**Table S1:** Results of Pairwise Population Fst Analysis

Fst Calculated Via Frequency Option
No. Samples 135 and No. Pops 23

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acce-1 | Acce-2 | Acce-3 | Acce-4 | Acce-5 | Acce-6 | Acce-7 | Acce-8 | Acce-9 | Acce-10 | Acce-11 | Acce-12 | Acce-13 | Acce-14 | Acce-15 | Acce-16 | Acce-17 | Acce-18 | Acce-19 | Acce-20 | Acce-21 | Acce-22 | Acce-23 |

**Pairwise Population Fst Values**

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 0,000 | | | | | | | | | | | | | | | | | | | | | | | A |
| B | 0,185 | 0,000 | | | | | | | | | | | | | | | | | | | | | | B |
| C | 0,124 | 0,249 | 0,000 | | | | | | | | | | | | | | | | | | | | | C |
| D | 0,123 | 0,235 | 0,178 | 0,000 | | | | | | | | | | | | | | | | | | | | D |
| E | 0,184 | 0,288 | 0,269 | 0,237 | 0,000 | | | | | | | | | | | | | | | | | | | E |
| F | 0,127 | 0,252 | 0,146 | 0,188 | 0,237 | 0,000 | | | | | | | | | | | | | | | | | | F |
| G | 0,121 | 0,214 | 0,198 | 0,141 | 0,187 | 0,203 | 0,000 | | | | | | | | | | | | | | | | | G |
| H | 0,117 | 0,240 | 0,185 | 0,166 | 0,235 | 0,208 | 0,184 | 0,000 | | | | | | | | | | | | | | | | H |
| I | 0,126 | 0,250 | 0,197 | 0,150 | 0,269 | 0,210 | 0,169 | 0,211 | 0,000 | | | | | | | | | | | | | | | I |
| J | 0,137 | 0,278 | 0,207 | 0,247 | 0,230 | 0,233 | 0,220 | 0,210 | 0,286 | 0,000 | | | | | | | | | | | | | | J |
| K | 0,173 | 0,294 | 0,220 | 0,225 | 0,248 | 0,228 | 0,231 | 0,255 | 0,174 | 0,254 | 0,000 | | | | | | | | | | | | | K |
| L | 0,253 | 0,369 | 0,327 | 0,253 | 0,318 | 0,343 | 0,254 | 0,261 | 0,270 | 0,367 | 0,328 | 0,000 | | | | | | | | | | | | L |
| M | 0,196 | 0,247 | 0,246 | 0,248 | 0,260 | 0,242 | 0,243 | 0,230 | 0,274 | 0,250 | 0,274 | 0,337 | 0,000 | | | | | | | | | | | M |
| N | 0,196 | 0,367 | 0,277 | 0,283 | 0,283 | 0,266 | 0,273 | 0,306 | 0,216 | 0,378 | 0,161 | 0,398 | 0,351 | 0,000 | | | | | | | | | | N |
| O | 0,066 | 0,212 | 0,128 | 0,167 | 0,175 | 0,149 | 0,151 | 0,140 | 0,128 | 0,138 | 0,156 | 0,265 | 0,184 | 0,228 | 0,000 | | | | | | | | | O |
| P | 0,091 | 0,227 | 0,163 | 0,151 | 0,157 | 0,185 | 0,116 | 0,164 | 0,123 | 0,157 | 0,158 | 0,269 | 0,241 | 0,207 | 0,076 | 0,000 | | | | | | | | P |
| Q | 0,090 | 0,223 | 0,175 | 0,155 | 0,178 | 0,175 | 0,136 | 0,204 | 0,095 | 0,191 | 0,126 | 0,290 | 0,231 | 0,127 | 0,097 | 0,091 | 0,000 | | | | | | | Q |
| R | 0,067 | 0,201 | 0,151 | 0,137 | 0,140 | 0,167 | 0,122 | 0,146 | 0,151 | 0,129 | 0,161 | 0,242 | 0,199 | 0,244 | 0,052 | 0,063 | 0,085 | 0,000 | | | | | | R |
| S | 0,189 | 0,276 | 0,247 | 0,245 | 0,284 | 0,251 | 0,225 | 0,265 | 0,220 | 0,296 | 0,250 | 0,370 | 0,293 | 0,273 | 0,230 | 0,199 | 0,190 | 0,228 | 0,000 | | | | | S |
| T | 0,152 | 0,270 | 0,287 | 0,265 | 0,283 | 0,269 | 0,219 | 0,283 | 0,277 | 0,243 | 0,301 | 0,395 | 0,263 | 0,382 | 0,204 | 0,248 | 0,193 | 0,193 | 0,318 | 0,000 | | | | T |
| U | 0,223 | 0,317 | 0,295 | 0,320 | 0,290 | 0,276 | 0,263 | 0,298 | 0,356 | 0,326 | 0,323 | 0,457 | 0,289 | 0,290 | 0,235 | 0,267 | 0,235 | 0,235 | 0,322 | 0,326 | 0,000 | | | U |
| V | 0,171 | 0,233 | 0,257 | 0,270 | 0,251 | 0,258 | 0,230 | 0,242 | 0,211 | 0,275 | 0,250 | 0,379 | 0,243 | 0,320 | 0,150 | 0,164 | 0,170 | 0,175 | 0,265 | 0,259 | 0,305 | 0,000 | | V |
| W | 0,230 | 0,350 | 0,296 | 0,306 | 0,344 | 0,325 | 0,293 | 0,337 | 0,244 | 0,317 | 0,214 | 0,443 | 0,370 | 0,182 | 0,239 | 0,206 | 0,187 | 0,231 | 0,291 | 0,387 | 0,332 | 0,307 | 0,000 | W |
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | |

