

SUPPLEMENTARY MATERIALS

to the article A.F. Muterko, E.D. Badaeva, E.V. Zuev, E.A. Salina
 “Karyological differentiation among bread wheat cultivars (*Triticum aestivum* L.)
 with distinct breeding statuses and growth habits”

Table S1. Tested cultivars of common wheat. C – modern, L – landraces, S – spring, W – winter

| Designation | Cultivar | Accession | Growth habit |
|-------------|------------------------------|---|--------------|
| CS01 | Saratovskaya 29 | – | S |
| CS02 | Saratovskaya 42 | – | S |
| CS03 | Saratovskaya-68 | – | S |
| CS04 | Belyanka | – | S |
| CS05 | Favorit | – | S |
| CS06 | Dobrynya/ L-1089 | – | S |
| CS07 | Yugo-Vostochnaya-2 | C-02225 | S |
| CS08 | Prokhorovka | C-01026 | S |
| CS09 | Tulaikovskaya 10 | K-63714 | S |
| CS10 | Bezenchukskaya 98 | C-00338 | S |
| CS11 | Aviada | – | S |
| CS12 | Chelyaba 75 | C-01918 | S |
| CS13 | Omskaya 23 | C-02253 | S |
| CS14 | Novosibirskaya 15 | C-01846 | S |
| CS15 | Novosibirskaya 29 | K-64258 | S |
| CS16 | Novosibirskaya 31 | C-02249 | S |
| CS17 | Novosibirskaya 44 | C-01914 | S |
| CS18 | Novosibirskaya 67 | C-01099 | S |
| CS19 | Pamyati Vavenkova | K-65132 | S |
| CS20 | Pamyati Maistrenko | – | S |
| CW01 | Bezostaya 1 | K-42790; CI-15158; AFRC-6644; PI-276704 | W |
| CW02 | Kavkaz | K-45654 | W |
| CW03 | Fisht | – | W |
| CW04 | Pallada | – | I |
| CW05 | Zimorodok | – | W |
| CW06 | Yelanchik | – | W |
| CW07 | Filatovka | K-64750 | W |
| CW08 | Skorospelka-35 | TRI 9367 | W |
| CW09 | Severodonetskaya Yubileinaya | K-63567 | W |
| CW10 | Bezenchukskaya 380 | K-61966 | W |
| CW11 | Djanganl | K-65610 | W |
| CW12 | Siluet | K-65068 | W |
| CW13 | Splav | K-63117 | W |
| CW14 | Erythrospermum 31 | K-61992 | W |
| CW15 | Priirtyshskaya-86 | K-63464 | W |
| CW16 | Sibirskaya niva | K-58661; K-61548 | W |
| CW17 | Bagrationovskaya | K-64745; PI-639488 | W |
| CW18 | Kulundinka | K-64752 | W |
| CW19 | Novosibirskaya 32 | K-64746 | W |
| CW20 | Novosibirskaya 40 | K-64751 | W |
| CW21 | Mironovskaya 808 | K-43920; PI-392080 | W |
| CW22 | Yatran-60 | – | W |
| CW23 | Zarya, Moskwa | – | W |
| LS01 | Lutescens B-32 | K-38402 | S |
| LS02 | Belaya | K-1152 | S |
| LS03 | Chul | K-3256 | S |
| LS04 | Kairak | K-4013 | S |
| LS05 | Kizyl-Bidai | K-1563 | S |

Table S1 (end)

| Designation | Cultivar | Accession | Growth habit |
|-------------|-----------------------------|------------|--------------|
| LS06 | Khivinka | K-1986 | S |
| LS07 | Shvedskaya | K-404 | S |
| LS08 | Pererod | K-1934 | S |
| LS09 | Khludovskaya | K-4132 | S |
| LS10 | Belaya Bezostaya | K-4145 | S |
| LS11 | Krasnokoloska | K-4130 | S |
| LS12 | Kushchovka-T | K-4122 | S |
| LS13 | Kushchovka-N | K-4122 | S |
| LS14 | LV-Lohja | K-3470 | S |
| LS15 | LV-Abo | K-3474 | S |
| LS16 | LV-Vjartsilja | K-3473 | S |
| LS17 | Krasnokoloska-1 | K-142 | S |
| LS18 | Krasnokoloska-2 | K-142 | S |
| LS19 | Pakshenskaya | K-1492 | S |
| LS20 | K-2158 | K-2158 | S |
| LS21 | Ul'ka | K-3113 | S |
| LS22 | K-3387 | K-3387 | S |
| LW01 | Ustyuzhinskaya | K-38321 | W |
| LW02 | K-9765 | K-9765-1 | W |
| LW03 | Sumarokovskaya | K-38435 | W |
| LW04 | Batetskaya belokoloska | K-35698 | W |
| LW05 | Bogorodskaya (Shuklinskaya) | K-35766-1 | W |
| LW06 | Batishchevskaya | K-9789 | W |
| LW07 | Veshkinskaya | K-10896 | W |
| LW08 | Sandomirka | K-22418 | W |
| LW09 | Beloturka Bezostaya | K-9723 | W |
| LW10 | K-36507 | K-36507 | W |
| LW11 | K-4832 | K-4832 | W |
| LW12 | Shatilovskaya | K-37478 | W |
| LW13 | Donka-1 | K-10890 | W |
| LW14 | Donka-2 | K-10890 | W |
| LW15 | Kosobryukhovka | K-10376 | W |
| LW16 | Krymka (K-11221)-8 | TRI 4503-8 | W |
| LW17 | Krymka Khersonskaya | K-2606 | W |
| LW18 | Krymka-Kharkovskaya 1 | K-798-1 | W |
| LW19 | Krymka-Kharkovskaya 2 | K-798-2 | W |
| LW20 | Krymka | K-9457 | W |
| LW21 | Gorkonkur | K-10213 | W |
| LW22 | Banatka | K-4784 | W |

