

Supplementary material

Article title: Transcriptome-wide association mapping provides insights into genetic basis and candidate genes governing flowering, maturity and seed weight in rice bean (*Vigna umbellata*)

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Supplementary Figures

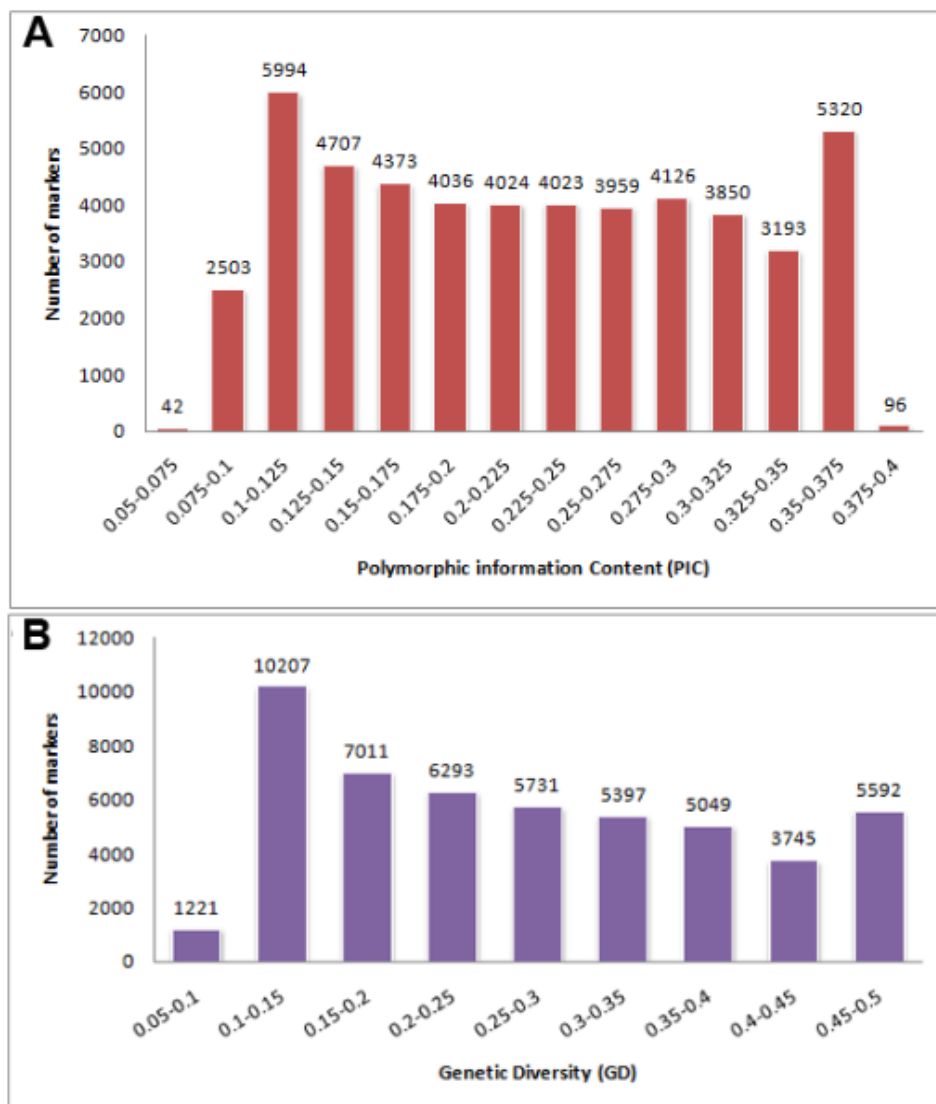


Figure S1. The distribution of (A) polymorphic information content (PIC) and (B) genetic diversity (GD) values calculated from the genotypic data.

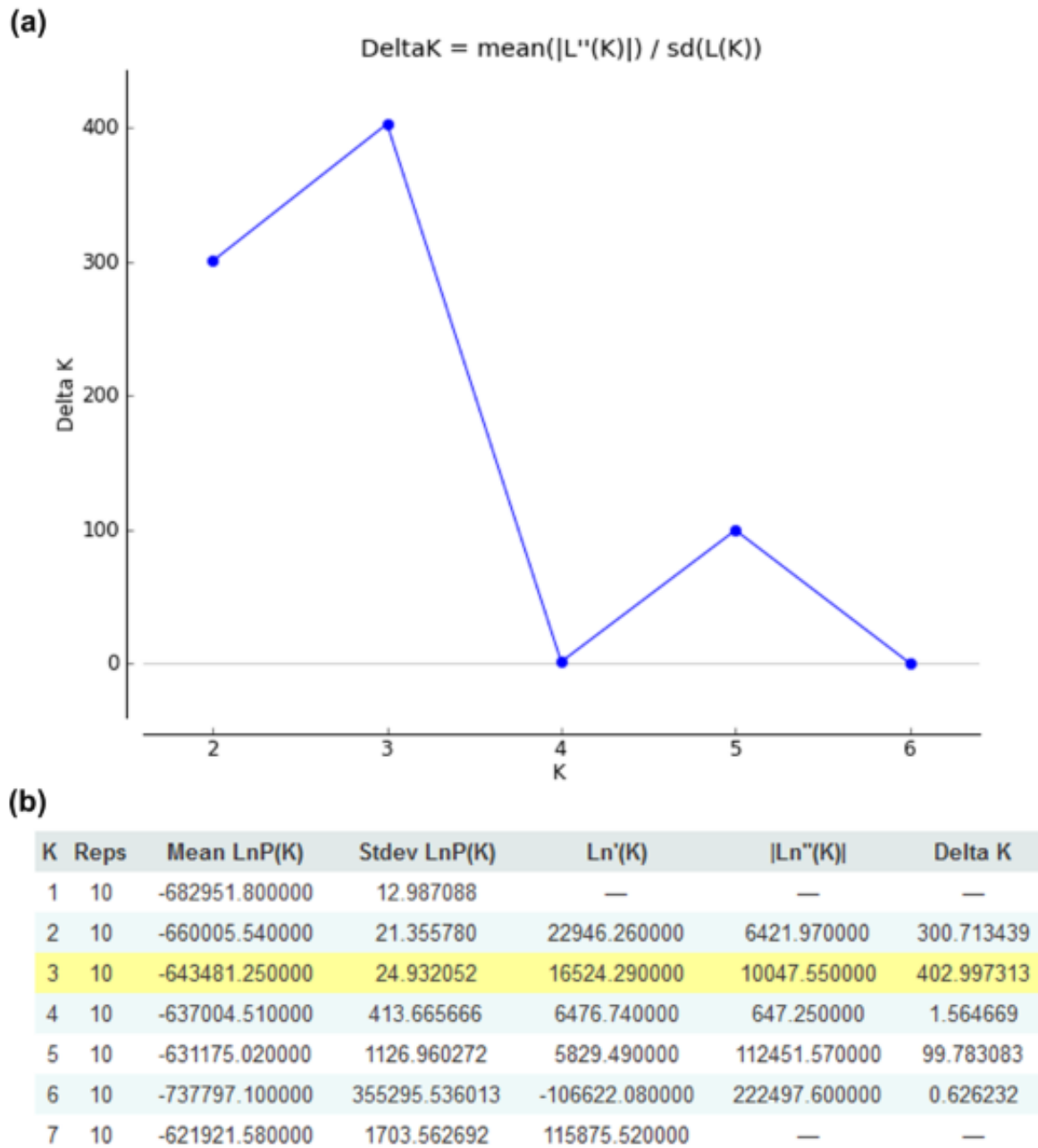


Figure S2. The graph showing the highest value of ΔK at $K=3$ (*i.e.*, three putative population). (A) Plot showing K in X-axis and ΔK in Y-axis. (B) Values of Mean LnP(K), Standard deviation LnP(K), Ln'(K), |Ln''(K)| and ΔK for all values of K from 1 to 7.

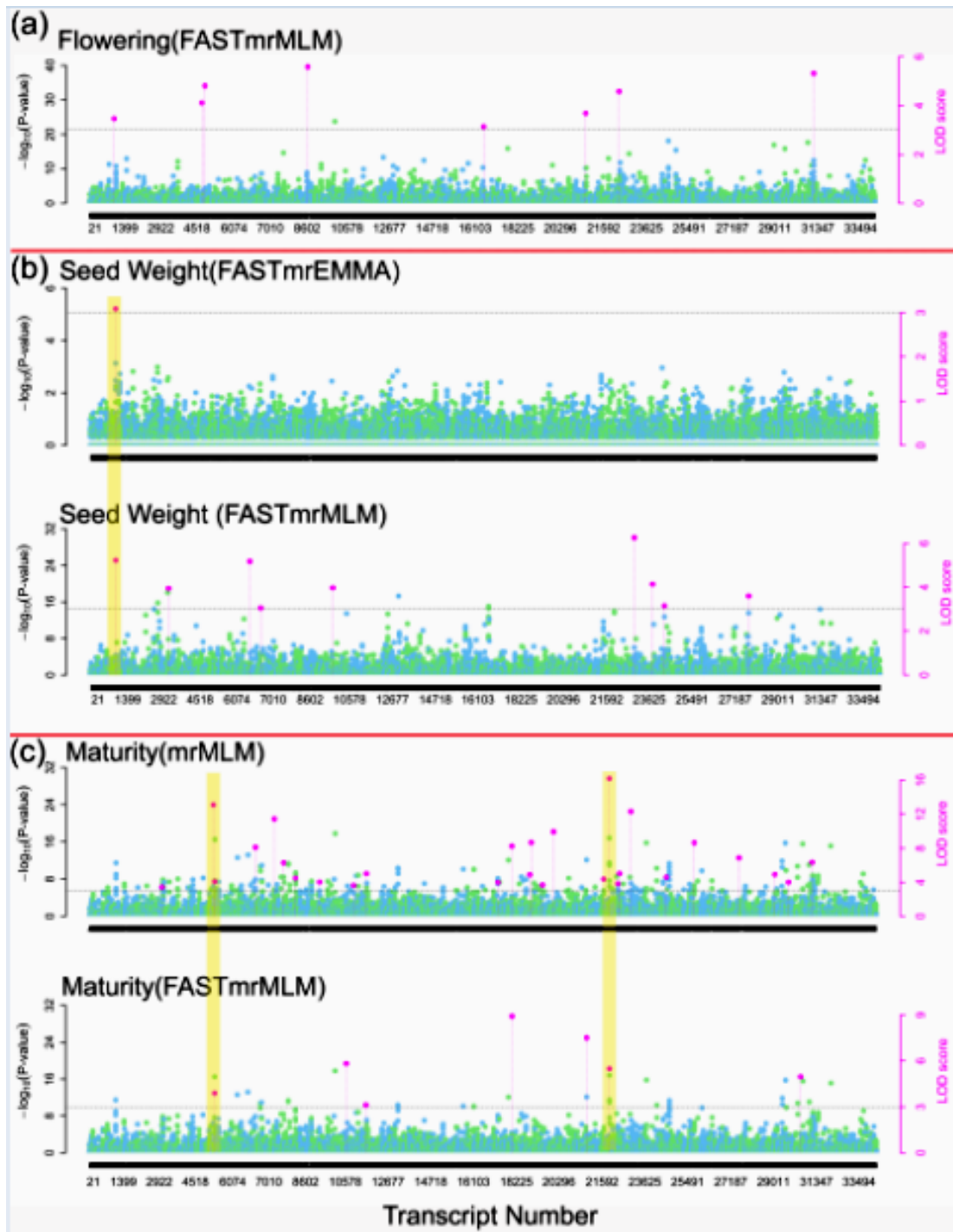


Figure S3. Significantly associated markers for (A) flowering, (B) seed weight and (C) maturity shown on the Manhattan plots, predicted by various models using the phenotypic dataset collected from Almore in the year 2021. The highlighted regions show the consistent markers predicted by at least two models. The markers shown on single Manhattan plots for any trait are predicted by ISIS EM-BLASSO for which Manhattan plot is not generated.

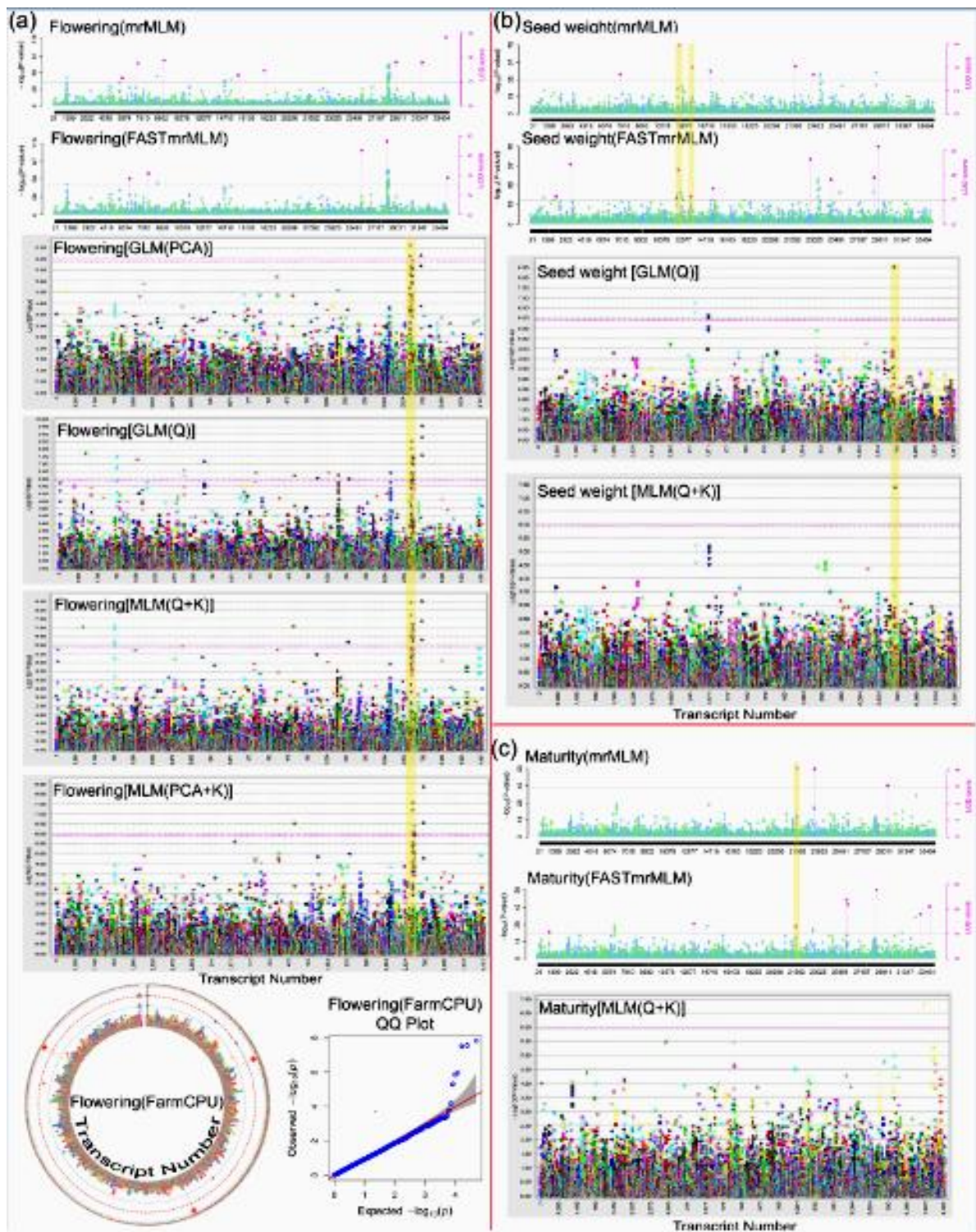


Figure S4. Significantly associated markers for (A) flowering, (B) seed weight and (C) maturity shown on the Manhattan plots, predicted by various models using the phenotypic dataset collected from Delhi in the year 2020. The highlighted regions show the consistent markers predicted by at least two models. The markers shown on single Manhattan plots for any trait are predicted by ISIS EM-BLASSO for which Manhattan plot is not generated.

