Content of Vitamin E in Palm Oil and its Antioxidant Activity

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The occurrence of an anti-sterility factor which was characterized as a vitamin was first reported in 1922; later, in 1925, it was given the designation vitamin E. It is now known that vitamin E comprises two groups of related compounds, known as tocopherols and tocotrienols and that, in nature, there are four homologues in each group (*Figure 1*).

Vitamin E is a fat-soluble vitamin which is present in small amount in vegetable oils. Studies on the identity of vitamin E compounds in oils and fats have shown that by contrast with the situation in other vegetable oils, vitamin E in palm oil is mainly composed of tocotrienols (*Table 1*).

In view of the fact that most vegetable oils including palm oil are consumed in processed forms, we have carried out studies on the vitamin E content of crude and processed palm oil products and the results are given in *Table 2*. The vitamin E content in processed oils was slightly lower than in the corresponding crude oils. It was also found that most of the vitamin E lost during processing went into the palm fatty acid distillate during the step of deacidification/deodorization.

In order to have a better understanding of the role of vitamin E in palm oil, the antioxidant activities of its major components have been studied: α-tocotrienol, γ-tocotrienol and δ-tocotrienol were added individually to vitamin E-free RBD palm olein at various concentrations from 200 to 2000ppm and the stability of the samples, expressed as the induction period (IP), was measured by using the Rancimat 617 apparatus. The results as given in *Figure 2* indicated that the order of antioxidant activity of individual tocotrienols is as follows:-

γ-tocotrienol ≥ δ-tocotrieonol > α-tocotrienol

It was found that γ-tocotrienol had about twice the activity of α-tocotrienol and that at 200 ppm, α-tocotrienol improved the stability of the substrate by a factor of about 6.3. It was also noted that vitamin E-free RBD palm olein had a relatively low stability (IP *ca.* 2hr) compared with fresh RBD palm olein (IP *ca.* 48hr).

It is obvious that the vitamin E components in palm oil play an important role in stabilizing it. The presence of vitamin E is also important nutritionally and it has been suggested by many researchers recently that vitamin E, particularly tocotrienols, are anti-carcinogenic and cholesterol reducing. Further research and development on vitamin E with particular reference to tocotrienols is being actively pursued.

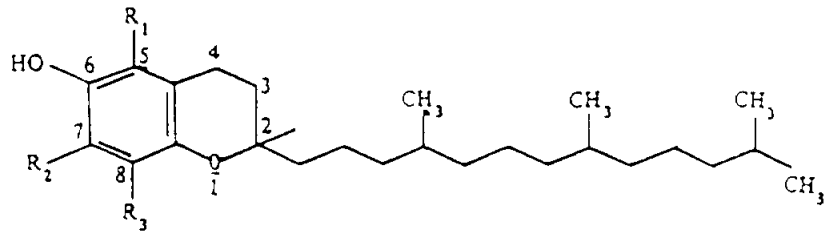
TABLE 1. TYPICAL COMPOSITION OF VITAMIN E IN CRUDE PALM OIL

Compound	% Composition
α-tocopherol	22
α-tocotrienol	20
γ-tocotrienol	46
δ-tocotrienol	12

TABLE 2. VITAMIN E CONTENT (ppm) IN CRUDE AND PROCESSED PALM OILS

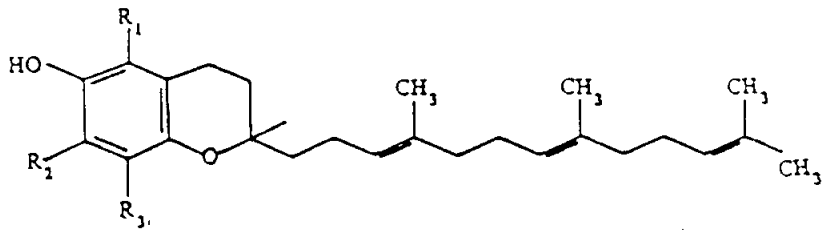
Sample	Range	Average	n
Crude palm oil	708-1141	843	33
RBD palm oil	378-890	581	33
Crude palm olein	880-1129	998	12
RBD palm olein	559-902	716	12
Crude palm stearin	426-552	489	2
RBD palm stearin	348-381	365	2

