

## **Identification of QTLs for Berry Acid and Tannin in a *Vitis aestivalis*-derived 'Norton'-based population**

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**Supplementary Fig. 1** Genetic linkage map in centimorgans for a 'Norton' × 'Cabernet Sauvignon' F<sub>1</sub> population.

1

|      |                    |
|------|--------------------|
| 0    | 1_353100           |
| 1.3  | 1_93886            |
| 1.6  | 1_FAM79            |
| 2.9  | 1_465283           |
| 3.1  | 1_556323           |
| 3.8  | 1_VMF8             |
| 3.6  | 1_573037           |
| 3.8  | 1_885854           |
|      | 1_962186           |
|      | 1_288676           |
|      | 1_1246628          |
| 4.5  | 1_1552608          |
| 4.9  | 1_1486776          |
| 5.2  | 1_1395159          |
| 5.6  | 1_1505622          |
| 6.7  | 1_1398674          |
|      | 1_1689948          |
| 7.2  | 1_1964061          |
| 7.4  | 1_1849091          |
|      | 1_2533155          |
| 8.3  | 1_3192039          |
| 9.4  | 1_3087071          |
| 9.9  | 1_3068621          |
|      | 1_3040377          |
| 10.1 | 1_1502642          |
| 10.8 | 1_2426441          |
| 11.9 | 1_2898207          |
| 12.3 | 1_3046128          |
| 12.8 | 1_3062036          |
| 13   | 1_3014930          |
|      | ctg6282            |
| 13.7 | 1_3526348          |
| 13.9 | 1_3755477          |
|      | 1_2800157          |
|      | 1_3655009          |
| 14.6 | 1_4279281          |
| 15   | 1_4189974          |
| 15.7 | 1_3204938          |
| 16.1 | 1_4867972          |
| 18.2 | 1_4234303          |
| 20.4 | 1_4690555          |
| 20.9 | 1_4690555          |
| 22.4 | 1_VRZAG29          |
| 22.7 | 1_4912833          |
|      | 1_5408631          |
|      | 1_5061989          |
|      | 1_4467914          |
| 22.9 | 1_VVC19            |
| 23.8 | 1_5787519          |
|      | 1_5687889          |
| 24   | 1_VVCS1H069G02F1-1 |
| 25.8 | 1_C008             |
|      | 1_6286966          |
| 26.5 | 1_6289485          |
| 26.9 | 1_6307606          |
| 29.2 | 1_VVIB94           |
| 30.3 | 1_VMCNG2g7         |
|      | ctg6234            |
| 30.7 | 1_8882681          |
| 31.8 | 1_7244781          |
| 32.7 | 1_7406974          |
| 33   | 1_747246           |
| 33.4 | 1_7494929          |
| 34.3 | 1_7644169          |
| 35.7 | 1_7983018          |
| 36.1 | 1_9284824          |
| 36.2 | 1_8519509          |
| 36.6 | 1_8458102          |
| 37.2 | 1_8335044          |
| 38.3 | 1_ctg5664          |
| 39.2 | 1_862026           |
| 39.9 | 1_VVIP60           |
| 40.8 | 1_CTG1774          |
| 41.7 | 1_9738524          |
| 44.2 | 1_VMC7g5           |
| 44.9 | 1_10791551         |
|      | 1_10876405         |
|      | 1_10740923         |
|      | 1_10608019         |
| 45.3 | 1_11162355         |
| 45.8 | 1_11800012         |
|      | 1_11175875         |
|      | 1_11549429         |
| 46   | 1_VVIS21           |
| 46.4 | 1_FAM86            |
|      | 1_12207509         |
| 46.6 | 1_11874489         |
| 46.9 | 1_12003411         |
| 48.4 | 1_11234592         |
| 48.7 | 1_12163517         |
| 48.9 | 1_12654439         |
| 51.4 | 1_14650306         |
|      | 1_17587559         |
|      | 1_16954078         |
|      | 1_16686475         |
|      | 1_14811545         |
| 51.6 | 1_12994903         |
| 51.8 | 1_15403182         |
| 52.3 | 1_21230270         |
| 53.7 | 1_17070119         |
| 54   | 1_18503682         |
| 54.3 | 1_19948138         |
| 54.4 | 1_VMC4D2           |
| 54.9 | 1_FAM141           |
|      | 1_17686226         |
| 56.3 | 1_VVIT60           |
| 56.5 | 1_VMC8D1           |
|      | 1_VMC2B3           |
|      | 1_1954762          |
| 57   | 1_19368455         |
| 57.2 | 1_19631033         |
| 57.4 | 1_18957788         |
| 57.6 | 1_20679386         |
| 58.1 | 1_20163885         |
| 59.9 | 1_20928235         |
|      | 1_20793925         |
|      | 1_21011343         |
| 60.6 | 1_21209239         |
|      | 1_VMC9F2           |
| 60.8 | 1_AF3277           |
| 61.7 | 1_21601176         |
|      | 1_VVIC61           |
|      | 1_CTG6392          |
| 62.1 | 1_VVIF52           |
|      | 1_20687142         |
|      | 1_22064642         |
|      | 1_18089574         |
| 63.2 | 1_21857685         |
| 64.4 | 1_22957513         |
|      | 1_23059670         |
| 65.9 | 1_22138495         |
| 66.2 | 1_23050414         |
|      | 1_22789955         |
| 69.5 | 1_23998687         |
|      | 1_VMC9D3           |
| 70   | 1_23931909         |
| 70.9 | 1_23481315         |
| 71.8 | 1_23487293         |
| 72.2 | 1_23979172         |
| 73.1 | 1_22019852         |
| 73.8 | 1_23014824         |
| 74.2 | 1_22695094         |
| 75.1 | 1_22883631         |
| 75.6 | 1_2182493          |
| 76   | 1_18596337         |
| 77.2 | 1_19614442         |
| 77.8 | 1_17440748         |
| 78.9 | 1_19077195         |
| 80.3 | 1_12796523         |