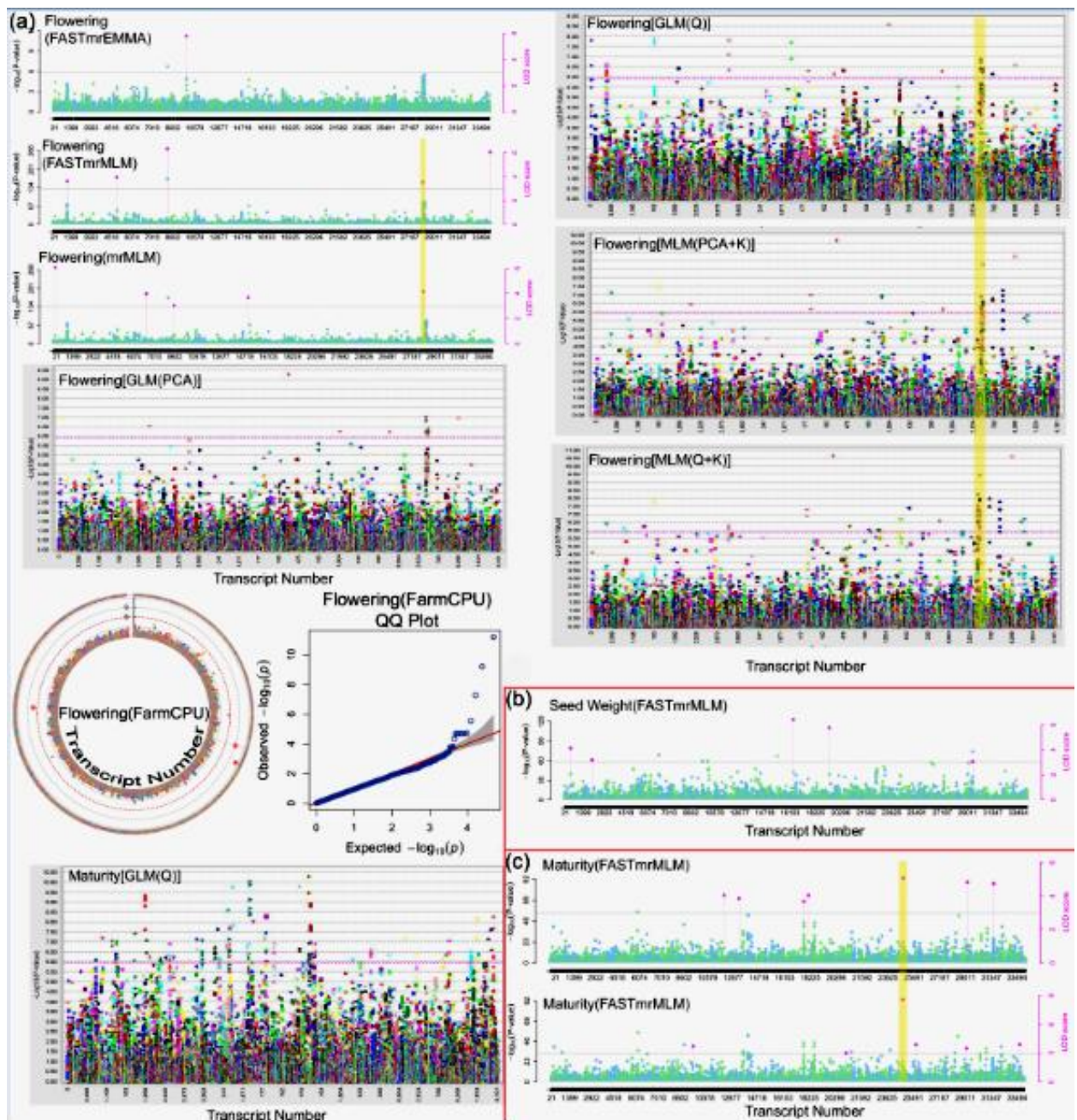


Figure S5. Significantly associated markers for (A) flowering, (B) seed weight and (C) maturity shown on the Manhattan plots, predicted by various models using the phenotypic dataset collected from Delhi in the year 2021. The highlighted regions show the consistent markers predicted by at least two models. The markers shown on single Manhattan plots for any trait are predicted by ISIS EM-BLASSO for which Manhattan plot is not generated.

Supplementary Tables

Table S1. The detailed available passport information on 100 considered accessions including date of collection, site of origin and cultivar name.

| Accession | Date of collection | Collector Number | Cultivar Name | Village | Mandal | District | State | Country | Latitude | Longitude |
|-----------|--------------------|------------------|-------------------|------------------------|------------|----------------|-----------------------------|---------|----------|-----------|
| EC16167 | 07-03-60 | NA | Var. yang-liu-tou | NA | NA | NA | NA | China | NA | NA |
| IC567233 | 11-14-08 | JAS/08-09 | NBPGRT/2008-83 | Betapur | NA | M.Andaman | Andaman and Nicobar Islands | India | 12.717 | 92.9 |
| IC384034 | 10-30-02 | SSK-166 | Thivirlu | Peddalowa/ Kanivada | NA | East Godavari | Andhra Pradesh | India | 17.47 | 81.49 |
| IC426783 | 12-04-03 | BAR-064 | Bobberlu | Killoyi | Mandasa | Srikakulam | Andhra Pradesh | India | 18.297 | 83.8968 |
| IC426778 | 12-04-03 | BAR-055-2 | Pedda bobberlu | Singapuram | Mandasa | Srikakulam | Andhra Pradesh | India | 18.273 | 84.0048 |
| IC426789 | 12-06-03 | BAR-143-1 | Judumulu | Sathinaguda | Seethapeta | Srikakulam | Andhra Pradesh | India | 18.273 | 84.0048 |
| IC343841 | 12-22-01 | SKN-032 | NA | Jamthota | NA | Srikakulam | Andhra Pradesh | India | 18.721 | 84.477 |
| IC343929 | 12-25-01 | SKN-120 | Minumulu | 12th mile | NA | Visakhapatnam | Andhra Pradesh | India | 17.687 | 83.2185 |
| IC350374 | 12-28-01 | RSMP-841 | Timmerlu | Chintapalli | NA | Vishakhapatnam | Andhra Pradesh | India | 17.687 | 83.2185 |
| IC353877 | 01-29-02 | SMAR-909 | Timerlu | Potaram | NA | Vishakhapatnam | Andhra Pradesh | India | 17.687 | 83.2185 |
| IC369607 | 02-16-02 | NDS-201 | Cuttingulu | Mucherlavalasa | NA | Vizianagaram | Andhra Pradesh | India | 18.188 | 83.0546 |
| IC350127 | 01-19-02 | BKSB-248 | Pincha | Phanyak | NA | Changlang | Arunachal Pradesh | India | 27.742 | 96.6424 |
| IC433853 | 03-13-04 | DRLT-1732 | Moshum | Loiliang | Lohit | Lohit | Arunachal Pradesh | India | 27.98 | 96.5975 |

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|----------|----------|--------------|---------------------------------|---------------------|--------------|---------------------|-------------------|-------|--------|---------|
| IC538983 | 10-22-05 | SKS-126 | Amuperung | Pinegrove | NA | Lower Subansiri | Arunachal Pradesh | India | 27.1 | 93.5 |
| IC435833 | 04-09-04 | DRLT-1956 | Andeyu | New Aropo | Upper Dibang | Upper Dibang Valley | Arunachal Pradesh | India | 28.733 | 95.6166 |
| IC19351 | 03-31-73 | NIC NO.-100 | NA | Daringibadi | NA | Phulbani | Bihar | India | 20.134 | 84.0167 |
| IC521356 | 02-11-04 | RKH-7 | Moth | Balrina(Jandhota) | NA | Bilaspur | Himachal Pradesh | India | 31.371 | 76.6713 |
| IC362094 | 11-21-99 | BDS-2848 | Moong | Sahar | NA | Mandi | Himachal Pradesh | India | 31.717 | 76.9166 |
| IC469177 | 01-01-97 | CMX-68P-1 | Hara moong | NA | NA | Shimla | Himachal Pradesh | India | 31.197 | 77.6327 |
| IC469185 | 01-01-97 | CXM8-1-1 | Hara moong | NA | NA | Shimla | Himachal Pradesh | India | 31.197 | 77.6327 |
| IC326994 | 10-29-01 | SKY-1022 | Ganga-Jamuna | Jaunaji | NA | Solan | Himachal Pradesh | India | 30.917 | 77.1166 |
| IC129080 | NA | NKG-110(A) | NA | NA | NA | NA | Himachal Pradesh | India | | |
| IC369230 | 11-15-02 | VKG-23/51 | Lalldhusri | Kamaishela/Bengabad | NA | Giridih | Jharkhand | India | 24.3 | 86.35 |
| IC15642 | 06-19-72 | NA | NA | Netarhat | NA | Latehar | Jharkhand | India | 23.756 | 84.3542 |
| IC15663 | 06-19-70 | NIC No.-09 | NA | Lithipara | NA | Pakur | Jharkhand | India | 24.634 | 87.8501 |
| IC15664 | 06-19-72 | NA | NA | Lithipara | NA | Pakur | Jharkhand | India | 24.634 | 87.8501 |
| IC373406 | 10-27-02 | NR/02-141 | NA | Sakleshpur | NA | S.Kanara | Karnataka | India | 12.844 | 75.2479 |
| IC273820 | 04-27-00 | IGR-6-2000-6 | Bhadi | Lamker | NA | Bastar | Madhya Pradesh | India | 19.207 | 81.9339 |
| IC618587 | 02-06-16 | NA | Jawahar Rice bean 2 (JRBJ 05-4) | JNKVV | NA | Jabalpur | Madhya Pradesh | India | 23.182 | 79.9864 |
| IC26962 | 01-22-77 | NA | NA | None | NA | Tamenglong | Manipur | India | 24.764 | 93.8557 |
| IC352944 | 12-16-01 | BKSB-149 | Chakwai achaouba | ICAR (RC), Manipur | NA | Imphal East | Manipur | India | 24.817 | 93.95 |
| IC352853 | 09-12-01 | BKSB-122 | Chakwi achouba | Nagarup | NA | Imphal East | Manipur | India | 24.817 | 93.95 |
| IC16799 | 09-11-72 | NIC No.-98 | NA | Tonibari | NA | SENAPATI | Manipur | India | 25.208 | 94.0397 |
| IC16796 | 12-30-72 | NA | NA | Tonibari | NA | SENAPATI | Manipur | India | 25.208 | 94.0397 |

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|----------|----------|--------------|------------|-------------|----------|------------------|----------|-------|--------|---------|
| IC352931 | 12-14-01 | BKSB-145 | Chakhawai | Kakching | NA | Thoubal | Manipur | India | 24.483 | 93.9833 |
| IC16706 | 09-11-72 | NA | NA | B.Kalgong | NA | Ukhrul | Manipur | India | 25.017 | 94.4311 |
| IC129062 | 12-31-89 | CXM-12P3-1 | NA | NA | NA | NA | Manipur | India | | |
| IC350791 | 07-01-02 | BKSB-221 | Tohja | Lumkhudung | NA | Jaintia Hill | Meghalay | India | 25.333 | 92.6666 |
| IC129038 | 12-31-89 | RXS-27-P3 | NA | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC144701 | NA | RXS-4-P-3 | NA | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC551632 | 03-15-07 | LRB-70 | Raj moong | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC551711 | 03-15-07 | Vum-85 | Raj moong | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC144685 | NA | CXN-16-P-1-1 | NA | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC144695 | NA | CXN-42-P-2-1 | NA | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC112381 | NA | NA | NA | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC112383 | NA | NA | NA | NA | NA | Shillong | Meghalay | India | 25.368 | 91.7539 |
| IC569120 | 01-11-08 | M-006 | Rymbai-ja | NA | NA | West Khasi Hills | Meghalay | India | 25.34 | 91.53 |
| IC141074 | NA | BD-139-D | NA | NA | NA | NA | Meghalay | India | NA | NA |
| IC129069 | NA | CXM-11-P5-1 | NA | NA | NA | NA | Meghalay | India | NA | NA |
| IC298121 | 01-03-00 | BKSB-70 | Bethe | Kaishang | NA | Serchhip | Mizoram | India | 23.295 | 92.9376 |
| IC554711 | 05-01-06 | NRB-21 | Naga dal | NA | NA | Khonoma | Nagaland | India | 25.652 | 94.023 |
| IC423374 | 12-23-03 | APRB-9 | anukchama | Chuntia | NA | Mokokchung | Nagaland | India | 26.333 | 94.5333 |
| IC129089 | NA | D-19 | NA | NA | NA | NA | Nagaland | India | | |
| IC569073 | 08-12-08 | HNS/RS-113 | Simba | Muniguda | Muniguda | Kalahandi | Odisha | India | 19.914 | 83.1649 |
| IC342229 | 12-06-00 | ORB-49 | Dangarrani | Aligaon | NA | Koraput | Odisha | India | 18.856 | 82.7347 |
| IC311934 | 12-16-00 | SS-143 | Kutting | Sabarnagiri | NA | Phussari | Odisha | India | 20.134 | 84.0167 |

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|----------|----------|-----------------|---------------|------------------|-----------------------|---------------|---------------|-------|--------|---------|
| IC342242 | 08-04-00 | ORB-66 | Dangarrani | Bhamarjod | NA | Rayagada | Odisha | India | 19.362 | 83.5144 |
| IC521177 | 03-23-05 | VUM-22 | NA | NA | NA | NA | Others | India | NA | NA |
| IC521224 | 03-23-05 | BRS-1-A | NA | NA | NA | NA | Others | India | NA | NA |
| IC521039 | 03-23-05 | LRB-282 | NA | NA | NA | NA | Others | India | NA | NA |
| IC521146 | 03-23-05 | LRB-466 | NA | NA | NA | NA | Others | India | NA | NA |
| IC521156 | 03-23-05 | LRB-510 | NA | NA | NA | NA | Others | India | NA | NA |
| IC140810 | NA | RBL-50 | NA | NA | NA | NA | Punjab | India | NA | NA |
| IC137205 | NA | RBL-70 | NA | NA | NA | NA | Punjab | India | NA | NA |
| IC557317 | 12-16-07 | BK-07-39 | Mashiam dal | Gangtok Market | NA | East Sikkim | Sikkim | India | 27.293 | 88.6781 |
| IC557283 | 11-12-07 | BK-07-05 | Mashiam dal | Pachyekhani | NA | East Sikkim | Sikkim | India | 27.293 | 88.6781 |
| IC129097 | NA | RXS-58-P3-2 | NA | NA | NA | NA | Sikkim | India | NA | NA |
| IC129078 | NA | A-1350A | NA | NA | NA | NA | Sikkim | India | NA | NA |
| IC621844 | 11-15-16 | AD-16/87 | Be-Te | Behliangchhip | Vanghmun, Jampui Hill | North Tripura | Tripura | India | 23.93 | 92.27 |
| IC316123 | 11-12-00 | VRS-OM-1912 | Muad | Dewaraniya | NA | Bareilly | Uttar Pradesh | India | 28.453 | 79.4168 |
| IC129115 | NA | VT-72/844-A | NA | NA | NA | NA | Uttar Pradesh | India | | |
| IC621805 | 09-27-16 | KCB/RSR/PK M-13 | Dhuans | Bugoti/Chakarata | NA | Dehradun | Uttarakhand | India | 30.317 | 78.0322 |
| IC116113 | 03-31-89 | ARB-83(114-D) | NA | Bhowali | NA | Nainital | Uttarakhand | India | 29.38 | 79.4636 |
| IC116118 | 03-31-89 | CXN-7-B | NA | Bhowali | NA | Nainital | Uttarakhand | India | 29.38 | 79.4636 |
| IC137169 | 10-10-85 | PRR-8801-A | Ghurush | Ranichauri | NA | Tehri | Uttarakhand | India | 30.301 | 78.5661 |
| IC351534 | 12-15-01 | BKSB-166 | Thulibhatamas | Damri Tari | NA | Darjeeling | West Bengal | India | 27.041 | 88.2663 |
| IC552979 | 01-29-04 | KRB-96 | Gaimung | Garubathan | NA | Darjeeling | West Bengal | India | 27.041 | 88.2663 |
| IC2074 | 04-18-53 | NIC No.-100 | NA | Kalimpong | NA | Darjeeling | West Bengal | India | 27.041 | 88.2663 |
| IC351508 | 12-13-01 | BKSB-160 | Gala dal | Rangsang | NA | Darjeeling | West Bengal | India | 27.041 | 88.2663 |