THE TOCOPHEROLS



-Tocopherol	-Tocopherol	R_1	R_2	R_3
α-	5,7,8-Trimethyl	CH_3	CH_3	CH_3
β -	5,8-Dimethyl	CH_3	H	CH_3
γ -	7,8-Dimethyl	H	CH_3	CH_3
δ -	8-Methyl	H	H	CH_3

THE TOCOTRIENOLS



-Tocotrienol	-Tocotrienol	R_1	R_2	R_3
α -	5,7,8–Trimethyl	CH_3	CH_3	CH_3
β -	5,8 - Dimethyl	CH_3	H	CH_3
γ -	7,8 - Dimethyl	H	CH_3	CH_3
δ -	8 - Methyl	H	H	CH_3

Note: α-Tocopherol, α-, γ- and δ-tocotrienols are the major homologues in palm oil.

Figure 1. Naturally Occurring Tocopherols and Tocotrienols.

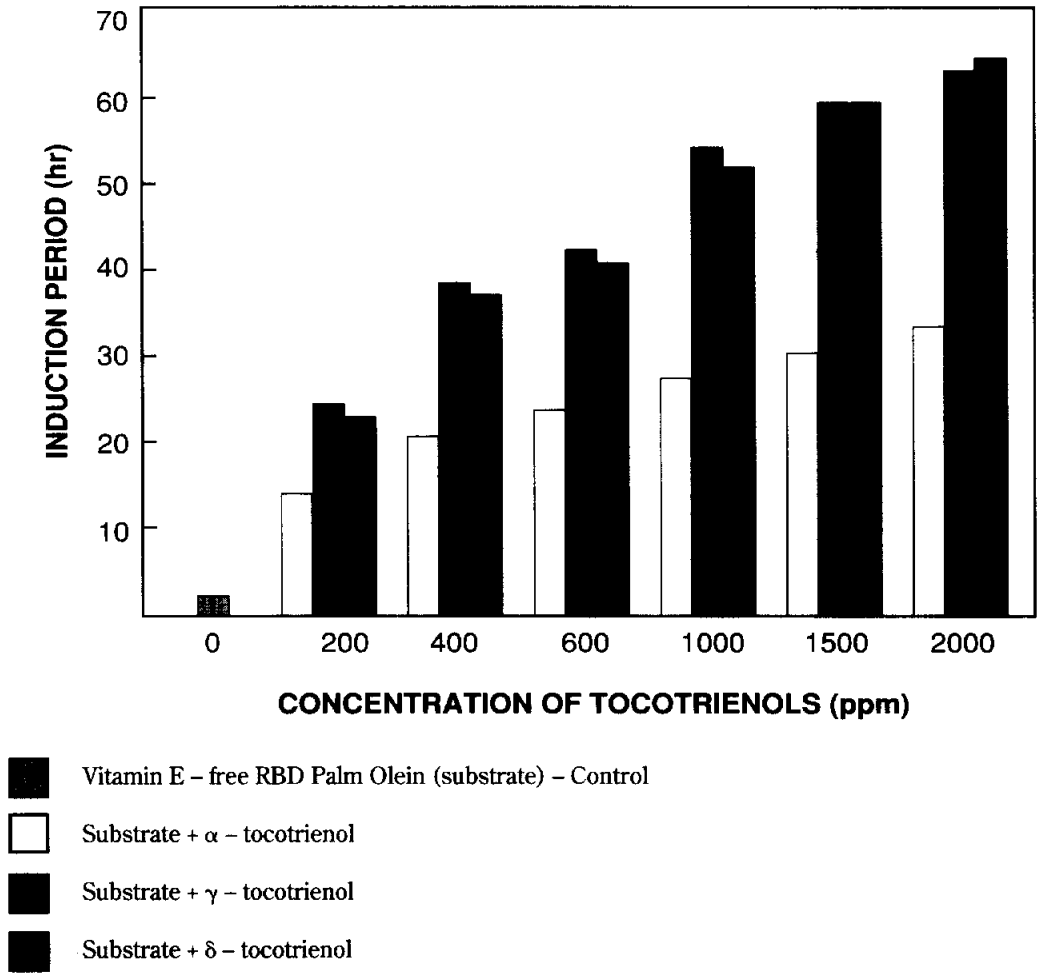


Figure 2. Antioxidant Activities of Tocotrienols in Vitamin E-free RBD Palm Olein