2

|      |            |
|------|------------|
| 0    | UDV-109    |
| 2    | 2_183762   |
| 3.4  | 2_627317   |
| 3.8  | 2_99072    |
|      | 2_259805   |
|      | 2_628284   |
|      | 2_227675   |
| 4.3  | 2_1075884  |
| 5.6  | 2_681714   |
| 6.1  | 2_518200   |
|      | 2_628284   |
|      | 2_571146   |
| 6.3  | 2_715116   |
| 6.7  | 2_622466   |
| 7    | 2_539303   |
| 7.2  | 2_1021390  |
| 7.8  | 2_1267269  |
| 8.3  | 2_1352277  |
| 8.7  | 2_1996740  |
|      | 2_1408665  |
| 9.2  | 2_1701139  |
| 9.4  | 2_2170541  |
|      | 2_2008936  |
| 10.8 | 2_2052665  |
| 10.8 | 2_2267024  |
| 11   | 2_2524834  |
| 11.7 | 2_2307909  |
| 13.2 | 2_3629105  |
|      | 2_4650256  |
|      | 2_2338142  |
| 13.5 | 2_3044019  |
| 14.4 | 2_3293017  |
| 16.4 | 1_VWMD30   |
| 17.3 | 2_3794479  |
| 17.5 | 2_2863695  |
| 18.8 | 2_4167126  |
| 20.4 | 2_4154260  |
| 20.6 | 2_3960220  |
| 21.1 | 2_4150765  |
| 22   | 2_426784   |
| 22.2 | 2_4650256  |
| 23.5 | 2_4670354  |
|      | 1_VMC3B10  |
| 23.8 | 1_VMC6F1   |
| 26.2 | 2_5086689  |
| 26.5 | 1_5189316  |
| 26.7 | 1_VVIO55   |
| 28.3 | 2_5528881  |
|      | 2_5166348  |
| 28.9 | 1_5189316  |
|      | 2_5275317  |
| 29.6 | 2_4793734  |
| 29.8 | 2_4531063  |
| 30.1 | 2_5333549  |
| 30.9 | 2_5715424  |
| 34.3 | 1_VRIP93   |
| 34.8 | 1_VRZAG93  |
| 35.2 | 2_5741591  |
| 36.8 | 2_6496759  |
| 37.2 | 2_6189582  |
|      | 2_6360230  |
| 38.4 | 1_VMC2C10  |
|      | 2_6871603  |
| 41   | 2_7434950  |
| 42.4 | 2_7293317  |
|      | 2_7540715  |
|      | 2_7343828  |
|      | 2_7991581  |
| 43.7 | 2_7324992  |
| 44.4 | 2_7271746  |
| 45.3 | 2_8251144  |
| 45.5 | 1_VMC5G7   |
| 45.8 | 1_VMC6B1   |
| 48.4 | 2_8281947  |
| 48.7 | 2_8581724  |
| 49.3 | 2_8876524  |
| 50.2 | 1_FAM140   |
| 50.9 | 1_9126571  |
| 51.4 | 2_10146394 |
| 52.3 | 2_8871985  |
| 52.9 | 2_8874337  |
| 53.4 | 2_9289776  |
|      | 2_9022174  |
| 54.3 | 2_10522814 |
| 55.2 | 2_15748193 |
| 55.4 | 2_15380371 |
|      | 2_15291546 |
| 56.5 | 1_FAM24    |
| 57   | 2_1398259  |
|      | 2_14428045 |
| 58.1 | 1_VVIU20   |
| 59.2 | 2_16610595 |
| 59.9 | 1_VMC9C2   |
| 61   | 2_17017102 |
|      | 2_17420491 |
| 61.2 | 2_17628816 |
| 61.5 | 2_17019735 |
|      | 2_16994368 |
| 61.7 | 2_17254857 |
| 61.9 | 2_17723411 |
| 62.4 | 2_17854999 |
| 62.8 | 1_VMC7g3   |
| 63.7 | 2_17261738 |
| 64.4 | 2_16801039 |
|      | 2_16660058 |
| 64.8 | 2_18012093 |
| 67.7 | 2_18456757 |
| 69.1 | 2_18126379 |