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|----------|----------|----------------|---------------|--------------|-----------|-------------|-------------|-----------|--------|---------|
| IC552995 | 06-02-04 | KRB-113 | Gaimung | Banarhat | NA | Jalpaiguri | West Bengal | India | 26.544 | 88.7205 |
| IC552977 | 01-29-04 | KRB-94 | Gaimung | Garubathan | NA | Jalpaiguri | West Bengal | India | 26.544 | 88.7205 |
| IC552970 | 01-25-04 | KRB-87 | Gaimung | Madarihat | NA | Jalpaiguri | West Bengal | India | 26.544 | 88.7205 |
| IC449234 | 05-12-04 | KG/PB-10 | Maskalai | Brajalaltola | Manikchak | Maldah | West Bengal | India | 25.179 | 88.2461 |
| IC564858 | 02-08-05 | KRB-153 | Gaimung | Berhampur | NA | Murshidabad | West Bengal | India | 24.161 | 88.2328 |
| IC564865 | 02-10-05 | KRB-161 | Gaimung | Raningar-I | NA | Murshidabad | West Bengal | India | 24.161 | 88.2328 |
| IC545607 | 05-01-03 | KRB-64 | Gaimung | Balarampur | NA | Purulia | West Bengal | India | 23.183 | 86.4833 |
| IC2567 | NA | NA | NA | NA | NA | NA | NA | India | NA | NA |
| EC114075 | 07-08-75 | NA | ((1085)w5a) | NA | NA | NA | NA | Indonesia | NA | NA |
| EC934343 | 02-11-17 | JP No223033 | NA | NA | NA | NA | NA | Japan | NA | NA |
| EC934368 | 02-11-17 | JP No251211 | NA | NA | NA | NA | NA | Japan | NA | NA |
| EC934417 | 02-11-17 | JP No31442 | NA | NA | NA | NA | NA | Japan | NA | NA |
| EC18136 | 04-18-61 | Pokhra village | Moshang | NA | NA | NA | NA | Nepal | NA | NA |
| EC18183 | 04-18-61 | Bhumri | Shilli | NA | NA | NA | NA | Nepal | NA | NA |
| EC18261 | 04-18-61 | Matikhana | NA | NA | NA | NA | NA | Nepal | NA | NA |
| EC615198 | 03-13-08 | NA | Hong kong HK1 | NA | NA | NA | NA | Taiwan | NA | NA |
| EC615199 | 03-13-08 | NA | Hong Kong HK2 | NA | NA | NA | NA | Taiwan | NA | NA |
| EC615195 | 03-13-08 | NA | Mogimass | NA | NA | NA | NA | Taiwan | NA | NA |
| EC615201 | 03-13-08 | NA | NA | NA | NA | NA | NA | Taiwan | NA | NA |
| EC18222 | NA | Dumbri Khola | NA | NA | NA | NA | NA | India | NA | NA |

EC1843 NA NA NA NA NA NA NA NA NA NA

Table S2. The number of bases and reads before and after filtration from the transcriptome data of 100 accessions of rice bean

| Sample | Total reads | Total bases | Reads after filtration | Bases after filtration |
|---------------|--------------------|--------------------|-------------------------------|-------------------------------|
| IC362094 | 36819636 | 5559765036 | 33717652 | 4917640072 |
| IC129062 | 31444232 | 4748079032 | 28828384 | 4209254643 |
| IC112381 | 22706738 | 3428717438 | 20509398 | 2955955654 |
| IC384034 | 23352124 | 3526170724 | 21259702 | 3087996122 |
| IC2567 | 21459328 | 3240358528 | 20279740 | 3054448536 |
| EC16167 | 30497154 | 4605070254 | 29401510 | 4416367942 |
| IC144701 | 27301512 | 4122528312 | 26134908 | 3928259800 |
| IC15663 | 126603058 | 19117061758 | 115922528 | 16917765535 |
| IC373406 | 51919498 | 7839844198 | 47263438 | 6857884444 |
| IC449234 | 45084298 | 6807728998 | 41335656 | 6031928670 |
| EC18261 | 43577642 | 6580223942 | 41687614 | 6291179824 |
| IC129038 | 39809460 | 6011228460 | 38096944 | 5749476994 |
| IC469177 | 38935994 | 5879335094 | 35225834 | 5097728408 |
| IC521224 | 37776142 | 5704197442 | 36373266 | 5457704369 |
| IC140810 | 37679322 | 5689577622 | 36325710 | 5472247386 |
| IC521356 | 37021004 | 5590171604 | 33918838 | 4935017567 |
| IC426783 | 36688940 | 5540029940 | 35425498 | 5334800800 |
| EC18183 | 36395406 | 5495706306 | 33170848 | 4796940704 |
| EC114075 | 36006220 | 5436939220 | 32464060 | 4705669121 |
| IC521146 | 35784686 | 5403487586 | 31214402 | 4664653632 |
| IC552977 | 35626502 | 5379601802 | 34353016 | 5129300225 |

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| IC129078 | 35539446 | 5366456346 | 33704394 | 5073741377 |
| IC353877 | 35157496 | 5308781896 | 31699606 | 4657735376 |
| IC521156 | 35134458 | 5305303158 | 33693888 | 5079088773 |
| IC116118 | 35037812 | 5290709612 | 32025558 | 4685313810 |
| IC618587 | 34896772 | 5269412572 | 31644576 | 4587161587 |
| EC1843 | 34736162 | 5245160462 | 33508626 | 5043663700 |
| EC934417 | 34554966 | 5217799866 | 31462564 | 4600598780 |
| IC521039 | 34518194 | 5212247294 | 33325856 | 5020557003 |
| IC426778 | 34431552 | 5199164352 | 33222606 | 4983874750 |
| IC316123 | 34257030 | 5172811530 | 32855888 | 4958859535 |
| IC326994 | 34212624 | 5166106224 | 32394088 | 4877575843 |
| IC369230 | 34173840 | 5160249840 | 31187874 | 4566892334 |
| IC2074 | 34087934 | 5147278034 | 31190348 | 4546121372 |
| IC129069 | 34009918 | 5135497618 | 32521238 | 4908714330 |
| IC141074 | 33347404 | 5035458004 | 31732666 | 4779839884 |
| IC564858 | 33174806 | 5009395706 | 30512488 | 4466591862 |
| EC615199 | 33164412 | 5007826212 | 30273646 | 4386464052 |
| IC352944 | 33076738 | 4994587438 | 29885212 | 4349451915 |
| IC351534 | 32991796 | 4981761196 | 28982862 | 4167666586 |
| EC615195 | 32988670 | 4981289170 | 29991590 | 4352980144 |
| IC426789 | 32947076 | 4975008476 | 31460036 | 4737617377 |
| IC552995 | 32718744 | 4940530344 | 29647226 | 4283996199 |
| IC350791 | 32636006 | 4928036906 | 29290636 | 4257385288 |
| IC15664 | 32322948 | 4880765148 | 31078232 | 4680264266 |
| IC350374 | 32279416 | 4874191816 | 29334150 | 4207053939 |
| IC569120 | 32177150 | 4858749650 | 30998222 | 4668830545 |
| IC369607 | 31836728 | 4807345928 | 30611834 | 4604553867 |
| IC621844 | 31642204 | 4777972804 | 28977744 | 4178109392 |
| IC144685 | 31496144 | 4755917744 | 30074108 | 4527290004 |
| EC18136 | 31445624 | 4748289224 | 28566304 | 4127606621 |

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| IC342229 | 31249634 | 4718694734 | 28487838 | 4153712458 |
| EC934343 | 31188932 | 4709528732 | 28458388 | 4135230880 |
| IC569073 | 31096630 | 4695591130 | 28407118 | 4130850338 |
| IC551711 | 30703792 | 4636272592 | 27501270 | 3973834404 |
| IC129080 | 30463206 | 4599944106 | 29410944 | 4420157805 |
| IC16706 | 30222338 | 4563573038 | 29185454 | 4399891346 |
| IC521177 | 30101188 | 4545279388 | 28629864 | 4321614374 |
| IC144695 | 30049828 | 4537524028 | 28840420 | 4343279332 |
| IC351508 | 29875244 | 4511161844 | 27207196 | 3952148272 |
| IC552970 | 29243756 | 4415807156 | 28025266 | 4222443288 |
| IC137169 | 29138546 | 4399920446 | 26818154 | 3902165556 |
| IC567233 | 28763476 | 4343284876 | 26442498 | 3841696091 |
| EC615198 | 28745474 | 4340566574 | 26198000 | 3812270726 |
| IC554711 | 28721980 | 4337018980 | 27393870 | 4122834124 |
| IC352931 | 28648924 | 4325987524 | 27484120 | 4148391732 |
| IC621805 | 28310500 | 4274885500 | 27181650 | 4088459405 |
| EC18222 | 28088900 | 4241423900 | 26545144 | 4005428780 |
| IC112383 | 28036112 | 4233452912 | 26987132 | 4047570091 |
| IC26962 | 28004548 | 4228686748 | 26665484 | 4016366029 |
| IC343929 | 27983170 | 4225458670 | 26691796 | 4014354268 |
| IC552979 | 27803498 | 4198328198 | 26753842 | 4009222381 |
| IC15642 | 27790330 | 4196339830 | 24455418 | 3480527279 |
| EC934368 | 27786944 | 4195828544 | 25022368 | 3629493271 |
| IC435833 | 27576654 | 4164074754 | 24718710 | 3540437024 |
| IC116113 | 27532386 | 4157390286 | 26500020 | 3978709315 |
| IC557283 | 27441632 | 4143686432 | 24908386 | 3597109502 |
| IC564865 | 27356544 | 4130838144 | 26212870 | 3955944556 |
| IC538983 | 27296446 | 4121763346 | 24840326 | 3590888833 |
| IC350127 | 27258134 | 4115978234 | 26251276 | 3934637119 |
| IC16799 | 27210738 | 4108821438 | 23847258 | 3424257212 |

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|----------|----------|------------|----------|------------|
| IC298121 | 27182044 | 4104488644 | 26111506 | 3918039404 |
| IC16796 | 27178530 | 4103958030 | 25844260 | 3892204051 |
| IC19351 | 27149416 | 4099561816 | 25720204 | 3879244220 |
| IC129089 | 26956328 | 4070405528 | 25589760 | 3851215287 |
| IC433853 | 26680642 | 4028776942 | 25743082 | 3866843031 |
| IC557317 | 26647174 | 4023723274 | 25365606 | 3827494394 |
| IC545607 | 26160306 | 3950206206 | 23787988 | 3425619160 |
| IC137205 | 25979038 | 3922834738 | 23979038 | 3405890365 |
| IC342242 | 25498482 | 3850270782 | 23141442 | 3361704154 |
| IC469185 | 25189682 | 3803641982 | 22827010 | 3300204216 |
| IC311934 | 24607454 | 3715725554 | 22341342 | 3212799348 |
| IC273820 | 24381096 | 3681545496 | 22180804 | 3205790264 |
| IC129115 | 24212892 | 3656146692 | 21751190 | 3143688357 |
| EC615201 | 24206134 | 3655126234 | 21377814 | 3057066224 |
| IC343841 | 23783392 | 3591292192 | 21756340 | 3158586198 |
| IC129097 | 23186710 | 3501193210 | 21009328 | 3036510510 |
| IC423374 | 22808980 | 3444155980 | 20631752 | 2962221575 |
| IC352853 | 22077506 | 3333703406 | 20025582 | 2908927223 |
| IC551632 | 21141650 | 3192389150 | 19321214 | 2811402893 |

Table S3. Associated Markers for flowering, maturity and seed weight predicted using phenotypic data of Almora location in the year 2021.

| Marker ID^a | SNP[#] | Transcript ID | Position | Models^b | Trait(s) | LOD[#] | MAF[#] | R² |
|------------------------------|------------------------|----------------------|-----------------|---------------------------|---------------------|---------------------------|------------------------|------------------------------------|
| <i>SVUTC21295_283</i> | G/A | VUTC21295 | 283 | 6 | Flowering, Maturity | <i>LOD</i> : 3.69 to 7.50 | 0.110 | Flowering: 6.35 Maturity: 20.45 |
| SVUTC22319_77 | T/C | VUTC22319 | 77 | 6, 8 | Flowering | <i>LOD</i> :4.58 to 5.74 | 0.284 | 5.92 to 7.31 |
| SVUTC31327_3358 | T/G | VUTC31327 | 3358 | 6, 8 | Flowering | <i>LOD</i> :5.32 to 6.18 | 0.165 | 23.22 to 24.54 |
| SVUTC05378_2089 | T/C | VUTC05378 | 2089 | 6, 8 | Maturity | <i>LOD</i> :3.89 to 8.60 | 0.077 | 9.73 to 7.15 |
| SVUTC21831_6083 | G/A | VUTC21831 | 6083 | 5,6 | Maturity | <i>LOD</i> :5.49 to 16.21 | 0.060 | 15.12 to 19.28 |
| SVUTC01132_259 | A/G | VUTC01132 | 259 | 6, 7 | Seed weight | <i>LOD</i> : 3.09 to 5.23 | 0.396 | 7.16 to 7.95 |
| SVUTC06850_2182 | C/A | VUTC06850 | 2182 | 6, 8 | Seed weight | <i>LOD</i> :3.06 to 6.23 | 0.192 | 5.32 to 7.15 |
| SVUTC09951_1960 | C/A | VUTC09951 | 1960 | 6,8 | Seed weight | <i>LOD</i> :3.97 to 4.78 | 0.3032 | 6.79 to 8.69 |
| SVUTC23058_1028 | A/T | VUTC23058 | 1028 | 6,8 | Seed weight | <i>LOD</i> :6.26 to 13.15 | 0.140 | 17.22 to 21.87 |
| SVUTC24042_2561 | T/A | VUTC24042 | 2561 | 6,8 | Seed weight | <i>LOD</i> :4.13 to 5.71 | 0.318 | 1.66 to 2.29 |
| SVUTC24699_1593 | G/T | VUTC24699 | 1593 | 6,8 | Seed weight | <i>LOD</i> :3.16 to 5.69 | 0.081 | 3.94 to 5.55 |

^a The marker names in bold italics are associated with more than one trait.

^b 1. GLM (Q), 2. GLM (PCA)], 3. MLM (Q+K), 4. MLM (PCA+K), 5. mrMLM, 6. FASTmrMLM, 7. FASTmrEMMA, 8. ISIS EMBLASSO, 9. FarmCPU, 10. BLINK.

[#] *SNP*: single nucleotide polymorphism, *LOD*: logarithm of the odds, *MAF*: minor allele frequency

Table S4. Associated Markers for flowering, maturity and seed weight predicted using phenotypic data of Delhi location in the year 2020.

| Marker ID | SNP # | Transcript ID | Position | Models ^a | Trait(s) | $-\log_{10}(P)/ \text{LOD}^{\#}$ | MAF [#] | R ² |
|-----------------|-------|---------------|----------|----------------------|-----------|--|------------------|----------------|
| SVUTC02166_197 | G/A | VUTC02166 | 197 | 1,3 | Flowering | $-\log_{10}(P):7.01$ to 7.7 | 0.071 | 33 to 35 |
| SVUTC04837_563 | C/T | VUTC04837 | 563 | 1,3 | Flowering | $-\log_{10}(P):7.10$ to 7.51 | 0.286 | 29 to 31 |
| SVUTC04837_620 | T/C | VUTC04837 | 620 | 1,3 | Flowering | $-\log_{10}(P):6.90$ to 7.47 | 0.296 | 28 to 30 |
| SVUTC04837_772 | G/T | VUTC04837 | 772 | 1,3 | Flowering | $-\log_{10}(P):6.12$ to 6.68 | 0.109 | 26 to 28 |
| SVUTC04837_782 | A/C | VUTC04837 | 782 | 1,3 | Flowering | $-\log_{10}(P):6.14$ to 6.78 | 0.096 | 27 to 29 |
| SVUTC04837_786 | G/C | VUTC04837 | 786 | 1,3 | Flowering | $-\log_{10}(P):6.14$ to 6.78 | 0.074 | 27 to 29 |
| SVUTC06321_645 | C/T | VUTC06321 | 645 | 1,6,9,10, | Flowering | $-\log_{10}(P):4.40$ to 8.44 LOD:3.67 | 0.110 | 7.07 to 29 |
| SVUTC14443_583 | T/C | VUTC14443 | 583 | 9,10 | Flowering | $-\log_{10}(P):7.56$ to 8.3 | 0.095 | NA* |
| SVUTC15693_1885 | T/C | VUTC15693 | 1885 | 5,8 | Flowering | $-\log_{10}(P):4.51$ to 4.51 LOD:3.7705 to 3.7725 | 0.220 | 8.22 to 16.28 |
| SVUTC18323_834 | G/A | VUTC18323 | 834 | 1,3,4 | Flowering | $-\log_{10}(P):6.21$ to 7.06 | 0.067 | 28 to 34 |
| SVUTC22119_491 | C/A | VUTC22119 | 491 | 1,3 | Flowering | $-\log_{10}(P):5.99$ to 6.15 | 0.061 | 27 to 28 |
| SVUTC26171_1046 | A/C | VUTC26171 | 1046 | 6,8 | Flowering | LOD:3.67 to 7.65 | 0.133 | 13.99 to 19.49 |
| SVUTC28154_1391 | G/T | VUTC28154 | 1391 | 1,2, 3,4 | Flowering | $-\log_{10}(P):6.12$ to 8.00 | 0.076 | 21 to 36 |
| SVUTC28154_1530 | A/G | VUTC28154 | 1530 | 1,3 | Flowering | $-\log_{10}(P):6.45$ to 7.05 | 0.071 | 29 to 31 |
| SVUTC28154_1646 | G/A | VUTC28154 | 1646 | 6,8,9,10 1,2, 3,4 | Flowering | $-\log_{10}(P):6..60$ to 8.51 LOD: 7.49 to 8.58 | 0.065 | 19 to 35 |
| SVUTC28154_4577 | A/C | VUTC28154 | 4577 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28154_4595 | T/C | VUTC28154 | 4595 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28154_4614 | A/C | VUTC28154 | 4614 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28154_4619 | T/A | VUTC28154 | 4619 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28154_4769 | G/A | VUTC28154 | 4769 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28155_2560 | G/T | VUTC28155 | 2560 | 1,3 | Flowering | $-\log_{10}(P):6.2$ to 6.75 | 0.063 | 27 to 29 |
| SVUTC28163_1003 | T/C | VUTC28163 | 1003 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |

