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| Boudersa Y, Benouchenne D, Bellil I, Khelifi D. Genetic diversity in Algerian diploid and tetraploid oats (*Avena* L.) based on their morphological characters and eco-geographical parameters. Plant Science Today (Early Access). <https://doi.org/10.14719/pst.2896> |

**Supplementary Tables**

**Table 1.** Morphological characters state and code used for PCA.

|  |  |  |  |
| --- | --- | --- | --- |
| Organs/Plant part  | Character | State | Code |
| General habit | 1-Longevity (GhL) | Perennial | 0 |
| Annual | 1 |
| 2-Juvenile growth (GhJ) | Erect | 0 |
| Prostrate to erect | 1 |
| Prostrate | 2 |
| Stem | 3-Color appearance (SCa) | Glaucous | 0 |
| Green light | 1 |
| Green | 2 |
| Dark green | 3 |
| 4-Culm (SCu) | Geniculate  | 0 |
| Prostrate | 1 |
| Prostrate to erect | 2 |
| Erect | 3 |
| 5-Height (SHe)  | cm |  |
| 6-Hairiness of upper most node (SHu) | Weak | 0 |
| Medium | 1 |
| Strong | 2 |
| 7-Lower internode diameter (SLd) | mm |  |
| 8-Lower internode length (SLl) | cm |  |
| 9-Internodes (roughness) (SIr) | Smooth | 0 |
| Scabrous | 1 |
| 10-Culm consistency (SCc) | Firm | 0 |
| Spongy | 1 |
| 11-Peduncle (SPe) | Straight | 0 |
| Slightly bent | 1 |
| Curved | 2 |
| Leaf | 12-Lobes (LeL) | Absent | 0 |
| Present | 1 |
| 13-Intensity of green color (LeI) | Light | 0 |
| Medium | 1 |
| Dark | 2 |
| 14-Blade: hairiness of margins (LeB) | Absent | 0 |
| Weak | 1 |
| Medium | 2 |
| 15-Lowest leaves:hairiness of sheaths (LeS) | Absent | 0 |
| Weak | 1 |
| Medium | 2 |
| Strong | 3 |
| 16-Total length of longest green leaf (including petiole) (LeT) | Short | 0 |
| Short to medium | 1 |
| Medium to long | 2 |
| Long | 3 |
| 17-Flag leaf: glaucosity of sheath(LeF) | Absent | 0 |
| Weak | 1 |
| Medium | 2 |
| Strong | 3 |
| 18--Width at widest point (LeW) | Narrow | 0 |
| Medium | 1 |
| Broad | 2 |
| 19-Ligules shape at younger (LLs) | Obtuse | 0 |
| Acute | 1 |
| Obtuse with a point | 2 |
| Truncate with a point | 3 |
| 20-Ligules length on culm leaves (LLl) | mm |  |
| Panicle | 21-shape (PaS) | Equilateral | 0 |
| Equilateral to Slightly flagged | 1 |
| Slightly flagged | 2 |
| Flagged | 3 |
| Flagged or nearly so | 4 |
| 22-Density (PaD) | Lax | 0 |
| Intermediate | 1 |
| Dense | 2 |
| 23-Length (PaL) | Short | 0 |
| Medium | 1 |
| Long | 2 |
| Spikelets | 24-Length without awns (SL)  | mm |  |
| 25-Number of florets (SN) | 1 to 5 |  |
| 26-Separating from peduncle (SS) | Semi-abscission | 0 |
| Abscission | 1 |
