

Evaluation of Yield and Yield Components of Malaysian Palm Oil Board-Senegal Oil Palm Germplasm Using Multivariate Tools

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Abstract : The narrow base of genetic is the main obstacle of breeding and genetic improvement in oil palm industry. In order to broaden the genetic bases, the Malaysian Palm Oil Board has been extensively collected wild germplasm from its original area of 11 African countries which are Nigeria, Senegal, Gambia, Guinea, Sierra Leone, Ghana, Cameroon, Zaire, Angola, Madagascar, and Tanzania. The germplasm collections were established and maintained as a field gene bank in Malaysian Palm Oil Board (MPOB) Research Station in Kluang, Johor, Malaysia to conserve a wide range of oil palm genetic resources for genetic improvement of Malaysian oil palm industry. Therefore, assessing the performance and genetic diversity of the wild materials is very important for understanding the genetic structure of natural oil palm population and to explore genetic resources. Principal component analysis (PCA) and Cluster analysis are very efficient multivariate tools in the evaluation of genetic variation of germplasm and have been applied in many crops. In this study, eight populations of MPOB-Senegal oil palm germplasm were studied to explore the genetic variation pattern using PCA and cluster analysis. A total of 20 yield and yield component traits were used to analyze PCA and Ward's clustering using SAS 9.4 version software. The first four principal components which have eigenvalue >1 accounted for 93% of total variation with the value of 44%, 19%, 18% and 12% respectively for each principal component. PC1 showed highest positive correlation with fresh fruit bunch (0.315), bunch number (0.321), oil yield (0.317), kernel yield (0.326), total economic product (0.324), and total oil (0.324) while PC 2 has the largest positive association with oil to wet mesocarp (0.397) and oil to fruit (0.458). The oil palm population were grouped into four distinct clusters based on 20 evaluated traits, this imply that high genetic variation existed in among the germplasm. Cluster 1 contains two populations which are SEN 12 and SEN 10, while cluster 2 has only one population of SEN 3. Cluster 3 consists of three populations which are SEN 4, SEN 6, and SEN 7 while SEN 2 and SEN 5 were grouped in cluster 4. Cluster 4 showed the highest mean value of fresh fruit bunch, bunch number, oil yield, kernel yield, total economic product, and total oil and Cluster 1 was characterized by high oil to wet mesocarp, and oil to fruit. The desired traits that have the largest positive correlation on extracted PCs could be utilized for the improvement of oil palm breeding program. The populations from different clusters with the highest cluster means could be used for hybridization. The information from this study can be utilized for effective conservation and selection of the MPOB-Senegal oil palm germplasm for the future breeding program.

Keywords : cluster analysis, genetic variability, germplasm, oil palm, principal component analysis

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