| | | | | | | | | |
|-----------------|-----|-----------|------|-----------|-----------|---|-------|---------------|
| SVUTC28164_1018 | G/A | VUTC28164 | 1018 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28164_684 | C/T | VUTC28164 | 684 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28164_974 | G/T | VUTC28164 | 974 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28165_2013 | C/T | VUTC28165 | 2013 | 1,3 | Flowering | $-\log_{10}(P):6.24$ to 6.74 | 0.063 | 27 to 29 |
| SVUTC28165_2563 | G/A | VUTC28165 | 2563 | 1,3 | Flowering | $-\log_{10}(P):6.36$ to 6.44 | 0.056 | 27 to 27 |
| SVUTC28165_2595 | G/A | VUTC28165 | 2595 | 1,3 | Flowering | $-\log_{10}(P):6.44$ to 6.51 | 0.056 | 27 to 27 |
| SVUTC28165_3265 | A/T | VUTC28165 | 3265 | 1,3,4 | Flowering | $-\log_{10}(P):6.10$ to 7.55 | 0.060 | 22 to 30 |
| SVUTC28181_1427 | A/G | VUTC28181 | 1427 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28181_1461 | T/C | VUTC28181 | 1461 | 1,3 | Flowering | $-\log_{10}(P):6.36$ to 6.44 | 0.056 | 27 to 27 |
| SVUTC28183_2077 | G/A | VUTC28183 | 2077 | 1,3,4 | Flowering | $-\log_{10}(P):6.10$ to 7.55 | 0.060 | 22 to 30 |
| SVUTC28185_6557 | T/C | VUTC28185 | 6557 | 1,3,4 | Flowering | $-\log_{10}(P):6.40$ to 7.30 | 0.058 | 24 to 30 |
| SVUTC28186_2590 | C/A | VUTC28186 | 2590 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28192_1776 | G/A | VUTC28192 | 1776 | 1,3 | Flowering | $-\log_{10}(P):6.10$ to 6.35 | 0.057 | 26 to 27 |
| SVUTC28192_1815 | T/G | VUTC28192 | 1815 | 1,3 | Flowering | $-\log_{10}(P):7.03$ to 7.24 | 0.063 | 20 to 30 |
| SVUTC28192_1930 | A/G | VUTC28192 | 1930 | 1,3 | Flowering | $-\log_{10}(P):6.38$ to 6.50 | 0.055 | 26 to 27 |
| SVUTC28192_2307 | G/A | VUTC28192 | 2307 | 1,3,4 | Flowering | $-\log_{10}(P):7.10$ to 7.55 | 0.060 | 22 to 30 |
| SVUTC28196_1051 | T/A | VUTC28196 | 1051 | 1,3 | Flowering | $-\log_{10}(P):6.42$ to 6.49 | 0.057 | 27 to 27 |
| SVUTC28201_1062 | G/A | VUTC28201 | 1062 | 1,3 | Flowering | $-\log_{10}(P):7.44$ to 7.87 | 0.065 | 28 to 30 |
| SVUTC28201_425 | A/G | VUTC28201 | 425 | 1,3 | Flowering | $-\log_{10}(P):6.81$ to 7.35 | 0.066 | 28 to 30 |
| SVUTC28201_516 | C/A | VUTC28201 | 516 | 1,3 | Flowering | $-\log_{10}(P):6.80$ to 7.35 | 0.066 | 28 to 30 |
| SVUTC28201_680 | A/T | VUTC28201 | 680 | 1,3 | Flowering | $-\log_{10}(P):6.87$ to 7.44 | 0.065 | 28 to 30 |
| SVUTC28201_76 | T/C | VUTC28201 | 76 | 1,3 | Flowering | $-\log_{10}(P):6.23$ to 6.96 | 0.066 | 28 to 31 |
| SVUTC28966_1949 | C/A | VUTC28966 | 1949 | 1,3, 7 | Flowering | $-\log_{10}(P):7.38$ to 8.51 LOD:3.06-9.52 | 0.250 | 6.81 to 34 |
| SVUTC29107_1520 | A/C | VUTC29107 | 1520 | 1,3,4 | Flowering | $-\log_{10}(P):6.54$ to 8.78 | 0.056 | 26 to 37 |
| SVUTC29109_1026 | G/T | VUTC29109 | 1026 | 1, 2, 3,4 | Flowering | $-\log_{10}(P):6.16$ to 9.55 | 0.059 | 20 to 39 |
| SVUTC29109_858 | C/G | VUTC29109 | 858 | 1,3 | Flowering | $-\log_{10}(P):6.13$ to 7.59 | 0.065 | 28 to 33 |
| SVUTC34794_4308 | G/A | VUTC34794 | 4308 | 6,8 | Flowering | $-\log_{10}(P):4.50$ to 4.82/"-lod": 3.76-4.07 | 0.184 | 7.58 to 10.91 |
| SVUTC21642_866 | T/A | VUTC21642 | 866 | 6,5 | Maturity | $-\log_{10}(P):4.66$ to 4.86 | 0.142 | 8.85 to 38.77 |

| | | | | | | | | |
|-----------------|-----|-----------|------|-------|----------------|---|-------|-------------------|
| SVUTC26129_1121 | T/C | VUTC26129 | 1121 | 6,8 | Maturity | <i>LOD</i> :3.9-4.11 <i>-log10(P)</i> :6.18 to 8.01 | 0.068 | 17.16 to 22.68 |
| SVUTC32582_1223 | A/G | VUTC32582 | 1223 | 1,3 | Maturity | <i>-log10(P)</i> :6.79 to 9.71 | 0.063 | 25 to 33 |
| SVUTC33036_2172 | G/T | VUTC33036 | 2172 | 1,6 | Maturity | <i>-log10(P)</i> : 7.01 <i>LOD</i> : 5.39 | 0.058 | 9.05 to 32 |
| SVUTC02299_468 | G/C | VUTC02299 | 468 | 6,7 | Seed weight | <i>LOD</i> :3.38-3.44 | 0.293 | 2.53 to 4.58 |
| SVUTC12393_763 | C/T | VUTC12393 | 763 | 1,7,5 | Seed weight | <i>-log10(P)</i> :4.40 to 7.54 <i>LOD</i> : 3.66 to 6.68 | 0.274 | 8.30 to 29 |
| SVUTC13707_7465 | C/G | VUTC13707 | 7465 | 1, 5 | Seed weight | <i>-log10(P)</i> :4.76 to 6.09 <i>LOD</i> : 4.01 | 0.109 | 20.42 to 27 |
| SVUTC13707_7487 | A/G | VUTC13707 | 7487 | 1, 6 | Seed weight | <i>-log10(P)</i> :4.08 to 6.11 <i>LOD</i> : 3.37 | 0.114 | 6.43 to 27 |
| SVUTC25355_209 | A/G | VUTC25355 | 209 | 6,8 | Seed weight | <i>-log10(P)</i> :6.30 to 8.77 <i>LOD</i> :5.48-7.88 | 0.219 | 12.14 to 24.79 |

^a 1. GLM (Q), 2. GLM (PCA)], 3. MLM (Q+K), 4. MLM (PCA+K), 5. mrMLM, 6. FASTmrMLM, 7. FASTmrEMMA, 8. ISIS EMBLASSO, 9. FarmCPU, 10. BLINK.* As FarmCPU and BLINK don't give R² value, NA is written for the markers predicted only by these two methods

[#] *SNP*: single nucleotide polymorphism, *LOD*: logarithm of the odds, *MAF*: minor allele frequency

Table S5. Associated Markers for flowering, maturity and seed weight predicted using phenotypic data of Delhi location in the year 2021.

| Marker ID ^a | SNP [#] | Transcript ID | Position | Models ^b | Trait(s) | $-\log_{10}(P)$ / LOD [#] | MAF [#] | R ² |
|------------------------|------------------|---------------|----------|---------------------|-----------|---|------------------|----------------|
| SVUTC00230_1049 | A/T | VUTC00230 | 1049 | 2,4,5 | Flowering | $-\log_{10}(p)$: 6.02 to 7.01 LOD: 6.063 | 0.113 | 16.86 to 22 |
| SVUTC01074_2125 | A/G | VUTC01074 | 2125 | 3,4 | Flowering | $-\log_{10}(p)$: 6.37 to 7.09 | 0.118 | 27 |
| SVUTC01110_689 | T/C | VUTC01110 | 689 | 1,8 | Flowering | $-\log_{10}(P)$:5.90 to 6.31 LOD: 5.10 | 0.070 | 12.07 to 26 |
| SVUTC04786_495 | T/A | VUTC04786 | 495 | 3,4 | Flowering | $-\log_{10}(P)$:7.37 to 7.70 | 0.060 | 30 |
| SVUTC04786_499 | A/T | VUTC04786 | 499 | 3,4 | Flowering | $-\log_{10}(P)$:7.18 to 7.52 | 0.060 | 29 |
| SVUTC06771_4276 | G/C | VUTC06771 | 4276 | 2,4 | Flowering | $-\log_{10}(P)$:6.43 to 6.55 | 0.153 | 20 to 25 |
| SVUTC08154_978 | G/A | VUTC08154 | 978 | 6,8 | Flowering | $-\log_{10}(P)$:7.18 to 7.19 LOD: 6.341 to 6.3495 | 0.051 | 29.21 to 33.54 |
| SVUTC09869_1881 | C/G | VUTC09869 | 1881 | 1,3 | Flowering | $-\log_{10}(P)$:6.28 to 7.81 | 0.098 | 35 |
| SVUTC09870_149 | C/T | VUTC09870 | 149 | 1,7,8,9 | Flowering | $-\log_{10}(P)$:6.95 to 9.18 LOD: 5.77 to 7.12 | 0.092 | 15.04 to 33 |
| SVUTC09871_149 | C/T | VUTC09871 | 149 | 1,3 | Flowering | $-\log_{10}(P)$:6.11 to 6.33 | 0.077 | 28 |
| SVUTC15414_2770 | T/C | VUTC15414 | 2770 | 1,3,4 | Flowering | $-\log_{10}(P)$:6.30 to 7.29 | 0.075 | 25 to 26 |
| SVUTC15414_2854 | A/T | VUTC15414 | 2854 | 3,4 | Flowering | $-\log_{10}(P)$:6.16 to 6.86 | 0.081 | 23 |
| SVUTC15418_711 | C/T | VUTC15418 | 711 | 1, 3,4 | Flowering | $-\log_{10}(P)$:6.30 to 7.29 | 0.075 | 25 to 26 |
| SVUTC17024_838 | C/T | VUTC17024 | 838 | 1,2,3,4 | Flowering | $-\log_{10}(P)$:6.14 to 10.64 | 0.111 | 24 to 34 |
| SVUTC20322_1284 | A/G | VUTC20322 | 1284 | 3,4 | Flowering | $-\log_{10}(P)$:5.99 to 6.82 | 0.148 | 28 |
| SVUTC20322_1298 | A/T | VUTC20322 | 1298 | 3,4 | Flowering | $-\log_{10}(P)$:5.92 to 5.99 | 0.160 | 28 |
| SVUTC20819_606 | T/C | VUTC20819 | 606 | 1,2 | Flowering | $-\log_{10}(P)$:6.16 to 6.86 | 0.079 | 20 to 37 |
| SVUTC25024_1324 | A/G | VUTC25024 | 1324 | 1,2,3,4 | Flowering | $-\log_{10}(P)$:6.23 to 6.59 | 0.090 | 19 to 27 |
| SVUTC25312_4994 | A/G | VUTC25312 | 4994 | 8,9 | Flowering | $-\log_{10}(P)$:5.66 to 7.27 LOD: 4.87 | 0.376 | 7.76 |
| SVUTC28152_1002 | C/T | VUTC28152 | 1002 | 1,3 | Flowering | $-\log_{10}(P)$:6.40 to 6.49 | 0.065 | 26 |
| SVUTC28154_1391 | G/T | VUTC28154 | 1391 | 1,2,3,4,6 | Flowering | $-\log_{10}(P)$:4.25 to 822 LOD: 3.52 | 0.076 | 8.74 to 32 |
| SVUTC28154_1530 | A/G | VUTC28154 | 1530 | 1,2,3,4 | Flowering | $-\log_{10}(P)$:6.17 to 7.53 | 0.071 | 20 to 28 |

| | | | | | | | | |
|------------------------|-----|-----------|------|---------|--------------------------|---|-------|---------------|
| SVUTC28154_1646 | G/A | VUTC28154 | 1646 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.18$ to 7.19 | 0.065 | 20 to 29 |
| SVUTC28165_3265 | A/T | VUTC28165 | 3265 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.00$ to 7.16 | 0.060 | 18 to 26 |
| SVUTC28183_1588 | T/G | VUTC28183 | 1588 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.00$ to 9.27 | 0.074 | 19 to 32 |
| SVUTC28183_2077 | G/A | VUTC28183 | 2077 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.00$ to 7.16 | 0.060 | 18 to 22 |
| SVUTC28185_6557 | T/C | VUTC28185 | 6557 | 1,2 | Flowering | $-\log_{10}(P):5.99$ to 6.38 | 0.058 | 18 to 25 |
| SVUTC28186_2802 | G/C | VUTC28186 | 2802 | 3,4 | Flowering | $-\log_{10}(P):6.18$ to 6.26 | 0.071 | 26 |
| SVUTC28192_1815 | T/G | VUTC28192 | 1815 | 1, 2,3 | Flowering | $-\log_{10}(P):6.04$ to 7.05 | 0.063 | 18 to 27 |
| SVUTC28192_2307 | G/A | VUTC28192 | 2307 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.00$ to 7.16 | 0.060 | 18 to 26 |
| SVUTC28201_1062 | G/A | VUTC28201 | 1062 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.25$ to 7.95 | 0.065 | 18 to 26 |
| SVUTC28201_425 | A/G | VUTC28201 | 425 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.26$ to 7.90 | 0.066 | 18 to 26 |
| SVUTC28201_516 | C/A | VUTC28201 | 516 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.17$ to 7.85 | 0.066 | 18 to 26 |
| SVUTC28201_680 | A/T | VUTC28201 | 680 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.25$ to 7.95 | 0.065 | 18 to 26 |
| SVUTC28201_76 | T/C | VUTC28201 | 76 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.17$ to 7.82 | 0.066 | 19 to 28 |
| SVUTC29109_1026 | G/T | VUTC29109 | 1026 | 3,4 | Flowering | $-\log_{10}(P):6.68$ to 7.99 | 0.059 | 25 |
| SVUTC29109_858 | C/G | VUTC29109 | 858 | 3,4 | Flowering | $-\log_{10}(P):6.78$ to 7.50 | 0.065 | 26 |
| SVUTC29946_2497 | T/G | VUTC29946 | 2497 | 3,4 | Flowering | $-\log_{10}(P):6.10$ to 6.68 | 0.087 | 25 |
| SVUTC29946_2507 | A/G | VUTC29946 | 2507 | 3,4 | Flowering | $-\log_{10}(P):6.64$ to 7.31 | 0.091 | 28 |
| SVUTC29946_2525 | G/C | VUTC29946 | 2525 | 3,4 | Flowering | $-\log_{10}(P):7.25$ to 7.25 | 0.090 | 29 |
| SVUTC29946_2663 | G/A | VUTC29946 | 2663 | 3,4 | Flowering | $-\log_{10}(P):6.96$ to 7.76 | 0.077 | 26 |
| SVUTC31155_1020 | A/G | VUTC31155 | 1020 | 1,2,3,4 | Flowering | $-\log_{10}(P):6.23$ to 10.59 | 0.061 | 24 to 38 |
| SVUTC12308_931 | T/A | VUTC12308 | 931 | 1,6 | Maturity | $-\log_{10}(P):4.79$ to 8.57 <i>LOD: 4.04</i> | 0.163 | 9.05 to 35 |
| SVUTC18444_3244 | C/A | VUTC18444 | 3244 | 1,6 | Maturity | $-\log_{10}(P):4.7$ to 9.45 <i>LOD: 4.032</i> | 0.148 | 13.41 to 39 |
| SVUTC29349_1348 | G/A | VUTC29349 | 1348 | 5,6 | Maturity | $-\log_{10}(P):4.22$ to 5.60 <i>LOD: 3.49-4.81</i> | 0.478 | 4.65 to 5.24 |
| SVUTC25248_8323 | G/A | VUTC25248 | 8323 | 5,6,8 | Maturity, Seed weight | $-\log_{10}(P):5.22$ to 9.50 <i>LOD: 4.44-8.59</i> | 0.159 | 6.37 to 31.87 |
| SVUTC00580_1033 | T/C | VUTC00580 | 1033 | 6,8 | Seed weight | $-\log_{10}(P):3.75$ to 4.88 | 0.085 | 2.15 to 5.59 |

| | | | | | | | | |
|-----------------|-----|-----------|------|-----|-------------|--|-------|---------------|
| SVUTC16440_582 | A/G | VUTC16440 | 582 | 6,8 | Seed weight | <i>LOD</i> : 3.05 to 4.12 <i>-log10(P)</i> :4.59 to 7.25 <i>LOD</i> : 3.84 to 7.25 | 0.074 | 5.88 to 22.38 |
| SVUTC19671_1032 | G/A | VUTC19671 | 1032 | 6,8 | Seed weight | <i>-log10(P)</i> :4.48 to 6.57 <i>LOD</i> : 3.74 to 5.75 | 0.087 | 6.99 to 18.92 |

^a The marker names in bold italics are associated with more than one trait.

