**Table S1: Weather variables during testing years at experimental location during crop season (March to July)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** |  **Average Temperature**  **(0C)** | **Average RH (%)** | **Total Rainfall (mm)** | **Average Sunshine (hrs)** |
|  | Max | Min | Max | Min |  |  |
| 2009 | 26.04 | 16.74 | 84.36 | 54.06 | 1590.76 | 2.70 |
| 2010 | 26.08 | 17.46 | 88.88 | 57.80 | 2284.30 | 2.51 |
| 2011 | 26.07 | 16.51 | 85.85 | 51.11 | 1884.90 | 3.10 |
| 2012 | 25.91 | 16.58 | 87.33 | 53.51 | 1983.70 | 2.85 |
| 2013 | 25.69 | 16.74 | 80.81 | 52.78 | 1750.10 | 3.20 |
| 2014 | 27.23 | 16.32 | 87.98 | 51.58 | 1985.60 | 3.53 |
| 2015 | 25.50 | 16.60 | 88.60 | 54.40 | 2575.0 | 3.5 |
| 2019 | 25.70 | 16.70 | 88.20 | 64.30 | 2305.70 | 3.0 |

**Table S2: Descriptive statistics of landraces, OPVs and hybrids tested over years at Gangtok location**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Mean** | **Std Dev** | **Min** | **Max** |
|  | LR | OPV | SCH | LR | OPV | SCH | LR | OPV | SCH | LR | OPV | SCH |
| YPHA | 4.53 | 5.58 | 8.85 | 1.63 | 2.81 | 3.16 | 1.10 | 1.32 | 2.09 | 9.96 | 13.96 | 18.47 |
| DF | 87.21 | 78.37 | 73.83 | 12.87 | 9.92 | 5.39 | 54.0 | 48.0 | 62.0 | 120.0 | 112.0 | 89.0 |
| DS | 94.40 | 81.47 | 76.64 | 14.26 | 9.88 | 6.22 | 59.0 | 54.0 | 66.0 | 125.0 | 115.0 | 91.0 |
| ASI | 7.18 | 3.09 | 2.98 | 3.23 | 2.43 | 1.79 | 1.0 | 0 | 0.50 | 16.0 | 11.0 | 9.0 |
| DM | 132.60 | 120.73 | 115.98 | 12.31 | 11.26 | 6.55 | 103.0 | 91.0 | 99.0 | 159.0 | 160.0 | 130.0 |
| PH | 306.80 | 207.40 | 159.60 | 54.79 | 37.97 | 19.06 | 148.0 | 127.55 | 104.0 | 430.0 | 308.0 | 221.0 |
| CL | 17.57 | 18.78 | 17.40 | 2.24 | 2.06 | 1.71 | 10.30 | 14.2.0 | 12.30 | 22.80 | 24.0 | 25.60 |
| CD | 13.91 | 14.84 | 14.88 | 1.35 | 0.79 | 1.37 | 7.80 | 12.33 | 10.0 | 19.30 | 16.04 | 21.60 |
| NCPPT | 33.49 | 81.26 | 51.05 | 2.94 | 26.75 | 17.82 | 19.0 | 23.0 | 12.0 | 41.0 | 145.4 | 93.0 |
| KRPC | 12.59 | 13.73 | 14.06 | 1.37 | 0.87 | 0.97 | 9.30 | 10.66 | 11.60 | 16.30 | 16.0 | 16.80 |
| KPR | 32.25 | 37.20 | 32.95 | 4.53 | 4.87 | 3.17 | 20.40 | 250 | 22.70 | 44.70 | 51.0 | 40.30 |
| TW | 316.10 | 293.50 | 309.17 | 50.93 | 43.59 | 29.85 | 109.0 | 199.20 | 225.55 | 412.0 | 382.01 | 378.78 |

