**Supplementary Table 1**: The carotenoid profile of the 147 maize inbred lines used in the present study

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial number** | **Line** | **Lutein**  | **Zeaxanthin** | **β-cryptoxanthin** | **α-carotene**  | **β-carotene**  | **Provitamin A**  | **Total-carotenoids** |
| 1 | TZMI2010-1 | 9.58 | 20.91 | 3.23 | 0.86 | 6.52 | 8.52 | 41.53 |
| 2 | TZMI2010-2 | 9.13 | 22.38 | 3.05 | 1.12 | 6.42 | 8.39 | 42.02 |
| 3 | TZMI2011 | 14.49 | 5.00 | 2.88 | 1.15 | 6.07 | 7.99 | 29.80 |
| 4 | TZMI2012 | 8.34 | 6.17 | 3.76 | 1.35 | 6.72 | 9.37 | 26.93 |
| 5 | TZMI2013 | 2.37 | 19.89 | 4.91 | 1.34 | 5.74 | 8.87 | 34.08 |
| 6 | TZMI2014-1 | 2.92 | 15.61 | 3.83 | 1.08 | 4.48 | 7.02 | 28.11 |
| 7 | TZMI2015-1 | 2.09 | 15.52 | 2.69 | 0.92 | 3.79 | 5.63 | 25.05 |
| 8 | TZMI2015-2 | 2.99 | 18.47 | 3.59 | 1.13 | 4.12 | 6.39 | 30.45 |
| 9 | TZMI2015-2 | 2.63 | 18.69 | 3.37 | 1.00 | 3.94 | 6.09 | 29.66 |
| 10 | TZMI2015-3 | 1.75 | 16.83 | 3.08 | 0.98 | 3.60 | 5.66 | 26.14 |
| 11 | TZMI2015-4 | 2.12 | 15.27 | 3.57 | 1.08 | 4.21 | 6.47 | 26.75 |
| 12 | TZMI2016-1 | 2.62 | 19.07 | 5.46 | 1.66 | 6.40 | 9.98 | 35.13 |
| 13 | TZMI2016-2 | 1.67 | 12.04 | 3.24 | 1.02 | 3.88 | 6.00 | 22.04 |
| 14 | TZMI2016-3 | 2.36 | 17.97 | 5.63 | 1.56 | 6.35 | 9.99 | 34.04 |
| 15 | TZMI2017-1 | 4.97 | 6.17 | 3.09 | 0.89 | 6.71 | 8.60 | 21.62 |
| 16 | TZMI2018-1 | 7.38 | 6.40 | 4.40 | 1.46 | 8.45 | 11.35 | 28.42 |
| 17 | TZMI2018-2 | 3.36 | 23.28 | 3.36 | 1.08 | 4.72 | 7.06 | 35.85 |
| 18 | TZMI2018-3 | 6.98 | 12.03 | 5.49 | 1.26 | 7.94 | 11.45 | 33.85 |
| 19 | TZMI2018-4 | 7.43 | 6.75 | 4.60 | 1.51 | 9.18 | 12.23 | 29.90 |
| 20 | TZMI2019 | 3.07 | 1.25 | 3.84 | 1.42 | 15.49 | 18.17 | 25.30 |
| 21 | TZMI2022-2 | 16.96 | 15.48 | 3.81 | 1.15 | 4.81 | 7.40 | 42.36 |
| 22 | TZMI2022-4 | 28.04 | 17.91 | 2.54 | 1.03 | 3.54 | 5.11 | 52.76 |
| 23 | TZMI2023-5-1 | 14.03 | 29.48 | 5.96 | 2.43 | 9.00 | 13.21 | 60.91 |
| 24 | TZMI2023-5-2 | 10.12 | 32.44 | 4.81 | 2.07 | 7.97 | 11.47 | 57.19 |
| 25 | TZMI2024-1-1 | 6.62 | 3.45 | 3.68 | 1.23 | 9.11 | 11.67 | 23.80 |

