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Yolk Pigmenters

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Commercial quantities of deeply pigmented egg yolk are used by certain food manufacturers to give desirable yellow color to some of their products. Yellow corn and alfalfa meal are the major natural sources of the yellow pigments (xanthophylls) found in the egg yolk. The degree of pigmentation depends largely on two factors, the pigment concentration in the diet and the amount of pigment absorbed by the yolk fat during yolk formation.

Several natural sources of xanthophylls, including corn, corn gluten, dehydrated alfalfa meal, alfalfa concentrates, marigold petal meal and two synthetic pigments, β-apo 8' carotenal and β-apo 8' carotenoic acid ethyl ester, have been studied at this station. Because xanthophyll pigments are also deposited in the skin, the shanks and body fat tissues, it is necessary to grow the pullets from 8 to 20 weeks of age on essentially pigment-free diets. To further deplete the body stores of pigments, a milo-soy laying diet is fed for 4 weeks prior to the test. During the test, the pigmenting materials are incorporated into the milo-based diet at various concentrations calculated on the basis of milligrams (mg) of xanthophyll per kilogram (kg) of diet or parts per million (ppm).

The color of the yolk produced is evaluated either by a visual comparison with the Heiman-Carver (H-C) color chart or chemically analyzed for xanthophyll content following the procedure developed by the Association of Official Agricultural Chemists (A.O.A.C.). The amount of xanthophyll found is expressed as micrograms (mcg) of β-carotene equivalents (BCE) per gram of yolk.

In the two most recent tests, five sources of pigments were compared, 20% protein dehydrated alfalfa meal, alfalfa concentrate (X-Pro), marigold meal, β-apo 8' carotenal (BAC) and β-apo 8' carotenoic acid ethyl ester (BACE). Observations taken included BCE (mcg/gm), hen day egg production, egg weight and efficiency of pigment utilization.

At the beginning of the tests, the hens produced eggs with 4 to 6 mcg BCE per gram of yolk. The color was a very pale yellow with a visual score of 6 on the H-C scale. Eggs acceptable for table use are those that score 10 to 12 on the H-C scale, have from 10 to 25 mcg BCE per gram of yolk and can be produced with diets containing 10 ppm of xanthophyll from alfalfa products or BAC. Intensely colored yolks with a H-C score of 20 to 22 or 100 to 135 mcg BCE per gram required 80 to 100 ppm of dietary xanthophyll from alfalfa products or BAC. There were no consistent differences observed in utilization efficiencies between pigments from alfalfa meal, alfalfa concentrate and BAC. Although marigold petal meal is one of the most highly concentrated natural sources of xanthophylls, its pigments are used about two-thirds as efficiently as those from the alfalfa products and

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BAC. BACE was the most potent of all the materials used and was utilized approximately twice as efficiently as the other sources tested. The most intensely colored yolk, 135 mcg BCE per gram, was produced with a milo diet containing a combination of 10.6% alfalfa meal and 0.002% BACE.