| Fracture only | 2 |
| 27-Glume’s shape (GS) | Subulate | 0 |
| Lanceolate | 1 |
| Cordate | 2 |
| 28-Glumes relative length (GR) | Equal  | 0 |
| Nearly | 1 |
| Slightly unequal | 2 |
| Unequal | 3 |
| 29-Upper glume length (GUl) | mm |  |
| 30-Lower glume length (GLl) | mm |  |
| 31-Upper Glume width (GUw) | mm |  |
| 32-Lower glume width (GLw) | mm |  |
| 33-Number of veins of upper glume (GNu) | 3 to 11 |  |
| 34-Presence of keels (GP) | Without keels | 0 |
| Keeled | 1 |
| Floret’s dispersal unit | 35-Florets: disarticulation (FDd) | Not-disarticulating | 0 |
| Disarticulating | 1 |
| 36-Floret’s mode of disarticulation (FMd) | All the florets are no disarticulating  | 0 |
| Only lowermost floret disarticulating | 1 |
| All the florets are disarticulating | 2 |
| 37-Separate (FSd) | Basi-fracture | 0 |
| Hetero-fracture | 1 |
| Distal | 2 |
| Disarculating | 3 |
| Scars | 38-Shape of first floret scar (SSf) | Not-existing | 0 |
| Oval | 1 |
| Round | 2 |
| Heart-shaped or slightly so | 3 |
| Elliptic | 4 |
| Narrow elliptic | 5 |
| Linear | 6 |
| 39-Shape of third floret scar (SSt) | Not-existing | 0 |
| Heart-shaped | 1 |
| Not heart-shaped | 2 |
| 40-Periphery ring (SP) | Not-existing  | 0 |
| Confined to ⅓ - ½ scar | 1 |
| Confined to ⅓ scar | 2 |
| Confined to ¼ scar  | 3 |
| Confined to ⅛ scar | 4 |
| Confined to ⅛ - 1/16 scar | 5 |
| 41-Length (ScL)  | mm |  |
| 42-Width (ScW)  | mm |  |
| Callus | 43- Shape (CS) | Absent | 0 |
| Oval | 1 |
| Round | 2 |
| Elliptical | 3 |
| linear elongated | 4 |
| Awl-shaped | 5 |
| Lemma | 44-Color (LCe) | White | 0 |
| Yellow | 1 |
| Red | 2 |
| Brownish-Red | 3 |
| Brown | 4 |
| Gray | 5 |
| Black | 6 |
| 45-Hairiness (LHa) | Glabrous | 0 |
| Some glabrous and some hairy | 1 |
| Hairy | 2 |
| 46-Place of awn insertion (LPa) | Absent or rudimentary, or inserted about middle of lemma to below tip | 0 |
| Inserted at about lower one-third | 1 |
| Inserted between lower one-third and one-half | 2 |
| Inserted at about middle | 3 |
| Inserted at about upper one-third | 4 |
| Inserted between upper one-third and one-quarter | 5 |
| 47-Structure (LSt) | Tough | 0 |
| Resembling glumes | 1 |
| Tough or resembling glumes | 2 |
| 48-Shape of tip (LTt) | Bidenticulate | 0 |
| Bisubulate | 1 |
| Biaristulate | 2 |
| Bisetulate-biaristulate | 3 |
| Bisubulate to biaristulate | 4 |
| Bidenticulate to bisubulate | 5 |
| 49-Grain husk (LGh) | Absent | 0 |
| Present | 1 |
| Awns | 50-Number of awns (AN) | 1 or absent | 0 |
| 2 | 1 |
| 2 - 3 | 2 |
