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**Fig. S1** Oil palm breeding program at Prince of Songkla University, Thailand. Deli *dura* and AVROS *pisifera* were genetic backgrounds of *tenera* hybrids imported from Malaysia during 1980s-1990s to plantation in southern Thailand. A population of 501 palms from either selfed or crossed *tenera*s selected based on individual performance were planted at Khlong Hoy Kong Research Station, Songkhla. The population was a segregation of *dura, pisifera* and *tenera* palms. Selected *dura* plants were selfed for multiplication purpose and crossed with *pisifera* for *tenera* seed production. The asterisk indicates where the studied materials were from.

**Table S1** Analysis of variance, means and coefficient of variation (CV) for leaf area (LA), plant height (PH), stem diameter (SD), fresh weight (FW), dry weight (DW) and number of leaves per plant (NL), root to shoot ratio (RS), proline content, SPAD value and Fv/Fm for eight DxP genotypes (G) after 3 months of growing under three drought severity (DS): well-watered (WW), moderate stress (MS) and severe stress (SS)

|  |  |
| --- | --- |
| Treatment | Traits |
| LA (cm2) | PH (cm) |  SD (cm) | FW (g) | DW (g) | RS | NL | Proline (µmol/g FW) | SPAD | Fv/Fm |
| Genotype |  |  |  |  |  |  |  |  |  |  |
| PSU- 96PSU- 106PSU- 128PSU- 206PSU- 208PSU- 210PSU- 220PSU- 206/1 |  1111.67bcd 1211.50ab 1083.50 bcd 1005.67 bcd 1330.33a 966.17d 967.67cd 1175.67abc | 12.4412.3911.8313.1111.8912.8912.1111.56 | 2.812.743.173.103.003.113.183.22 |  127.38125.84109.81115.23141.14108.17112.00125.43 | 29.37ab28.56ab25.37b24.83b32.81a22.99b24.90b28.40ab |  0.44a 0.30ab 0.32ab 0.32ab 0.27b 0.35ab 0.33ab 0.32ab | 9.67ab10.56a9.56ab10.00ab8.67b8.56b9.11ab8.44b | 1.62b1.61b1.70ab1.67ab1.50b1.67ab2.05a1.86ab | 60.14a57.81ab53.00b54.70ab57.40ab56.69ab57.69ab56.29ab | 0.7100.7440.7410.7350.7310.7370.7350.715 |
| DSWWMSSS |  1319.25a 1210.06b 790.25c | 13.42a12.83a10.58b | 3.34a3.36a2.43b |  142.93a125.88b93.06c |  277.34a 153.56b 70.64c |  0.32b 0.28b 0.39a | 11.13a9.17b7.67c | 1.60c1.70b1.83a | 57.0456.8056.00 | 0.752a0.739a0.701b |
| F-testGDSG×DS |  \*\* \*\* \*\* |  ns \*\* ns |  ns \*\* ns | ns\*\*ns | \*\*\*\*ns |  \* \*\* ns | \*\*\*\*\* | \*\*\*\* | \*nsns | ns \*\* ns |
| CV (%) |  12.59 |  10.04 |  12.25 |  10.04 |  12.78 |  23.54 | 13.39 | 11.54 | 6.49 | 4.33 |

Note: Means with the same letter in the same column and within the same attribute are not significantly different at a probability level of 0.05 (the Tukey test)

