

UNIVERSITI TEKNOLOGI MARA

**EFFECT OF FRACTIONATION CONDITIONS
AND THE ADDITION OF DIACYLGLYCEROL
ON THE PHYSICO-CHEMICAL PROPERTIES
OF REFINED BLEACHED AND DEODORISED
PALM OIL (RBDPO)**

NORMAH ISMAIL

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ABSTRACT

The effects of fractionation conditions and DP (dipalmitin) addition on RBDPO (refined bleached and deodorised palm oil) fractions (olein and stearin) were studied. RBDPO was fractionated at 14 to 28°C for 90 min. The collected oleins and stearins were analysed for physico-chemical characteristics, yield, olein entrainment, crystal size distribution and morphology. Oleins were softer during the first 25 to 50 min of fractionation at 14 to 22°C and after 40 min of fractionation at 26 and 28°C. Stearins produced at 14 to 22°C were softer between 15 to 20 min of fractionation while stearins produced at 26 and 28°C were harder beginning from 60 min of fractionation. Oleins and stearins produced at 14 to 22°C were softer than those produced at 26 and 28°C. Fractionation at 14 to 22°C resulted in rapid crystallisation, softer oleins and stearins, lower olein entrainment, higher count of fine crystals and lower yield of oleins but higher yield of stearins. DP was prepared by glycerolysis and purified by short path distillation (SPD) and fractionation. The optimum processing conditions for DP purified by SPD (DGSDU) were from Raw (110°C) to Res (165°C) to Dis (135°C) with 96.6% of DP in DGSDU and the yield of 9.6% (w/w). The optimum conditions for DP purified by fractionation (DGCHM) were 3.5 hr, 65°C and molar ratio of 2:1 palmitic acid to glycerol with 89.38% DP in DGCHM and the yield of 71% (w/w). DP preparation by fractionation was considered to be a better route due to the ease and shorter period of preparation, higher yield and reasonable concentration. DGCHM was added into RBDPO at 0, 1, 3 and 6% followed by fractionation at 22 and 26°C. Oleins produced with DAG (diacylglycerol) addition were softer at shorter fractionation time than those produced without DAG. Fractionation time has no effect on the physico-chemical properties of stearins. Stearins were harder at higher percentages of DAG addition. Crystallisation was rapid, yield of stearin was higher and crystals were larger while count of fine crystals increased at higher percentages of DAG addition. Fractionation conditions and DP addition were found to affect the physico-chemical properties of RBDPO fractions while DP enhanced the crystallisation of RBDPO.

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CHAPTER 1

INTRODUCTION

1.1 Background

Palm oil like any other fats and oils consists of a mixture of triacylglycerols (TAG). Each TAG has its own melting point; those that melt at high temperature, those that melt at about body temperature and those that melt at room temperature, depending on the type of fatty acids attached to it. Thus palm oil has a melting range instead of a sharp melting point. Owing to its TAG composition and equal amounts of palmitic and oleic acid, palm oil appears as semi-solid slurry at ambient temperature comprising of a mixture of solid (stearin) and liquid oil (olein). Fractionation at temperatures below the melting point of the higher melting TAG in palm oil allows the crystallisation of the high melting TAG to occur and subsequently the formation of two phases; the solid and liquid; each having its own physical and chemical properties. These two phases can be separated by separation techniques such as filtration and centrifugation.

In general, fractionation is performed for several purposes; 1) to remove some amounts of the high melting components from the oil so that the oil can be used at temperature lower than the ambient temperature, 2) for enrichment of the oil with more unsaturated TAG so that its usage as a liquid oil is improved; the liquid oil can also be blended with another soft oil like soy bean oil to enhance its utilization as a frying oil and 3) to produce a fraction with narrower range of TAG compositions and sharper melting properties (Hamm, 1995). Olein is used as a frying oil while stearin is used as a solid component in the formulation of margarine and shortening. Palm mid fraction can be used as a cocoa butter equivalent.