| 3 or up | 3 |
| 51-Dorsal awn length (AD)  | mm |  |
| 52-Color (AC) | Gray | 0 |
| Brown on lower part | 1 |
| Dark on lower part | 2 |
| 53-Pubescnce (AP) | Not pubescent below geniculation | 0 |
| Pubescent below geniculation | 1 |
| 54-Vestiture below awn insertion (AV) | Without macrohairs below awn insertion | 0 |
| Without macrohairs or a few around awn insertion | 1 |
| Beset densely with macrohairs | 2 |
| Palea | 55-Presence (PP) | Absent or minute | 0 |
| Present | 1 |
| 56-Apex (incision) (PI) | Straight | 0 |
| Oblic | 1 |
| 57-apex (presence of awn) (PA) | muticous | 0 |
| Awned | 1 |
| 58-Rows of cilia along edges of keels (PR) | 1 | 0 |
| 1 or 2 | 1 |
| 2 | 2 |
| 1 – 3 | 3 |
| 59-Vestiture of back (PV) | Glabrous | 0 |
| Prickles | 1 |
| Macrohairs | 2 |
| Prickles or Glabrous | 3 |
| Lodicule | 60-Type (LTy) | Sativa | 0 |
| Fatua | 1 |
| Fatua and Sativa | 2 |
| 61-Prickles (LPr) | Absent | 0 |
| Present | 1 |
| Rachilla | 62- Type presence (RT) | Present with lower most floret | 0 |
| Present with all florets | 1 |
| 63-Length (RL)  | mm |  |
| 64-Pubescence (RP) | Absent | 0 |
| Only the lowest floret | 1 |
| Under all the florets | 2 |
| Epiblast | 65-Type (ET) | Brevis | 0 |
| Fatua | 1 |
| Septentrionalis | 2 |
| Sativa | 3 |
| Sativa and Brevis | 4 |
| 66-Median range (EM) | mm |  |
| Grain | 67-Length (L)  | mm |  |
| 68-Wide (W)  | mm |  |
| 69-Thickness (T)  | mm |  |

**Table 2**. Eco-geographic characteristics and Emberger quotient calculation of sampling sites of Algeria *Avena* L. species.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **N°** | **Sites** | **Positions (latitude, longitude)** | **Accessions** | **Alt** | **Stat. Alt** | **Q2** | **Climate Type** |
| 1 | Echatt | 36°50'22.64"N, 7°55'39.83"E | hir | 16 | 2 | 93.80 | SH-warm winter |
| 2 | Guerbes | 36°54'56.34"N, 7°10'20.75"E | wie | 35 | 2 | 124.26 |
| 3 | Filfila | 36°53'47.66"N, 7° 3'49.20"E | bar | 39 | 2 | 124.83 |
| 4 | Skikda  | 36°51'0.19"N, 6°55'0.45"E | wie | 81 | 2 | 130.85 |
| 5 | Kerkera | 36°55'14.32"N, 6°35'29.76"E | bar | 27 | 2 | 123.12 |
| 6 | Collo | 36°59'37.80"N, 6°33'46.92"E | bar | 27 | 2 | 123.12 |
| 7 | Sidi Abdelaziz | 36°51'29.87"N, 6°3'47.86"E | bar-hir | 12 | 8 | 119.85 |
| 8 | El KennarNouchfi | 36°49'43.56"N, 5°57'56.45"E | 14 | 8 | 120.11 |
| 9 | Boumerdes | 36°45'50.68"N, 3°28'54.78"E | bar-hir-wie | 10 | 58 | 123.12 | SH-mild winter |
| 10 | Mazagran | 35°53'22.78"N, 0° 3'48.02"E | bar-hir-lon-eri-cla | 122 | 137 | 123.12 | LSA-mild winter |
