GENETICS OF DELI-AVROS DXP OIL PALM BREEDING POPULATIONS AT CONSOLIDATED PLANTATIONS, MALAYSIA

MUSA B.B., S.G. LOONG AND G.B. SALEH

INTRODUCTION

MATERIALS AND METHODS

RESULTS

CONCLUSIONS

INTRODUCTION

- Perennial and cross pollinated plant
- A new crop in the breeding context & eight to ten years to complete a breeding cycle
- No true inbred lines like in maize – DxP genetically heterogenous
- Variability assessment (VA)- is essential for important traits- yield and yield components
- VA – useful tool for selection and widening genetic base

OBJECTIVE

- To investigate the extent of variability and heritability among fresh fruit bunch yield and its components, bunch and fruit components, and vegetative as well as physiological traits in two Deli-AVROS DxP breeding populations

MATERIALS AND METHODS

Materials

- Two Deli-AVROS DxP oil palm breeding populations
- Population 1- 15 DxP crosses (5 males and 15 females)
- Population 2 - 18 DxP crosses (6 males and 18 females)

Methodology

- Population 1- November 1995 at Sg. Buloh Estate in Kuala Selangor
- Population 2 - September 1995 at Nova Scotia Estate in Lower Perak
- Experimental design:
  - RCBD – 3 replications
  - Plot size – 12 palms
  - Spacing – 8.8 m triangular planting

Methodology (cont'd)

- Field maintenance - according to standard estate practices

- Data collection (Jan to Dec 2000)

    - FFB yield and its components
    - Bunch and fruit components (BA)
    - Vegetative and physiological traits (VM)

Methodology (cont'd)

- Data – subjected to ANOVA
- Variance components, standard errors and broad-sense heritability - estimated using method by Lukhele and Obilana (1984)
- Genotypic coefficients of variation (gcv) - estimated using method by Singh and Chaudhry (1977)

RESULTS

Sequence of results:

- FFB yield and yield components
- Bunch and fruit components
- Vegetative traits
- Physiological traits

Table 1 : Mean,range and gcv for FFB yield and its components in Populations 1 & 2

Trait	**Mean**		**Range**	**gcv (%)**
<u>Population 1</u>				
FFB yield (kg/palm)	141.9	13.26	122.3 - 165.2	10.1
Bunch no./palm	20.3	1.69	17.9 - 23.9	5.8
Average bunch wt (kg)	7.0	0.27	6.3 - 7.9	5.9
<u>Population 2</u>				
FFB yield (kg/palm)	148.7	15.99	117.9 - 177.5	9.6
Bunch no./palm	19.4	1.78	14.9 - 24.0	11.8
Average bunch wt (kg)	7.7	0.69	6.4 – 8.7	6.8

Table 2 : Mean,range and gcv for bunch and fruit components in Population 1

Trait	Mean		Range	gcv (%)
% Fruit/bunch	59.8	1.76	55.3 - 64.2	3.2
% Oil/bunch	24.5	0.84	22.8 - 26.4	4.1
% Kernel/bunch	6.1	0.60	4.4 - 8.1	15.9
Fruit weight (g)	11.8	0.74	9.7 - 13.8	10.8
% Mesocarp/fruit	81.0	1.46	75.9 - 83.9	2.7
% Shell/fruit	8.8	0.88	6.9 - 11.3	11.6
% Kernel/fruit	10.2	0.86	7.4 - 12.7	14.2
% Oil/wet mesocarp	50.6	1.24	48.6 - 52.6	1.9

Table 3: Mean,range and gcv for bunch and fruit components in Population 2

Trait	Mean		Range	gcv (%)
% Fruit/bunch	60.3	2.73	56.9 - 65.3	3.2
% Oil/bunch	23.3	1.06	20.1 - 26.5	6.2
% Kernel/bunch	6.7	0.86	5.1 - 9.2	16.0
Fruit weight (g)	11.9	1.05	9.8 - 15.6	10.3
% Mesocarp/fruit	78.8	1.87	73.4 - 83.9	3.8
% Shell/fruit	10.1	0.94	6.9 - 12.3	15.9
% Kernel/fruit	11.1	1.14	8.5 - 15.1	14.9
% Oil/wet mesocarp	49.1	1.36	45.1 - 52.0	4.0

