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Biofortified cassava contributes to carotenes enrichment of egg yolks

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Introduction

Vitamin A deficiency is a major public health problem in developing countries (1). Some studies also identify suboptimal vitamin A intake in certain parts of the population of the industrialized world (1). Provitamin A carotenoids such as beta-carotene are the major source for retinoids (vitamin A and its derivatives) in the human diet (1). Hens, like all animals, cannot synthesize these carotenoids, however, they can store the pigments obtained from their diet (2). Hence the use of flours from biofortified cassava roots and leaves (Fig. 1&2) can be important for enrichment egg yolks with carotenes.

Figure 1. Biofortified cassava root

Figure 2. Cassava leaves

Materials and methods

189 Isa Brown hens of thirty week old were fed with a diet based on 40% biofortified cassava roots flour (BCRF), 10% cassava leaves flour (CLF) and 50% other ingredients, over a 12 week period. A control group with a similar number of hens was fed a commercial diet based on yellow corn and artificial carotenoids pigments. BCRF and CLF (Fig. 3) were analyzed for Total Carotenes (TC), Beta Carotenes (BC), and cyanidric acid (HCN). Color evaluation of yolks was made with a Roche's Color Gauge (RCG) and a Minolta colorimeter (valuations: a for red and b for yellow) (2) (Fig. 4&5). Total carotenes in egg yolks were quantified by spectrophotometry, and beta carotenes were determined by HPLC methods (3, 4) (Fig. 6).

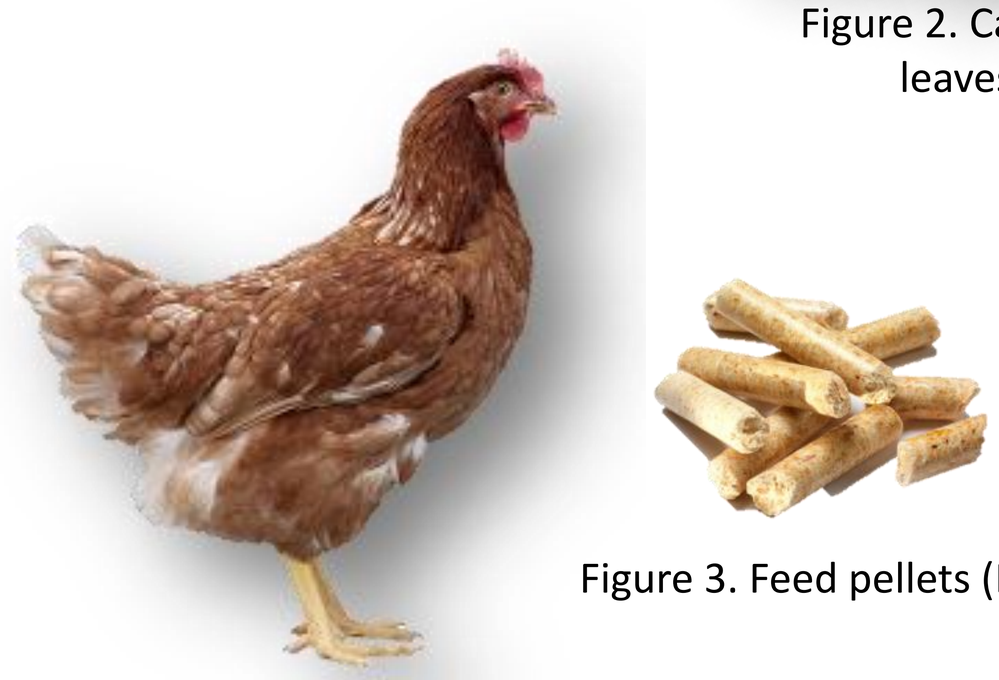

Figure 3. Feed pellets (BCRF)

Results and conclusions

The content of TC, BC and HCN in the flours and diets is given in Table 1. The total carotenoid content in the feed with biofortified cassava was relatively low compared with that in the commercial feed when considering the differences in concentration on a dry basis.

Egg yolks from hens on the biofortified cassava diet contained more beta-carotenes than yolks from the commercial diet (Table 2), however the retention of beta-carotenes was lower in the case of the cassava diet. Total carotenes were lower in yolks from the cassava diet. The red and yellow hue of the yolks from the cassava diet were low compared to yolks from the commercial diet.

Figure 4. Roche color gauge

Figure 5. Minolta colorimeter

Figure 6. HPLC

Table 1. Characteristics of the flours and diets

	TC µg/g db	BC µg/g db	HCN mg/kg db
Biofortified Cassava Roots Flour	3.330	1.923	79
Cassava Leaf Flour	58.637	22.264	69
Feed with biofortified cassava	1.659	0.066	15
Commercial feed	8.742	1.568	-------

Table 2. Color of the yolk and content of carotenes

	RCG	Minolta	TC µg/g db	BC µg/g db
Eggs yolk From biofortified cassava diet	8	a= 4.68 b=133.82	5.895	0.823
Eggs yolk from commercial diet	13	a= 10.59 b= 161.29	29.62	0.278

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