3

|      |            |
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| 0    | 3_630046   |
| 1.6  | 3_45714    |
| 2    | 3_1001061  |
| 3.4  | 3_534717   |
| 5.2  | UDV-093    |
| 5.6  | 3_1692690  |
| 6.5  | 3_1804581  |
| 7.2  | 3_2215225  |
| 8.5  | 3_2507923  |
| 9    | 3_2541755  |
| 9.2  | 3_2730321  |
| 9.6  | 3_2511389  |
| 10.3 | 3_2870081  |
| 10.8 | 3_2961944  |
| 11   | 3_2879036  |
|      | 3_2823098  |
| 11.4 | 3_2775319  |
| 11.9 | 3_2995975  |
| 12.6 | 3_1055879  |
| 13   | 3_931142   |
| 13.7 | 3_3489467  |
| 13.9 | 3_1045159  |
| 14.6 | 3_1482979  |
| 16.6 | 3_4222059  |
| 17.3 | 3_4282069  |
| 17.5 | 3_4298411  |
| 18.4 | 3_4365084  |
|      | 3_4520582  |
| 20.2 | 3_5133870  |
| 21.8 | CF8956     |
|      | FAM138     |
|      | 1_1773634  |
| 22.9 | 3_5645575  |
|      | 1_VMC2E7   |
| 25.6 | 3_5606724  |
| 25.8 | 3_5606970  |
| 26.2 | 3_5345910  |
|      | 1_UDV-021  |
| 33   | 3_5895144  |
| 33.2 | 3_5975414  |
| 35   | 3_5645685  |
| 35.5 | 3_6003253  |
| 35.9 | 3_8343289  |
| 36.1 | 3_6821792  |
| 37.3 | 3_5417646  |
| 38.8 | 1_VMC1A5   |
| 39.3 | 3_6059155  |
| 39.7 | 3_6821894  |
|      | 3_7076535  |
| 42.4 | 1_VMC3F3   |
| 42.9 | 3_7815436  |
| 43.6 | 1_VWMD36   |
| 44   | 3_12679209 |
| 44.7 | 1_VMC1G7   |
| 45.6 | 3_8793587  |
| 45.8 | 3_8916660  |
|      | 3_8423516  |
| 46   | 3_8565152  |
| 47.6 | 3_10965564 |
| 49.6 | 3_11346944 |
| 50.1 | 1_VVIN54   |
| 50.7 | 3_4898288  |
|      | 3_11095355 |
|      | ctg0171    |
| 51.2 | 3_11841707 |
|      | 3_11657172 |
| 52.3 | 3_12679209 |
|      | 1_FAM030   |
| 52.7 | 3_12221133 |
| 53   | 3_14761020 |
| 53.4 | 3_9953252  |
|      | 3_14649635 |
| 53.6 | 3_14761125 |
| 53.9 | 3_12331467 |
| 54.1 | 3_12779026 |
| 54.3 | 3_1227718  |
| 55.9 | 3_14789191 |
|      | 3_18229580 |
| 56.6 | 3_18229855 |
| 56.8 | 3_18229390 |
| 57.2 | 3_18815282 |
| 57.5 | 3_19185118 |
| 57.9 | 3_18786793 |
| 58.9 | 3_19186297 |
| 59   | 3_18727278 |
| 61.1 | 3_19185531 |
| 61.9 | 3_20462208 |
| 63.7 | 3_20285707 |