Table 4 : Mean,range and gcv for vegetative traits in Population 1

Trait	**Mean**	**Range**	**gcv (%)**
Trunk girth (cm)	60.7 1.70	56.2 - 64.6	3.2
Trunk height (cm)	133.0 9.36	117.3 - 150.2	5.9
Rachis length (cm)	488.9 16.88	464.8 - 514.8	2.3
Petiole cross section (cm^2)	21.8 1.44	19.2 - 25.7	7.6
Leaf area (m^2)	6.0 0.39	5.4 - 6.8	5.6

Table 5 : Mean,range and gcv for vegetative traits in Population 2

Trait	**Mean**	**Range**	**gcv (%)**
Trunk girth (cm)	55.3 1.71	47.3 - 60.4	5.5
Trunk height (cm)	106.6 5.47	88.2 - 120.4	7.0
Rachis length (cm)	490.6 10.53	454.8 - 525.3	3.8
Petiole cross section (cm^2)	21.1 1.35	19.2 – 26.3	7.9
Leaf area (m^2)	5.9 0.37	5.2 - 6.8	7.4

Table 6 : Mean,range and gcv for physiological traits in Population 1

Trait	**Mean**	**Range**	**gcv (%)**
Leaf area index	4.1 0.36	3.4 - 4.9	7.6
Vegetative dry matter (kg/palm)	108.2 7.45	95.4 - 130.3	5.4
Bunch dry matter (kg/palm)	75.0 6.93	64.8 - 87.6	7.1
Bunch index	0.4 0.02	0.36 - 0.45	6.1

Table 7: Mean,range and gcv for physiological traits in Population 2

Trait	**Mean**	**Range**	**gcv (%)**
Leaf area index	4.3 0.26	3.4 - 4.6	6.8
Vegetative dry matter (kg/palm)	107.5 6.51	96.4 - 119.3	5.4
Bunch dry matter (kg/palm)	78.9 8.6	62.5 - 98.6	10.4
Bunch index	0.4 0.03	0.37 - 0.47	5.7

Table 8 : Heritability estimates for FFB yield and its components in Populations 1 and 2

Trait	**h^2_B (Pop 1)**		**h^2_B (Pop 2)**	
FFB yield	0.70	0.246	0.62	0.337
Bunch no./palm	0.49	0.377	0.77	0.329
Average bunch wt	0.83	0.356	0.54	0.342

Table 9 : Heritability estimates for bunch and fruit components in Populations 1 and 2

Trait	**h^2_B (Pop 1)**		**h^2_B (Pop 2)**	
% Fruit/bunch	0.70	0.362	0.56	0.340
% Oil/bunch	0.74	0.359	0.78	0.328
% Kernel/bunch	0.84	0.356	0.76	0.329
Fruit weight	0.86	0.356	0.73	0.331
% Mesocarp/fruit	0.81	0.357	0.84	0.327
% Shell/fruit	0.73	0.360	0.85	0.326
% Kernel/fruit	0.85	0.356	0.81	0.327
% Oil/wet mesocarp	0.55	0.372	0.81	0.327

Table 10 : Heritability estimates for vegetative traits in Populations 1 and 2

Trait	**h^2_B (Pop 1)**		**h^2_B (Pop 2)**	
Trunk girth	0.72	0.360	0.86	0.326
Trunk height	0.59	0.369	0.79	0.328
Rachis length	0.46	0.380	0.86	0.326
Petiole cross section	0.73	0.360	0.77	0.329
Leaf area	0.59	0.367	0.73	0.330

Table 11 : Heritability estimates for physiological traits in Populations 1 and 2

Trait	**h^2_B (Pop 1)**		**h^2_B (Pop 2)**	
Leaf area index	0.59	0.369	0.69	0.332
Vegetative dry matter	0.56	0.371	0.69	0.332
Bunch dry matter	0.55	0.372	0.65	0.334
Bunch index	0.81	0.356	0.63	0.334

CONCLUSIONS

- Low genetic variability
- Improvement by introgression of genes
- Moderate to high broad-sense heritability noted for most of the traits

Thank you