PRODUCTION OF PALM-BASED TOCOTRIENOLS-ENHANCED FRACTION (TEF)

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Tocotrienols as well as tocopherols are homologues of vitamin E. Vitamin E is a fat-soluble natural antioxidant and present in small amount in vegetable oils and fats. The importance of vitamin E, an essential vitamin, for keeping the good health in animals and human has long been recognized. Deficiency of vitamin E in animals would lead to complications, such as foetal resorption and muscular dystrophy. Although α-tocopherol is the most active form of vitamin E in terms of foetal resorption tests, it is interesting to note that progress on research over the last few years indicates that tocotrienols form of vitamin E are superior than α-tocopherol in activities such as hypocholesterolemic and anti-cancer effects. In order to harness the full benefits of tocotrienols, there is a need for tocotrienols preparation with minimal amount of tocopherols in it. Almost all current tocotrienols preparations in the market contain tocopherols, for instance Palm Vitamin E, a tocotrienols-rich fraction (TRF) is a mixture of tocotrienols and tocopherols at a typical ratio of 75 to 25. A process for preparing tocotrienols-enhanced fraction (TEF) products with a ratio of tocotrienols to tocopherols more than 90:10 is presented.

PRODUCTION OF TEF

The current sources for extraction of tocotrienols are from agro-based industries including palm oil and rice bran oil. TRF preparations are available in the market, for example at 20%, 50% and 70% total vitamin E content, with a typical ratio of tocotrienols to tocopherols at 75:25. We propose a technology for increasing the content of tocotrienols to more than 80% and improving the ratio of tocotrienols to tocopherols to 90:10 or more. An example is the production of MPOB-T3Mix88, a TEF from palm fatty acid distillate (*Figure 1*). The process involves the preparation of palm-based TRF and subsequently extraction of tocopherol resulting in an increase of tocotrienols content from 57.3% to 88.0% and the ratio of tocotrienols to tocopherols from 76:24 to 97:3 (*Table 1*). Another product, MPOB-T3 Mix 50