**TABLE 3:| Standardized major axis (SMA) slopes fitted within individual cultivar type**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Traits** | **Cultivar types** | **n** | **slope** | **CI****(lower limit)** | **CI****(upper limit)** | **R2** | **p‐value** |
| YPHA‐PH |  | OPV | 51 | 0.07 | 0.06 | 0.10 | 0.002 | 0.755 |
| LR | 171 | 0.03 | 0.03 | 0.03 | 0.109 | **0.000** |
|  | SCH | 151 | 0.17 | 0.14 | 0.19 | 0.117 | **0.000** |
| YPHA‐DF |  | OPV | 51 | 0.28 | 0.21 | 0.37 | 0.037 | 0.176 |
|  | LR | 171 | 0.13 | 0.11 | 0.15 | 0.068 | **0.001** |
|  | SCH | 151 | ‐0.59 | ‐0.69 | ‐0.50 | 0.049 | **0.006** |
| YPHA‐DS |  | OPV | 51 | 0.28 | 0.21 | 0.38 | 0.014 | 0.408 |
|  | LR | 171 | 0.11 | 0.10 | 0.13 | 0.049 | **0.004** |
|  |  SCH | 151 |  -0.51 | -0.59 | -0.43 | 0.061 | **0.002** |
| YPHA‐DM |  | OPV | 51 | 0.25 | 0.19 | 0.33 | 0.011 | 0.456 |
|  | LR | 171 | 0.13 | 0.11 | 0.15 | 0.084 | **0.000** |
|  | SCH | 151 | ‐0.48 | ‐0.56 | ‐0.41 | 0.066 | **0.001** |
| YPHA‐CL |  | OPV | 51 | 1.36 | 1.03 | 1.81 | 0.000 | 0.978 |
|  | LR | 171 | 0.73 | 0.63 | 0.84 | 0.089 | **0.000** |
|  | SCH | 151 | 1.85 | 1.60 | 2.13 | 0.214 | **0.000** |
| YPHA‐CD |  | OPV | 51 | 3.54 | 2.70 | 4.63 | 0.101 | **0.023** |
|  | LR | 171 | 1.20 | 1.04 | 1.40 | 0.038 | **0.010** |
|  | SCH | 151 | 2.30 | 1.99 | 2.65 | 0.210 | **0.000** |
| YPHA‐KRPC |  | OPV | 51 | 3.22 | 2.43 | 4.26 | 0.016 | 0.380 |
|  | LR | 171 | 1.19 | 1.02 | 1.38 | 0.040 | **0.008** |
|  | SCH | 151 | 3.23 | 2.76 | 3.79 | 0.041 | **0.013** |
| YPHA‐KPR |  | OPV | 51 | ‐0.58 | ‐0.76 | ‐0.44 | 0.042 | 0.151 |
|  | LR | 171 | 0.36 | 0.31 | 0.42 | 0.113 | **0.000** |
|  | SCH | 151 | 1.00 | 0.87 | 1.15 | 0.250 | **0.000** |
| YPHA‐ NCPPT |  | OPV | 51 | 0.11 | 0.08 | 0.14 | 0.007 | 0.558 |
| LR | 171 | 0.56 | 0.48 | 0.64 | 0.069 | **0.001** |
|  |
| SCH | 151 | 0.21 | 0.20 | 0.22 | 0.924 | **0.000** |
| YPHA‐ TW |  | OPV | 51 | 0.06 | 0.05 | 0.08 | 0.138 | **0.007** |
|  | LR | 171 | 0.03 | 0.03 | 0.04 | 0.008 | 0.253 |
|  |  SCH | 151 |  -0.11 | -0.12 | -0.09 | 0.013 | 0.168 |
| YPHA‐ASI |  | OPV | 51 | ‐1.15 | ‐1.51 | ‐0.88 | 0.109 | **0.018** |
|  | LR | 171 | ‐0.50 | ‐0.59 | ‐0.43 | 0.003 | 0.448 |
| SCH | 151 | ‐1.76 | ‐2.06 | ‐1.50 | 0.037 | **0.018** |

 Bold values signifies significant correlation at P < 0.05