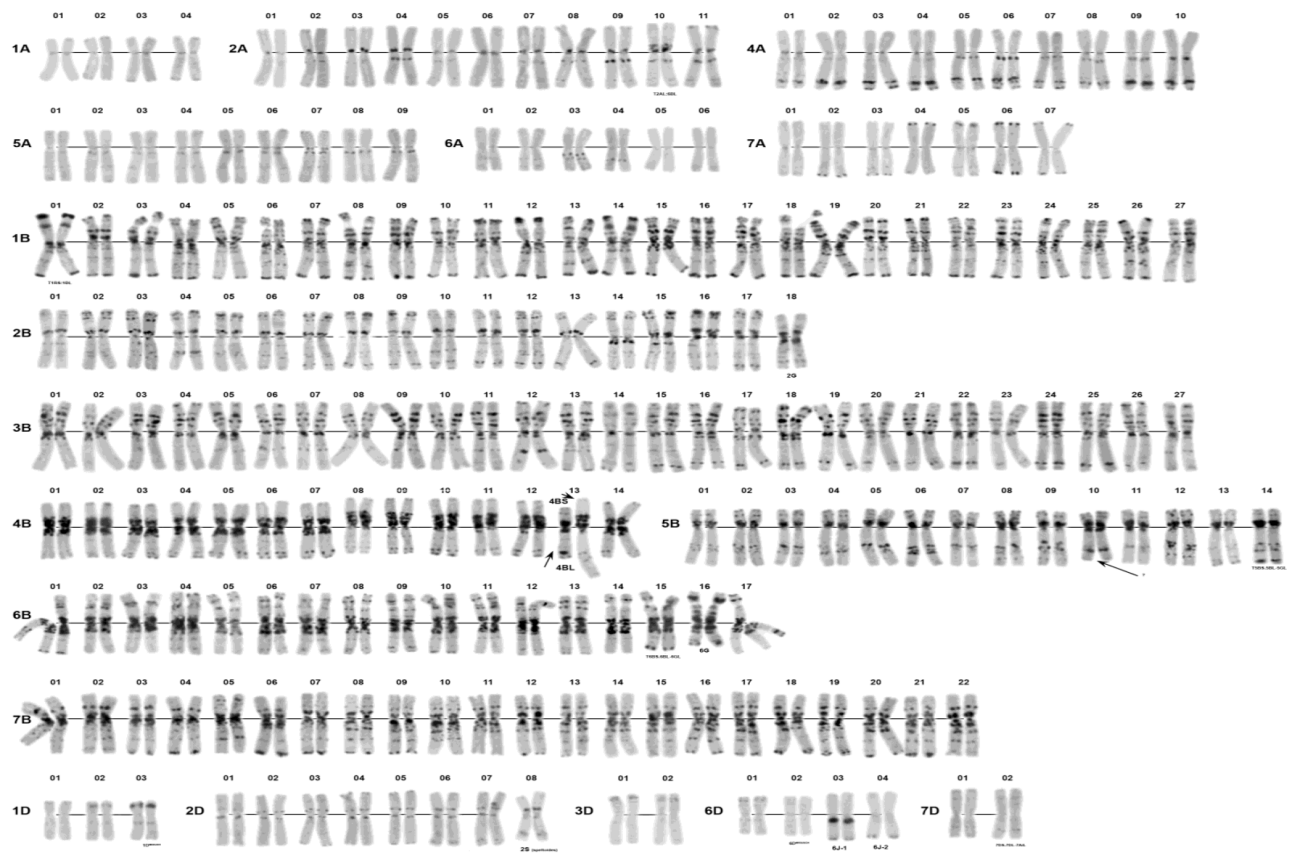


Fig. S1. Polymorphic variants of chromosomes among landraces and modern cultivars of common wheat, as identified by Giemsa C-banding. The numbers of the polymorphic variants are given above the chromosomes.

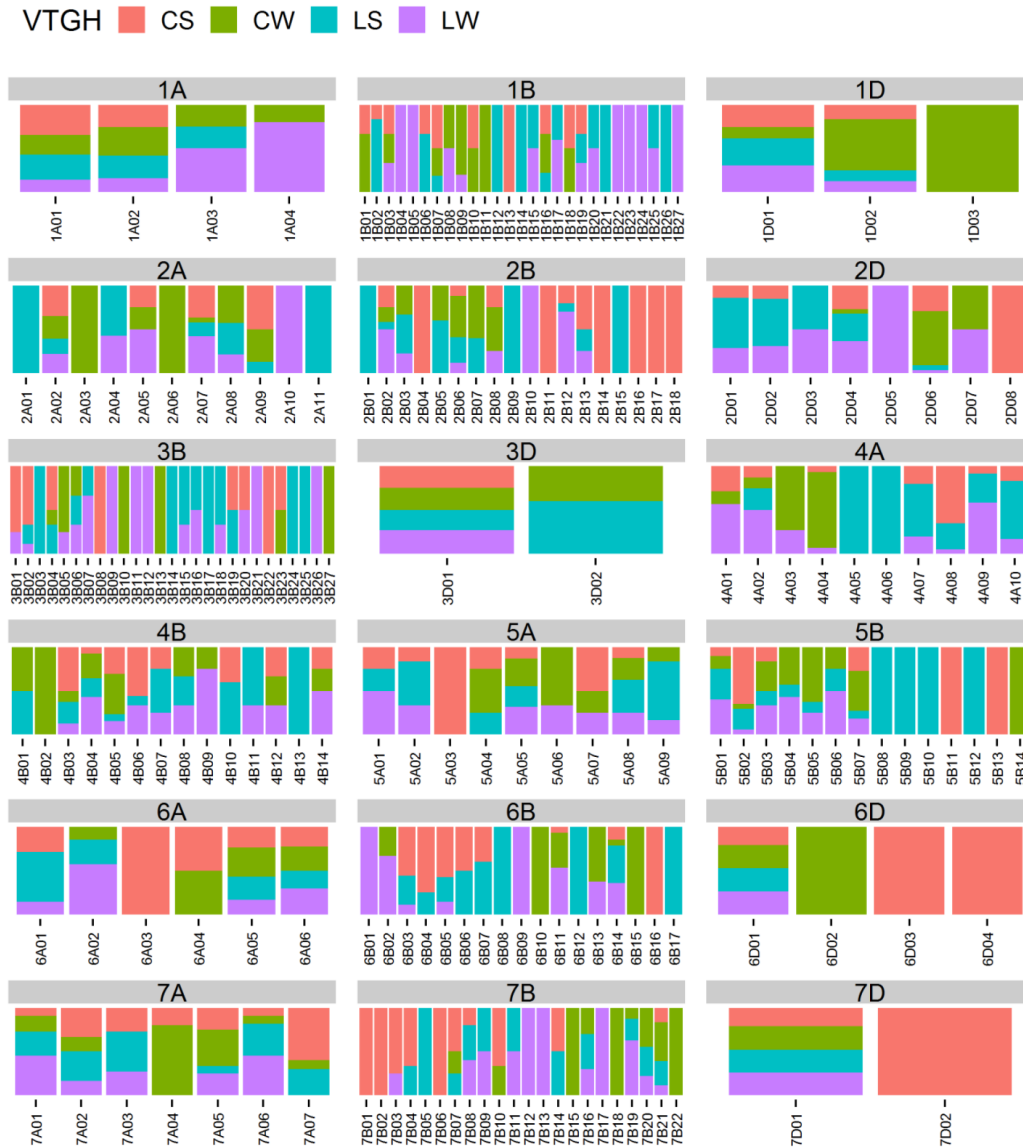


Fig. S2. Frequencies of chromosome types in subsamples of cultivars by breeding status and growth habit: modern spring (CS), modern winter (CW), landraces spring (LS) and landraces winter (LW).