**Supplementary Table 1:** The carotenoid profile of the 147 maize inbred lines used in the present study(continued)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial number** | **Line** | **Lutein**  | **Zeaxanthin** | **β-cryptoxanthin** | **α-carotene**  | **β-carotene**  | **Provitamin A**  | **Total-carotenoids** |
| 26 | TZMI2024-1-2 | 6.89 | 3.55 | 3.57 | 1.23 | 9.74 | 12.23 | 25.07 |
| 27 | TZMI2024-2-1 | 9.70 | 4.30 | 4.23 | 1.41 | 10.49 | 13.31 | 30.20 |
| 28 | TZMI2024-2-2 | 7.85 | 3.19 | 3.79 | 1.27 | 8.50 | 10.95 | 24.44 |
| 29 | TZMI2025-1-1 | 8.96 | 3.56 | 4.01 | 1.39 | 10.79 | 13.45 | 30.24 |
| 30 | TZMI2025-1-2 | 5.77 | 2.88 | 3.02 | 1.12 | 8.32 | 10.27 | 20.90 |
| 31 | TZMI2025-2 | 8.31 | 3.10 | 3.78 | 1.20 | 9.17 | 11.83 | 25.56 |
| 32 | TZMI2025-3 | 9.43 | 3.48 | 3.45 | 1.14 | 9.08 | 11.37 | 26.33 |
| 33 | TZMI2025-4 | 5.97 | 4.89 | 4.39 | 1.11 | 10.54 | 13.23 | 26.86 |
| 34 | TZMI2025-5 | 7.44 | 4.79 | 4.09 | 1.35 | 11.57 | 14.31 | 29.23 |
| 35 | TZMI2027-1 | 5.21 | 2.66 | 2.55 | 0.90 | 4.79 | 6.51 | 18.01 |
| 36 | TZMI2027-2 | 4.92 | 2.25 | 1.82 | 0.59 | 4.57 | 5.72 | 14.01 |
| 37 | TZMI2028-1-1 | 11.41 | 3.52 | 4.47 | 1.74 | 12.52 | 15.60 | 33.43 |
| 38 | TZMI2028-1-2 | 8.13 | 3.81 | 4.32 | 1.82 | 13.85 | 16.81 | 31.44 |
| 39 | TZMI2028-2-1 | 5.26 | 3.48 | 2.80 | 0.79 | 5.38 | 7.18 | 17.58 |
| 40 | TZMI2028-2-2 | 3.75 | 2.02 | 1.97 | 0.67 | 4.05 | 5.45 | 12.99 |
| 41 | TZMI2028-3-1 | 11.20 | 3.82 | 2.94 | 1.18 | 9.58 | 11.53 | 28.03 |
| 42 | TZMI2028-3-2 | 7.95 | 3.52 | 2.59 | 1.12 | 9.73 | 11.60 | 25.12 |
| 43 | TZMI2028-4 | 6.44 | 2.74 | 3.45 | 1.15 | 8.08 | 10.40 | 21.96 |
| 44 | TZMI2028-5-1 | 4.25 | 2.09 | 1.67 | 0.48 | 4.09 | 5.24 | 12.99 |
| 45 | TZMI2028-5-2 | 4.86 | 3.43 | 3.61 | 1.06 | 5.75 | 8.09 | 18.71 |
| 46 | TZMI2029-1 | 8.28 | 8.82 | 5.43 | 1.80 | 11.23 | 14.62 | 35.32 |
| 47 | TZMI2029-2 | 1.83 | 2.22 | 3.00 | 1.11 | 10.65 | 12.94 | 19.19 |
| 48 | TZMI2029-3-1 | 5.31 | 7.16 | 5.38 | 1.82 | 11.41 | 15.14 | 31.27 |
| 49 | TZMI2029-3-2 | 1.65 | 4.20 | 4.32 | 1.31 | 11.10 | 13.87 | 22.83 |
| 50 | TZMI2029-3-3 | 2.39 | 2.43 | 3.72 | 1.22 | 10.00 | 12.44 | 19.59 |