| 11 | Bethioua | 35°46'14.41"N, 0°14'22.42"O | bar-eri-cla | 71 | 90 | 119.85 |
| 12 | Oran  | 35°39'17.16"N, 0°41'53.59"O | bar-lon-eri-cla-ven | 181 | 90 | 120.11 | SH-mildwinter |
| 13 | El Tarf | 36°45'44.99"N, 8°20'50.75"E | bar-wie | 29 | 2 | 129.51 |
| 14 | Bouteldja | 36°47'37.83"N, 8°11'36.82"E | hir | 12 | 2 | 92.64 |
| 15 | Lac des Oiseaux | 36°46'21.54"N, 8° 6'23.49"E | 6 | 2 | 53.33 |
| 16 | Ben M’hidi | 36°45'43.03"N, 7°54'46.61"E | bar | 7 | 2 | 61.27 |
| 17 | El Besbas | 36°42'25.97"N, 7°49'28.72"E | wie | 17 | 2 | 77.04 |
| 18 | Berrahal | 36°49'47.81"N, 7°28'14.28"E | wie | 32 | 2 | 33.19 |
| 19 | Ramdane Djamel | 36°44'56.74"N, 6°53'49.36"E | bar | 39 | 2 | 92.72 |
| 20 | Tamalous | 36°49'21.26"N, 6°39'4.91"E | hir | 54 | 2 | 92.91 |
| 21 | Bin el ouidene | 36°48'40.53"N, 6°33'3.35"E | bar | 90 | 2 | 92.36 |
| 22 | Ain kechra | 36°45'3.07"N, 6°25'21.23"E | hir | 239 | 2 | 91.46 |
| 23 | Settara | 36°43'48.83"N, 6°20'35.14"E | 182 | 8 | 91.52 |
| 24 | El milia | 36°44'20.96"N, 6°17'1.38"E | bar-hir | 214 | 8 | 92.15 |
| 25 | AïnTinn | 36°23'46.66"N, 6°19'48.33"E | bar | 614 | 437 | 92.34 | SH-temperate winter |
| 26 | Mila  | 36°27'19.52"N, 6°14'29.26"E | 413 | 437 | 106.02 |
| 27 | Zeghaïa | 36°27'55.06"N, 6°10'57.87"E | bar-wie | 374 | 437 | 121.63 |
| 28 | Redjas | 36°25'51.50"N, 6° 7'48.42"E | bar | 340 | 437 | 124.74 |
| 29 | Ferdjioua | 36°23'59.66"N, 5°55'35.25"E | 506 | 437 | 125,14 |
| 30 | Kherrata | 36°28'37.51"N, 5°16'42.68"E | hir | 522 | 2 | 132.20 | H-mild winter |
| 31 | El kseur | 36°40'33.12"N, 4°52'2.70"E | bar-hir-wie | 37 | 2 | 120.61 | SH-mild winter |
| 32 | Sidi aiche | 36°34'35.36"N, 4°39'44.72"E | bar | 101 | 2 | 121.56 | SH-temperate winter |
| 33 | Tazmalt | 36°23'10.22"N, 4°24'32.42"E | bar-hir-wie | 284 | 555 | 122.51 |
| 34 | Issers | 36°43'28.40"N, 3°39'0.97"E | hir-wie | 24 | 58 | 124.10 | SH-mild winter |
| 35 | Boudouaou | 36°43'20.80"N, 3°25'17.91"E | hir-wie-eri | 46 | 58 | 133.52 |
| 36 | Hoceinia | 36°19'54.53"N, 2°25'14.94"E | bar | 285 | 294 | 123.70 | USA-mild winter |
| 37 | Ain defla | 36°14'49.02"N, 1°55'43.11"E | 273 | 294 | 126.59 |
| 38 | Yellel | 35°43'35.42"N, 0°21'56.07"E | bar | 115 | 95 | 138.85 | LSA-mild winter |
| 39 | Sirat | 35°46'38.59"N, 0°11'37.25"E | 49 | 137 | 133.64 |
| 40 | Boutlélis | 35°34'59.24"N, 0°49'24.25"O | wie | 98 | 90 | 136.15 | HSA-mild winter |
| 41 | AïnTémouchent | 35°18'0.41"N, 1° 9'54.36"O | bar-wie | 207 | 235 | 83.42 |
| 42 | El amirabdelkader | 35°12'55.22"N, 1°24'49.43"O | bar | 18 | 235 | 104.15 | LSA-warm winter |