^b 1. GLM (Q), 2. GLM (PCA)], 3. MLM (Q+K), 4. MLM (PCA+K), 5. mrMLM, 6. FASTmrMLM, 7. FASTmrEMMA, 8. ISIS EMBLASSO, 9. FarmCPU, 10. BLINK.

[#] *SNP*: single nucleotide polymorphism, *LOD*: logarithm of the odds, *MAF*: minor allele frequency

Table S6. The chromosomal localization of markers with respect to the genome of the rice bean cultivar FF25

| Transcript (Marker position with left and right flanking coordinates) | Subject (FF25) accession | Query Start | Query end | Subject start | Subject end | e-value | Bit score | Perce nt Identi ty | Query covera ge | Chrom osome number (FF25) | Chromos omal position |
|--|-------------------------------------|------------------------|----------------------|--------------------------|------------------------|----------------|----------------------|---------------------------------------|--------------------------------|---|--------------------------------------|
| VuTC00230_1049_999_1099 | CM045811.1 | 1 | 101 | 9631952 | 9631852 | 1.19E-46 | 187 | 100 | 100 | 3 | 9631902 |
| VuTC00580_1033_983_1083 | CM045811.1 | 1 | 101 | 4772554 | 4772454 | 1.19E-46 | 187 | 100 | 100 | 3 | 4772504 |
| VuTC01074_2125_2075_2175 | CM045811.1 | 1 | 101 | 1173835 | 1173935 | 1.19E-46 | 187 | 100 | 100 | 3 | 1173885 |
| VuTC01110_689_639_739 | CM045811.1 | 1 | 71 | 769885 | 769815 | 5.65E-30 | 132 | 100 | 100 | 3 | 769835 |
| VuTC01132_259_209_309 | CM045811.1 | 1 | 101 | 695239 | 695339 | 1.19E-46 | 187 | 100 | 100 | 3 | 695289 |
| VuTC02283_1297_1247_1347 | CM045811.1 | 1 | 101 | 30937366 | 30937466 | 1.19E-46 | 187 | 100 | 100 | 3 | 30937416 |
| VuTC02299_468_418_518 | CM045811.1 | 1 | 101 | 30795162 | 30795062 | 1.2E-41 | 171 | 97.03 | 100 | 3 | 30795112 |
| VuTC02300_1585_1535_1635 | CM045811.1 | 1 | 87 | 30758380 | 30758294 | 3.35E-37 | 156 | 98.851 | 86 | 3 | 30758330 |
| VuTC04786_495_445_545 | CM045809.1 | 24 | 101 | 28992314 | 28992237 | 7.26E-34 | 145 | 100 | 77 | 1 | 28992287 |
| VuTC04786_499_449_549 | CM045809.1 | 20 | 101 | 28992314 | 28992233 | 4.34E-36 | 152 | 100 | 81 | 1 | 28992283 |
| VuTC04837_563_513_613 | CM045809.1 | 1 | 101 | 30497299 | 30497399 | 1.19E-46 | 187 | 100 | 100 | 1 | 30497349 |
| VuTC04837_620_570_670 | CM045809.1 | 1 | 101 | 30497356 | 30497456 | 1.19E-46 | 187 | 100 | 100 | 1 | 30497406 |
| VuTC04837_772_722_822 | CM045809.1 | 1 | 101 | 30497508 | 30497608 | 1.19E-46 | 187 | 100 | 100 | 1 | 30497558 |
| VuTC04837_782_732_832 | CM045809.1 | 1 | 101 | 30497518 | 30497618 | 5.53E-45 | 182 | 99.01 | 100 | 1 | 30497568 |
| VuTC04837_786_736_836 | CM045809.1 | 1 | 101 | 30497522 | 30497622 | 5.53E-45 | 182 | 99.01 | 100 | 1 | 30497572 |
| VuTC05378_2089_2039_2139 | CM045815.1 | 1 | 101 | 4657299 | 4657199 | 5.53E-45 | 182 | 99.01 | 100 | 7 | 4657249 |
| VuTC06321_645_595_695 | CM045817.1 | 1 | 101 | 6378333 | 6378433 | 1.19E-46 | 187 | 100 | 100 | 9 | 6378383 |
| VuTC06771_4276_4226_4326 | CM045814.1 | 1 | 101 | 26027670 | 26027570 | 1.19E-46 | 187 | 100 | 100 | 6 | 26027620 |
| VuTC06850_2182_2132_2232 | CM045809.1 | 1 | 101 | 48733273 | 48733373 | 1.19E-46 | 187 | 100 | 100 | 1 | 48733323 |
| VuTC06910_1648_1598_1698 | CM045818.1 | 1 | 74 | 9729407 | 9729480 | 2.63E-28 | 126 | 97.297 | 73 | 10 | 9729457 |
| VuTC06910_1702_1652_1752 | CM045818.1 | 24 | 101 | 9729475 | 9729552 | 1.57E-30 | 134 | 97.436 | 77 | 10 | 9729502 |
| VuTC06910_1746_1696_1796 | CM045818.1 | 1 | 101 | 9729496 | 9729596 | 2.57E-43 | 176 | 98.02 | 100 | 10 | 9729546 |
| VuTC06910_177_127_227 | CM045818.1 | 1 | 101 | 9727974 | 9728074 | 5.53E-45 | 182 | 99.01 | 100 | 10 | 9728024 |
| VuTC07229_692_642_742 | CM045812.1 | 17 | 101 | 5850084 | 5850168 | 9.32E-38 | 158 | 100 | 84 | 4 | 5850118 |
| VuTC08788_874_824_924 | CM045814.1 | 1 | 62 | 29005354 | 29005293 | 2.65E-23 | 110 | 98.387 | 100 | 6 | 29005304 |
| VuTC09869_1881_1831_1931 | CM045814.1 | 1 | 101 | 37159630 | 37159530 | 1.19E-46 | 187 | 100 | 100 | 6 | 37159580 |
| VuTC09870_149_99_199 | CM045814.1 | 1 | 101 | 37164076 | 37163976 | 1.19E-46 | 187 | 100 | 100 | 6 | 37164026 |
| VuTC09951_1960_1910_2010 | CM045814.1 | 1 | 101 | 37648884 | 37648984 | 2.57E-43 | 176 | 98.02 | 100 | 6 | 37648934 |
| VuTC12308_931_881_981 | CM045810.1 | 1 | 101 | 42038354 | 42038254 | 1.19E-46 | 187 | 100 | 100 | 2 | 42038304 |

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|--------------------------|------------|----|-----|----------|----------|----------|------|-------|-----|----|----------|
| VuTC12393_763_713_813 | CM045810.1 | 46 | 101 | 40905743 | 40905688 | 1.23E-21 | 104 | 100 | 100 | 2 | 40905738 |
| VuTC12822_2877_2827_2927 | CM045810.1 | 1 | 101 | 34427114 | 34427214 | 1.19E-46 | 187 | 100 | 100 | 2 | 34427164 |
| VuTC13707_7465_7415_7515 | CM045818.1 | 1 | 101 | 2381645 | 2381745 | 1.19E-46 | 187 | 100 | 100 | 10 | 2381695 |
| VuTC13707_7487_7437_7537 | CM045818.1 | 1 | 101 | 2381667 | 2381767 | 1.19E-46 | 187 | 100 | 100 | 10 | 2381717 |
| VuTC14443_583_533_633 | CM045810.1 | 1 | 101 | 4826509 | 4826609 | 1.19E-46 | 187 | 100 | 100 | 2 | 4826559 |
| VuTC15414_2770_2720_2820 | CM045815.1 | 1 | 101 | 19788538 | 19788638 | 1.19E-46 | 187 | 100 | 100 | 7 | 19788588 |
| VuTC15414_2854_2804_2896 | CM045815.1 | 1 | 93 | 19788622 | 19788714 | 2.98E-42 | 172 | 100 | 100 | 7 | 19788672 |
| VuTC15418_711_661_761 | CM045815.1 | 1 | 101 | 19953618 | 19953518 | 1.19E-46 | 187 | 100 | 100 | 7 | 19953568 |
| VuTC15693_1885_1835_1935 | CM045817.1 | 1 | 101 | 3273097 | 3272997 | 1.19E-46 | 187 | 100 | 100 | 9 | 3273047 |
| VuTC16440_582_532_632 | CM045816.1 | 1 | 101 | 39541747 | 39541847 | 1.19E-46 | 187 | 100 | 100 | 8 | 39541797 |
| VuTC17024_838_788_888 | CM045816.1 | 1 | 101 | 22745909 | 22746009 | 1.19E-46 | 187 | 100 | 100 | 8 | 22745959 |
| VuTC18323_834_784_884 | CM045816.1 | 1 | 101 | 8513761 | 8513661 | 1.19E-46 | 187 | 100 | 100 | 8 | 8513711 |
| VuTC18444_3244_3194_3294 | CM045816.1 | 1 | 101 | 7456468 | 7456568 | 2.57E-43 | 176 | 98.02 | 100 | 8 | 7456518 |
| VuTC19671_1032_982_1082 | CM045813.1 | 1 | 101 | 33927832 | 33927932 | 1.19E-46 | 187 | 100 | 100 | 5 | 33927882 |
| VuTC20322_1284_1234_1334 | CM045819.1 | 1 | 101 | 30252077 | 30252177 | 1.19E-46 | 187 | 100 | 100 | 11 | 30252127 |
| VuTC20322_1298_1248_1348 | CM045819.1 | 1 | 101 | 30252091 | 30252191 | 1.19E-46 | 187 | 100 | 100 | 11 | 30252141 |
| VuTC20819_606_556_656 | CM045819.1 | 16 | 101 | 36813220 | 36813305 | 2.59E-38 | 159 | 100 | 85 | 11 | 36813255 |
| VuTC21295_283_233_333 | CM045819.1 | 1 | 61 | 2833591 | 2833531 | 2.05E-24 | 113 | 100 | 100 | 11 | 2833541 |
| VuTC21395_469_419_519 | CM045819.1 | 1 | 101 | 4638317 | 4638217 | 1.19E-46 | 187 | 100 | 100 | 11 | 4638267 |
| VuTC21543_375_325_425 | CM045819.1 | 1 | 101 | 6875160 | 6875260 | 1.19E-46 | 187 | 100 | 100 | 11 | 6875210 |
| VuTC21642_866_816_916 | CM045819.1 | 1 | 101 | 9131549 | 9131649 | 1.19E-46 | 187 | 100 | 100 | 11 | 9131599 |
| VuTC21831_6083_6033_6133 | CM045819.1 | 1 | 101 | 15796860 | 15796960 | 1.19E-46 | 187 | 100 | 100 | 11 | 15796910 |
| VuTC22119_491_441_541 | CM045809.1 | 28 | 101 | 41626966 | 41626893 | 1.21E-31 | 137 | 100 | 100 | 1 | 41626943 |
| VuTC22319_438_388_488 | CM045818.1 | 1 | 101 | 24046242 | 24046142 | 1.19E-46 | 187 | 100 | 100 | 10 | 24046192 |
| VuTC22319_77_27_127 | CM045818.1 | 1 | 101 | 24046603 | 24046503 | 1.19E-46 | 187 | 100 | 100 | 10 | 24046553 |
| VuTC23058_1028_978_1078 | CM045812.1 | 15 | 74 | 36013342 | 36013401 | 7.36E-24 | 111 | 100 | 86 | 4 | 36013378 |
| VuTC24042_2561_2511_2583 | CM045812.1 | 1 | 73 | 46439531 | 46439603 | 2.76E-31 | 135 | 100 | 100 | 4 | 46439581 |
| VuTC24699_1593_1543_1643 | CM045812.1 | 1 | 101 | 51636425 | 51636325 | 5.53E-45 | 182 | 99.01 | 100 | 4 | 51636375 |
| VuTC25024_1324_1274_1374 | CM045812.1 | 1 | 101 | 53823803 | 53823703 | 1.19E-46 | 187 | 100 | 100 | 4 | 53823753 |
| VuTC25248_8323_8273_8373 | CM045815.1 | 1 | 101 | 7578117 | 7578217 | 1.19E-46 | 187 | 100 | 100 | 7 | 7578167 |
| VuTC25312_4994_4944_5044 | CM045813.1 | 1 | 101 | 33147291 | 33147391 | 1.19E-46 | 187 | 100 | 100 | 5 | 33147341 |
| VuTC25312_5309_5259_5359 | CM045813.1 | 1 | 101 | 33147606 | 33147706 | 2.57E-43 | 176 | 98.02 | 100 | 5 | 33147656 |
| VuTC25355_209_159_259 | CM045813.1 | 32 | 96 | 31562818 | 31562882 | 1.22E-26 | 121 | 100 | 95 | 5 | 31562837 |
| VuTC25355_209_159_259 | CM045813.1 | 1 | 36 | 31562321 | 31562356 | 1.62E-10 | 67.6 | 100 | 95 | 5 | 31562371 |
| VuTC25491_6046_5996_6096 | CM045813.1 | 1 | 101 | 20955499 | 20955599 | 1.2E-41 | 171 | 97.03 | 100 | 5 | 20955549 |