**Supplementary Table 1:** The carotenoid profile of the 147 maize inbred lines used in the present study(continued)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial number** | **Line** | **Lutein**  | **Zeaxanthin** | **β-cryptoxanthin** | **α-carotene**  | **β-carotene**  | **Provitamin A**  | **Total-carotenoids** |
| 51 | TZMI2030 | 3.38 | 9.71 | 4.62 | 1.16 | 8.50 | 11.21 | 27.27 |
| 52 | TZMI2038 | 10.22 | 5.24 | 3.98 | 1.35 | 5.75 | 8.43 | 26.54 |
| 53 | TZMI2051 | 2.65 | 16.93 | 6.21 | 1.63 | 6.97 | 10.89 | 34.41 |
| 54 | TZMI2054-1 | 5.30 | 18.77 | 3.53 | 1.21 | 5.98 | 8.36 | 34.68 |
| 55 | TZMI2054-2 | 2.30 | 19.45 | 2.86 | 1.02 | 4.32 | 6.35 | 29.54 |
| 56 | TZMI2055 | 2.88 | 21.03 | 4.60 | 1.44 | 5.69 | 8.67 | 35.68 |
| 57 | TZMI2056 | 7.81 | 14.08 | 3.47 | 1.03 | 2.88 | 5.05 | 29.10 |
| 58 | TZMI2058 | 13.73 | 28.82 | 4.68 | 1.66 | 10.12 | 13.20 | 58.87 |
| 59 | TZMI20661 | 11.21 | 23.36 | 2.37 | 0.84 | 6.01 | 7.57 | 43.29 |
| 60 | TZMI20662 | 9.98 | 25.45 | 2.49 | 0.74 | 6.42 | 8.02 | 45.05 |
| 61 | TZMI2078 | 12.40 | 32.25 | 10.48 | 2.55 | 7.92 | 14.40 | 65.62 |
| 62 | TZMI2033-1 | 9.65 | 4.76 | 3.86 | 1.36 | 11.68 | 14.32 | 31.49 |
| 63 | TZMI2033-2 | 8.09 | 4.79 | 3.68 | 1.05 | 10.83 | 13.09 | 28.49 |
| 64 | TZMI2034-1 | 8.55 | 2.62 | 3.91 | 1.33 | 10.41 | 13.09 | 26.81 |
| 65 | TZMI2034-2 | 9.98 | 3.67 | 2.69 | 1.14 | 10.27 | 12.07 | 27.43 |
| 66 | TZMI2035-1-1 | 9.86 | 4.03 | 3.99 | 1.51 | 10.72 | 13.42 | 30.19 |
| 67 | TZMI2035-1-2 | 8.07 | 3.76 | 3.18 | 1.17 | 8.90 | 11.16 | 24.95 |
| 68 | TZMI2035-2 | 8.22 | 5.20 | 3.37 | 1.39 | 12.77 | 15.11 | 30.78 |
| 69 | TZMI2036-1 | 10.17 | 4.95 | 3.86 | 1.38 | 10.83 | 13.45 | 31.09 |
| 70 | TZMI2036-2 | 8.37 | 2.58 | 2.93 | 1.03 | 9.48 | 11.51 | 24.20 |
| 71 | TZMI2041-1 | 2.93 | 3.91 | 3.47 | 1.41 | 8.32 | 10.73 | 19.87 |
| 72 | TZMI2041-2 | 2.35 | 3.83 | 4.58 | 1.58 | 9.87 | 12.98 | 22.42 |
| 73 | TZMI2042 | 2.64 | 2.95 | 2.92 | 1.12 | 6.52 | 8.56 | 15.86 |
| 74 | TZMI2043-1 | 2.99 | 3.35 | 3.01 | 1.15 | 7.07 | 9.24 | 17.65 |
| 75 | TZMI2043-2 | 3.28 | 2.59 | 2.41 | 0.75 | 5.42 | 6.99 | 14.54 |

