# PRODUCTION OF TOCOTRIENOL-ENRICHED EGGS

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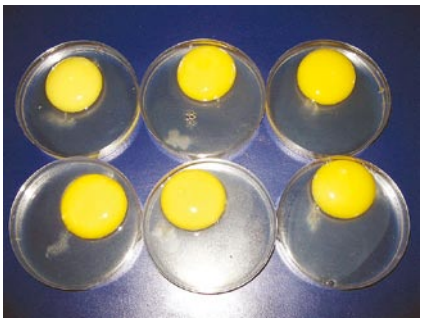
Tocotrienol-enriched egg was developed at the Energy Protein Centre (EPC), MPOB in Keratong, Pahang. It was technically feasible to produce tocotrienol-enriched chicken eggs through feeding formulated feed with tocotrienol-rich fraction (TRF) and / or MPOB-HIE. Tocotrienol and vitamin E enhanced oxidative stability and prevented off-flavour in the eggs (Ajuyah *et al.*, 1993). Vitamin E was demonstrated to reduce heat stress in laying hens (Whitehead *et al.*, 1998; Bollengier-Lee *et al.*, 1998). MPOB-HIE was developed from a palm oil product very rich in natural tocotrienols and vitamin E. It was technically and economically feasible to substitute crude palm oil (CPO) and part of the corn in layer chicken feed.



## MATERIALS AND METHOD

Seventeen-week-old 7200 H&N pullets were assigned to six treatment rations: commercial ration (T1), ration formulated with 5% MPOB-HIE (T2), ration formulated with an improved MPOB-HIE at 5% with 50 ppm tocotrienol (T3), 100 ppm tocotrienol (T4), 150 ppm tocotrienol (T5) and 200 ppm tocotrienol (T6). The tocotrienols came from TRF bought from a local manufacturer. All of the rations were isonitrogenous and isocaloric. Water was available *ad libitum*. The tocotrienol and fatty acid analyses were carried out using the techniques described by Sundram and Rosnah (2000). Egg quality analysis on shell thickness and Haugh units was adopted. The sensory test was carried out using half-boiled and scrambled eggs. The Haugh unit is a measurement of the albumen quality.

Formula:

$$HU = 100 \log_{10} (h - 1.7w^{0.37} + 7.6)$$

where,
HU = Haugh unit
$h$ = observed height of the albumen in millimeters
$w$ = weight of egg in grammes

## RESULTS AND DISCUSSION ON TOCOTRIENOLS, VITAMIN E AND FATTY ACIDS

The rates of tocotrienol accumulation in the eggs are presented in *Figure 1*. Accumulation of tocotrienols in the eggs was positive and directly related to the amount of tocotrienols in the rations. Ingested tocotrienols tended to accumulate in the egg yolk (Lanari *et al.*, 2004).

The result showed higher tocotrienols in the eggs as the bird grew older. This was a clear indication that the ingested tocotrienol tended to be deposited in the egg yolk throughout the feeding period. The feeding period and concentration of tocotrienol in the feed directly influenced the tocotrienol concentration of the egg.

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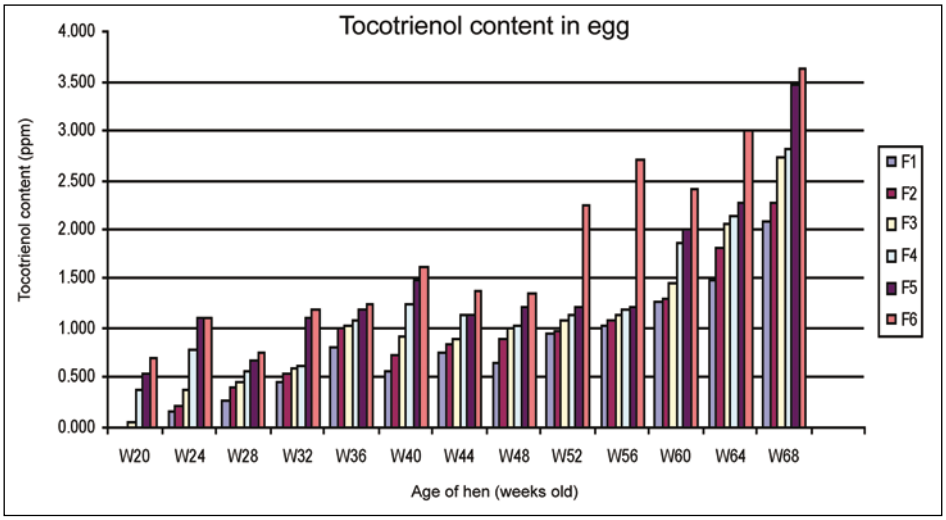


*Figure 1. Tocotrienol content in eggs.*

**TABLE 1. FATTY ACIDS COMPOSITION OF EGG YOLK FROM HENS FED RATIONS FORMULATED WITH MPOB-HIE**

| Feed | Fatty acid composition (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | C14:0 | C16:0 | C18:0 | C18:1 | C18:2 | C18:3 | C20:0 | C20:1 |
| F1 | 3.14 | 14.47 | 6.17 | 47.00 | 26.71 | 0.25 | 0.52 | 0.20 |
| F2 | 3.27 | 13.58 | 6.40 | 47.01 | 28.89 | 0.41 | 0.65 | 0.32 |
| F3 | 3.09 | 12.73 | 5.68 | 50.10 | 27.53 | 0.40 | 0.34 | 0.28 |
| F4 | 3.62 | 13.46 | 7.19 | 43.64 | 31.39 | 0.50 | 0.38 | 0.27 |
| F5 | 4.21 | 14.61 | 8.74 | 34.23 | 37.39 | 0.68 | 0.37 | 0.19 |
| F6 | 3.56 | 13.14 | 7.11 | 43.63 | 29.52 | 0.63 | 0.37 | 0.31 |

The predominant fatty acids in the egg yolk are tabulated in *Table 1*. They are oleic (C18:1), linoleic (C18:2), palmitic (16:0), stearic (C18:0) and myristic (C14:0).

