Carotenoid Biofortification of Yolks to Produce More Nutritious Eggs

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Biofortification increases the nutritional value of food crops by increasing the vitamin and mineral content. The objective of this research was to determine if a feed supplement including a high carotene-containing fruit in combination with high xanthophyll-containing petals could be used to produce a more nutritious Coturnix japonica (quail) egg that contains higher levels of both provitamin A (beta-carotene and beta-cryptoxanthin) and non-provitamin A (lutein and zeaxanthin) carotenoids important for human health and vision. Treatments included poultry feed only (control) and five supplements: marigold petals + tomato fruit, squash, squash + marigold, pumpkin, and pumpkin + marigold. Yolk color was measured using the yolk fan, and the carotenoid content of egg yolks was measured using high-performance liquid chromatography. All feed supplements resulted in darker yolks with higher yolk fan scores than control yolks. The darkest yolks were from the pumpkin + marigold diet, followed by the squash + marigold and the tomato + marigold diets. Egg yolks from all treatments containing marigolds had higher levels of lutein and zeaxanthin than the individual squash or pumpkin treatments. Pumpkin + marigold had the highest concentration of lutein and zeaxanthin in the yolks and significantly more beta-cryptoxanthin than control yolks. All the supplements resulted in beta-carotene deposition in the yolks, while control yolks had no detectable beta-carotene. Combining marigold petals with orange fruits resulted in the deposition of both provitamin A and non-provitamin A carotenoids in egg yolks, resulting in more nutritious eggs than quail diets with individual supplements.

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