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BREASTBONES OF TURKEYS IN RELATION TO ROOSTING

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The problem of producing market turkeys with straight breastbones is of great importance to all turkey growers. A study of breastbone malformation shows there are at least three factors responsible: nutrition, heredity, and environment. Kohn\(^1\) (1928) reported that the experimental work on crooked breastbones in turkeys showed that one cause was a deficient ration. A ration which was supplemented with lime, phosphorus, and abundant green feed prevented crooked breastbones provided the birds got the proper start. Any deficiencies in bone-forming elements and direct sunshine at the start could not be corrected at a later time no matter how perfect the ration. Kohn\(^2\) (1930) also stated that he could control the shape of the breastbone by changing the age at which he began to feed green alfalfa and a small amount of cod liver oil.

This work was outlined to study the effect of environmental factors which were thought responsible for differences in breastbone formation.

This was not the first attempt to study environmental conditions which were seemingly responsible for sternal irregularities. Nieman\(^3\) (1931) made a survey of turkey growers in Nevada, studying among other things the occurrence and cause of crooked breastbones. He reported that no evidence was found to indicate that poor roosting facilities definitely produced crooked breasted turkeys. It did seem probable, however, that a tendency to deformed breasts might be aggravated by too early or improper roosting.

North\(^4\) (1935) reported that the type of roost was of importance in preventing a breastbone malformation which was termed “roost dent.” These dents were caused by the pressure of

the birds' weight on the breastbone at the point of contact with the roost. Indentations of this type as deep as one and one-half inches occurred at 26 weeks when the birds roosted on very narrow roosts. Poults were taught to roost at two, three, and four months of age, but the age at which roosting began had no effect on the extent of bone deformities. At about the same time, Marsden⁸ (1935), in a brief note, stated that tilting a four inch roost was effective in preventing roost calouses and blisters.

Experiments have been in progress during the past several years, of which the above report was a part, to study the age at which roosting commenced, and various types of roosts for their effect on breastbone formation. During this study it was observed that the malformation which generally occurred was not a twisting or curving common to rickets or improper mineral balance, but an indentation of the bone near the anterior end. The following results deal with this type of deformity.

EXPERIMENTAL

Work was started on this study in 1934 and continued for four years. Bronze turkeys were used. They were brooded under electric hovers in the basement of the poultry building for the first six weeks, then moved during each of the first three years to straw-loft pens with outside grass runs. The fourth year they were moved to open-front, shed-roof type shelter houses, 8 feet by 10 feet in dimension, with attached grass runs of much larger size.

The following mash was fed each year: ground yellow corn, 50 pounds; mill run bran, 25 pounds; meat and bone meal, 18 pounds; soy bean oil meal, 8 pounds; dehydrated alfalfa leaf meal, 3 pounds; chick size oyster shell, 3 pounds; salt, ½ pound; and cod liver oil, containing 400 U.S.P. units of vitamin D per gram, ½ pound. The cod liver oil was omitted after the poults were two months old, when they were allowed to run outside regularly. Starting at ten weeks of age all the whole yellow corn which the birds would consume in thirty minutes was fed in the late afternoon. This ration was adequate for good growth and bone calcification.

Figure 1. Scale used to record breastbone indentations.
The poults were allowed to roost at different ages, varying from one to four months. The width of the roosts varied from one to six inches. Some were used flat, some were tilted at a 7-degree angle, and others at a 20-degree angle.

Once monthly the birds were weighed and breastbone malformation recorded. Indentations were measured in units as illustrated in Figure 1. Laterally curved or crooked keels were also recorded, but very few of these were encountered in this study.

RESULTS

During 1934 the poults were given 1-inch flat, 4-inch flat, and 4-inch pole roosts at 2, 3, and 4 months of age respectively. A control lot was maintained without roosts. The same types of roosts were constructed for 1935, but the poults were allowed to roost at 1, 2, and 3 months of age respectively. Two-inch, four-inch, and six-inch roosts were used flat and tilted during the last two years. In 1936 the tilted roosts were sloped at a 7-degree angle and in 1937 at a 20-degree angle with the horizontal. Pole roosts were also used each year for one lot. These were pine poles cut from trees about four inches in diameter. The knots were removed and the poles were cut as smooth as possible with a small hand axe. Records of the indentations were made on the basis of Figure 1.

Fig. 2. Indentation with value of 1.
The illustrations above show dressed birds with three degrees of breastbone indentation.

The results of the first year's work show that a flat roost, one inch wide, produced the most indentation, varying from 1.75 to 3.50 units in the males depending on the age at which roosting commenced. The amount of denting was small when the birds were given 4-inch flat, or 4-inch pole roosts or were allowed no roosts at all, varying from .00 to 1.00 units, depending on the age at which roosting commenced. The straightest breast bones were produced when the birds roosted on pole roosts. The females had practically no denting, while the males had no more than .5 unit.
During the second year the turkeys were allowed to begin roosting earlier. Poults in some lots were given roosts at one month of age. Such early roosting increased the tendency toward dented breastbones when flat 1-inch or flat 4-inch roosts were used. Pole roosts were best suited for early roosting as evidenced by the lack of indentation. Tilted roosts were tried during the third year. Two-inch, four-inch, and six-inch roosts were used flat and tilted at a 7-degree angle with the horizontal. There was no significant difference in breastbone indentation between flat roosts and roosts tilted at this angle.