**Supplementary Table 1:** The carotenoid profile of the 147 maize inbred lines used in the present study(continued)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial number** | **Line** | **Lutein**  | **Zeaxanthin** | **β-cryptoxanthin** | **α-carotene**  | **β-carotene**  | **Provitamin A**  | **Total-carotenoids** |
| 76 | TZMI2052-1 | 16.52 | 3.22 | 4.84 | 1.66 | 6.01 | 9.18 | 31.93 |
| 77 | TZMI2052-2 | 10.05 | 3.79 | 5.04 | 1.56 | 6.09 | 9.37 | 26.45 |
| 78 | TZMI2053 | 4.67 | 5.42 | 5.28 | 1.69 | 6.57 | 10.03 | 23.20 |
| 79 | TZMI2057 | 11.63 | 25.67 | 4.08 | 1.54 | 8.03 | 10.84 | 51.03 |
| 80 | TZMI2059 | 8.59 | 14.25 | 4.43 | 1.21 | 7.48 | 10.40 | 35.74 |
| 81 | TZMI2062 | 8.57 | 5.30 | 5.18 | 1.81 | 13.42 | 16.71 | 34.50 |
| 82 | TZMI2113 | 5.76 | 25.77 | 6.87 | 2.34 | 11.50 | 16.12 | 52.04 |
| 83 | TZMI2115 | 8.81 | 4.07 | 4.41 | 1.73 | 13.33 | 16.42 | 32.41 |
| 84 | TZMI2116 | 8.24 | 4.78 | 5.32 | 2.09 | 16.45 | 20.16 | 18.09 |
| 85 | TZMI2031-1-1 | 7.98 | 4.44 | 3.24 | 1.31 | 11.23 | 13.47 | 28.07 |
| 86 | TZMI2031-1-2 | 7.19 | 3.32 | 3.15 | 1.24 | 11.92 | 14.09 | 26.79 |
| 87 | TZMI2031-2-1 | 6.95 | 4.44 | 3.42 | 1.20 | 12.13 | 14.44 | 28.01 |
| 88 | TZMI2031-2-2 | 7.47 | 4.96 | 3.35 | 1.08 | 11.85 | 13.85 | 28.92 |
| 89 | TZMI2032-1-1 | 4.44 | 5.10 | 3.56 | 1.28 | 12.03 | 14.45 | 26.38 |
| 90 | TZMI2032-1-2 | 7.43 | 3.13 | 3.65 | 5.07 | 11.06 | 15.55 | 30.58 |
| 91 | TZMI2032-2-1 | 6.92 | 3.58 | 3.52 | 1.14 | 11.60 | 13.88 | 26.76 |
| 92 | TZMI2032-2-2 | 8.01 | 3.74 | 3.34 | 1.27 | 11.59 | 13.88 | 27.98 |
| 93 | TZMI2039 | 5.55 | 3.27 | 3.42 | 1.32 | 7.53 | 9.72 | 20.72 |
| 94 | TZMI2045-1 | 5.55 | 26.95 | 3.84 | 1.07 | 8.67 | 11.11 | 45.97 |
| 95 | TZMI2045-2 | 4.31 | 23.69 | 3.74 | 1.35 | 6.96 | 9.47 | 39.97 |
| 96 | TZMI2046-1 | 6.41 | 1.97 | 2.42 | 1.07 | 8.69 | 10.42 | 20.34 |
| 97 | TZMI2046-2 | 7.14 | 2.12 | 2.57 | 0.82 | 8.38 | 10.01 | 20.99 |
| 98 | TZMI2047 | 5.85 | 14.30 | 7.82 | 1.98 | 12.95 | 17.86 | 42.92 |
| 99 | TZMI2048 | 5.52 | 7.30 | 7.14 | 1.49 | 12.93 | 17.14 | 34.25 |
| 100 | TZMI2049-1 | 3.16 | 23.45 | 6.07 | 1.58 | 8.30 | 12.14 | 41.89 |