Table S2. Associated chromosome types

| | | | | |
|----|-------|-------|-------|------|
| 1 | 2A06, | 7B15 | | |
| 2 | 4A05, | 2B09 | | |
| 3 | 4A06, | 5B12 | | |
| 4 | 1B14, | 5B10 | | |
| 5 | 1B21, | 3B03, | 7B05 | |
| 6 | 1B26, | 3B14, | 5B09 | |
| 7 | 2B01, | 5B08 | | |
| 8 | 2B15, | 3B17, | 4B13 | |
| 9 | 2B18, | 6B16 | | |
| 10 | 3B11, | 6B09 | | |
| 11 | 5B14, | 6B15, | 1D03, | 6D02 |
| 12 | 7B02, | 7D02 | | |

Table S3. Fisher’s exact test for overrepresentation of chromosome types in the total sample and in subsamples of winter (W), spring (S), landraces (L), and modern (C) varieties

Frequencies of varieties in the total sample (T) and the test sample (S) are shown, along with the test *p*-value. Results with *p* < 0.05 are presented.

| T | S | <i>p</i> | T | S | <i>p</i> | T | S | <i>p</i> | | | |
|------|----|----------|--------------|------|----------|--------------|--------------|----------|----|--------------|--------------|
| CS | | | LW | | | S | | | | | |
| 4A08 | 20 | 13 | 3.007284e-06 | 2B12 | 10 | 7 | 0.002036483 | 4A08 | 20 | 19 | 8.679883e-07 |
| 5B02 | 17 | 11 | 3.646524e-05 | 2D05 | 4 | 4 | 0.003286319 | 5B02 | 17 | 15 | 2.131232e-04 |
| 5A03 | 6 | 6 | 7.675531e-05 | 4A09 | 12 | 7 | 0.009293125 | 7A07 | 10 | 9 | 5.383133e-03 |
| 3B02 | 9 | 6 | 3.971019e-03 | 6B11 | 15 | 8 | 0.010240539 | 5A03 | 6 | 6 | 1.038808e-02 |
| 1B07 | 16 | 8 | 8.339742e-03 | 1A04 | 5 | 4 | 0.013580810 | 1B02 | 6 | 6 | 1.038808e-02 |
| 7A07 | 10 | 6 | 8.426497e-03 | 1B23 | 3 | 3 | 0.014528987 | 3B02 | 9 | 8 | 1.122453e-02 |
| 2B11 | 3 | 3 | 1.075522e-02 | 7A06 | 22 | 10 | 0.014819235 | 6B03 | 9 | 8 | 1.122453e-02 |
| 3B22 | 3 | 3 | 1.075522e-02 | 1A03 | 16 | 8 | 0.017053505 | 1D01 | 62 | 35 | 1.441715e-02 |
| 4B06 | 9 | 5 | 2.713951e-02 | 7B19 | 8 | 5 | 0.022536181 | 1A01 | 35 | 22 | 2.172183e-02 |
| 6B03 | 9 | 5 | 2.713951e-02 | 2B02 | 12 | 6 | 0.044040080 | 4B10 | 5 | 5 | 2.302223e-02 |
| 3B01 | 4 | 3 | 3.649094e-02 | 4B09 | 4 | 3 | 0.048256993 | 6B07 | 5 | 5 | 2.302223e-02 |
| 6B04 | 4 | 3 | 3.649094e-02 | C | | | 6A01 | 7 | 6 | 4.501501e-02 | |
| 7B03 | 4 | 3 | 3.649094e-02 | 2D06 | 34 | 31 | 1.249488e-10 | 6B05 | 7 | 6 | 4.501501e-02 |
| 1A01 | 35 | 12 | 3.714427e-02 | 7A04 | 15 | 15 | 5.756800e-06 | W | | | |
| 6B05 | 7 | 4 | 4.604435e-02 | 4A04 | 15 | 14 | 1.367736e-04 | 3B05 | 20 | 20 | 1.334426e-07 |
| CW | | | 6B10 | 9 | 9 | 1.099441e-03 | 4A04 | 15 | 14 | 2.793617e-04 | |
| 2D06 | 34 | 21 | 2.035800e-09 | 1D02 | 24 | 18 | 3.098454e-03 | 6B11 | 15 | 14 | 2.793617e-04 |
| 4A04 | 15 | 13 | 8.962821e-08 | 1B07 | 16 | 13 | 4.774163e-03 | 4A03 | 11 | 11 | 3.624532e-04 |
| 3B05 | 20 | 15 | 1.641136e-07 | 3B05 | 20 | 15 | 8.703765e-03 | 6B10 | 9 | 9 | 1.727694e-03 |
| 6B10 | 9 | 9 | 1.593221e-06 | 5A03 | 6 | 6 | 1.207263e-02 | 6B13 | 8 | 8 | 3.688860e-03 |
| 7A04 | 15 | 12 | 2.229746e-06 | 1B01 | 6 | 6 | 1.207263e-02 | 7A04 | 15 | 12 | 1.521051e-02 |
| 1D02 | 24 | 14 | 8.079269e-05 | 2A03 | 5 | 5 | 2.605147e-02 | 1D02 | 24 | 17 | 2.406581e-02 |
| 4A03 | 11 | 8 | 7.909397e-04 | 2A09 | 8 | 7 | 2.674609e-02 | 1A04 | 5 | 5 | 3.306532e-02 |
| 2A03 | 5 | 5 | 9.106666e-04 | 4B05 | 13 | 10 | 3.082870e-02 | 2A03 | 5 | 5 | 3.306532e-02 |
| 4B02 | 4 | 4 | 3.978175e-03 | 5B02 | 17 | 12 | 4.612187e-02 | 1B09 | 5 | 5 | 3.306532e-02 |
| 1B09 | 5 | 4 | 1.624821e-02 | L | | | 1A03 | 16 | 12 | 3.559310e-02 | |
| 7B22 | 3 | 3 | 1.670834e-02 | 7A06 | 22 | 18 | 0.0006426653 | 5B05 | 8 | 7 | 3.630614e-02 |
| 5B05 | 8 | 5 | 2.775189e-02 | 1D01 | 62 | 38 | 0.0015867344 | 2D06 | 34 | 22 | 4.218509e-02 |
| 6B13 | 8 | 5 | 2.775189e-02 | 4A09 | 12 | 11 | 0.0019782316 | 5A05 | 38 | 24 | 4.779264e-02 |
| 2B06 | 17 | 8 | 3.627147e-02 | 2A04 | 7 | 7 | 0.0065579726 | W ⊆ C | | | |
| 1B01 | 6 | 4 | 3.981565e-02 | 2D02 | 13 | 11 | 0.0077049417 | 3B05 | 15 | 15 | 3.235699e-06 |
| LS | | | 5B01 | 20 | 15 | 0.0118798889 | 4A04 | 14 | 13 | 3.023581e-04 | |
| 2A01 | 4 | 4 | 0.003286319 | 3B18 | 6 | 6 | 0.0139788362 | 6B10 | 9 | 9 | 1.449119e-03 |
| 3B24 | 4 | 4 | 0.003286319 | 6B14 | 14 | 11 | 0.0214542052 | 2D06 | 31 | 21 | 3.307477e-03 |
| 1B02 | 6 | 5 | 0.003537404 | 1A03 | 16 | 12 | 0.0283459593 | 4A03 | 8 | 8 | 3.381277e-03 |
| 6B08 | 3 | 3 | 0.014528987 | 1B17 | 5 | 5 | 0.0293913993 | 1D02 | 18 | 14 | 7.506876e-03 |
| 2D02 | 13 | 7 | 0.016705809 | 7B19 | 8 | 7 | 0.0312323443 | 7A04 | 15 | 12 | 1.171745e-02 |
| 4A10 | 6 | 4 | 0.033667624 | 2D04 | 22 | 15 | 0.0473071038 | 2A08 | 6 | 6 | 1.655831e-02 |
| 5A09 | 6 | 4 | 0.033667624 | 2B12 | 10 | 8 | 0.0482425246 | 2A03 | 5 | 5 | 3.495644e-02 |
| 3B18 | 6 | 4 | 0.033667624 | | | | | 5B05 | 5 | 5 | 3.495644e-02 |
| | | | | | | | | 6B13 | 5 | 5 | 3.495644e-02 |