The males on the pole roosts showed more denting than during any other years. This was probably due to individual variation; the females in this lot showed indentation comparable with females roosting on pole roosts in other years.

During the fourth year new experimental facilities were provided. These consisted of larger houses and pens which gave conditions closely approximated by those found on most turkey ranches. A 4-inch pole roost, 4-inch and 6-inch wide roosts, tilted at a 20-degree angle, and flat were used. Tilting both the 4-inch and 6-inch roosts at an angle of 20 degrees was influential in preventing roost dents (Table 1). Birds roosting on flat roosts developed dents about five times as deep as those roosting on tilted roosts of the same width. The 6-inch flat roost produced indentations with a value of 1.06 for the males and 1.25 for the females which was about twice as deep as found in those birds which roosted on a 4-inch flat roost. No difference in the amount of breast denting was noted between a 4-inch or 6-inch tilted roost.

The pole roost and the tilted roosts produced the same amount of indentation, and the results during the last year showed, as during the previous years, that over the four year period the pole roost was not surpassed for preventing indentations.

Observation showed that the birds changed positions on the roosts, sometimes facing one side, sometimes the other. Evidently the position the bird took for roosting was not associated with the amount of breastbone malformation.
COMPARISON OF THE SEXES

In these trials the males consistently showed deeper dents than the females. The greater weight of the males was thought responsible but if this were true the heavier birds of each sex should show more indentation than the lighter birds. Coefficients of correlation between weight of the birds of each sex and the amount of indentation was found to be 0.110±0.054 for the males and 0.024±0.052 for the females. These figures which show a lack of correlation indicate that the greater amount of indentation in the males was a sex limited characteristic unassociated with body weight and that the heavier birds of each sex were no more likely to develop dents than the lighter birds.

Table I. Type of Roost, Age of Roosting, and Breastbone Indentation

<table>
<thead>
<tr>
<th>Type of roost</th>
<th>1934</th>
<th>1935</th>
<th>1936</th>
<th>1937</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>♂</td>
<td>♀</td>
<td>♂</td>
<td>♀</td>
</tr>
<tr>
<td>Control, no roosts</td>
<td>0.00</td>
<td>0.38</td>
<td>3.57</td>
<td>0.50</td>
</tr>
<tr>
<td>1-inch flat at 4 weeks</td>
<td>1.75</td>
<td>0.06</td>
<td>0.67</td>
<td>0.93</td>
</tr>
<tr>
<td>1-inch flat at 8 weeks</td>
<td>3.50</td>
<td>0.10</td>
<td>1.50</td>
<td>0.63</td>
</tr>
<tr>
<td>1-inch flat at 12 weeks</td>
<td>2.50</td>
<td>0.00</td>
<td>0.50</td>
<td>0.22</td>
</tr>
<tr>
<td>1-inch flat at 16 weeks</td>
<td>3.57</td>
<td>0.50</td>
<td>0.53</td>
<td>0.84</td>
</tr>
<tr>
<td>2-inch flat at 8 weeks</td>
<td>1.75</td>
<td>0.10</td>
<td>1.50</td>
<td>0.63</td>
</tr>
<tr>
<td>4-inch flat at 4 weeks</td>
<td>0.00</td>
<td>0.50</td>
<td>0.20</td>
<td>0.79</td>
</tr>
<tr>
<td>4-inch flat at 8 weeks</td>
<td>0.67</td>
<td>0.50</td>
<td>1.50</td>
<td>0.63</td>
</tr>
<tr>
<td>4-inch flat at 12 weeks</td>
<td>1.00</td>
<td>1.00</td>
<td>0.79</td>
<td>0.79</td>
</tr>
<tr>
<td>4-inch flat at 16 weeks</td>
<td>1.00</td>
<td>1.00</td>
<td>0.79</td>
<td>0.79</td>
</tr>
<tr>
<td>4-inch pole at 8 weeks</td>
<td>0.83</td>
<td>0.84</td>
<td>4.30</td>
<td>0.57</td>
</tr>
<tr>
<td>4-inch tilted (7°) at 8 weeks</td>
<td>0.25</td>
<td>0.10</td>
<td>0.25</td>
<td>0.06</td>
</tr>
</tbody>
</table>
SUMMARY

The amount of breastbone indentation was determined for turkeys which had been allowed to roost at various ages and on different types and widths of roosts, while they were fed a well-balanced ration.

Breastbones from turkeys which had roosted on a 4-inch pole roost had less indentation than those from birds which roosted on 1-inch, 2-inch, 4-inch, or 6-inch flat roosts or 4-inch and 6-inch roosts tilted at a 7-degree angle.

Four-inch pole roosts and 4-inch and 6-inch wide roosts tilted at a 20-degree angle produced breastbones with approximately the same amount of indentation.

Four-inch pole roosts produced less indentation than any others when roosting commenced at 4 weeks of age.

Breastbones of males had larger dents than those of females but there was no correlation within the sexes between weight and the amount of indentation.
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