**Supplementary Table 1:** The carotenoid profile of the 147 maize inbred lines used in the present study(continued)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial number** | **Line** | **Lutein**  | **Zeaxanthin** | **β-cryptoxanthin** | **α-carotene**  | **β-carotene**  | **Provitamin A**  | **Total-carotenoids** |
| 101 | TZMI2049-2-1 | 3.19 | 16.77 | 5.86 | 1.55 | 8.41 | 12.19 | 35.81 |
| 102 | TZMI2049-2-2 | 4.07 | 18.77 | 4.93 | 1.30 | 6.42 | 9.43 | 35.35 |
| 103 | TZMI2050 | 2.94 | 21.37 | 8.24 | 1.81 | 9.67 | 14.69 | 43.72 |
| 104 | TZMI2060-1 | 12.72 | 2.39 | 4.45 | 1.69 | 8.35 | 11.54 | 29.48 |
| 105 | TZMI2060-2 | 13.08 | 2.29 | 4.36 | 1.49 | 7.93 | 10.94 | 29.12 |
| 106 | TZMI2060-3 | 9.70 | 2.12 | 2.45 | 0.96 | 7.44 | 9.11 | 22.81 |
| 107 | TZMI2068 | 3.83 | 23.28 | 4.01 | 1.42 | 13.83 | 16.58 | 46.35 |
| 108 | TZMI2075 | 4.99 | 31.14 | 8.72 | 2.27 | 7.94 | 13.42 | 55.07 |
| 109 | TZMI2081 | 11.65 | 7.02 | 3.47 | 1.65 | 11.83 | 14.49 | 36.04 |
| 110 | TZMI2101-1 | 7.29 | 3.08 | 3.71 | 1.42 | 8.51 | 11.17 | 22.30 |
| 111 | TZMI2101-2-1 | 9.79 | 3.21 | 2.82 | 1.37 | 11.41 | 13.47 | 28.60 |
| 112 | TZMI2101-2-2 | 9.09 | 4.91 | 2.91 | 1.42 | 10.84 | 12.66 | 29.03 |
| 113 | TZMI2101-2-3 | 6.87 | 3.69 | 2.63 | 1.24 | 11.15 | 13.13 | 25.26 |
| 114 | TZMI2102-1 | 9.93 | 3.78 | 3.59 | 1.32 | 11.69 | 14.37 | 30.36 |
| 115 | TZMI2102-2 | 8.73 | 3.62 | 3.16 | 1.28 | 11.74 | 13.96 | 28.36 |
| 116 | TZMI2102-3 | 9.27 | 3.99 | 3.42 | 1.47 | 12.11 | 14.63 | 30.63 |
| 117 | TZMI2103-1 | 6.57 | 2.51 | 2.96 | 1.06 | 10.90 | 12.97 | 24.01 |
| 118 | TZMI2103-2 | 6.36 | 2.65 | 2.80 | 1.17 | 9.54 | 11.58 | 22.80 |
| 119 | TZMI2104 | 7.48 | 1.67 | 3.00 | 1.25 | 10.49 | 12.64 | 23.94 |
| 120 | TZMI2105-1 | 10.42 | 4.64 | 3.70 | 1.50 | 12.82 | 15.56 | 33.08 |
| 121 | TZMI2105-2 | 12.62 | 3.64 | 3.22 | 1.43 | 12.73 | 15.00 | 33.67 |
| 122 | TZMI2106-1 | 7.84 | 4.65 | 3.37 | 1.67 | 13.20 | 15.97 | 31.11 |
| 123 | TZMI2106-2 | 9.34 | 3.71 | 3.08 | 1.35 | 13.24 | 15.41 | 30.58 |
| 124 | TZMI2107-1 | 10.57 | 4.65 | 3.41 | 1.36 | 12.03 | 14.36 | 31.88 |
| 125 | TZMI2107-2 | 12.68 | 5.69 | 3.13 | 1.39 | 11.90 | 14.07 | 34.78 |