4

|      |                     |
|------|---------------------|
| 0    | 4_489508            |
| 1.6  | 4_601469            |
| 2.7  | 4_977771            |
| 4    | 4_1288544           |
| 5.2  | 4_2402739           |
| 6.1  | 4_1260769           |
| 6.7  | VMCNG1F1-1          |
| 7.4  | 1_VVIR46            |
| 9.4  | 4_1825577           |
| 9.9  | 4_3188373           |
| 10.3 | 4_2528017           |
| 10.5 | 4_971187            |
| 10.8 | 4_1336305           |
| 11   | 4_1329404           |
| 11.2 | 4_2283799           |
| 11.4 | 4_1848181           |
| 11.4 | 4_1933169           |
| 12.1 | 4_2406124           |
| 12.3 | 4_2581046           |
| 12.6 | 4_2520693           |
|      | 4_2584148           |
|      | 4_2239183           |
| 13.5 | ctg5780             |
| 14.6 | 4_1311919           |
|      | 4_3131772           |
|      | 4_3007368           |
| 15.5 | 1_BM48005           |
| 16.4 | 4_3602421           |
| 16.8 | 1_VMC4D4            |
|      | 4_4181524           |
|      | 4_3780507           |
|      | 4_3738807           |
|      | 4_3834108           |
|      | 4_3479809           |
|      | 4_3435781           |
|      | 4_3888421           |
|      | 4_3511733           |
| 17.7 | 4_4973627           |
| 18.2 | 4_4264443           |
|      | 4_3832912           |
| 18.6 | 4_4577637           |
| 18.8 | 4_4489886           |
| 19.1 | 4_4525341           |
| 19.5 | 1_FAM38             |
|      | ctg6426             |
|      | 4_5203117           |
|      | 4_4759027           |
|      | 4_4844125           |
|      | ctg1026             |
|      | 4_4803772           |
| 20.2 | 1_VMC7H3            |
|      | 4_4973249           |
| 20.6 | 4_4869694           |
| 21.1 | 4_5012590           |
| 21.3 | 4_5653413           |
| 22.4 | 4_5525201           |
|      | 4_5180706           |
|      | 1_FAM129            |
|      | 1_FAM46             |
| 22.9 | 4_5067179           |
|      | 1_VVCS1H081N04R1-1  |
| 23.8 | 4_5720306           |
| 24.7 | 4_5848384           |
| 29.2 | 4_6149490           |
| 30.1 | 4_6921085           |
| 30.3 | 4_6920919           |
| 30.5 | 4_7244304           |
| 30.7 | 4_9514156           |
| 31.2 | 4_5389593           |
| 31.6 | 4_6549227           |
| 32.3 | 4_7614354           |
| 32.8 | 4_7631196           |
| 33.2 | 4_8478010           |
| 33.4 | 4_8186452           |
| 34.1 | 4_8211327           |
| 35   | 1_SC8_0107_070      |
| 37.2 | 4_10392690          |
|      | ctg0171             |
|      | 3_11841707          |
|      | 3_11657172          |
| 37.9 | 4_9737996           |
| 38.1 | 4_14441480          |
| 38.4 | 4_10225946          |
| 38.8 | 4_10105881          |
| 39   | 4_10667973          |
|      | 4_23218838          |
| 39.3 | 4_13363274          |
| 39.5 | 4_13795886          |
| 40.2 | 1_VVCS1H069G06F1-1  |
| 40.8 | 1_VVCS1H069G118F1-1 |
| 41.3 | 1_SSRLG4-3          |
| 41.5 | 4_13478182          |
|      | 1_VMC2B5            |
|      | 1_VVIR2A21          |
| 42.2 | 1_VVIP29            |
| 42.4 | 4_13925607          |
| 44.2 | 1_VVIN75            |
| 44.7 | 4_14853692          |
| 47.3 | 4_16450967          |
| 47.6 | 4_16397018          |
| 47.8 | 4_17568374          |
| 48.2 | B002                |
|      | 4_16042385          |
| 48.5 | 4_16592622          |
| 48.7 | 4_16738048          |
| 49.6 | 4_16771564          |
|      | 1_VMC2E10           |
| 52.5 | 4_18072153          |
|      | 4_18940320          |
| 52.9 | 4_18806979          |
|      | 4_18767157          |
|      | 4_18644524          |
|      | 1_VVIP37            |
| 53.6 | 4_18954291          |
| 54.5 | 4_18                |