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|--------------------------|------------|----|-----|----------|----------|----------|-----|-----|-----|---|----------|
| VuTC25856_1400_1350_1450 | CM045813.1 | 1 | 101 | 13658717 | 13658617 | 1.19E-46 | 187 | 100 | 100 | 5 | 13658667 |
| VuTC26171_1046_996_1096 | CM045813.1 | 1 | 101 | 10365333 | 10365233 | 1.19E-46 | 187 | 100 | 100 | 5 | 10365283 |
| VuTC27187_1237_1187_1287 | CM045813.1 | 1 | 101 | 2923281 | 2923381 | 1.19E-46 | 187 | 100 | 100 | 5 | 2923331 |
| VuTC27441_1674_1624_1724 | CM045813.1 | 32 | 101 | 1533680 | 1533611 | 2.03E-29 | 130 | 100 | 100 | 5 | 1533661 |
| VuTC28152_1002_952_1052 | CM045809.1 | 1 | 71 | 41561653 | 41561723 | 5.65E-30 | 132 | 100 | 100 | 1 | 41561703 |
| VuTC28154_1391_1341_1441 | CM045809.1 | 1 | 100 | 41658663 | 41658762 | 4.28E-46 | 185 | 100 | 99 | 1 | 41658713 |
| VuTC28154_1530_1480_1580 | CM045809.1 | 1 | 101 | 41659267 | 41659367 | 1.19E-46 | 187 | 100 | 100 | 1 | 41659317 |
| VuTC28154_1646_1596_1696 | CM045809.1 | 1 | 101 | 41659383 | 41659483 | 1.19E-46 | 187 | 100 | 100 | 1 | 41659433 |
| VuTC28154_4577_4527_4627 | CM045809.1 | 1 | 101 | 41669342 | 41669442 | 1.19E-46 | 187 | 100 | 100 | 1 | 41669392 |
| VuTC28154_4595_4545_4645 | CM045809.1 | 1 | 101 | 41669360 | 41669460 | 1.19E-46 | 187 | 100 | 100 | 1 | 41669410 |
| VuTC28154_4614_4564_4664 | CM045809.1 | 1 | 101 | 41669379 | 41669479 | 1.19E-46 | 187 | 100 | 100 | 1 | 41669429 |
| VuTC28154_4619_4569_4669 | CM045809.1 | 1 | 101 | 41669384 | 41669484 | 1.19E-46 | 187 | 100 | 100 | 1 | 41669434 |
| VuTC28154_4769_4719_4819 | CM045809.1 | 1 | 101 | 41669533 | 41669633 | 1.19E-46 | 187 | 100 | 100 | 1 | 41669583 |
| VuTC28155_2560_2510_2610 | CM045809.1 | 1 | 101 | 41703835 | 41703735 | 1.19E-46 | 187 | 100 | 100 | 1 | 41703785 |
| VuTC28163_1003_953_1053 | CM045809.1 | 1 | 101 | 41827056 | 41826956 | 1.19E-46 | 187 | 100 | 100 | 1 | 41827006 |
| VuTC28164_1018_968_1068 | CM045809.1 | 1 | 97 | 41849398 | 41849494 | 1.99E-44 | 180 | 100 | 96 | 1 | 41849448 |
| VuTC28164_974_924_1024 | CM045809.1 | 1 | 101 | 41849354 | 41849454 | 1.19E-46 | 187 | 100 | 100 | 1 | 41849404 |
| VuTC28165_2013_1963_2063 | CM045809.1 | 29 | 101 | 41877116 | 41877044 | 4.37E-31 | 135 | 100 | 100 | 1 | 41877094 |
| VuTC28165_2563_2513_2613 | CM045809.1 | 1 | 64 | 41871680 | 41871617 | 4.4E-26 | 119 | 100 | 100 | 1 | 41871630 |
| VuTC28165_2595_2545_2645 | CM045809.1 | 33 | 101 | 41871525 | 41871457 | 7.31E-29 | 128 | 100 | 100 | 1 | 41871507 |
| VuTC28165_3265_3215_3315 | CM045809.1 | 1 | 101 | 41870199 | 41870099 | 1.19E-46 | 187 | 100 | 100 | 1 | 41870149 |
| VuTC28181_1427_1377_1477 | CM045809.1 | 1 | 101 | 41934837 | 41934937 | 1.19E-46 | 187 | 100 | 100 | 1 | 41934887 |
| VuTC28181_1461_1411_1511 | CM045809.1 | 1 | 101 | 41934871 | 41934971 | 1.19E-46 | 187 | 100 | 100 | 1 | 41934921 |
| VuTC28183_1588_1538_1638 | CM045809.1 | 1 | 101 | 42021835 | 42021935 | 1.19E-46 | 187 | 100 | 100 | 1 | 42021885 |
| VuTC28183_2077_2027_2127 | CM045809.1 | 1 | 101 | 42023280 | 42023380 | 1.19E-46 | 187 | 100 | 100 | 1 | 42023330 |
| VuTC28185_6557_6507_6607 | CM045809.1 | 1 | 101 | 42081846 | 42081746 | 1.19E-46 | 187 | 100 | 100 | 1 | 42081796 |
| VuTC28186_2590_2540_2640 | CM045809.1 | 1 | 101 | 42082222 | 42082122 | 1.19E-46 | 187 | 100 | 100 | 1 | 42082172 |
| VuTC28186_2802_2752_2852 | CM045809.1 | 1 | 101 | 42082010 | 42081910 | 1.19E-46 | 187 | 100 | 100 | 1 | 42081960 |
| VuTC28192_1776_1726_1826 | CM045809.1 | 42 | 101 | 42157742 | 42157683 | 7.36E-24 | 111 | 100 | 100 | 1 | 42157733 |
| VuTC28192_1815_1765_1865 | CM045809.1 | 3 | 101 | 42157742 | 42157644 | 1.54E-45 | 183 | 100 | 98 | 1 | 42157694 |
| VuTC28192_1930_1880_1980 | CM045809.1 | 12 | 100 | 42157452 | 42157364 | 5.57E-40 | 165 | 100 | 88 | 1 | 42157413 |
| VuTC28192_2307_2257_2357 | CM045809.1 | 1 | 101 | 42156997 | 42156897 | 1.19E-46 | 187 | 100 | 100 | 1 | 42156947 |
| VuTC28196_1051_1001_1101 | CM045809.1 | 1 | 101 | 42311037 | 42311137 | 1.19E-46 | 187 | 100 | 100 | 1 | 42311087 |
| VuTC28201_1062_1012_1112 | CM045809.1 | 17 | 101 | 42365752 | 42365668 | 9.32E-38 | 158 | 100 | 84 | 1 | 42365718 |
| VuTC28201_425_375_475 | CM045809.1 | 1 | 64 | 42367762 | 42367699 | 4.4E-26 | 119 | 100 | 100 | 1 | 42367712 |

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|--------------------------|------------|----|-----|----------|----------|----------|------|--------|-----|----|----------|
| VuTC28201_516_466_566 | CM045809.1 | 1 | 57 | 42367592 | 42367536 | 1.59E-20 | 100 | 98.246 | 100 | 1 | 42367542 |
| VuTC28201_680_630_730 | CM045809.1 | 1 | 101 | 42367245 | 42367145 | 1.19E-46 | 187 | 100 | 100 | 1 | 42367195 |
| VuTC28201_76_26_126 | CM045809.1 | 1 | 78 | 42369962 | 42369885 | 7.26E-34 | 145 | 100 | 77 | 1 | 42369912 |
| VuTC28966_1949_1899_1999 | CM045809.1 | 1 | 101 | 52172887 | 52172987 | 1.19E-46 | 187 | 100 | 100 | 1 | 52172937 |
| VuTC29107_1520_1470_1570 | CM045809.1 | 1 | 101 | 52792768 | 52792868 | 1.19E-46 | 187 | 100 | 100 | 1 | 52792818 |
| VuTC29109_1026_976_1076 | CM045809.1 | 1 | 101 | 52790172 | 52790272 | 1.19E-46 | 187 | 100 | 100 | 1 | 52790222 |
| VuTC29109_858_808_908 | CM045809.1 | 1 | 101 | 52790004 | 52790104 | 1.19E-46 | 187 | 100 | 100 | 1 | 52790054 |
| VuTC29349_1348_1298_1398 | CM045809.1 | 1 | 90 | 55001235 | 55001146 | 7.21E-39 | 161 | 98.889 | 89 | 1 | 55001185 |
| VuTC29946_2497_2447_2547 | CM045809.1 | 1 | 60 | 59772650 | 59772709 | 7.36E-24 | 111 | 100 | 100 | 1 | 59772700 |
| VuTC29946_2507_2457_2557 | CM045809.1 | 47 | 101 | 59772811 | 59772865 | 2.06E-19 | 97.1 | 98.182 | 100 | 1 | 59772815 |
| VuTC29946_2525_2475_2575 | CM045809.1 | 29 | 101 | 59772811 | 59772883 | 2.03E-29 | 130 | 98.63 | 100 | 1 | 59772833 |
| VuTC29946_2663_2613_2713 | CM045809.1 | 1 | 77 | 59772921 | 59772997 | 2.61E-33 | 143 | 100 | 76 | 1 | 59772971 |
| VuTC32100_1612_1562_1662 | CM045818.1 | 1 | 101 | 29307768 | 29307868 | 5.53E-45 | 182 | 99.01 | 100 | 10 | 29307818 |
| VuTC32582_1223_1173_1273 | CM045818.1 | 1 | 101 | 26767134 | 26767034 | 1.19E-46 | 187 | 100 | 100 | 10 | 26767084 |
| VuTC34794_4308_4258_4358 | CM045812.1 | 1 | 101 | 32392046 | 32391946 | 1.19E-46 | 187 | 100 | 100 | 4 | 32391996 |

Table S7. The annotation of transcripts in terms of molecular function.

| Transcript _ID^a | Trait(s) | Description (annotated through OmicsBox) | Enzyme name (EnzCode) | GO Names (GO IDs) | Description (annotated through offline BLASTX) |
|---------------------------------------|-----------------|---|--|---|--|
| VuTC15418 | Flowering | 40S ribosomal protein S19-1 | Transferring one-carbon groups(EC:2.1.1) | P:ribosomal small subunit assembly; P:translation; F:RNA binding; F:structural constituent of ribosome; F:methyltransferase activity; C:cytosolic small ribosomal subunit(P:GO:0000028; P:GO:0006412; F:GO:0003723; F:GO:0003735; F:GO:0008168; C:GO:0022627) | 40S ribosomal protein S19 |
| VuTC28165 | Flowering | 5'-3' exoribonuclease 3-like isoform X2 | Acting on ester bonds; Acting on ester bonds(EC:3.1.13; EC:3.1.15) | P:nuclear-transcribed mRNA catabolic process; P:mRNA processing; P:RNA phosphodiester bond hydrolysis, exonucleolytic; F:RNA binding; F:5'-3' exoribonuclease activity; F:zinc ion binding; C:nucleus(P:GO:0000956; P:GO:0006397; P:GO:0090503; F:GO:0003723; F:GO:0004534; F:GO:0008270; C:GO:0005634) | 5'-3' exoribonuclease 4 /Zinc finger CCHC-type |
| VuTC28192 | Flowering | arabinosyltransferase XEG113 | Glycosyltransferases(EC:2.4.2) | P:protein glycosylation; P:cell wall pectin biosynthetic process; F:arabinosyltransferase activity; C:membrane(P:GO:0006486; P:GO:0052325; F:GO:0052636; C:GO:0016020) | arabinosyltransferase XEG113 /Nucleotide-diphospho-sugar transferase/rhamnogalacturonan II specific xylosyltransferase |
| VuTC31155 | Flowering | bromodomain adjacent to zinc finger domain protein 1A-like | Not Available | Not Available | bromodomain adjacent to zinc finger domain protein 1A-like... |

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|-----------|-----------|-------------------------------|--|--|---|
| VuTC18323 | Flowering | Caffeoylshikimate esterase | Acting on ester bonds; 2-acylglycerol O-acyltransferase(EC:3.1; EC:2.3.1.22) | F:2-acylglycerol O-acyltransferase activity; F:lipase activity; C:membrane(F:GO:0003846; F:GO:0016298; C:GO:0016020) | golgin subfamily A member 6-like protein 2 [Vigna unguiculata, Caffeoylshikimate esterase/Serine aminopeptidase S33 |
| VuTC06771 | Flowering | callose synthase 12 | 1,3-beta-glucan synthase(EC:2.4.1.34) | P:(1->3)-beta-D-glucan biosynthetic process; P:regulation of cell shape; P:cell wall organization; F:1,3-beta-D-glucan synthase activity; C:1,3-beta-D-glucan synthase complex(P:GO:0006075; P:GO:0008360; P:GO:0071555; F:GO:0003843; C:GO:0000148) | /lysophospholipase Callose synthase, 1-3-beta-glucan synthase subunit FKS1-like domain-1 |
| VuTC06321 | Flowering | Cytochrome b5 | cytochrome-b5 reductase(EC:1.6.2.2) | F:cytochrome-b5 reductase activity, acting on NAD(P)H; F:heme binding; F:metal ion binding; C:membrane(F:GO:0004128; F:GO:0020037; F:GO:0046872; C:GO:0016020) | cytochrome B5 |
| VuTC28164 | Flowering | D-aminoacyl-tRNA deacylase | D-aminoacyl-tRNA deacylase(EC:3.1.1.96) | P:D-amino acid catabolic process; P:aminoacyl-tRNA metabolism involved in translational fidelity; F:metal ion binding; F:D-aminoacyl-tRNA deacylase activity(P:GO:0019478; P:GO:0106074; F:GO:0046872; F:GO:0051499) | D-aminoacyl-tRNA deacylase |
| VuTC01074 | Flowering | heat shock cognate protein 80 | nucleoside-triphosphate phosphatase(EC:3.6.1.15) | P:protein folding; P:cellular response to heat; P:protein stabilization; F:ATP binding; F:ATP hydrolysis activity; F:unfolded protein binding; F:ATP-dependent protein folding chaperone; | Heat Shock protein 81,83,90 |

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| VuTC31327 | Flowering | histone-lysine N-methyltransferase ATX3 | Transferring one-carbon groups(EC:2.1.1) | C:cytosol; C:plasma membrane; C:protein-containing complex; C:perinuclear region of cytoplasm(P:GO:0006457; P:GO:0034605; P:GO:0050821; F:GO:0005524; F:GO:0016887; F:GO:0051082; F:GO:0140662; C:GO:0005829; C:GO:0005886; C:GO:0032991; C:GO:0048471) P:regulation of transcription by RNA polymerase II; P:histone methylation; F:histone lysine N-methyltransferase activity; F:metal ion binding; C:Set1C/COMPASS complex(P:GO:0006357; P:GO:0016571; F:GO:0018024; F:GO:0046872; C:GO:0048188) | Histone-lysine N-methyltransferase |
| VuTC17024 | Flowering | hydroxyisourate hydrolase-like isoform X1 | Glycosylases(EC:3.2.1) | P:carbohydrate metabolic process; F:hydrolase activity, hydrolyzing O-glycosyl compounds(P:GO:0005975; F:GO:0004553) | beta-glucosidase/hydroxyisourate hydrolase |
| VuTC26171 | Flowering | hypothetical protein VIGAN_05139400, partial | Not Available | C:membrane; C:membrane(C:GO:0016020; C:GO:0016020) | lysine ketoglutarate reductase trans-splicing-like protein..., pentatricopeptide repeat-containing protein [Citrus sinensis] |
| VuTC08154 | Flowering | hypothetical protein VIGAN_UM059100, partial | Not Available | F:nucleic acid binding; F:zinc ion binding(F:GO:0003676; F:GO:0008270) | hypothetical protein LR48_Vigan06g067900, uncharacterized protein HKW66_Vig0200390 |

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| VuTC20819 | Flowering | kinesin-like protein KIN-13B | Not Available | P:microtubule-based movement; P:microtubule depolymerization; F:microtubule motor activity; F:ATP binding; F:microtubule binding; C:microtubule(P:GO:0007018; P:GO:0007019; F:GO:0003777; F:GO:0005524; F:GO:0008017; C:GO:0005874) | kinesin-like protein/Kinesin motor domain |
| VuTC28201 | Flowering | pectin acetyltransferase 8-like | Acting on ester bonds(EC:3.1.1) | P:cell wall organization; F:pectin acetyltransferase activity; C:extracellular region(P:GO:0071555; F:GO:0052793; C:GO:0005576) | Pectin acetyltransferase 8 /Alpha/Beta hydrolase fold /ribosome maturation protein SDO1 |
| VuTC28196 | Flowering | pentatricopeptide repeat-containing protein At1g77360, mitochondrial-like isoform X2 | Not Available | Not Available | pentatricopeptide repeat-containing protein |
| VuTC28155 | Flowering | pentatricopeptide repeat-containing protein At3g12770 | Acting on ester bonds(EC:3.1) | P:nucleic acid phosphodiester bond hydrolysis; F:endonuclease activity; F:zinc ion binding(P:GO:0090305; F:GO:0004519; F:GO:0008270) | structure-specific endonuclease subunit SLX1/pentatricopeptide repeat-containing protein |
| VuTC25312 | Flowering | pentatricopeptide repeat-containing protein At4g33990 | Acting on ester bonds; nucleoside-triphosphate phosphatase(EC:3.1; EC:3.6.1.15) | P:nucleic acid phosphodiester bond hydrolysis; F:endonuclease activity; F:ATP binding; F:zinc ion binding; F:ATP hydrolysis activity(P:GO:0090305; F:GO:0004519; F:GO:0005524; F:GO:0008270; F:GO:0016887) | structure-specific endonuclease subunit SLX1 /Pentatricopeptide repeat-containing protein |
| VuTC00230 | Flowering | Peroxidase 4 | peroxidase(EC:1.11.1.7) | P:response to oxidative stress; P:hydrogen peroxide catabolic process; P:cellular oxidant detoxification; F:heme binding; | Peroxidase 4 |