Table S3 (end)

| T | S | p | T | S | p | T | S | p |
|-------|----|--------------|-------|----|-------------|-------|----|--------------|
| S ⊆ C | | | W ⊆ L | | | C ⊆ W | | |
| 4A08 | 13 | 2.119373e-06 | 6B11 | 8 | 0.001804239 | 2D06 | 22 | 1.357636e-09 |
| 5B02 | 12 | 2.600648e-04 | 2B12 | 8 | 0.022973975 | 7A04 | 12 | 4.701241e-05 |
| 1D01 | 24 | 3.341667e-03 | 3B05 | 5 | 0.024248440 | 4A04 | 14 | 1.557286e-04 |
| 5A03 | 6 | 6.357794e-03 | 2B02 | 7 | 0.047286095 | 6B10 | 9 | 9.221665e-04 |
| 3B02 | 6 | 6.357794e-03 | S ⊆ L | | | 1D02 | 17 | 1.248544e-03 |
| 2A07 | 8 | 1.316426e-02 | 1B02 | 5 | 0.02424844 | 3B05 | 20 | 4.690627e-03 |
| 4B06 | 5 | 1.610641e-02 | 4A08 | 7 | 0.04728609 | 2A03 | 5 | 2.754144e-02 |
| 6B03 | 5 | 1.610641e-02 | C ⊆ S | | | 1B07 | 5 | 2.754144e-02 |
| 7A07 | 7 | 3.007065e-02 | 2D06 | 12 | 0.004205031 | 2B06 | 10 | 4.149749e-02 |
| 2D04 | 7 | 3.007065e-02 | 5A03 | 6 | 0.007388788 | 7B21 | 10 | 4.149749e-02 |
| 6B05 | 4 | 3.925938e-02 | 5B02 | 15 | 0.014607896 | L ⊆ W | | |
| | | | 4A08 | 19 | 0.015501855 | 1D01 | 27 | 0.000474373 |
| | | | 5A07 | 4 | 0.043285982 | 4A09 | 7 | 0.003758163 |
| | | | L ⊆ S | | | 2B12 | 7 | 0.003758163 |
| | | | 2A08 | 5 | 0.03095685 | 7A06 | 12 | 0.006275135 |
| | | | 7A06 | 10 | 0.04849073 | 2A07 | 9 | 0.008860818 |
| | | | | | | 2D04 | 9 | 0.008860818 |
| | | | | | | 2D02 | 4 | 0.049095607 |
| | | | | | | 2D05 | 4 | 0.049095607 |

Table S4. Evaluation of agglomerative hierarchical clustering methods

The empirical evaluation is based on the best separation of varieties based on the tested characteristics

The parsimony value of a topology corresponds to the smallest number of changes explaining the tested topology.

| | single | complete | average | mcquitty | median | centroid | ward.D | ward.D2 |
|-----------|--------|----------|---------|----------|--------|----------|--------|---------|
| VT | 45 | 65 | 72 | 52 | 2 | 2 | 77 | 76 |
| GH | 37 | 56 | 61 | 55 | 2 | 2 | 60 | 61 |
| VTGH | 26 | 42 | 51 | 34 | 2 | 2 | 52 | 52 |
| Parsimony | 1008 | 935 | 938 | 935 | 992 | 1066 | 937 | 930 |

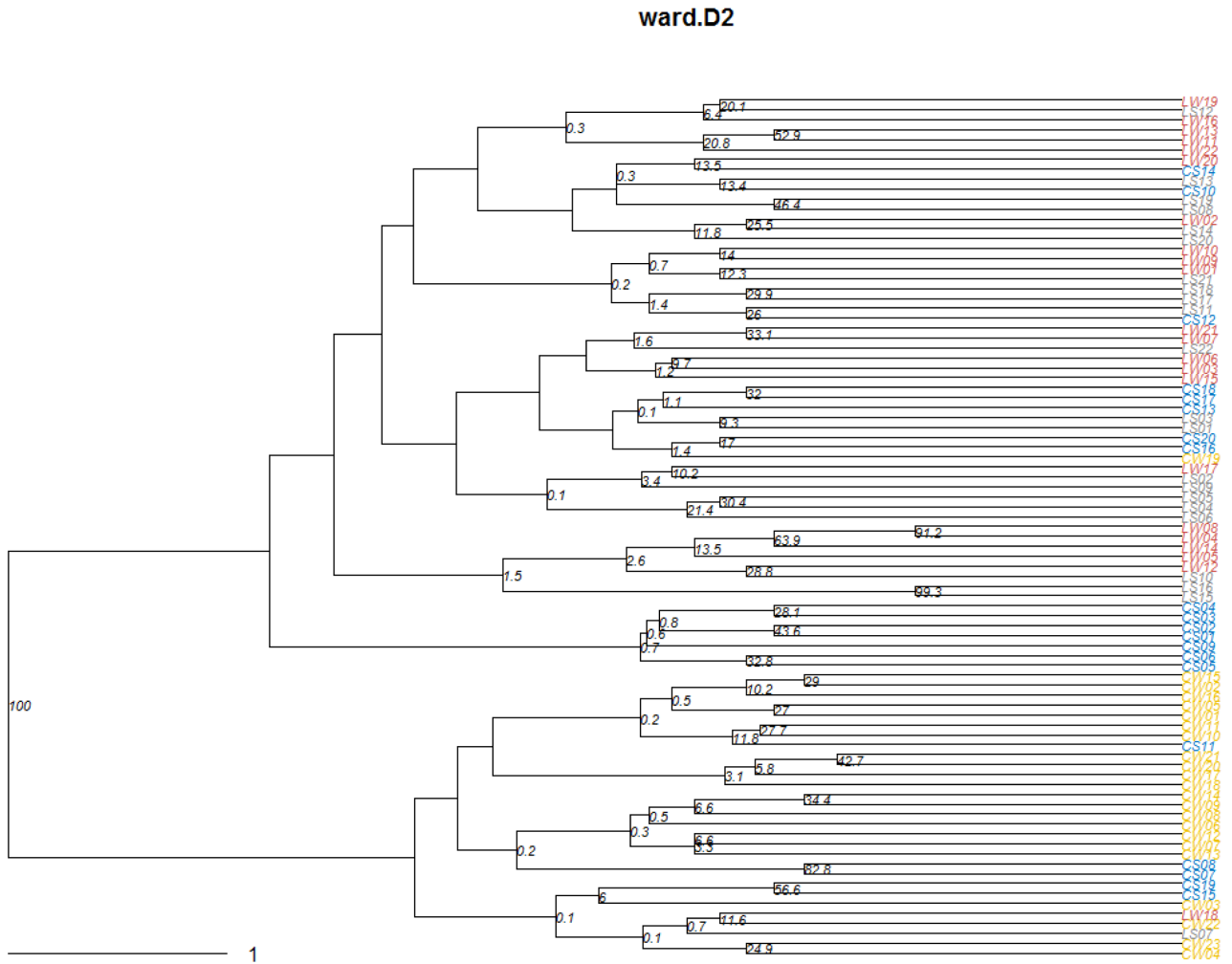


Fig. S3. Preservation of clades in the Ward's dendrogram (%), based on the qualitative assessment of karyograms.