6

|      |            |
|------|------------|
| 0    | 6 908191   |
| 1.3  | 6 780659   |
| 4.5  | 6 574407   |
| 5.7  | 6 784574   |
| 6.1  | 6 796303   |
| 5.2  | 6 770204   |
| 5.2  | 6 790404   |
| 6.1  | 6 669886   |
| 6.3  | UDV_090    |
| 6.5  | 6 1654938  |
| 6.5  | 6 566347   |
| 6.7  | 6 141387   |
| 6.7  | 6 598262   |
| 7.2  | 6 165984   |
| 8.1  | 6 848477   |
| 8.5  | 6 1274469  |
| 8.5  | 6 747441   |
| 9    | FAM40      |
| 9.6  | 6 1798209  |
| 11.2 | 6 1440087  |
| 11.4 | 6 1920586  |
| 11.9 | 6 1943424  |
| 12.3 | 6 2585195  |
| 12.3 | 6 2292019  |
| 12.6 | 6 1645561  |
| 12.8 | 6 2124790  |
| 13.2 | 6 2687060  |
| 13.2 | 6 2353231  |
| 13.7 | 6 2338892  |
| 13.7 | 6 2248129  |
| 13.9 | 6 3007153  |
| 13.9 | 6 2424153  |
| 14.8 | 6 3101046  |
| 15.1 | 6 2919445  |
| 16.1 | 6 2994534  |
| 16.4 | 6 3340474  |
| 20.4 | 6 3351851  |
| 20.4 | 6 4422901  |
| 20.9 | 6 3234780  |
| 20.9 | 6 3741796  |
| 20.9 | FAM110     |
| 21.5 | 6 3562155  |
| 21.5 | 6 3039855  |
| 22.2 | 6 3845208  |
| 23.6 | 6 4257303  |
| 23.6 | 6 5019047  |
| 23.6 | 6 4935235  |
| 23.8 | 6 4331877  |
| 24   | UDV_085    |
| 24.5 | 6 508214   |
| 24.9 | 6 4843784  |
| 25.4 | 6 4824149  |
| 27.1 | 6 564905   |
| 27.1 | 6 5368590  |
| 27.1 | 6 5310116  |
| 27.6 | 6 5737131  |
| 27.6 | 6 5269855  |
| 28.3 | 6 6502718  |
| 28.3 | 6 6610151  |
| 28.7 | 6 6487586  |
| 28.7 | 6 6517454  |
| 28.9 | 6 6141654  |
