

PROCESS FOR RECOVERY OF SQUALENE FROM PALM OIL PRODUCTS

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Squalene is a minor constituent of oils and fats. It is a triterpenoid aliphatic hydrocarbon with six unconjugated double bonds (Figure 1), first discovered in shark liver oil in 1906 by Mitsumaru Tsujimoto. It is present in human tissue and plant oils in small amounts. Squalene is a valuable commercial product and traditionally produced from shark liver oil.

The occurrence of squalene in palm oil has been confirmed (Ab. Gapor *et al.*, 1985) and we aim to develop palm oil products as an alternative source of squalene.

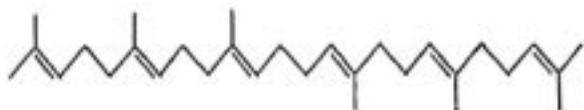


Figure 1. Structure of squalene ($C_{30}H_{50}$).

USES OF SQUALENE

Nutraceuticals and Functional Foods

The use of shark liver oil, naturally rich in squalene, for health benefits (*e.g.* against cold) is not new, particularly as an active ingredient in traditional herbal medical preparations. Squalene has been commercialized as a food supplement for several years (Kaiya, 1990). It has been claimed to be able to help renew body cells and boost the immune system (Lane and Comac, 1992). The anti-cancer effect of squalene as demonstrated in laboratory studies in certain types of cancer and other potential clinical uses are areas for further exploration and exploitation (Kelly, 1999).

Cosmetics

The use of squalene as an ingredient functioning as an emollient or a conditioning agent (for hair/skin) in body, hand and other relevant preparations is well documented (*e.g.* Rosenthal, 1964; Wenninger and McEwen, 1997). As squalene occurs naturally at about 10% in human sebum, the use of squalene as an ingredient for cosmetic

formulations is considered to be natural and highly relevant. Squalane ($C_{30}H_{62}$, Figure 2), an oily fully saturated material is obtained by the catalytic hydrogenation of squalene (Takamatsu, 1994). It is used as a skin lubricant and emollient in foundation creams, lipsticks and hair lotions (Barnett, 1972; Howard and Poucher, 1974). Kaiya (1990) reported that natural squalane has been the most important oily ingredient for all cosmetic products.



Figure 2. Structure of squalane ($C_{30}H_{62}$).

Pharmaceuticals

Squalene is used in a large quantity as an intermediate material for the production of pharmaceuticals. Its saturated form (squalane) is used as an ingredient of the oil phase in pharmaceutical creams and lotions. Squalane is not only used as a skin lubricant but also as a carrier of lipid soluble drugs (Barnett, 1972; Howard and Poucher, 1974).

Other Industries

Squalene has been reported to be used as a bactericide and an intermediate for the manufacture of organic chemicals, rubber chemicals, aromatics, surfactants (Ash and Ash, 1997). Squalane is considered as an excellent industrial lubricant because of its high resistance to oxidation.

RECOVERY OF SQUALENE

The contents of squalene in palm oil products are given in Table 1 (Ab Gapor *et al.*, 1999). Shark liver oil, containing up to 89% squalene (Peyronel *et al.*, 1984) is a traditional source of squalene. However, looking at the growing concerns for the protection of marine animals particularly with regard to depletion of shark, development of new sources especially from renewable plant sources is of relevance. Research and development to produce squalene from palm oil products, especially palm fatty acid distillate (PFAD) merit serious consideration. We have taken up the



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challenge and succeeded in producing pure colourless squalene (Figure 3). It is estimated that potential availability of squalene from PFAD is 1470 and 2205 t in year 2000 and year 2010 respectively (Ab. Gapor and Hazrina, 2000).

TABLE 1. SQUALENE CONTENT IN PALM OIL PRODUCTS

Oils and Fats	Squalene (ppm)		
	Mean	Range	n
Crude Palm Oil ^(a)	580	537-659	3
Crude Palm Oil ^(b)	588	421-979	11
Bleached Palm Oil ^(a)	572	530-645	3
RBD Palm Oil ^(a)	683	478-791	3
RBD Palm Oil ^(b)	257	184-361	9
Palm Fatty Acid Distillate ^(a)	5 465	2 128-8 191	14
Palm Fatty Acid Distillate ^(b)	7 887	2 404-13 504	16

Notes: ^(a) Ab. Gapor *et al.* (1999).

^(b) Ab. Gapor *et al.* (1985).



Figure 3. Squalene (coloured and colourless).

CONCLUSION

Squalene finds applications in nutraceuticals, cosmetics, and pharmaceuticals industries. In view of the value of squalene, we have researched and developed relevant process to recover it from palm oil products, to be capitalized accordingly.

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