>
<tr>
<td>Ground Wheat</td>
<td>12.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Ground Oats</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Wheat Bran</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Wheat Shorts</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Meat Scraps</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Soybean Meal</td>
<td>14.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Dry Milk</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Vitamelk</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Fish Meal</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Alfalfa Meal</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Salt</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Bone Meal</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Limestone</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Fish Oil (400D)</td>
<td>1/4 lb</td>
<td>1/4 lb</td>
</tr>
<tr>
<td>Mn. Sulfate</td>
<td>1/2 oz</td>
<td>1/2 oz</td>
</tr>
<tr>
<td>Ribo. Mix</td>
<td>3 oz</td>
<td>3 oz</td>
</tr>
</tbody>
</table>

*lbs.*
### TABLE II
#### HATCHING RECORD—PERCENTAGE OF FERTILE EGGS

<table>
<thead>
<tr>
<th>Year</th>
<th>Ration</th>
<th>Pen</th>
<th>Total Eggs Set</th>
<th>Per cent Infertile</th>
<th>Per cent Dead Germs</th>
<th>Good Poults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24th day</td>
<td>End of Hatch</td>
<td></td>
</tr>
<tr>
<td>1946</td>
<td>A</td>
<td>2</td>
<td>215</td>
<td>20.5</td>
<td>25.1</td>
<td>44.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>205</td>
<td>12.7</td>
<td>25.1</td>
<td>42.0</td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>210</td>
<td>16.7</td>
<td>25.1</td>
<td>43.1</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>A</td>
<td>1</td>
<td>202</td>
<td>23.3</td>
<td>26.5</td>
<td>44.5</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>147</td>
<td>33.3</td>
<td>35.7</td>
<td>34.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>175</td>
<td>27.5</td>
<td>30.8</td>
<td>40.7</td>
<td></td>
</tr>
<tr>
<td>1946</td>
<td>B</td>
<td>3</td>
<td>213</td>
<td>32.9</td>
<td>30.8</td>
<td>37.1</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>184</td>
<td>20.1</td>
<td>30.6</td>
<td>31.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>198</td>
<td>27.0</td>
<td>30.7</td>
<td>44.1</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>B</td>
<td>2</td>
<td>150</td>
<td>41.3</td>
<td>30.7</td>
<td>42.0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>164</td>
<td>31.7</td>
<td>33.0</td>
<td>40.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>157</td>
<td>36.3</td>
<td>32.0</td>
<td>41.0</td>
<td></td>
</tr>
<tr>
<td>1946</td>
<td>C</td>
<td>4</td>
<td>183</td>
<td>44.8</td>
<td>23.8</td>
<td>38.6</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>188</td>
<td>15.4</td>
<td>25.8</td>
<td>57.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>186</td>
<td>29.9</td>
<td>25.0</td>
<td>50.0</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>C</td>
<td>5</td>
<td>177</td>
<td>19.8</td>
<td>35.2</td>
<td>43.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>184</td>
<td>15.8</td>
<td>34.2</td>
<td>38.4</td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>180</td>
<td>17.7</td>
<td>34.7</td>
<td>45.5</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>C</td>
<td>3</td>
<td>126</td>
<td>34.1</td>
<td>34.9</td>
<td>47.0</td>
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<tr>
<td></td>
<td>6</td>
<td>148</td>
<td>29.7</td>
<td>34.6</td>
<td>49.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
<td>137</td>
<td>31.8</td>
<td>34.8</td>
<td>48.1</td>
<td></td>
</tr>
</tbody>
</table>

*No corresponding ration.

Two or three things that command special attention stand out rather clearly in Table II. The number of dead germs was excessive in all lots, but this is in line with previous hatchability studies at the Wyoming Experiment Station. Especially great was the number of embryos that matured in the shell and failed
to pip or hatch. When those eggs were broken, the poults were fully developed and seemed to be in a normal position in the egg.

Although the percentage of poults hatched from fertile eggs is low, it is apparent from the two years work that the lots receiving the Vitamelk concentrate produced the greatest per cent of good poults.

Fertility in all lots varied widely and was undoubtedly influenced by a factor, or factors, other than the feed, but it is interesting to note that the average fertility for the two years was highest with the hens that received the Vitamelk supplement.

DISCUSSION

Dry milk products have been recognized for years as an excellent source of quality protein and riboflavin and have been considered an essential part of the breeding ration. The results of this study indicate that in the rations used some nutrients were lacking in the milk ration that were present in the multiple vitamin concentrate.

In a recent review of poultry nutrition, Boucher (Feedstuffs, February 9, 1946, page 50) brings out the importance of some of the less understood, but nevertheless very important, B-complex vitamins and their effect on growth in turkey poults, indicating a close relationship and interdependency between this class of vitamins.

The Idaho Experiment Station has also published information showing the wide variation in the riboflavin content of milk at different seasons, with different cows and with cows fed on different feeds.

The same close relationship that exists between certain of the vitamins may also exist between the amino acids. Sokoloff (Feedstuffs, April 20, 1946, page 22) makes an excellent point of this inter-relationship and interdependency of the amino acids in his discussion, particularly between phenylalanine and tyrosine and between methionine and cystine. He makes this statement, “Each of the amino acids has its specific field of action related to different phases of organism existence; its growth, its weight, its reproduction and vitality in general.”
The importance of trace or minor minerals on hatchability of chicken eggs was recently reported by the New Jersey Agricultural Experiment Station (Poultry Science, Vol. 26, No. 3, May 1947, page 223-28). In this work two sources of calcium were used, one a rather pure calcite and the other containing in addition to the calcium nearly 30 trace minerals in minute quantities. No difference was noted in egg production, body weights, and other recorded factors, but 11 per cent more chicks were hatched from the eggs laid by the hens that were fed the calcite containing the trace minerals.

SUMMARY AND CONCLUSIONS

1. The commercial vitamin and mineral supplement (Vitamelk) used in these trials was a complete replacement for dry milk under the conditions as they existed in these trials, as measured by fertility and hatchability and egg production.

2. Although hatchability was greatly reduced due to undetermined factors that exist at high elevations, the hens receiving the Vitamelk produced the greatest number and percentage of good poults during both years of the test.

3. These results do not discredit the use of dry milk products in the turkey breeder ration, but rather show that a multiple-vitamin, trace-mineral supplement, properly fortified with high quality proteins, is the equal of or superior to milk products and that hatchability might be improved by the inclusion of these elements in the turkey breeder ration.