

PRODUCTION OF PHYTONUTRIENTS (CAROTENES, VITAMIN E, STEROLS, SQUALENE, CO-ENZYME Q AND PHOSPHOLIPIDS) FROM PALM METHYL ESTERS

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Palm oil contains many valuable components (phytonutrients) that are beneficial to health. These phytonutrients include the carotenes (500 - 700 ppm), tocopherols (600 - 1000 ppm), sterols (250 - 620 ppm), squalene (200-600 ppm), ubiquinones (250-300 ppm) and phospholipids (20-80 ppm) (Goh *et al.*, 1985).

Much attention has been given to the recovery of carotenes in the past. Recent findings have shown that other phytonutrients that are present in palm oil also exhibit special properties that gives them a promising future in the pharmaceuticals, nutraceuticals, food as well as cosmetics industries.

PRODUCTION TECHNOLOGY

The production of phytonutrients from crude palm oil consists of a few steps:

- transesterification of crude palm oil into alkyl esters e.g. methyl esters; and
- distillation of alkyl esters to produce phytonutrients concentrate.

The phytonutrients concentrate that is obtained from molecular distillation is subjected to an integrated process which includes various chemical and physical treatments, supercritical fluid extraction (SFE), supercritical fluid chromatography (SFC) and flash chromatography to produce high purity carotenes, vitamin E, sterols, squalene, co-enzyme Q and phospholipids.

ADVANTAGES OF THE PROCESS

- The integrated process is clean, safe and environmental friendly.
- Palm carotenes, tocopherols, squalene, sterols, ubiquinones and phospholipids which are high valued products can be produced simultaneously.
- By-products from the integrated process such as glycerol and distilled alkyl esters can be utilized in the oleochemicals, cosmetics, pharmaceutical, biofuel and lubricant industries.
- Minimal organic solvents are used in the integrated process.
- The supercritical fluid (*i.e.* supercritical carbon dioxide)

- used as solvent in the production of these valuable palm oil phytonutrients is non-toxic, non-hazardous, non-inflammable and environmentally friendly. Most importantly, it leaves no *solvent* residue in the products.
- This process incurs very low operating cost.
 - The harvesting of these phytonutrients from palm oil provides business opportunities for the industries.

RANGE OF PRODUCTS

A range of products can be produced using the integrated process.

- Tocopherols (up to 95% concentration).
- Carotenes (up to 95% concentration).
- Ubiquinone (0.3% concentration)
- concentrated by 300 folds.
- Sterols (up to 95% concentration).
- Squalene (up to 50% concentration).
- Phospholipids (0.1% concentration).

IMPORTANCE OF PHYTONUTRIENTS

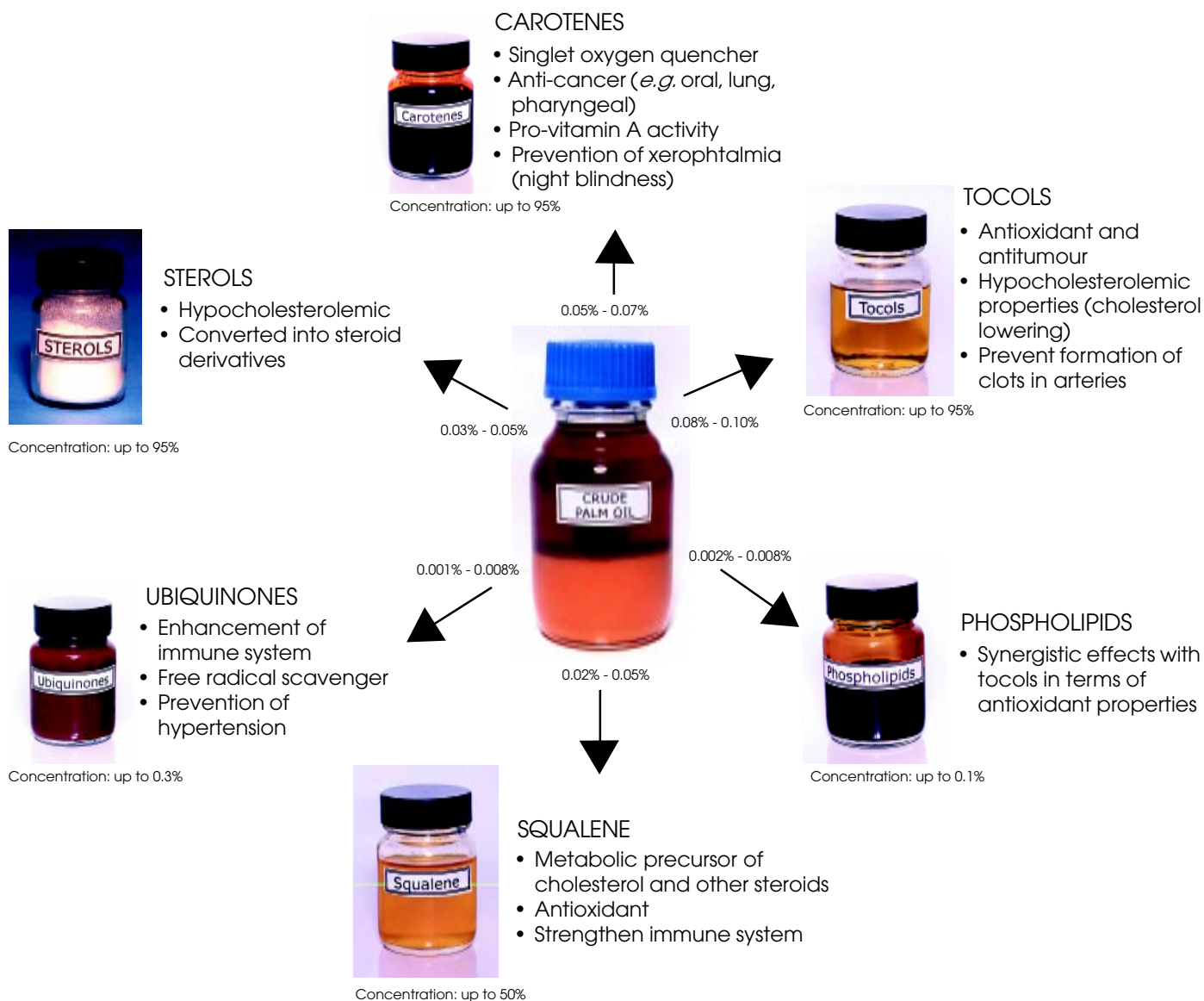
The carotenes and tocopherols are known for their antioxidant as well as anticancer properties. Studies have shown that optimal carotene intake can reduce the risk of cancer growth and offer protection against some common diseases such as cardiovascular diseases as well as xerophthalmia. They are widely used in pharmaceuticals, nutraceuticals, food as well as cosmetics industries. Palm sterols which consist mainly of β -sitosterol, campesterol and stigmasterol have slowly gained attention worldwide as they exhibit hypocholesterolemic or cholesterol lowering properties used to make cholesterol-free margarine. Ubiquinones or better known as Coenzyme Q10 is a powerful antioxidant (10 times more than that of vitamin E). It is widely used in cosmetics and pharmaceutical industries. The phospholipids, especially phosphatidyl choline (lecithin) is known for its emulsifying properties. It also has synergistic antioxidant effect with tocopherols.

CONCLUSION

High valued phytonutrients with nutritional attributes can be produced using the integrated process.



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