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| VuTC28966 | Flowering | phosphatidylinositol glycan anchor biosynthesis class U protein | Not Available | F:metal ion binding; F:lactoperoxidase activity; C:extracellular region(P:GO:0006979; P:GO:0042744; P:GO:0098869; F:GO:0020037; F:GO:0046872; F:GO:0140825; C:GO:0005576) P:attachment of GPI anchor to protein; P:protein localization to cell surface; C:GPI-anchor transamidase complex(P:GO:0016255; P:GO:0034394; C:GO:0042765) | phosphatidylinositol glycan anchor biosynthesis class U protein |
| VuTC04837 | Flowering | phosphoenolpyruvate carboxylase | phosphoenolpyruvate carboxylase; phosphoenolpyruvate carboxykinase (GTP)(EC:4.1.1.31; EC:4.1.1.32) | P:tricarboxylic acid cycle; P:carbon fixation; P:photosynthesis; P:leaf development; F:phosphoenolpyruvate carboxylase activity; C:cytosol(P:GO:0006099; P:GO:0015977; P:GO:0015979; P:GO:0048366; F:GO:0008964; C:GO:0005829) | phosphoenolpyruvate carboxylase |
| VuTC14443 | Flowering | Photosystem II PsbX | Oxidoreductases(EC:1) | P:photosynthesis; F:oxidoreductase activity; C:photosystem II(P:GO:0015979; F:GO:0016491; C:GO:0009523) | Photosystem II PsbX |
| VuTC01110 | Flowering | photosystem II stability/assembly factor HCF136, chloroplastic | Not Available | C:chloroplast(C:GO:0009507) | photosystem II stability/assembly factor HCF136 |
| VuTC28152 | Flowering | plant UBX domain-containing protein 7 | Not Available | P:proteasome-mediated ubiquitin-dependent protein catabolic process; F:protein-macromolecule adaptor activity; F:ubiquitin binding; C:nucleus(P:GO:0043161; F:GO:0030674; F:GO:0043130; C:GO:0005634) | Plant UBX domain-containing protein |

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| VuTC29946 | Flowering | plasma membrane ATPase 4 | H(+)-exporting diphosphatase; P-type H(+)-exporting transporter; nucleoside-triphosphate phosphatase(EC:7.1.3.1; EC:7.1.2.1; EC:3.6.1.15) | P:regulation of intracellular pH; P:proton export across plasma membrane; F:ATP binding; F:P-type proton-exporting transporter activity; F:ATP hydrolysis activity; C:plasma membrane(P:GO:0051453; P:GO:0120029; F:GO:0005524; F:GO:0008553; F:GO:0016887; C:GO:0005886) | Plasma membrane ATPase |
| VuTC28185 | Flowering | probable apyrase 7 | nucleoside diphosphate phosphatase(EC:3.6.1.6) | P:nucleoside diphosphate catabolic process; F:ATP binding; F:nucleoside diphosphate phosphatase activity; C:membrane(P:GO:0009134; F:GO:0005524; F:GO:0017110; C:GO:0016020) | KAG2408970.1 apyrase 7 |
| VuTC28186 | Flowering | probable apyrase 7 | nucleoside diphosphate phosphatase(EC:3.6.1.6) | P:nucleoside diphosphate catabolic process; F:ATP binding; F:nucleoside diphosphate phosphatase activity; C:membrane(P:GO:0009134; F:GO:0005524; F:GO:0017110; C:GO:0016020) | Apyrase 7 |
| VuTC02166 | Flowering | probable E3 ubiquitin-protein ligase RHG1A | Transferases(EC:2) | P:protein ubiquitination; F:metal ion binding; F:ubiquitin protein ligase activity(P:GO:0016567; F:GO:0046872; F:GO:0061630) | E3 ubiquitin-protein ligase RHG1A/HIP1/X1/X2/X3 |
| VuTC22119 | Flowering | Putative isoprenylcysteine alpha-carbonyl methylesterase ICME1 | arylformamidase; Acting on ester bonds(EC:3.5.1.9; EC:3.1.1) | F:arylformamidase activity; F:prenylcysteine methylesterase activity; C:Golgi membrane; C:endoplasmic reticulum membrane(F:GO:0004061; F:GO:0010296; C:GO:0000139; C:GO:0005789) | isoprenylcysteine alpha-carbonyl methylesterase ICME/prenylcysteine methylesterase /Carboxylesterase |

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| VuTC28154 | Flowering | putative phospholipid-transporting ATPase 9 | P-type phospholipid transporter; nucleoside-triphosphate phosphatase(EC:7.6.2.1; EC:3.6.1.15) | P:phospholipid translocation; F:magnesium ion binding; F:ATP binding; F:ATP hydrolysis activity; F:ATPase-coupled intramembrane lipid transporter activity; C:plasma membrane(P:GO:0045332; F:GO:0000287; F:GO:0005524; F:GO:0016887; F:GO:0140326; C:GO:0005886) | phospholipid-transporting ATPase 9 /calcium-transporting ATPase /autoinhibited Ca2+/ATPase II /P-type ATPase |
| VuTC34794 | Flowering | Retrovirus-related Pol polyprotein from transposon TNT 1-94 | Not Available | P:DNA integration; F:nucleic acid binding(P:GO:0015074; F:GO:0003676) | Beta-galactosidase , Copia protein, protein kinase domain-containing protein, retrovirus-related pol polyprotein from transposon RE1 [Citrus. |
| VuTC09869 | Flowering | RNA polymerase sigma factor sigA | Not Available | P:cellular response to redox state; P:cellular response to light stimulus; P:photosystem stoichiometry adjustment; P:regulation of DNA-templated transcription initiation; F:DNA binding; F:sigma factor activity; C:chloroplast(P:GO:0071461; P:GO:0071482; P:GO:0080005; P:GO:2000142; F:GO:0003677; F:GO:0016987; C:GO:0009507) | RNA polymerase sigma subunit 1 |
| VuTC09870 | Flowering | RNA polymerase sigma factor sigA | Not Available | P:cellular response to redox state; P:cellular response to light stimulus; P:photosystem stoichiometry adjustment; P:regulation of DNA-templated transcription initiation; F:DNA binding; F:sigma factor activity; | RNA polymerase sigma subunit 1 , sigma factor A |

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| VuTC09871 | Flowering | RNA polymerase sigma factor sigA | Not Available | C:chloroplast(P:GO:0071461; P:GO:0071482; P:GO:0080005; P:GO:2000142; F:GO:0003677; F:GO:0016987; C:GO:0009507) P:cellular response to redox state; P:cellular response to light stimulus; P:photosystem stoichiometry adjustment; P:regulation of DNA-templated transcription initiation; F:DNA binding; F:sigma factor activity; | RNA polymerase sigma factor sigA, RNA polymerase sigma subunit 1 |
| VuTC32100 | Flowering | RNA pseudouridine synthase 4, mitochondrial | pseudouridylate synthase; Intramolecular transferases(EC:4.2.1.70; EC:5.4) | C:chloroplast(P:GO:0071461; P:GO:0071482; P:GO:0080005; P:GO:2000142; F:GO:0003677; F:GO:0016987; C:GO:0009507) P:enzyme-directed rRNA pseudouridine synthesis; F:RNA binding; F:pseudouridylate synthase activity; F:pseudouridine synthase activity(P:GO:0000455; F:GO:0003723; F:GO:0004730; F:GO:0009982) | RNA pseudouridine synthase 4 |
| VuTC29107 | Flowering | serine/threonine-protein kinase AFC2 isoform X1 | dual-specificity kinase(EC:2.7.12.1) | P:mRNA processing; P:protein phosphorylation; F:protein serine/threonine kinase activity; F:protein serine/threonine/tyrosine kinase activity; F:ATP binding; C:nucleus(P:GO:0006397; P:GO:0006468; F:GO:0004674; F:GO:0004712; F:GO:0005524; C:GO:0005634) | serine/threonine-protein kinase /LAMMER-type protein kinase |
| VuTC29109 | Flowering | serine/threonine-protein kinase AFC2 isoform X3 | Transferring phosphorus-containing groups(EC:2.7.1) | P:protein phosphorylation; F:protein kinase activity; F:ATP binding(P:GO:0006468; F:GO:0004672; F:GO:0005524) | Serine/threonine-protein kinase /LAMMER-type protein kinase |

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| VuTC20322 | Flowering | silicon efflux transporter LSI3 | Not Available | P:transmembrane transport; C:membrane(P:GO:0055085; C:GO:0016020) | silicon efflux transporter LSI3 or LSI2/ arsenical pump membrane protein |
| VuTC22319 | Flowering | STS14 protein | Not Available | Not Available | STS14 protein / pathogenesis-related protein 1 |
| VuTC28183 | Flowering | subtilisin-like protease SBT3.5 | Acting on peptide bonds (peptidases)(EC:3.4.21) | P:proteolysis; P:response to symbiotic fungus; F:serine-type endopeptidase activity; C:membrane(P:GO:0006508; P:GO:0009610; F:GO:0004252; C:GO:0016020) | Subtilisin-like protease/ Peptidase S8 |
| VuTC15414 | Flowering | THO complex subunit 1 | Not Available | P:DNA replication; P:mRNA export from nucleus; P:regulation of DNA-templated transcription elongation; C:THO complex part of transcription export complex; C:GINS complex; C:membrane(P:GO:0006260; P:GO:0006406; P:GO:0032784; C:GO:0000445; C:GO:0000811; C:GO:0016020) | THO complex subunit 1 |
| VuTC15693 | Flowering | TMV resistance protein N-like | Not Available | P:defense response; P:signal transduction; F:ADP binding(P:GO:0006952; P:GO:0007165; F:GO:0043531) | TMV resistance protein |
| VuTC28163 | Flowering | translin-associated protein X isoform X1 | Not Available | F:sequence-specific DNA binding; C:nucleus(F:GO:0043565; C:GO:0005634) | Translin-associated protein X |
| VuTC04786 | Flowering | Two-component response regulator ARR3 | Transferring phosphorus-containing groups(EC:2.7) | P:phosphorelay signal transduction system; P:cytokinin-activated signaling pathway; P:phosphorylation; F:kinase activity(P:GO:0000160; | two-component response regulator ARR5/ ARR3/ARR4/ARR6/ARR17, Signal |

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| VuTC02300 | Flowering | ubinuclein-1 isoform X3 | Not Available | P:GO:0009736; P:GO:0016310; F:GO:0016301 | transduction response regulator receiver domain Ubinuclein-1 protein |
| VuTC25024 | Flowering | UDP-glycosyltransferase 75D1-like protein | Glycosyltransferases(EC:2.4.1) | P:chromatin organization; C:nucleus(P:GO:0006325; C:GO:0005634) F:quercetin 3-O-glucosyltransferase activity; F:quercetin 7-O-glucosyltransferase activity(F:GO:0080043; F:GO:0080044) Not Available | Crocetin glucosyltransferase |
| VuTC28181 | Flowering | uncharacterized protein LOC124826145 isoform X2 | Not Available | Not Available | Uncharacterized protein HKW66_Vig0038020 |
| VuTC21295 | Flowering, Maturity | probable aldo-keto reductase 2 | Acting on the CH-OH group of donors(EC:1.1.1) | F:aldo-keto reductase (NADP) activity; C:cytoplasm(F:GO:0004033; C:GO:0005737) | aldo-keto reductase /NADP-dependent oxidoreductase/auxin-induced atb2 |
| VuTC05378 | Maturity | 4-coumarate--CoA ligase-like 7 | Forming carbon-sulfur bonds(EC:6.2) | F:CoA-ligase activity; C:membrane(F:GO:0016405; C:GO:0016020) | coumarate-CoA ligase-like 7, AMP-dependent synthetase/ligase |
| VuTC08788 | Maturity | apoptosis-inducing factor homolog A-like | electron-transferring-flavoprotein dehydrogenase(EC:1.5.5.1) | P:respiratory electron transport chain; F:electron-transferring-flavoprotein dehydrogenase activity; F:flavin adenine dinucleotide binding; C:cytoplasm(P:GO:0022904; F:GO:0004174; F:GO:0050660; C:GO:0005737) | Apoptosis-inducing factor A , External alternative NAD(P)H-ubiquinone oxidoreductase, AMID-like mitochondrial oxidoreductase |
| VuTC07229 | Maturity | chromatin assembly factor 1 subunit FAS1 | Not Available | P:nucleosome assembly; C:nucleus; C:membrane; C:CAF-1 complex(P:GO:0006334; C:GO:0005634; C:GO:0016020; C:GO:0033186) | Chromatin assembly factor 1 subunit FAS1 |

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| VuTC29349 | Maturity | cingulin-like protein 1 isoform X1 | Not Available | Not Available | Not Available | cingulin-like protein 1 /outer dense fiber protein 2 /tropomyosin/shootin-1/spindle pole body component 110 |
| VuTC34182 | Maturity | cysteine-rich receptor-like protein kinase 29 | Transferring phosphorus-containing groups(EC:2.7.1) | P:protein phosphorylation; F:protein serine/threonine kinase activity; F:ATP binding; C:plasma membrane(P:GO:0006468; F:GO:0004674; F:GO:0005524; C:GO:0005886) | C:membrane(C:GO:0016020) | serine/threonine-protein kinase PBS1 /Cysteine-rich receptor-like protein |
| VuTC21642 | Maturity | hypothetical protein LR48_Vigan10s001000 | Not Available | | | hypothetical protein LR48_Vigan02g061500, uncharacterized protein HKW66_Vig0183570 |
| VuTC32582 | Maturity | membrin-11-like | Not Available | P:vesicle fusion; P:protein transport; F:SNARE binding; F:SNAP receptor activity; C:endoplasmic reticulum membrane; C:Golgi apparatus; C:ER to Golgi transport vesicle membrane; C:SNARE complex; C:late endosome membrane(P:GO:0006906; P:GO:0015031; F:GO:0000149; F:GO:0005484; C:GO:0005789; C:GO:0005794; C:GO:0012507; C:GO:0031201; C:GO:0031902) | | Bos1/membrin family Qb-SNARE protein, golgi SNAP receptor complex member 2, GOSR2/Membrin/Bos 1 ,membrin-11, V-SNARE_C domain-containing protein [Cephalotus follicularis] |
| VuTC06910 | Maturity | No annotation available | Not Available | Not Available | | Not Available |
| VuTC27441 | Maturity | oligopeptide transporter 4-like | Not Available | P:protein transport; P:oligopeptide transmembrane transport; F:oligopeptide transmembrane transporter activity; C:membrane(P:GO:0015031; | | oligopeptide transporter 2/4 /Isp4-like protein |

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| VuTC31321 | Maturity | pentatricopeptide repeat-containing protein At4g18975, chloroplastic-like | Not Available | P:GO:0035672; F:GO:0035673; C:GO:0016020) F:zinc ion binding(F:GO:0008270) | B-box-type zinc finger [Vigna unguiculata], Pentatricopeptide repeat-containing protein [Actinidia chinens., PPR containing plant-like protein [Medicago truncatula], ubiquitin-protein ligase TRIM32 |
| VuTC21395 | Maturity | preprotein translocase secA family protein | Transferases(EC:2) | F:transferase activity; F:metal ion binding; F:catalytic activity, acting on a protein; C:membrane(F:GO:0016740; F:GO:0046872; F:GO:0140096; C:GO:0016020) | casein kinase (serine/threonine/tyrosine protein kinase) [Pisu..., choline kinase [Glycine max], choline/ethanolamine kinase [Trifolium pratense], Ethanolamine kinase 2, GmCK1p [Glycine max] [Glycine soja], putative phosphotransferase with an alcohol group as acceptor... |
| VuTC18444 | Maturity | probable choline kinase 2 isoform X1 | ethanolamine kinase; choline kinase(EC:2.7.1.82; EC:2.7.1.32) | P:phosphatidylethanolamine biosynthetic process; P:CDP-choline pathway; P:phosphorylation; F:choline kinase activity; F:ethanolamine kinase activity; C:cytoplasm(P:GO:0006646; P:GO:0006657; P:GO:0016310; F:GO:0004103; F:GO:0004305; C:GO:0005737) | protein phosphatase 2C 27 ,protein phosphatase 2C 54 |
| VuTC12308 | Maturity | probable protein phosphatase 2C 27 | protein-serine/threonine phosphatase(EC:3.1.3.16) | P:protein dephosphorylation; F:myosin phosphatase activity; F:metal ion binding(P:GO:0006470; | |