Fst: pair-wise genetic differentiation

**Table S2 : Diversity parameters for the different onion accessions**

| Population | Accession N° | % P | Number alleles | Ne | I | No. Private Alleles | Ho | He | UHe |
|---|---|---|---|---|---|---|---|---|---|
| **A** | Acce-1 | 100,00% | 2,800 | 2,106 | 0,814 | 1 | 0,386 | 0,499 | 0,555 |
| **B** | Acce-2 | 70,00% | 1,800 | 1,550 | 0,530 | 1 | 0,372 | 0,338 | 0,366 |
| **C** | Acce-3 | 80,00% | 2,200 | 1,778 | 0,635 | 0 | 0,482 | 0,400 | 0,445 |
| **D** | Acce-4 | 80,00% | 2,100 | 1,673 | 0,605 | 0 | 0,368 | 0,387 | 0,436 |
| **E** | Acce-5 | 80,00% | 2,200 | 1,664 | 0,552 | 0 | 0,450 | 0,333 | 0,369 |
| **F** | Acce-6 | 80,00% | 2,200 | 1,688 | 0,603 | 0 | 0,397 | 0,376 | 0,406 |
| **G** | Acce-7 | 90,00% | 2,300 | 1,677 | 0,615 | 0 | 0,364 | 0,369 | 0,415 |
| **H** | Acce-8 | 90,00% | 2,200 | 1,848 | 0,657 | 0 | 0,482 | 0,416 | 0,466 |
| **I** | Acce-9 | 90,00% | 2,300 | 1,924 | 0,668 | 0 | 0,317 | 0,436 | 0,496 |
| **J** | Acce-10 | 70,00% | 2,200 | 1,843 | 0,560 | 0 | 0,379 | 0,337 | 0,390 |
| **K** | Acce-11 | 90,00% | 2,300 | 1,841 | 0,671 | 0 | 0,412 | 0,417 | 0,453 |
| **L** | Acce-12 | 60,00% | 1,500 | 1,305 | 0,394 | 0 | 0,350 | 0,260 | 0,330 |
| **M** | Acce-13 | 70,00% | 2,000 | 1,582 | 0,577 | 1 | 0,372 | 0,356 | 0,388 |
| **N** | Acce-14 | 70,00% | 2,000 | 1,600 | 0,481 | 0 | 0,360 | 0,306 | 0,335 |
| **O** | Acce-15 | 100,00% | 2,400 | 2,060 | 0,742 | 0 | 0,481 | 0,477 | 0,516 |
| **P** | Acce-16 | 90,00% | 2,400 | 2,007 | 0,714 | 0 | 0,413 | 0,452 | 0,495 |
| **Q** | Acce-17 | 100,00% | 2,900 | 2,124 | 0,843 | 0 | 0,591 | 0,500 | 0,555 |
| **R** | Acce-18 | 90,00% | 2,500 | 2,136 | 0,775 | 0 | 0,510 | 0,490 | 0,533 |
| **S** | Acce-19 | 80,00% | 1,700 | 1,547 | 0,550 | 0 | 0,500 | 0,375 | 0,500 |
| **T** | Acce-20 | 60,00% | 1,500 | 1,298 | 0,347 | 0 | 0,350 | 0,235 | 0,297 |
| **U** | Acce-21 | 50,00% | 1,500 | 1,278 | 0,321 | 0 | 0,317 | 0,210 | 0,257 |
| **V** | Acce-22 | 80,00% | 1,700 | 1,620 | 0,530 | 0 | 0,517 | 0,376 | 0,510 |
| **W** | Acce-23 | 60,00% | 1,600 | 1,520 | 0,390 | 0 | 0,500 | 0,275 | 0,433 |