ns represents no significance

\* represents significant difference at P ≤ 0.05

\*\* represents significant difference at P ≤ 0.01

**Table S2** Means for leaf area (LA), plant height (PH), stem diameter (SD), fresh weight (FW), dry weight (DW), number of leaves per plant (NL), root to shoot ratio (RS), proline content, SPAD value and Fv/Fm for eight DxP progenies after 6 months of growing under three drought severity (DS): well-watered (WW), moderate stress (MS) and severe stress (SS).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Genotypes | LA (cm2) | PH (cm) | SD (cm) | FW (g) | DW (g) |
|  | WW | MS | SS | WW | MS | SS | WW | MS | SS | WW | MS | SS | WW | MS | SS |
| PSU-96 | 6207c | 4493c | 2703cd | 30.0ab | 23.3 | 20.3ab | 5.6 | 5.0 | 3.8 | 848b | 528ab | 281ab | 298 | 141ab | 75ab |
| PSU-106 | 10041a | 5255b | 2851bc | 35.3a | 25.6 | 24.5a | 5.7 | 5.3 | 3.7 | 1498a | 617ab | 322a | 342 | 158ab | 85a |
| PSU-128 | 7828bc | 5754ab | 2643cd | 35.3a | 26.6 | 21.3ab | 5.8 | 5.0 | 4.0 | 1061ab | 691a | 289bc | 285 | 187a | 67ab |
| PSU-206 | 7364bc | 6282a | 3005ab | 29.3ab | 24.6 | 23.3ab | 5.8 | 5.1 | 3.7 | 1059ab | 624ab | 316ab | 309 | 175a | 83a |
| PSU-208 | 8333ab | 4345c | 2791cd | 33.0ab | 24.3 | 22.6ab | 6.3 | 4.7 | 3.7 | 1131ab | 546ab | 257bc | 275 | 159ab | 66ab |
| PSU-210 | 7093bc | 4143c | 2572d | 29.6ab | 24.6 | 22.0ab | 7.0 | 4.9 | 3.5 | 971b | 446b | 231c | 248 | 115b | 54b |
| PSU-220 | 6706bc | 4406c | 3056a | 25.3b | 21.6 | 20.0b | 6.3 | 4.5 | 3.9 | 1071ab | 520ab | 277bc | 211 | 135ab | 70ab |
| PSU-206/1 | 8384ab | 4154c | 2992ab | 28.6ab | 25.0 | 21.3ab | 5.9 | 4.9 | 3.8 | 945b | 584ab | 246c | 247 | 155ab | 62ab |
| Genotypes | NL | RS | Proline (µmol/g FW) |  SPAD | Fv/Fm |
|  | WW | MS | SS | WW | MS | SS | WW | MS | SS | WW | MS | SS | WW | MS | SS |
| PSU-96 | 7.0b | 7.0ab | 3.6abc | 0.23 | 0.35 | 0.36a | 1.35 | 1.11bc | 2.27bc | 61.3a | 61.2a | 59.9a | 0.78ab | 0.75b | 0.74bc |
| PSU-106 | 11.0a | 8.0a | 5.6ab | 0.29 | 0.30 | 0.34ab | 1.38 | 1.33ab | 2.88a | 60.7ab | 56.0ab | 57.3ab | 0.79a | 0.78a | 0.76ab |
| PSU-128 | 9.3a | 7.3a | 4.3abc | 0.21 | 0.33 | 0.28cd | 1.04 | 0.96c | 2.86ab | 57.3ab | 51.2b | 57.7ab | 0.77ab | 0.77ab | 0.72c |
| PSU-206 | 9.6a | 7.3a | 3.3bc | 0.30 | 0.27 | 0.32ab | 1.01 | 1.18bc | 2.89a | 56.2ab | 54.6ab | 53.9ab | 0.77ab | 0.77ab | 0.78a |
| PSU-208 | 9.6a | 7.3a | 3.3bc | 0.24 | 0.28 | 0.24d | 0.74 | 1.50ab | 1.90c | 61.8ab | 57.2ab | 58.5a | 0.77b | 0.76ab | 0.77ab |
| PSU-210 | 9.3a | 4.0b | 4.0abc | 0.21 | 0.30 | 0.34ab | 1.04 | 1.69a | 2.31ab | 58.7a | 52.2ab | 58.2ab | 0.79a | 0.79a | 0.76ab |
| PSU-220 | 9.6a | 7.0ab | 6.0a | 0.28 | 0.33 | 0.31abc | 1.00 | 1.20bc | 1.91bc | 53.4ab | 56.8ab | 51.9b | 0.78ab | 0.78a | 0.74cd |
| PSU-206/1 | 9.3a | 6.7ab | 3.0c | 0.20 | 0.26 | 0.28bcd | 0.74 | 1.46ab | 2.49ab | 57.2ab | 56.8ab | 57.4ab | 0.78ab | 0.78a | 0.77ab |

Note: Means with the same letter in the same column and within the same attribute are not significantly different at a probability level of 0.05 (the Tukey test)

**Table S3** Principal components for 9 physiological and growth traits from eight oil palm genotypes grown under well water (WW) and severe stress (SS) conditions and under well water (WW) and moderate stress (MS) conditions for 6 months

|  |  |  |
| --- | --- | --- |
|  | SS and WWconditions |  MS and WW conditions |
|  | PC1 | PC2 | PC1 | PC2 |
| Eigen values | 5.67 | 1.25 | 5.16 | 1.55 |
| % of total variance | 62.94 | 13.85 | 57.37 | 17.21 |
| Cumulative % | 62.94 | 76.80 | 57.37 | 74.58 |
| Eigen vector |  |  |  |  |
| Variables |  |  |  |  |
|  FW | 0.41 | -0.09 | 0.41 | 0.02 |
|  DW | 0.41 | -0.11 | 0.41 | -0.03 |
|  NL | 0.34 | -0.22 | 0.36 | -0.10 |
|  PH | 0.33 | -0.22 | 0.40 | 0.05 |
|  LA | 0.41 | -0.04 | 0.42 | 0.09 |
|  RS | -0.30 | -0.35 | -0.26 | -0.37 |
|  Proline | -0.38 | -0.20 | -0.24 | -0.30 |
|  SPAD | 0.15 | -0.48 | 0.25 | -0.46 |
|  Fv/Fm | 0.19 | 0.70 | -0.09 | 0.74 |

LA:leaf area, PH: plant height, RS: root to shoot ratio,

FW: fresh weight, DW: dry weight, NL: number of leaves per plant

**Table S4** Principal components for drought tolerance indices (DTIs) based on proline content and growth traits of eight oil palm progenies under severe stress (SS) and moderate stress (MS) conditions.

|  |  |  |
| --- | --- | --- |
|  |  SS conditions |  MS conditions |
|  | PC1 | PC2 | PC1 | PC2 |
| Eigen values | 4.30 | 1.12 | 4.04 | 0.64 |
| % of total variance | 61.39 | 15.95 | 80.80 | 12.80 |
| Cumulative % | 61.39 | 77.34 | 80.80 | 93.60 |
| Eigen vector |  |  |  |  |
| Variables |  |  |  |  |
|  FW | 0.45 | 0.03 | 0.48 | -0.26 |
|  DW | 0.43 | 0.25 | 0.44 | 0.31 |
|  NL | 0.29 | -0.44 | 0.43 | -0.61 |
|  PH | 0.31 | 0.63 | 0.39 | 0.68 |
|  LA | 0.37 | 0.29 | 0.49 | -0.04 |
|  RS | 0.38 | 0.46 |  |  |
|  Proline | 0.39 | 0.23 |  |  |

LA:leaf area, PH: plant height, FW: fresh weight, DW: dry weight,

 NL: number of leaves per plant, RS: root to shoot ratio.