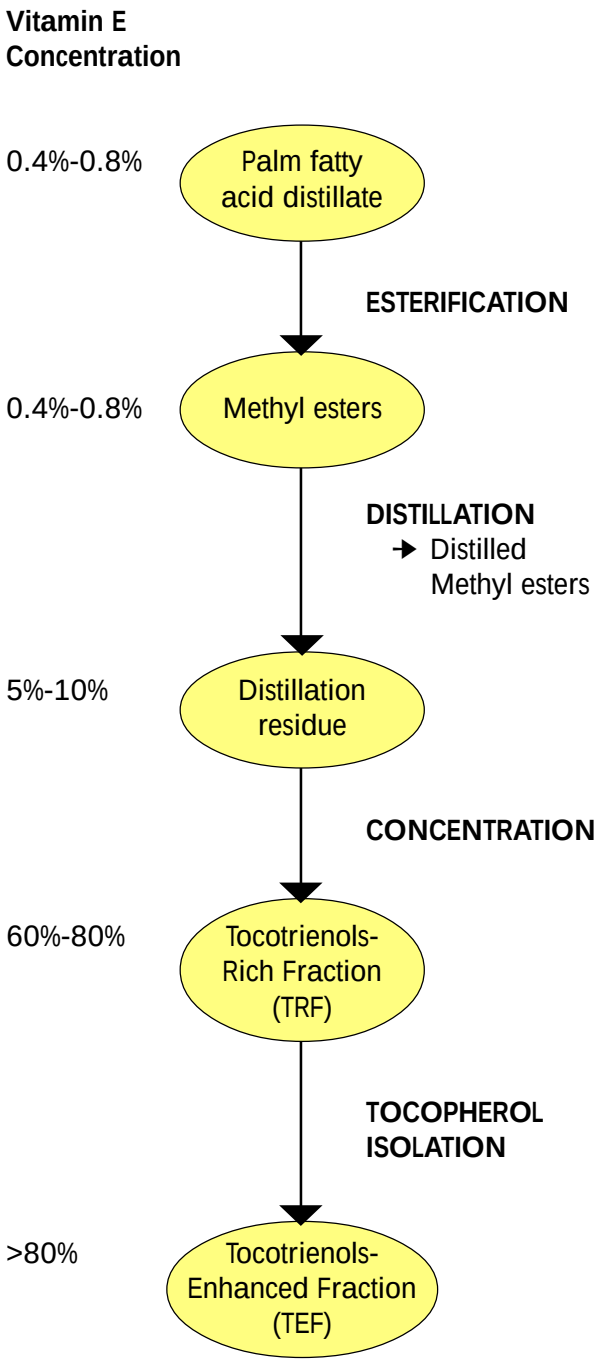

Figure 1. Production of palm-based tocotrienols-enhanced fraction (TEF).

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TABLE 1. TOCOPHEROLS AND TOCOTRIENOLS CONTENT OF TOCOTRIENOLS PREPARATIONS

Tocotrienols Preparation	α-Tocopherol (%)	α-Tocotrienol (%)	γ-Tocotrienol (%)	δ-Tocotrienol (%)	Total (%)
Palm Vitamin E (TRF)	17.8	17.1	23.0	17.2	75.1
MPOB-T3 Mix88 (TEF)	2.6	25.2	37.9	24.9	90.6
MPOB-T3 Mix50	1.5	14.6	21.6	14.8	52.5

Notes: TRF = tocotrienols-rich fraction.
TEF = tocotrienols-enhanced fraction.

(*Figure 2*) with tocotrienols content 51% is prepared by blending MPOB-T3Mix88 with RBD palm olein accordingly. The product (MPOB-T3 Mix50) with a minimal tocotrienols content of 50%, can be easily promoted for various applications.

Figure 2. Palm-based tocotrienols (MPOB-T3Mix50).

POTENTIAL BENEFITS OF TOCOTRIENOLS

Both tocopherols and tocotrienols are known for their antioxidant activities in foods and biological systems (Ab Gapor *et al.*, 1989; Minhajuddin *et al.*, 2005). α-Tocotrienol showed better antioxidant activity than α-tocopherol in the order of 40-60 times against lipid peroxidation (Serbinova *et al.*, 1991). In a human study, O'Byrne *et al.* (2000) reported that α-tocotrienol may be potent in decreasing low-density lipoprotein (LDL) oxidizability. Tocotrienols have been shown to be a potential hypocholesterolemic agent (Qureshi *et al.*, 1995; Hasselwander *et al.*, 2002). Tocotrienols have also been shown to have anti-cancer activities (Kato *et al.*, 1985; Komiyama *et al.*, 1989; Wan Ngah *et al.*, 1999; Nesaretnam *et al.*, 2000). The superiority of tocotrienols over tocopherols in anti-cancer effects have been confirmed (Guthrie *et al.*, 1997; Yu *et al.*, 1999; McIntyre *et al.*, 2000; Yu *et al.*, 2003). Tocotrienols have been reported to show anti-angiogenic activity, suggesting potential usefulness as a therapeutic agent for tumour angiogenesis (Miyazawa *et al.*, 2004). α-Tocotrienol but not tocopherols has been shown to be a potent neuroprotection agent (Sen *et al.*, 2000; Osakada *et al.*, 2004). Anderson *et al.* (2003) reported that tocotrienols induce IKBKAP expression, thus suggesting a possible therapy for familial dysautonomia.

CONCLUSION

A substantial amount of evidence indicates that tocotrienols are more effective than tocopherols in health promoting activities including hypocholesterolemic, anti-cancer and antioxidant properties. Technology for producing TEF is available for further development. The products are expected to have applications in the high end nutraceuticals, functional foods and cosmetics industries.

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