| 43 | M’Daourouche | 36° 5'20.67"N, 7°49'41.19"E | lon | 856 | 680 | 91.78 | SH-cool winter |
| 44 | Guelma  | 36°27'14.78"N, 7°26'54.82"E | wie | 270 | 227 | 89.44 | SH-temperate winter |
| 45 | Hammam Debagh | 36°26'8.18"N, 7°18'4.53"E | hir | 315 | 227 | 87.42 |
| 46 | Ksar Sbahi | 36° 5'0.78"N, 7°16'7.60"E | lon | 878 | 889 | 97.43 | USA-cool winter |
| 47 | Ain abid | 36°14'21.37"N, 6°57'46.15"E | bar | 882 | 693 | 45.55 | SH-cool winter |
| 48 | El khroub | 36°14'41.72"N, 6°43'38.05"E | bar-wie | 701 | 693 | 172.50 |
| 49 | Zighoud Youcef 1 | 36°31'1.02"N, 6°41'50.58"E | bar-hir | 532 | 693 | 131.02 |
| 50 | Zighoud Youcef 2 | 36°32'13.13"N, 6°41'32.15"E | bar | 674 | 693 | 116.96 |
| 51 | Ksar Naadja | 36°31'34.30"N, 6°39'11.22"E | 677 | 693 | 89.38 |
| 52 | Beni Hamidene | 36°29'45.00"N, 6°34'25.59"E | 442 | 693 | 160.69 | SH-temperate winter |
| 53 | Didouchemourad | 36°28'14.05"N, 6°38'3.36"E | bar-hir | 483 | 693 | 97.14 | SH-cool winter |
| 54 | Université Cne1 | 36°20'23.05"N, 6°37'10.97"E | bar | 612 | 693 | 95.97 |
| 55 | Université Cne3 | 36°16'51.03"N, 6°35'25.12"E | 744 | 693 | 94.76 |
| 56 | Hammabouziane | 36°24'54,04"N, 6°36'41,83"E | 524 | 693 | 95.96 | SH-temperate winter |
| 57 | Aïn Smara | 36°15'22.14"N, 6°29'6.19"E | 616 | 693 | 110.37 | SH-cool winter |
| 58 | Ibn Ziad | 36°22'55.14"N, 6°29'00.50"E | bar-wie | 485 | 693 | 62.25 | SH-temperate winter |
| 59 | Oued el Athmania | 36°14'40.27"N, 6°18'12.02"E | bar-hir | 688 | 437 | 61.61 |
| 60 | ChelghoumLaïd | 36°11'7.35"N, 6°11'11.44"E | wie | 754 | 437 | 45.24 | SH-cool winter |
| 61 | El Eulma | 36°10'19.23"N, 5°41'28.93"E | lon | 978 | 1007 | 52.10 | HSA-cold winter |
| 62 | Setif | 36°12'1.57"N, 5°27'30.99"E | hir | 1108 | 1007 | 64.57 | SH-cold winter |
| 63 | Bordj Bou Areridj |  36° 2'43.25"N, 4°47'59.62"E | bar-lon | 912 | 928 | 69.20 | LSA-cool winter |
| 64 | Ain Oussara | 35°27'23.91"N, 2°49'35.98"E | lon | 671 | 1180 | 56.79 | UA-cool winter |
| 65 | Médéa  | 36°15'2.27"N, 2°44'5.31"E | bar | 748 | 1030 | 77.74 | SH-temperate winter |
| 66 | Boumedfaa | 36°20'36.40"N, 2°31'17.45"E | 330 | 294 | 90.96 | HSA-cool winter |
| 67 | Mahdia | 35°25'53.81"N, 1°43'29.20"E | 915 | 997 | 63.35 | HSA-cool winter |
| 68 | Chlef | 36°7'56.54"N, 1°21'59.37"E | 156 | 143 | 73.31 | LSA-mild winter |
| 69 | Tiaret  | 35°22'21.23"N, 1°18'20.16"E | 1062 | 997 | 73.60 | HSA-cool winter |
| 70 | Rahouia | [35°32'13.89"N, 1° 0'1.09"E](https://fr.wikipedia.org/wiki/Rahouia#/maplink/1) | 623 | 997 | 75.94 | LSA-temperate winter |
