

Breeding of high yielding and dwarf oil palm planting materials using Deli dura × Nigerian pisifera population

ABSTRACT

In practice, progeny and individual palm selection are believed to be the most suitable breeding approach for improvement of quantitative traits in oil palm because their phenotypic expressions are strongly influenced by abiotic factors. Therefore progeny selection approach was applied in this study for the selection of high fresh fruit bunch (FFB) and dwarf oil palm planting materials. Cross between Deli dura and Nigerian pisifera resulted into 34 D × P full sib progenies with 1036 seedlings. For six consecutive years, data were collected on yield and yield component traits, while vegetative traits were recorded once. Bi-parental analysis was carried out using analysis of variance, followed by progenies mean comparison, variance components, heritabilities and cluster analysis. Highly significant ($P < 0.01$) progeny effect was recorded in this study and this had a pronounced effect on the expression of all the quantitative traits. Progenies performance of FFB varied significantly and it ranged from 166.49 to 220.06 kg/palm/year (kg/p/yr) with trial mean of 192.93 kg/p/yr. Palm height after 8 years of field planting ranged from 1.67 to 2.78 m (control cross) with trial mean of 2.12 m. Broad sense heritability (h^2_B) was found to be very low ($< 17.60\%$) for all the yield traits, however this parameter was high for vegetative traits with palm height having h^2_B of 90%. Cluster analysis based on all the quantitative traits grouped all the 34 DP progenies into nine distinct clusters. From this study, five progenies (DP3, DP4, DP5, DP8 and DP24) were identified to be high yielding and dwarf palms compare to trial mean. At density of 140 palm/ha, they will produce FFB of 28.63 to 30.81 t/ha and average of 29.69 t/ha which is about 27.15% higher in FFB when compared to the current planting material with FFB of 23.35 t/ha. In addition, the selected progenies possessed average annual palm increment of 29.82 cm/yr with range of 26 and 32.5 cm/yr which was 57.33% shorter than the current planting material with palm height increment of 45.675 cm/yr.

Keyword: Cluster analysis; Genetic diversity; Heritability; Dwarf oil palm; Oil yield