**Table S3**: Morphological and quality features of the studied onion genotypes (mean ± SD), field experiment done at the arid region of South-Tunisia (Gabes oasis)

| | **Bulb diameter (mm)** | **Fresh weight (g)** | **Dry matter content (%)** | **Scales number** | **TSS (°Brix)** |
|---|---|---|---|---|---|
| Acce-1 | 68.96 ± 5.68 a | 142.83 ± 19.73 c | 12.93 ± 0.79 a | 8.67 ± 0.58 b | 11.33 ± 0.29 b |
| Acce-2 | 83.92 ± 6.47 a | 389.67 ± 22.14 a | 6.88 ± 0.69 c | **11.67 ± 0.58 a** | 14.83 ± 0.76 a |
| Acce-3 | **93.82 ± 14.07 a** | 325.01 ± 12.53 a | 12.54 ± 0.72 a | 10.67 ± 0.58 a | 13.83 ± 0.29 b |
| Acce-4 | 79.37 ± 5.45 a | 244.67 ± 10.54 b | 9.54 ± 0.36 b | 6.67 ± 1.15 c | 15.33 ± 1.15 a |
| Acce-5 | 91.83 ± 5.56 a | 359.17 ± 30.62 a | 11.48 ± 2.41 a | 8.67 ± 0.58 b | 10.67 ± 2.08 c |
| Acce-6 | 86.01 ± 6.62 a | 268.33 ± 38.35 b | 9.16 ± 1.12 b | 10.00 ± 0.00 a | 8.51 ± 1.32 d |
| Acce-7 | 91.55 ± 9.42 a | 289.52 ± 76.29 b | 7.50 ± 1.46 c | 9.33 ± 0.58 b | 8.85 ± 1.03 d |
| Acce-8 | 83.31 ± 3.09 a | 268.00 ± 52.23 b | 10.22 ± 1.26 b | 8.00 ± 1.00 b | 10.33 ± 0.76 c |
| Acce-9 | 88.68 ± 14.4 a | 258.33 ± 54.21 b | 9.62 ± 0.54 b | 10.33 ± 0.58 a | 12.08 ± 1.18 b |
| Acce-10 | 86.92 ± 12.67 a | 307.17 ± 69.28 a | 9.37 ± 2.06 b | 10.33 ± 1.15 a | 16.5 ± 0.87 a |
| Acce-11 | 72.45 ± 11.10 a | 111.67 ± 15.04 c | 13.05 ± 1.86 a | 10.33 ± 0.58 a | 9.67 ± 0.58 c |
| Acce-12 | 48.23 ± 6.37 c | 61.25 ± 9.88 d | 10.11 ± 0.52 b | 7.00 ± 0.00 c | 14.47 ± 0.95 a |
| Acce-13 | 74.18 ± 3.82 a | 170.67 ± 22.7 c | 10.03 ± 1.50 b | 9.67 ± 0.58 b | 9.63 ± 1.03 c |
| Acce-14 | 53.29 ± 9.94 b | 57.67 ± 8.55 d | 13.27 ± 0.61 a | 7.00 ± 0.00 c | 12.00 ± 1.00 b |
| Acce-15 | 64.66 ± 2.17 b | 117.60 ± 16.98 c | 10.54 ± 0.69 b | 7.33 ± 0.58 c | 13.85 ± 1.99 b |
| Acce-16 | 75.62 ± 3.55 a | 181.33 ± 40.32 c | 11.08 ± 2.32 a | 10.00 ± 1.00 a | 7.08 ± 0.14 d |
| Acce-17 | 93.41 ± 10.67 a | **391.33 ± 65.62 a** | 12.65 ± 2.05 a | 11.33 ± 1.53 a | 9.51 ± 1.32 c |
| Acce-18 | 75.41 ± 8.27 a | 180.51 ± 1.80 c | 12.67 ± 1.26 a | 10.00 ± 1.00 a | 9.83 ± 1.04 c |
| Acce-19 | 93.11 ± 12.99 a | 289.83 ± 85.99 b | **13.47 ± 1.63 a** | 7.67 ± 1.53 c | 8.51 ± 0.50 d |