**Supplementary Table 1:** The carotenoid profile of the 147 maize inbred lines used in the present study(continued)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial number** | **Line** | **Lutein**  | **Zeaxanthin** | **β-cryptoxanthin** | **α-carotene**  | **β-carotene**  | **Provitamin A**  | **Total-carotenoids** |
| 126 | TZMI2108-1 | 7.62 | 20.08 | 5.95 | 1.70 | 9.74 | 13.55 | 44.97 |
| 127 | TZMI2108-2 | 8.30 | 8.14 | 4.65 | 1.42 | 8.17 | 11.18 | 30.37 |
| 128 | TZMI2109 | 7.29 | 11.64 | 5.27 | 1.47 | 7.70 | 11.12 | 33.79 |
| 129 | TZMI2110 | 5.29 | 4.56 | 3.05 | 0.57 | 7.83 | 9.56 | 19.24 |
| 130 | TZMI2111 | 6.49 | 8.05 | 5.15 | 1.50 | 10.48 | 13.79 | 31.41 |
| 131 | TZMI2122 | 11.90 | 4.47 | 3.30 | 1.22 | 7.80 | 10.11 | 28.44 |
| 132 | TZMI2123 | 7.23 | 5.47 | 5.62 | 1.62 | 11.90 | 15.62 | 32.10 |
| 133 | TZMI2125 | 7.58 | 6.84 | 3.71 | 1.54 | 10.36 | 12.87 | 30.16 |
| 134 | TZMI2126-1 | 5.54 | 2.61 | 2.60 | 1.07 | 7.26 | 9.14 | 19.76 |
| 135 | TZMI2020-1 | 2.15 | 8.34 | 5.83 | 1.52 | 10.70 | 14.31 | 28.57 |
| 136 | TZMI2020-2 | 2.10 | 8.10 | 6.26 | 1.54 | 11.00 | 14.94 | 28.98 |
| 137 | TZMI2067-1-1 | 2.88 | 11.10 | 1.29 | 1.30 | 22.05 | 25.30 | 38.56 |
| 138 | TZMI2067-1-2 | 2.99 | 9.62 | 1.73 | 0.87 | 27.52 | 28.79 | 42.84 |
| 139 | TZMI2067-2 | 3.81 | 19.40 | 7.12 | 1.74 | 10.83 | 15.28 | 42.84 |
| 140 | TZMI2114 | 5.18 | 10.03 | 2.21 | 1.31 | 32.35 | 34.20 | 51.37 |
| 141 | TZMI2119 | 4.46 | 7.91 | 2.10 | 1.69 | 30.44 | 32.35 | 46.74 |
| 142 | TZMI2120  | 5.61 | 10.47 | 2.00 | 1.55 | 24.98 | 26.74 | 44.80 |
| 143 | TZMI2127 | 3.19 | 13.73 | 6.10 | 1.60 | 14.87 | 18.77 | 39.56 |
| 144 | TZI2354 | 4.88 | 18.00 | 4.39 | 1.01 | 3.75 | 6.63 | 31.83 |
| 145 | TZI2360 | 6.44 | 11.72 | 0.84 | 0.22 | 1.71 | 2.24 | 21.09 |
| 146 | 4001 | 2.75 | 13.93 | 3.39 | 0.69 | 2.57 | 4.63 | 23.55 |
| 147 | KU1409 | 9.03 | 22.90 | 3.63 | 1.50 | 6.77 | 9.42 | 44.01 |