| 28.9 | 6 5942389  |
| 28.9 | 6 6511296  |
| 28.9 | 6 6516386  |
| 29.2 | 6 6612079  |
| 29.2 | 6 6328471  |
| 29.4 | 6 5649946  |
| 29.6 | VMC2G2     |
| 29.6 | 6 6497294  |
| 29.6 | 6 6593207  |
| 30.7 | 6 7343675  |
| 30.7 | 6 5782555  |
| 31.9 | 6 5679935  |
| 32   | 6 5702481  |
| 33.6 | 6 7456990  |
| 33.6 | 6 7240956  |
| 33.9 | 6 7434965  |
| 33.9 | 6 7410104  |
| 34.1 | FAM78      |
| 34.1 | VMC2F10    |
| 34.5 | 6 814179   |
| 34.5 | VMCNg1h11  |
| 34.8 | 6 786261   |
| 35   | 6 8929136  |
| 35.2 | 6 8585435  |
| 35.9 | 6 8286299  |
| 36   | 6 8139288  |
| 36   | 6 8833974  |
| 36.8 | 6 8594717  |
| 37.2 | 6 8357785  |
| 37.2 | 6 8882019  |
| 37.2 | 6 855015   |
| 38.8 | 6 9366152  |
| 38.8 | 6 11607560 |
| 39.9 | 6 11454244 |
| 39.9 | 6 11398042 |
| 39.9 | 6 12067132 |
| 40.4 | 6 11692519 |
| 40.4 | 6 11963182 |
| 41.5 | 6 12868227 |
| 41.5 | 6 12192456 |
| 42   | 6 13629084 |
| 42.6 | 6 14358962 |
| 42.6 | 6 11430026 |
| 42.8 | 6 14610100 |
| 43.1 | 6 13690378 |
| 43.7 | 6 13471208 |
| 43.7 | 6 14262997 |
| 43.7 | VVS5       |
| 44.6 | 6 14731971 |
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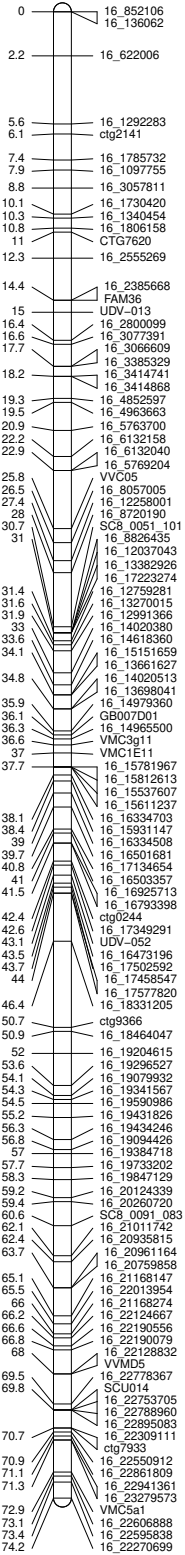
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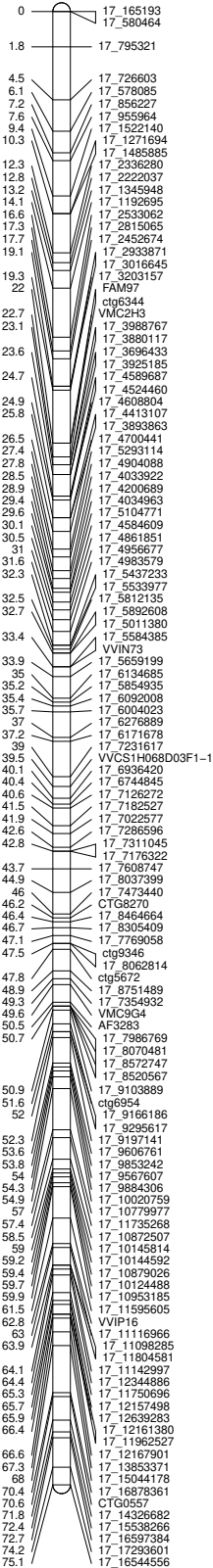
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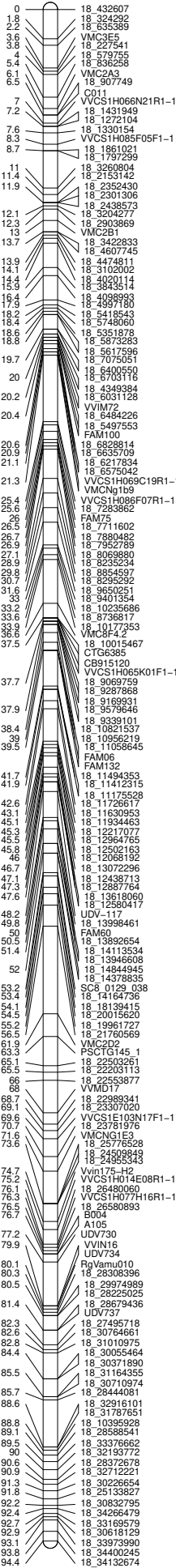
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