**Table S4**: Morphological and quality features of the studied onion genotypes (mean ± SD), field experiment done at the semi-arid region of Centre-East Tunisia (Sahline station)

| | **Bulb diameter (cm)** | **Fresh weight (g)** | **Dry matter content (%)** | **Scales number** |
|---|---|---|---|---|
| Acce-1 | 8.30±0.55a | 250.00 ± 10.00c | 12.03±0.20a | 10.34±0.28c |
| Acce-2 | 7.20±0.75b | 235.00 ± 15.00c | 12.70±0.32a | 8.34±0.25e |
| Acce-3 | 5.53±0.23 | 176.67 ± 7.64d | 12.36±0.15a | 9.35±0.23e |
| Acce-4 | 6.47±0.41 | 185.00 ± 15.00d | 10.75±0.35 | 7.33±0.22f |
| Acce-5 | 8.53±015a | 281.66 ± 17.55c | 12.10±0.15a | 12.35±1.22b |
| Acce-6 | 8.90±0.25a | 337.00 ± 15.00b | 10.30±0.25 | **13.00±1.25a** |
| Acce-7 | **9.43±0.23a** | **409.66 ± 10.01a** | **12.95±0.21a** | 12.00±0.22b |
| Acce-8 | 7.30±0.10b | 213.33 ± 10.41c | 11.05±0.35b | 09.00±0.12e |
| Acce-9 | 8.47±0.25a | 224.33 ± 10.06c | 9.20±0.15c | 08.00±0.15e |
| Acce-10 | 9.16±0.21a | 408.33 ± 10.40a | 12.33±0.05a | 12.00±0.15b |
| Acce-11 | 7.83±1.07b | 316.33 ± 18.71b | 10.95±0.22b | 10.00±0.20d |
| Acce-12 | 8.47±0.55a | 259.33 ± 28.04c | 10.45±0.25b | 8.35±0.10e |
| Acce-13 | 8.07±0.15a | 308.33 ± 18.92b | 12.48±0.35a | 12.00±1.12b |
| Acce-14 | 8.23±0.38a | 282.56 ± 12.37c | 9.15±0.23c | 11.00±0.12c |
| Acce-15 | 8.00±0.46a | 290.00 ± 13.22c | 12.00±0.15a | 11.00±0.25c |
| Acce-16 | 7.70±0.35b | 296.66 ± 07.63c | 12.50±0.15a | 10.75±0.25c |
| Acce-17 | 7.23±0.21b | 276.66 ± 10.40c | 10.00±0.05c | 10.00±0.10c |
| Acce-18 | 7.97±0.22b | 291.66 ± 11.28c | 11.30±0.10b | 11.00±0.11c |
| Acce-19 | 7.70±0.20b | 280.00 ± 10.00c | 10.15±0.09c | 10.00±0.10d |