**Supplementary Table 2:** The p-value from ANOVA for Provitamin A content and the pedigree

|  |  |  |
| --- | --- | --- |
|  Pedigree | Groups | p\_value |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 43\_26 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 38\_26 | 5E-07 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) | 43\_34 | 8.9E-06 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B) | 43\_13 | 1.73E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 43\_17 | 1.92E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 43\_1 | 0.000022 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-2-B | 43\_11 | 3.32E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 43\_12 | 3.96E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B | 43\_33 | 0.000145 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) | 38\_34 | 0.000213 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 43\_10 | 0.000267 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B | 43\_31 | 0.000285 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 38\_17 | 0.000437 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 43\_19 | 0.000553 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 38\_1 | 0.00061 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-2-B | 38\_11 | 0.000725 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B) | 38\_13 | 0.000919 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 38\_12 | 0.001202 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 43\_28 | 0.001973 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 26\_2 | 0.002457 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B | 38\_33 | 0.002788 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) | 8\_43 | 0.003847 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 3\_26 | 0.004105 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B | 38\_31 | 0.00509 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 38\_10 | 0.007842 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 43\_2 | 0.009106 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 38\_19 | 0.009143 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B | 43\_4 | 0.009982 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) | 7\_43 | 0.010256 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B | 43\_3 | 0.012261 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) | 5\_43 | 0.017522 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 38\_28 | 0.027328 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B | 43\_37 | 0.032371 |

**Supplementary Table 3:** P-value from the ANOVA for total carotenoid content and the pedigree

|  |  |  |
| --- | --- | --- |
|  Pedigree | Groups | p-value |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 10-1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 11-1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 12-1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 13-1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 17-1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 19-1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 2-1 | 2E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 26-1 | 1.1E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 28-1 | 1.5E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 3-1 | 1.6E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 31-1 | 2.9E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 32-1 | 4.5E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 33-1 | 5.1E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 34-1 | 8.6E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 37-1 | 1.17E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 38-1 | 3.12E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 4-1 | 0.001 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 43-1 | 0.001 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 5-1 | 0.001 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 7-1 | 0.001 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 8-1 | 0.002 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 11-10 | 0.002 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 12-10 | 0.004 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 13-10 | 0.010 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 17-10 | 0.014 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 19-10 | 0.015 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 2-10 | 0.026 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 26-10 | 0.030 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 5-10 | 0.039 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 26-1 | 0.040 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 19-1 | 0.044 |

**Supplementary Table 4:** P-value from ANOVA for beta-carotene content and the pedigree.

|  |  |  |
| --- | --- | --- |
|  Pedigree | Group | p-value |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 43\_26 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 38\_26 | 1.1E-06 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 43\_34 | 1.35E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B) | 43\_1 | 1.45E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B) | 43\_13 | 3.91E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-1-B) | 43\_11 | 5.45E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) | 43\_33 | 5.89E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B) | 43\_17 | 7.08E-05 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B) | 43\_12 | 0.000125 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) | 43\_31 | 0.000218 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 38\_34 | 0.000415 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B)  | 43\_10 | 0.00044 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B) | 38\_1 | 0.000558 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B) | 43\_19 | 0.000599 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) | 43\_28 | 0.000621 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-1-B) | 38\_11 | 0.001495 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) | 38\_33 | 0.001605 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B) | 38\_17 | 0.001896 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 26\_2 | 0.001939 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B)  | 38\_13 | 0.002674 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 3\_26 | 0.003874 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B) | 38\_12 | 0.004505 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B)  | 38\_31 | 0.005159 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B | 8\_43 | 0.007292 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 38\_19 | 0.012467 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 38\_28 | 0.012859 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 43\_2 | 0.014728 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 38\_10 | 0.015946 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) | 43\_4 | 0.016571 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B)  | 43\_3 | 0.017404 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B | 7\_43 | 0.019535 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B | 5\_43 | 0.04066 |