| 71 | Oued Rhiou | 35°58'23.00"N, 0°54'24.36"E | 63 | 95 | 54.29 | LSA-mild winter |
| 72 | Oued el abtal | 35°27'18.71"N, 0°41'15.27"E | bar-hir | 263 | 511 | 95.10 |
| 73 | Matmar | 35°43'49.89"N, 0°28'23.37"E | bar-hir-lon | 68 | 95 | 97.75 |
| 74 | Tighenif | 35°23'56.37"N, 0°17'49.31"E | bar-hir-lon | 497 | 511 | 86.14 | HSA-temperate winter |
| 75 | Mascara  | 35°21'58.25"N, 0°6'2.02"E | bar-hir | 491 | 511 | 101.23 |
| 76 | Bou Hanifia | 35°17'37.29"N, 0° 5'22.26"O | hir | 297 | 511 | 75.67 | LSA-mild winter |
| 77 | Sidi Bel abbès | 35°10'32.43"N, 0°34'50.00"O | bar-lon | 484 | 475 | 84.44 | HSA-tempearte winter |
| 78 | Tlemcen  | 34°52'52.24"N, 1°17'26.86"O | bar | 776 | 246 | 84.63 | SH-cool winter |
| 79 | Moghnia | 34°50'28.62"N, 1°46'2.45"O  | bar | 399 | 428 | 70.24 | HSA-temperate winter |
| 80 | El Aouinet | 35°52'26.34"N, 7°52'51.83"E | hir | 643 | 680 | 72.70 | UA-cool winter |
| 81 | Berriche | 35°54'15.70"N, 7°22'10.16"E | bar | 902 | 889 | 80.58 | HSA-cool winter |
| 82 | Guettar El Aich | 36°11'28.41"N, 6°35'10.58"E | 749 | 693 | 88.86 | SH- cool winter |
| 83 | Fesdis | 35°36'39.03"N, 6°14'2.63"E | bar-wie-lon | 956 | 822 | 75.19 | LSA-cool winter |
| 84 | Batna | 35°34'25.52"N, 6°11'7.49"E | wie-lon | 1015 | 822 | 80.83 | HSA-cool winter |
| 85 | Hidoussa | 35°30'32,76"N, 5°57' 8,96"E | wie | 1446 | 822 | 72.82 | SH-cold winter |
| 86 | M’sila | [35°39'58.02"N, 4°30'37.89"E](https://fr.wikipedia.org/wiki/M%27Sila#/maplink/0) | bar | 446 | 441 | 71.26 | UA-temperate winter |
| 87 | Ichemoul | 35°18'13,03"N, 6°33'39,85"E | wie | 1525 | 822 | 108.84 | SH-cold winter |
| 88 | Ichemoul2 | 35°17'51,10"N, 6°36'46,22"E | ven | 1777 | 822 | 113.10 |
| 89 | Bou Saâda | 35°11'48.24"N, 4° 9'5.68"E | lon | 702 | 111 | 119.40 | LSA-cool winter |
| 90 | Hamla | 35°34’33.39"N, 6° 2’28.03"E  | mac | 1568 | 822 | 47.42 | SH-cold winter |
| 91 | Oued Echaaba 1 | 35°34’26.55"N, 6° 1’58.85"E | 1563 | 822 | 53.44 |
| 92 | Oued Echaaba 2 | 35°34’24.48"N, 5°59’29.08"E | 1737 | 822 | 36.72 |
| 93 | Djurdjura 3 | 36°28’20.42"N, 4°12’26.61"E | 1641 | 555 | 89.36 | H-cold winter |
| 94 | Djurdjura 2 | 36°27’49.78"N, 4°11’00.26"E | 1613 | 555 | 27.18 |
| 95 | Djurdjura 1 | 36°27’36.00"N, 4°09’52.24"E | 1810 | 555 | 73.85 |
| 96 | Tikejda 3 | 36°27’39.28"N, 4°08’42.18"E | 1651 | 555 | 55.88 |
| 97 | Tikejda 2 | 36°27’37,48"N, 4°08’09.17"E | 1605 | 555 | 57.41 |
| 98 | Tikejda 1 | 36°26’28.03"N, 4°06’53.46"E | 1498 | 555 | 50.98 |