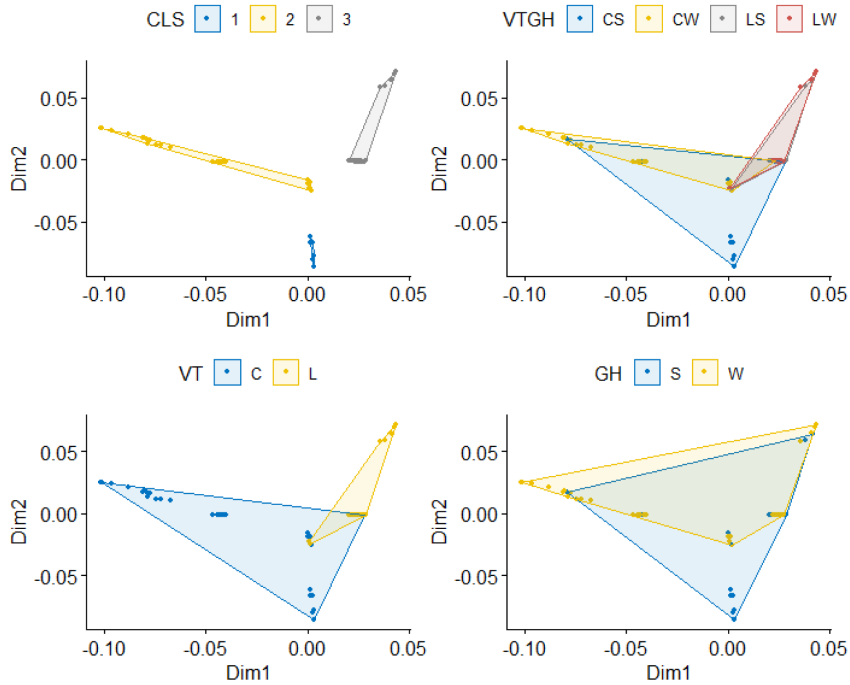


Fig. S4. Distribution of cultivars on the principal coordinate plane of multidimensional scaling after dendrogram optimization using the likelihood maximization method. Four variants of cultivar grouping corresponding to clusters on the dendrogram (CLS), breeding status (VT), growth habit (GH), and a combination of these traits (VTGH) are presented.

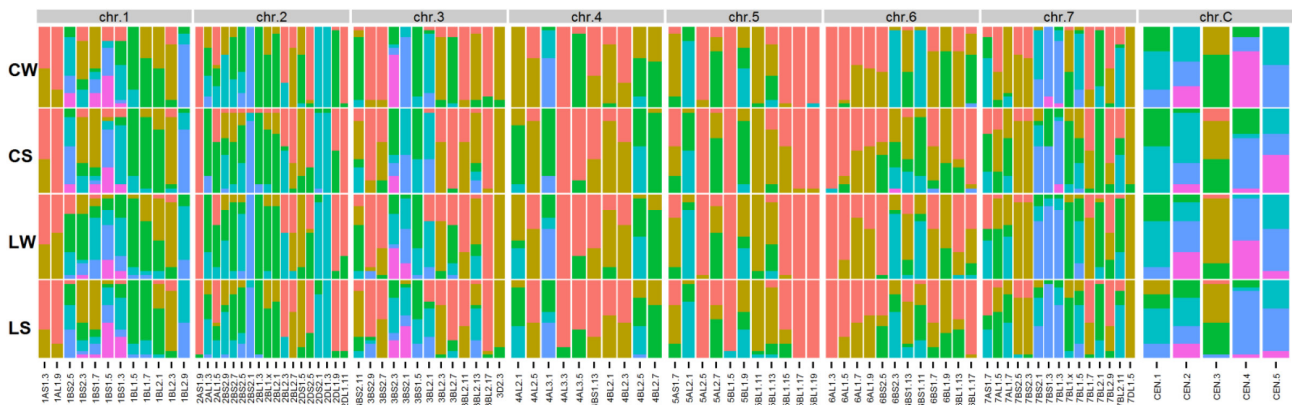


Fig. S5. Frequencies of occurrence of C-bands of different sizes (on a scale from 0 to 5) in subsamples of cultivars by breeding status and growth habit: modern spring (CS), modern winter (CW), landraces spring (LS), and landraces winter (LW).

Table S5 (end)