The egg albumen quality is routinely measured in Haugh units. Haugh unit is determined by a micrometer which measures the albumen height. Haugh units of the eggs from rations formulated with MPOB-HIE were higher than the commercial ration.

The shell was thicker from the eggs of hens fed on rations formulated with MPOB-HIE (*Table 2*).

*Figures 2* and *3* show the sensory attributes of boiled and scrambled eggs. The sensory attributes of boiled and scrambled eggs of hens fed rations formulated with MPOB-HIE tended to be superior to the commercial ration. As such, MPOB-HIE imparted superior sensory atributes. Therefore, inclusion of MPOB-HIE and palm tocols in the ration of hens produce good quality eggs and good taste. The eggs were readily accepted by consumers.

**TABLE 2. AVERAGE SHELL THICKNESS AND HAUGH UNITS OF EGGS FROM HENS FED RATIONS FORMULATED WITH MPOB-HIE**

| Feed | Shell thickness (mm) | Haugh unit |
|---|---|---|
| F1 | 0.385 | 79.519 |
| F2 | 0.390 | 79.594 |
| F3 | 0.388 | 81.028 |
| F4 | 0.383 | 80.460 |
| F5 | 0.399 | 81.313 |
| F6 | 0.396 | 80.559 |

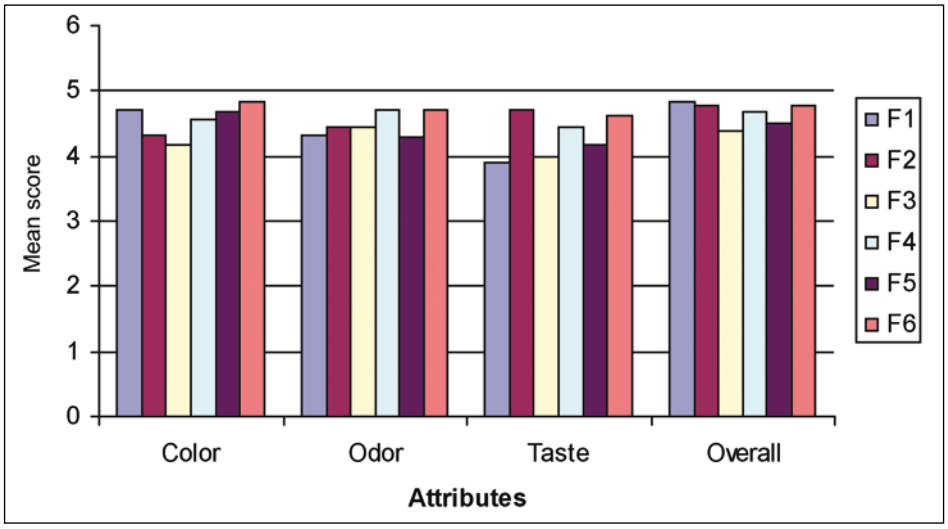


*Figure 2. Sensory evaluation on half-boiled egg.*

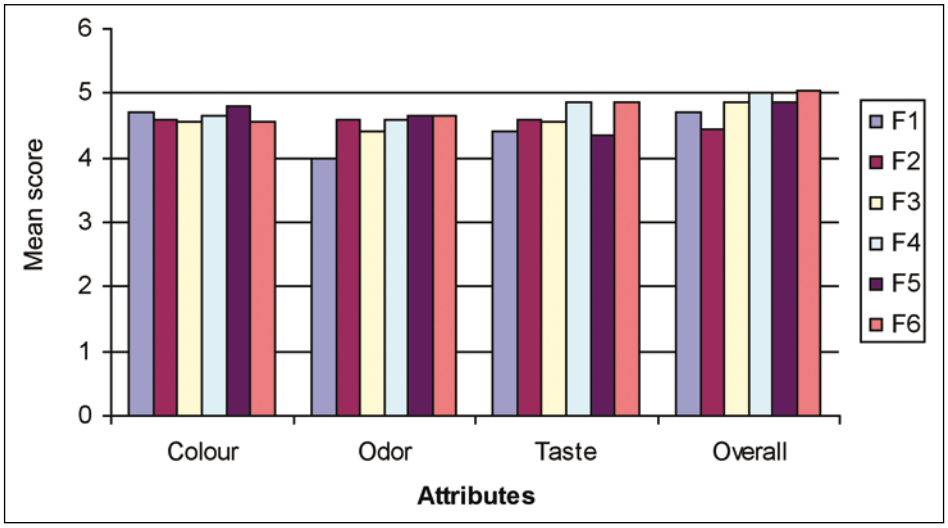


*Figure 3. Sensory evaluation on scrambled egg.*

## CONCLUSION

- It was technically feasible to use 5% MPOB-HIE in the formulation of layer rations.
- It was technically feasible to produce tocotrienol-enriched eggs through feeding.
- MPOB-HIE tended to improve the quality of eggs.
- MPOB-HIE impart superior eating quality to the eggs.

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