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Some Effects of Copper Sulfate, Copper Oxide and
4-Nitrophenylarsonic Acid on Aortic Rupture
and Growth of Turkeys

E. Guenther and C. W. Carlson¹

Previous studies have shown that adding copper, as copper sulfate, to raise the copper level to 120 ppm in low and high protein diets resulted in increased weight gains and reduced incidence of aortic ruptures. Without copper additives the diets contain 8 to 12 ppm Cu. In all previous studies, 4-nitrophenylarsonic acid was used as a blackhead preventative. It is acknowledged that "4-nitro" depressed growth. Also sulfate ions, from various sources, have shown a sparing effect on the sulfur amino acids, thereby promoting growth. These facts raised several questions. Does the added copper promote growth by suppressing toxicity of "4-nitro" or by adding sulfate ions to the diet? Also, does the added copper increase the amount of copper stored in the liver?

A low protein series of diets, with protein ranging from a 23% starter to a 12% finisher, was fed to 600 male and 200 female Large White poults. The experimental design provided three copper treatments, normal (8-12 ppm) and two sources of copper (120 ppm) from CuSO_4 and Cu_2O . Each copper source was fed with control diets and with the recommended level for blackhead treatment of 0.0375% "4-nitro." The poults were started in electric brooders and at 2 weeks were moved to 12 pens with corn-cob litter and gas brooders. The hens were marketed at 15 weeks of age and the toms at 24 weeks of age.

Adding copper to a level of 120 ppm increased market weights, 0.362 kg at 15 weeks and 0.489 kg at 24 weeks of age. The source of copper (oxide or sulfate) did not affect gains.

The number of aortic ruptures were very low, probably an effect of the low protein diets among other things. In previous tests more ruptures were associated with higher protein diets. In this test 4, 2 and 1 aortic ruptures were associated with the normal copper, Cu_2O and CuSO_4 treatments, respectively.

The added dietary copper did not increase the amount of copper found in the liver tissue. All copper values were considered well within the normal range.

¹Assistant Professor and Professor and Leader, Poultry Research and Extension, respectively.

Table 1. Effects of CuSO_4 , Cu_2O and 4-nitrophenylarsonic Acid on Growth, Aortic Ruptures and Level of Liver Copper of Turkeys

| Treatment variable | Market weight | |
|---------------------------------|--------------------|----------|
| | 15 weeks | 24 weeks |
| | Mixed sex | Males |
| Copper | kg | kg |
| Normal, 8-12 ppm | 6.40a ¹ | 11.98a |
| Cu_2O , 120 ppm | 6.73b | 12.47b |
| CuSO_4 , 120 ppm | 6.80b | 12.46b |
| Blackhead preventative | | |
| 0 control | 6.80a | 12.73b |
| + "4-Nitro" 0.0375% | 6.50a | 11.85a |
| Aortic ruptures | number | number |
| Normal | - | 4 |
| Cu_2O | - | 2 |
| CuSO_4 | - | 1 |
| Copper content of liver | ppm | ppm |
| Normal | 13.69 | 13.64 |
| Cu_2O | 15.18 | 13.09 |
| CuSO_4 | 14.44 | 13.82 |

¹Data followed by unlike letters are different at the 0.05 level of significance.