| L/C ⊆ S | | | LS | | |
|---------|-------------|--------------|---------|------------|--------------|
| oddFC | p | | oddFC | p | |
| 7BL1.x | 12.21238544 | 0.0056395026 | CEN.4 | 2.3032660 | 4.720135e-02 |
| 7BL1.7 | 9.60000000 | 0.0027646478 | 7BL1.5 | 2.1772197 | 2.036061e-02 |
| 7AL1.5 | 8.76954407 | 0.0011501148 | 3BS2.11 | 1.9293118 | 3.523730e-02 |
| 7BS2.3 | 6.42857143 | 0.0393550143 | 3BS2.3 | 1.8133985 | 9.279638e-03 |
| 3BS2.7 | 5.60459933 | 0.0492204641 | 1BS2.5 | 1.7356265 | 2.927579e-02 |
| 4BL2.5 | 5.26681478 | 0.0055907296 | 7AS1.7 | 1.7134786 | 2.279269e-02 |
| 2DS2.5 | 4.91926098 | 0.0035499957 | 1BS1.3 | 0.5876856 | 1.692918e-02 |
| 1AL1.9 | 4.32000000 | 0.0364664028 | 4BL2.3 | 0.3402778 | 4.294953e-02 |
| 4BL2.3 | 4.00000000 | 0.0382506071 | 2DS2.5 | 0.3107904 | 1.133060e-02 |
| 3BL2.13 | 3.76258583 | 0.0236931000 | 3BL2.13 | 0.3052966 | 1.700284e-03 |
| 7AL1.7 | 3.08851624 | 0.0078135258 | 4BL2.7 | 0.3000000 | 2.696245e-02 |
| 1BS2.3 | 2.16402634 | 0.0270840761 | 7BS2.3 | 0.2856251 | 2.409416e-02 |
| 1BS1.3 | 1.97141883 | 0.0462657065 | 7AL1.7 | 0.2625497 | 2.387118e-03 |
| 6BL1.17 | 0.29599501 | 0.0111290917 | 4BL2.5 | 0.2569985 | 9.614478e-04 |
| 6BL1.9 | 0.25000000 | 0.0382506071 | 1BL1.7 | 0.2483128 | 6.510611e-03 |
| 1BL2.9 | 0.21245264 | 0.0148592766 | 3BS1.5 | 0.2246264 | 2.012799e-02 |
| 4AL3.5 | 0.18898224 | 0.0006157437 | 7BL1.7 | 0.2211107 | 8.228204e-03 |
| 1BS2.5 | 0.18701385 | 0.0028006958 | 7AL1.5 | 0.1986961 | 1.696114e-04 |
| CEN.3 | 0.12101106 | 0.0045773674 | 7BL1.x | 0.1508183 | 4.338966e-04 |
| 2DS1.5 | 0.08859840 | 0.0028273986 | 3BL2.11 | 0.1224490 | 9.458024e-03 |
| 2DL1.9 | 0.06741999 | 0.0001428884 | 5BL1.15 | 0.1175061 | 3.923902e-02 |
| | | | 3BS2.7 | 0.1121521 | 5.215304e-03 |
| CS | | | LW | | |
| 4BL2.7 | 8.6739128 | 0.046950747 | 1BL1.7 | 4.70154646 | 0.0044718811 |
| 4AL2.5 | 4.5945941 | 0.027645072 | 4AL2.1 | 3.58462962 | 0.0003171028 |
| 3BL2.11 | 4.0833333 | 0.010752451 | 5BL1.15 | 2.81462474 | 0.0203973817 |
| 3BS2.7 | 3.2386825 | 0.010012353 | 3BS1.5 | 2.65024170 | 0.0196268890 |
| CEN.5 | 2.9524869 | 0.011739822 | 7AL1.5 | 2.46354471 | 0.0179318097 |
| 5BL1.15 | 2.7100691 | 0.022421883 | 3BL2.13 | 2.31000988 | 0.0009117454 |
| 4BL2.5 | 2.3170771 | 0.032137403 | 7AL1.7 | 2.03862332 | 0.0201830106 |
| 6BS2.5 | 2.1840738 | 0.013380643 | 6BS2.5 | 1.87929932 | 0.0366218972 |
| 1BS2.5 | 1.9951456 | 0.013270964 | 3BS2.9 | 1.71514841 | 0.0167794411 |
| 3BS2.3 | 0.6313926 | 0.043703371 | 3BL2.7 | 0.58108455 | 0.0389692437 |
| 2BS2.5 | 0.4741947 | 0.029020884 | 3BS2.11 | 0.52613601 | 0.0388633406 |
| 5BL1.13 | 0.4361177 | 0.037360960 | 6BS1.11 | 0.36110491 | 0.0024973766 |
| 5AL2.1 | 0.4286940 | 0.049261498 | 2DL1.9 | 0.30195442 | 0.0032698954 |
| 6BS2.3 | 0.4198854 | 0.012067344 | 4BL2.1 | 0.26790319 | 0.0113899417 |
| CEN.4 | 0.4059491 | 0.001498814 | 6BL1.17 | 0.07364306 | 0.0045532805 |
| 4AL3.5 | 0.4016772 | 0.008790350 | | | |
| 7BL1.5 | 0.3471609 | 0.001408687 | | | |
| 2BS2.7 | 0.3368214 | 0.016482198 | | | |
| 4AL3.1 | 0.2857028 | 0.001271349 | | | |
| 7BS1.3 | 0.2180138 | 0.000201228 | | | |
| 3BL2.7 | 0.2079990 | 0.002818173 | | | |
| CW | | | | | |
| 6BS1.11 | 11.2946305 | 3.673330e-02 | 1AL1.9 | 7.4666667 | 0.0006183566 |
| 2DS1.5 | 9.7625365 | 9.282923e-05 | 7BL1.7 | 2.8731206 | 0.0274442206 |
| 2DL1.9 | 8.8640526 | 1.144592e-04 | 7AL1.5 | 2.8390001 | 0.0076141794 |
| 4AL3.5 | 5.3878946 | 6.491259e-05 | 2DL1.11 | 2.7838822 | 0.0093178273 |
| 6BL1.17 | 4.7905170 | 2.223526e-04 | 2DS2.5 | 2.1878989 | 0.0045558139 |
| 6BL1.9 | 4.3636364 | 6.712062e-03 | CEN.4 | 2.1119984 | 0.0366137259 |
| 6BS2.3 | 2.9863831 | 1.623090e-02 | 1BS2.3 | 1.7269677 | 0.0184775923 |
| CEN.3 | 2.4163698 | 3.533379e-02 | 3BL2.7 | 1.6504583 | 0.0289953071 |
| 3BL2.7 | 2.3558037 | 5.425907e-04 | 1BS1.7 | 1.4380691 | 0.0390369060 |
| 4AL3.1 | 2.3549149 | 6.904786e-03 | 3BL2.1 | 0.6978848 | 0.0472167504 |
| | | | CEN.3 | 0.4076134 | 0.0390683340 |
| | | | 2DL1.9 | 0.3019544 | 0.0032698954 |
| | | | 1BS2.5 | 0.2859754 | 0.0001869793 |
| | | | 1BL2.9 | 0.2604521 | 0.0021461946 |
| | | | 6BS2.5 | 0.1538589 | 0.0229357010 |
| | | | 5BL1.15 | 0.1253938 | 0.0452428763 |

Table S6. Evaluation of agglomerative hierarchical clustering methods

The empirical evaluation is based on the best separation of varieties based on the tested characteristics.

The parsimony value of a topology corresponds to the smallest number of changes explaining the tested topology.

| | single | complete | average | mcquitty | median | centroid | ward.D | ward.D2 |
|-----------|--------|----------|---------|----------|--------|----------|--------|---------|
| VT | 40 | 53 | 51 | 49 | 2 | 2 | 74 | 72 |
| GH | 43 | 48 | 46 | 51 | 2 | 2 | 58 | 60 |
| VTGH | 28 | 32 | 29 | 33 | 2 | 2 | 49 | 51 |
| Parsimony | 2096 | 1983 | 1955 | 1962 | 2056 | 2265 | 1953 | 1949 |

