CHAPTER I

INTRODUCTION

Oil palm (*Elaies guineensis* Jacq.) is a diploid monocotyledon belonging to the family Arecaceae. The crop produces two types of oil, namely palm oil and palm kernel oil. Palm oil is one of the world's most traded vegetable oils in the international market and most widely consumed edible oil (Corley & Tinker, 2003; Rajanaidu, 1994). It has been predicted that by the year 2020, the world production of oils and fats will increase to 174 million tonnes and palm oil production to 35 million tonnes and that by then, palm oil will be the dominant vegetable oil in the world (Jalani, 1998).

The majority of oil palm plantation and palm oil production is provided by Indonesia and Malaysia, as both contribute about 44 % and 41.5 % respectively to the world palm oil production (Oil World, 2008). However, the oil palm breeding populations in both countries are derived from a narrow genetic pool. Most of the commercial planting materials utilized are derived from the Deli *dura*, which was first introduced in Indonesia in 1848 and afterwards in Malaysia (Corley & Tinker, 2003). The narrow genetic pool of oil palm resulted into quite a lot of expeditions being mounted by researchers in Malaysia to collect oil palm germplasm in Africa and south-central America (Rajanaidu et al., 1999).

Evaluation of oil palm genetic variability is needed for various purposes such as for the selection of superior palms and it also serves as a first step towards effective utility in breeding programmes (Mandal, 2008). With the dawn of advanced computer technologies, it has become possible to study the complex relationship among

genotypes through chemometric or multivariate analyses which offers enhanced understanding of the structure, predominantly of large germplasm collections (Martinez-Calvo et al., 2008). In this view, chemometrics or multivariate statistical methods particularly the principal component and cluster analyses have gained wide recognition in the evaluation of germplasm materials of many species (Muhammad et al., 2013; Ajmal et al., 2013; Doumbia, 2013; Lohani et al., 2012; Deyong, 2011; Lacis et al., 2010 and Bozokalfa et al., 2009).

Chemometric is the science of relating measurements made on a chemical system or process to the complex state of the system via multivariate statistical methods (Martens & Naes, 1993). One of the main advantages of chemometric method is that it is possible to explore complex co-linear multivariate information in a graphic display. Principal component analysis (PCA) is the fundamental chemometric method based on vector algebra (Martens & Naes, 1993). The main purpose of the method is to reduce dimensions of complex multivariate data and to simplify data interpretation by finding new orthogonal variables, principal components (PCs), describing the variance in data. Cluster analysis is used in the categorization of germplasm materials into groups based on similarity or dissimilarity (Ariyo, 1993).

1.1 Statement Problem

There is a need to introduce oil palm germplasm as the genetic base of oil palm industry in Malaysia. The oil palm in Malaysia mostly originating from the four palms planted in Bogor in 1848. The germplasm introduced needs to be evaluated and characterized.

1.2 Aim

To study variation in oil palm germplasm by using chemometric analysis [principal component analysis (PCA) and clustering].

1.3 Research Questions

i. Is there variation in the oil palm germplasm?

ii. What are the traits contributing to the variation?

iii. What is the relationship among accessions in the germplasm?

1.4 Objectives

The objectives of the study were:

i. To determine the level of variation in the oil palm germplasm; and

ii. To identify and classify the groups of accessions with different genetic diversity based on quantitative traits.