**Supplementary Table 5:** P-value from ANOVA for lutein content and the pedigree

|  |  |  |
| --- | --- | --- |
|  Pedigree | Group | p-value |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 13\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 26\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 17\_1 | 1E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 38\_1 | 1E-07 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 43\_1 | 1E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 28\_1 | 2E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 34\_1 | 2E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 2\_1 | 1.7E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 12\_1 | 5.9E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 31\_1 | 1.11E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 10\_1 | 1.81E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 3\_26 | 7.38E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-1-B | 26\_11 | 0.0006 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 37\_1 | 0.0012 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 8\_1 | 0.0012 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 5\_1 | 0.0017 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 3\_1 | 0.0021 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 33\_26 | 0.0023 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 8\_26 | 0.0036 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 7\_1 | 0.0040 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 4\_1 | 0.0048 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 26\_19 | 0.0051 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 7\_26 | 0.0081 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 26\_10 | 0.0164 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B)  | 5\_26 | 0.0190 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-1-B | 17\_11 | 0.0366 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 3\_17 | 0.0405 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-1-B | 38\_11 | 0.0465 |

**Supplementary Table 6:** P-value from ANOVA for zeaxanthin content and the pedigree

|  |  |  |
| --- | --- | --- |
|  Pedigree | Groups | p-value |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 10\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 12\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 13\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 17\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 19\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 2\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 3\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 33\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 37\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 4\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 5\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 7\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 8\_1 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 26\_10 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 26\_13 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 28\_13 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 34\_13 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 26\_2 | 0 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 11\_1 | 1E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 28\_10 | 1E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 34\_10 | 1E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 26\_12 | 2E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 28\_2 | 2E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 34\_2 | 2E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 8\_26 | 7E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 34\_12 | 8E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 28\_12 | 9E-07 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 8\_34 | 1.8E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 8\_28 | 2.1E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) | 7\_26 | 3.8E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 5\_26 | 4.1E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 7\_34 | 4.8E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 5\_34 | 5.1E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 34\_17 | 5.5E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) | 7\_28 | 5.5E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 5\_28 | 5.8E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 28\_17 | 6.3E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 26\_17 | 7.3E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 37\_34 | 8.8E-06 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 37\_28 | 0.00001 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 37\_26 | 1.29E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 3\_26 | 1.49E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 38\_1 | 1.74E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B | 34\_3 | 3.02E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B | 34\_33 | 3.36E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 3\_28 | 3.49E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 33\_28 | 0.000038 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 4\_34 | 4.51E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 4\_28 | 5.11E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-20-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 33\_26 | 6.33E-05 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B | 4\_26 | 0.00009 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 34\_19 | 0.000201 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 28\_19 | 0.000226 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-2-B | 34\_11 | 0.000238 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-2-B | 28\_11 | 0.000268 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-2-4-1-B | 26\_19 | 0.000525 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-12-5-2-2-B | 26\_11 | 0.000639 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 31\_13 | 0.001507 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 32\_1 | 0.002881 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 31\_10 | 0.003223 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-3-B | 43\_13 | 0.003726 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 31\_2 | 0.006512 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-1-B | 43\_10 | 0.007207 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 31\_12 | 0.00984 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-3-2-B | 43\_2 | 0.014288 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 43\_1 | 0.014572 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B | 8\_31 | 0.018897 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 31\_17 | 0.019324 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-21-2-2-1-B | 38\_34 | 0.019619 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-5-2-B | 43\_12 | 0.019995 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-4-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-4-1-B | 38\_28 | 0.021577 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B | 37\_31 | 0.027336 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B | 7\_31 | 0.027543 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B) vs (TZMI1017/SW 1 (S) C14-7-1-1-B)-57-1-1-2-B | 31\_1 | 0.028137 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-1-4-3-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-18-4-5-2-B | 5\_31 | 0.028804 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-15-4-5-2-B | 43\_17 | 0.035262 |
| (TZMI1029/SW 5 (S) C6-18-2-1-B)-1-2-2-2-B) vs (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B | 8\_43 | 0.036984 |
| (TZMI1046/SW 5 (S) C6-18-3-1-B)-35-1-1-1-B) vs (TZMI1029/SW 5 (S) C6-18-2-1-B)-32-3-2-2-B | 43\_37 | 0.048879 |