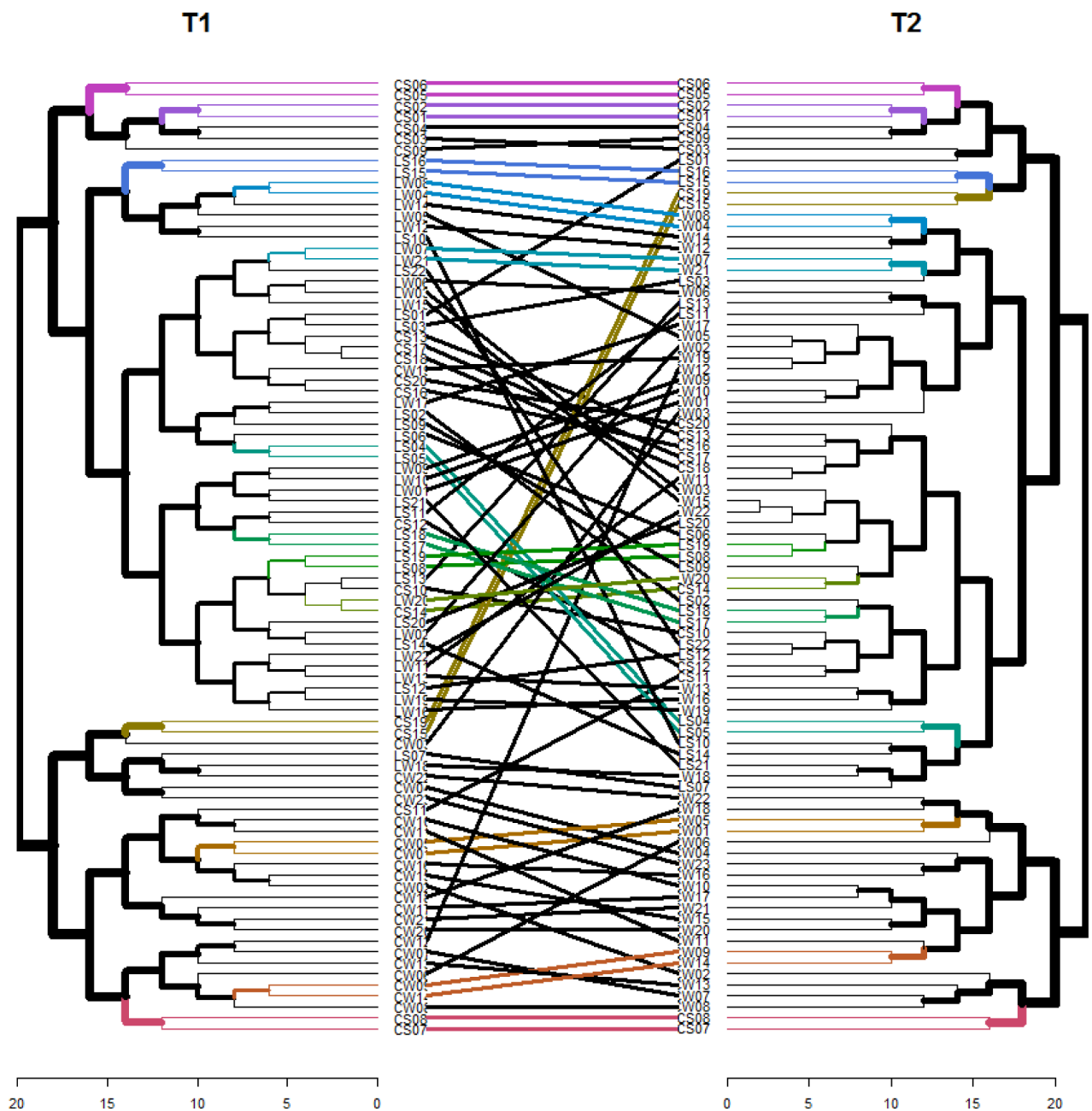


Fig. S6. Comparison of the topologies of Ward's dendrograms, according to the qualitative (T1) and quantitative (T2) assessment of karyograms.

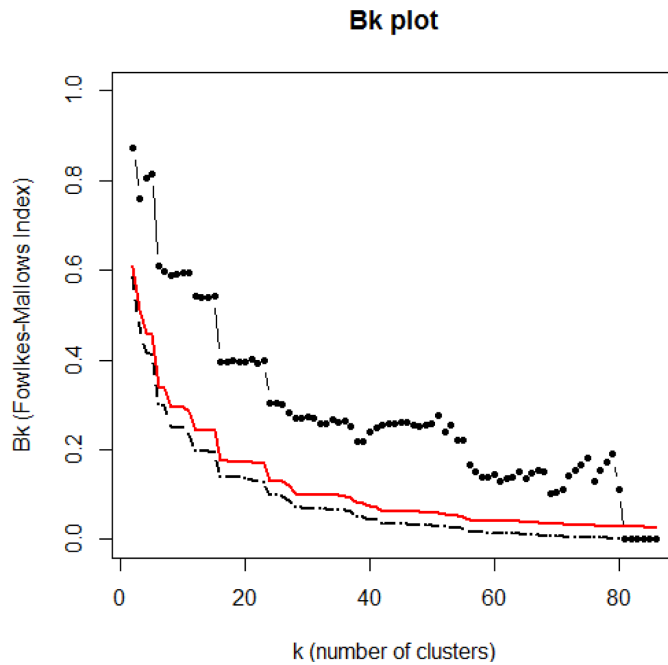


Fig. S7. Scatter plot of the Fowlkes–Mallows index (Bk) for different numbers of clusters (k), calculated from dendrograms obtained using alternative methods of karyogram estimation.

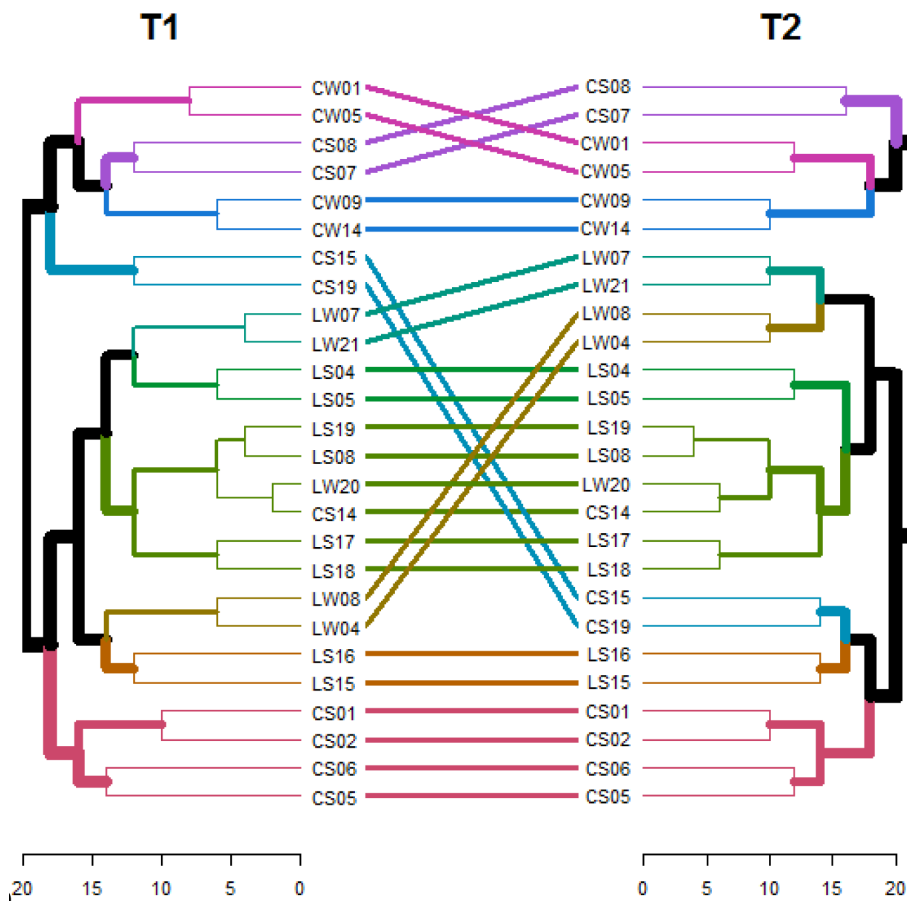


Fig. S8. Comparison of common clades from Figure S6.

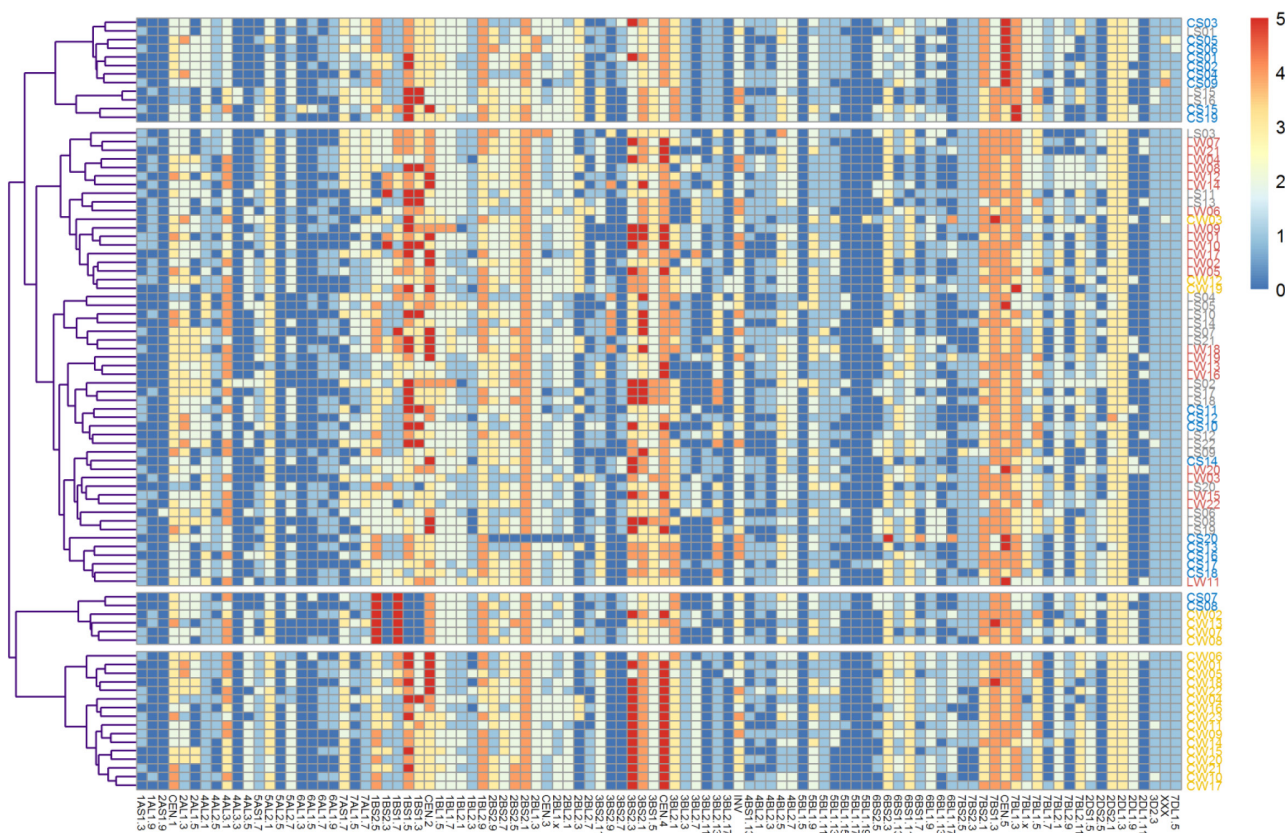


Fig. S9. Diagram of C-bands of different sizes (on a scale from 0 to 5) in cultivars classified using the Ward method. For clarity, the diagram is divided into four major clusters.

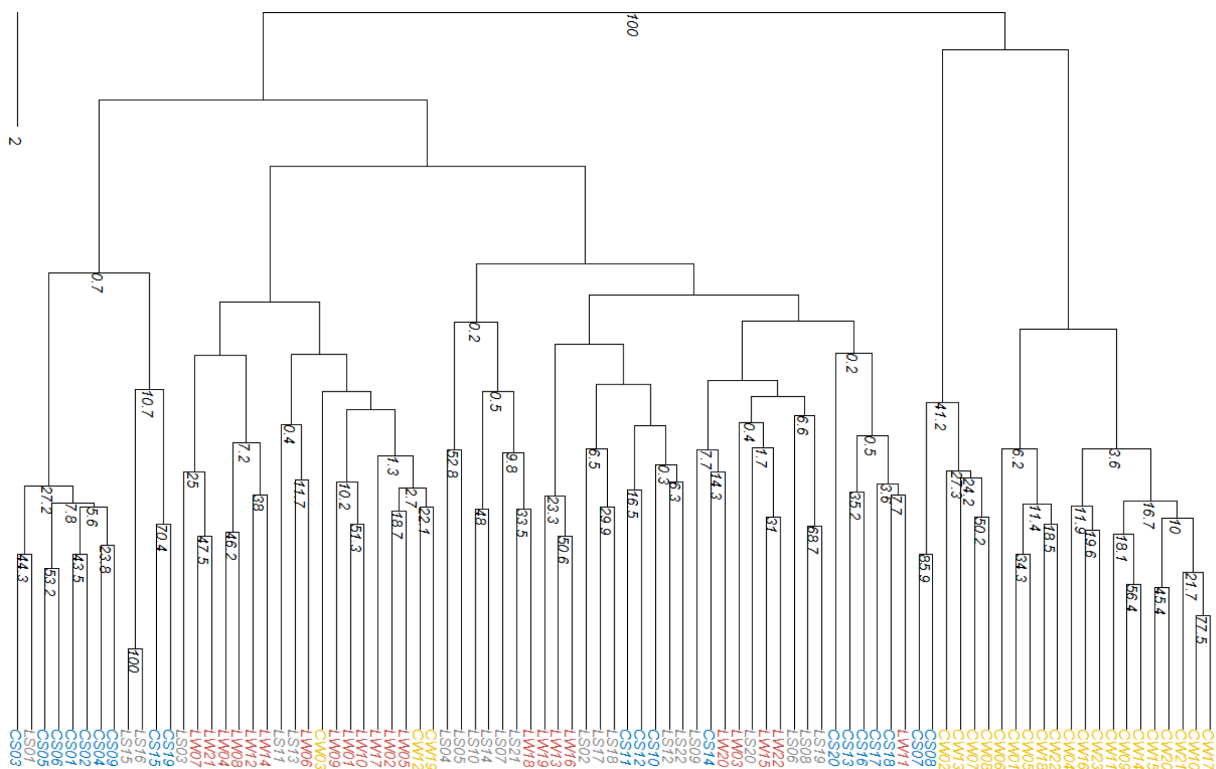


Fig. S10. CPreservation of clades in the Ward's dendrogram (%) based on the quantitative assessment of karyograms.

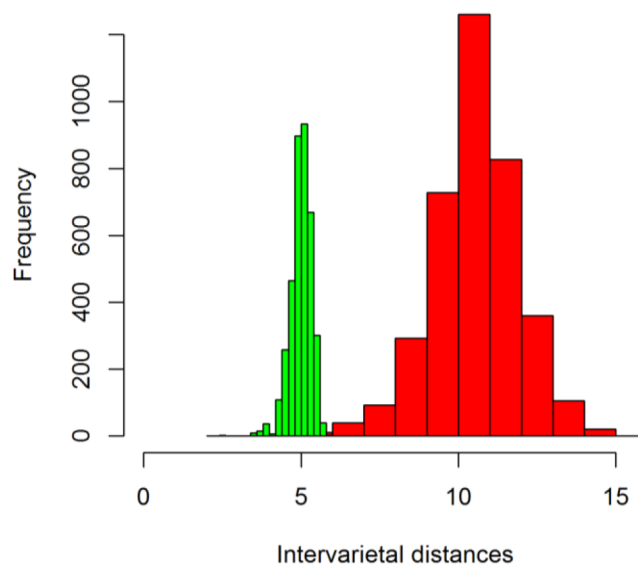


Fig. S11. Histogram of the frequency of intervarietal distances calculated using data from the qualitative (green) and quantitative (red) approaches to assessment of karyograms.