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| VuTC02283 | Maturity | probable receptor-like serine/threonine-protein kinase At5g57670 | receptor protein-tyrosine kinase(EC:2.7.10.1) | F:GO:0017018; F:GO:0046872) P:peptidyl-tyrosine phosphorylation; F:protein serine/threonine kinase activity; F:transmembrane receptor protein tyrosine kinase activity; F:ATP binding; C:plasma membrane(P:GO:0018108; F:GO:0004674; F:GO:0004714; F:GO:0005524; C:GO:0005886) | Receptor-like cytosolic serine/threonine-protein kinase RBK2/PBS1 |
| VuTC16925 | Maturity | protein fluG | Hydrolases; glutamine synthetase(EC:3; EC:6.3.1.2) | P:glutamine biosynthetic process; F:glutamate-ammonia ligase activity; F:hydrolase activity(P:GO:0006542; F:GO:0004356; F:GO:0016787) | protein fluG /Metal-dependent hydrolase /nodulinor glutamate-ammonia ligase/glutamine synthetase |
| VuTC27187 | Maturity | replication factor A1 | Not Available | Not Available | DNA-binding protein-related [Musa troglodytarum], Drought-responsive family protein [Hibiscus syriacus], Nucleic acid-binding, OB-fold containing protein [Parasponia...] |
| VuTC21831 | Maturity | Retrovirus-related Pol polyprotein from transposon TNT 1-94 | Not Available | P:DNA integration; F:nucleic acid binding; F:zinc ion binding; F:hydrolase activity; F:racemase and epimerase activity, acting on amino acids and derivatives(P:GO:0015074; F:GO:0003676; F:GO:0008270; F:GO:0016787; F:GO:0016855) | copia protein (gag-int-pol protein), Cysteine-rich RLK (receptor-like protein kinase) 8, flavonol sulfotransferase-like protein , GAG-pre-integrase domain [Arabidopsis suecica], polyprotein, Integrase catalytic core |

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| VuTC33036 | Maturity | U-box domain-containing protein 5 | Transferases(EC:2) | P:protein ubiquitination; F:ubiquitin-protein transferase activity; C:nucleus; C:cytoplasm(P:GO:0016567; F:GO:0004842; C:GO:0005634; C:GO:0005737) | [Arabidopsis suecica],Retrotransposon Copia-like N-terminal [Arabidopsis suecica], Ribonuclease H domain [Arabidopsis suecica], RmlC-like cupins superfamily protein [Prunus dulcis], wall-associated kinase 2, Zinc finger CCHC-type [Arabidopsis thaliana x Arabidopsis... STIP1 homology and U-box containing protein/U-box domain-containing protein 5 |
| VuTC26129 | Maturity | WD repeat-containing protein 48 | Not Available | P:double-strand break repair via homologous recombination; P:protein deubiquitination; F:ubiquitin binding(P:GO:0000724; P:GO:0016579; F:GO:0043130) | WD repeat-containing protein 48 /ribosome assembly protein 4 |
| VuTC25248 | Maturity, Seed weight | Retrovirus-related Pol polyprotein from transposon TNT 1-94 | Acting on ester bonds(EC:3.1) | P:DNA integration; P:RNA phosphodiester bond hydrolysis; F:RNA binding; F:ribonuclease activity(P:GO:0015074; P:GO:0090501; F:GO:0003723; F:GO:0004540) | integrase core domain containing protein, Protein ENHANCED DISEASE RESISTANCE 2, Retrovirus-related Pol polyprotein from transposon RE1 [Glycin.. |

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| VuTC25856 | Maturity, Seed weight | transcription factor bHLH149 | Not Available | P:regulation of DNA-templated transcription; P:response to stress; P:response to oxygen-containing compound; F:transcription cis-regulatory region binding; F:protein dimerization activity; C:nucleus(P:GO:0006355; P:GO:0006950; P:GO:1901700;F:GO:0000976;F:GO:0046983; C:GO:0005634) | transcription factor bHLH147-like, transcription factor PIF3 |
| VuTC19671 | Seed weight | 40S ribosomal protein S17-4-like | Not Available | P:translation; F:structural constituent of ribosome; C:ribosome; C:ribonucleoprotein complex(P:GO:0006412; F:GO:0003735; C:GO:0005840; C:GO:1990904) | 40S ribosomal protein , 40S ribosomal protein S17-2, 40S ribosomal protein S17- 3, 40S ribosomal protein S17-4, 40S ribosomal protein S17- 4 |
| VuTC25355 | Seed weight | 60S ribosomal protein L18a | Not Available | P:translation; F:structural constituent of ribosome; C:cytosolic large ribosomal subunit(P:GO:0006412; F:GO:0003735; C:GO:0022625) | 60S ribosomal protein L18A /Ribosomal protein 50S- L18Ae/60S-L20/60S- L18A |
| VuTC16440 | Seed weight | alpha-1,6-mannosyl- glycoprotein 2-beta-N- acetylglucosaminyltran- sferase | alpha-1,6-mannosyl-glycoprotein 2-beta-N- acetylglucosaminyltransferase(EC: 2.4.1.143) | P:protein N-linked glycosylation; P:oligosaccharide biosynthetic process; F:alpha-1,6-mannosylglycoprotein 2-beta-N-acetylglucosaminyltransferase activity; F:metal ion binding; C:Golgi membrane; C:Golgi stack(P:GO:0006487; P:GO:0009312; F:GO:0008455; F:GO:0046872; C:GO:0000139; C:GO:0005795) | N- acetylglucosaminyltra- nsferase |
| VuTC23058 | Seed weight | Apyrase 2 | nucleoside diphosphate | P:nucleoside diphosphate catabolic | apyrase / Nucleoside |

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| | | | phosphatase(EC:3.6.1.6) | process; F:ATP binding; F:nucleoside diphosphate phosphatase activity; C:membrane(P:GO:0009134; F:GO:0005524; F:GO:0017110; C:GO:0016020) | phosphatase GDA1/CD39 |
| VuTC24042 | Seed weight | cactin isoform X1 | Not Available | P:embryo development ending in seed dormancy; P:mRNA cis splicing, via spliceosome; C:spliceosomal complex; C:cytoplasm(P:GO:0009793; P:GO:0045292; C:GO:0005681; C:GO:0005737) | Cactin protein |
| VuTC12393 | Seed weight | DEAD-box ATP-dependent RNA helicase 27 | RNA helicase(EC:3.6.4.13) | P:maturation of LSU-rRNA from tricistronic rRNA transcript (SSU-rRNA, 5.8S rRNA, LSU-rRNA); F:RNA binding; F:RNA helicase activity; F:ATP binding; F:hydrolase activity; C:nucleolus(P:GO:0000463; F:GO:0003723; F:GO:0003724; F:GO:0005524; F:GO:0016787; C:GO:0005730) | DEAD-box ATP-dependent RNA helicase |
| VuTC12822 | Seed weight | DNA topoisomerase 2 | Isomerases(EC:5) | P:resolution of meiotic recombination intermediates; P:sister chromatid segregation; F:nucleotide binding; F:DNA topoisomerase activity; F:ion binding; C:nucleus(P:GO:0000712; P:GO:0000819; F:GO:0000166; F:GO:0003916; F:GO:0043167; C:GO:0005634) | DNA topoisomerase 2 |
| VuTC06850 | Seed weight | kinesin-like protein KIN-4A isoform X2 | Not Available | P:microtubule-based movement; F:microtubule motor activity; F:ATP binding; F:microtubule | Chromosome-associated kinesin /KIF4/ FRA1, |

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| VuTC06074 | Seed weight | myosin-1 | Glycosyltransferases; myosin ATPase(EC:2.4.1; EC:5.6.1.8) | binding; C:microtubule(P:GO:0007018; F:GO:0003777; F:GO:0005524; F:GO:0008017; C:GO:0005874) P:protein glycosylation; P:actin filament organization; P:vesicle transport along actin filament; P:flavin-containing compound biosynthetic process; P:UDP-glucosylation; F:microfilament motor activity; F:nucleotide binding; F:UDP-glucose:glycoprotein glucosyltransferase activity; F:metal ion binding; F:actin filament binding; C:actin cytoskeleton(P:GO:0006486; P:GO:0007015; P:GO:0030050; P:GO:0042727; P:GO:0097359; F:GO:0000146; F:GO:0000166; F:GO:0003980; F:GO:0046872; F:GO:0051015; C:GO:0015629) | kinesin-like protein KIN-4A kinesin family member 4/7/21/27 myosin-1, UDP-glucose:glycoprotein glucosyltransferase |
| VuTC09951 | Seed weight | pentatricopeptide repeat-containing protein At4g25270, chloroplastic | Transferring phosphorus-containing groups; nucleoside-phosphate kinase; adenylate kinase; Acting on peptide bonds (peptidases)(EC:2.7.1; EC:2.7.4.4; EC:2.7.4.3; EC:3.4) | P:protein phosphorylation; P:proteolysis; P:nucleoside monophosphate phosphorylation; P:cell division; F:adenylate kinase activity; F:protein serine/threonine kinase activity; F:ATP binding; F:peptidase activity(P:GO:0006468; P:GO:0006508; P:GO:0046940; P:GO:0051301; F:GO:0004017; F:GO:0004674; F:GO:0005524; F:GO:0008233) | Adenylate kinase, Pentatricopeptide repeat-containing protein, PPR domain-containing protein/PPR_2 domain-containing protein..., putative serine/threonine protein kinase IRE , putative tetratricopeptide-like helical domain- |

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|-----------|-------------|---|---|--|--|
| VuTC00580 | Seed weight | probable tyrosine-protein phosphatase DSP4 isoform X1 | Acting on ester bonds(EC:3.1.3) | P:protein dephosphorylation; F:protein tyrosine/serine/threonine phosphatase activity; C:cytoplasm(P:GO:0006470; F:GO:0008138; C:GO:0005737) | containing.. tyrosine-protein phosphatase, Tyrosine-protein phosphatase DSP1 |
| VuTC13707 | Seed weight | protein SHOOT GRAVITROPISM 6 isoform X1 | Not Available | Not Available | Armadillo-type fold , Coatomer beta subunit, HEAT repeat-containing protein 7A like, Protein SHOOT GRAVITROPISM 6 [Glycine max] |
| VuTC30884 | Seed weight | putative disease resistance protein At3g14460 | Not Available | P:defense response; P:response to other organism; F:ADP binding(P:GO:0006952; P:GO:0051707; F:GO:0043531) | disease resistance RPP13- |
| VuTC24699 | Seed weight | rop guanine nucleotide exchange factor 5 | Not Available | P:regulation of catalytic activity; F:guanyl-nucleotide exchange factor activity(P:GO:0050790; F:GO:0005085) | rop guanine nucleotide exchange factor 5/ RHO guanyl-nucleotide exchange factor 7 |
| VuTC02299 | Seed weight | rust resistance kinase Lr10-like | Transferring phosphorus-containing groups(EC:2.7.1) | P:protein phosphorylation; F:protein serine/threonine kinase activity; F:ATP binding; F:polysaccharide binding; C:membrane(P:GO:0006468; F:GO:0004674; F:GO:0005524; F:GO:0030247; C:GO:0016020) | stress-induced receptor-like kinase, Rust resistance kinase Lr10 , brassinosteroid insensitive 1-associated receptor kinase 1, somatic embryogenesis receptor kinase 4 |
| VuTC21543 | Seed weight | TMV resistance protein N-like | Not Available | P:defense response; P:signal transduction; F:ADP binding; C:membrane(P:GO:0006952; P:GO:0007165; F:GO:0043531; | TMV resistance protein |

| | | | | | |
|-----------|-------------|-----------------------------------|---|--|---|
| VuTC25491 | Seed weight | Ty3/gypsy retrotransposon protein | Acting on peptide bonds (peptidases); RNA-directed DNA polymerase(EC:3.4.23; EC:2.7.7.49) | C:GO:0016020) P:RNA-templated DNA biosynthetic process; P:proteolysis; P:DNA integration; F:nucleic acid binding; F:RNA-directed DNA polymerase activity; F:aspartic-type endopeptidase activity(P:GO:0006278; P:GO:0006508; P:GO:0015074; F:GO:0003676; F:GO:0003964; F:GO:0004190) | uncharacterized protein HKW66_Vig0095200 |
| VuTC01132 | Seed weight | WRKY transcription factor 1 | Not Available | P:salicylic acid mediated signaling pathway; P:positive regulation of DNA-templated transcription; F:transcription cis-regulatory region binding; F:DNA-binding transcription factor activity; F:zinc ion binding; C:nucleus(P:GO:0009863; P:GO:0045893; F:GO:0000976; F:GO:0003700; F:GO:0008270; C:GO:0005634) | WRKY transcription factor 1/33 |

^aThe transcript IDs in bold italics are associated with more than one trait.

Table S8. Sub-population wise phenotypic data with mean values for each dataset

| Accession | Sub-Population | Almora 2020 | | | Almora 2021 | | | Delhi 2020 | | | Delhi 2021 | | |
|-----------|----------------|-----------------------|----------------------|-----------------|-----------------------|----------------------|-----------------|-----------------------|----------------------|-----------------|-----------------------|----------------------|-----------------|
| | | Days to 50% Flowering | Days To 80% Maturity | 100-Seed weight | Days to 50% Flowering | Days To 80% Maturity | 100-Seed weight | Days to 50% Flowering | Days To 80% Maturity | 100-Seed weight | Days to 50% Flowering | Days To 80% Maturity | 100-Seed weight |
| EC18136 | 1 | 78 | 119 | 7.29 | 82 | 121 | 8.15 | 62 | 112 | 4.5 | 66 | 110 | 7.09 |
| EC18222 | 1 | 80 | 115 | 8.64 | 81 | 120 | 8.37 | 62 | 119 | 3.37 | 69 | 115 | 5.84 |
| EC1843 | 1 | 67 | 113 | 7.05 | 75 | 120 | 7.4 | 52 | 108 | 4.55 | 67 | 92 | 5.28 |
| EC615199 | 1 | 78 | 130 | 7.18 | 82 | 130 | 8.54 | 82 | 115 | 8.06 | 86 | 117 | 5.7 |
| EC615201 | 1 | 77 | 122 | 7.29 | 79 | 115 | 7.85 | 62 | 115 | 5.52 | 65 | 108 | 7.12 |
| IC129062 | 1 | 70 | 110 | 7.82 | 75 | 115 | 7.18 | 64 | 113 | 4.45 | 68 | 120 | 5.72 |
| IC129069 | 1 | 75 | 115 | 9.65 | 78 | 121 | 7.58 | 63 | 113 | 4.67 | 67 | 107 | 6.01 |
| IC129078 | 1 | 70 | 148 | 8.28 | 77 | 131 | 8.15 | 66 | 113 | 4.75 | 72 | 128 | 5.9 |
| IC129080 | 1 | 73 | 119 | 9.15 | 78 | 125 | 9.65 | 66 | 115 | 7.17 | 70 | 120 | 7.32 |
| IC129089 | 1 | 70 | 107 | 8.95 | 75 | 113 | 9.21 | 78 | 118 | 4.6 | 84 | 119 | 6.66 |
| IC129097 | 1 | 70 | 128 | 9.35 | 76 | 115 | 8.65 | 53 | 111 | 5.14 | 88 | 142 | 6.69 |
| IC129115 | 1 | 70 | 138 | 7.95 | 72 | 110 | 7.15 | 59 | 113 | 5.35 | 70 | 118 | 6.41 |
| IC141074 | 1 | 80 | 137 | 8.25 | 81 | 123 | 8.18 | 54 | 113 | 8.98 | 67 | 114 | 5.79 |
| IC15642 | 1 | 98 | 133 | 7.89 | 69 | 105 | 7.28 | 82 | 120 | 7.34 | 88 | 136 | 5.91 |
| IC15663 | 1 | 70 | 128 | 9.15 | 72 | 116 | 7.95 | 62 | 121 | 5.03 | 68 | 129 | 4.61 |
| IC15664 | 1 | 76 | 130 | 9.85 | 78 | 114 | 7.91 | 62 | 123 | 6.2 | 80 | 120 | 7.55 |
| IC16706 | 1 | 80 | 110 | 8.02 | 82 | 112 | 7.98 | 64 | 120 | 5.63 | 70 | 126 | 6.49 |
| IC16796 | 1 | 73 | 108 | 7.19 | 78 | 115 | 7.08 | 64 | 113 | 4.63 | 68 | 111 | 6.41 |
| IC16799 | 1 | 74 | 130 | 8.19 | 75 | 126 | 8.05 | 72 | 124 | 3.83 | 69 | 120 | 5.56 |
| IC273820 | 1 | 100 | 135 | 8.65 | 89 | 132 | 7.18 | 86 | 122 | 4.58 | 98 | 123 | 0.73 |
| IC298121 | 1 | 96 | 128 | 7.82 | 92 | 128 | 7.98 | 87 | 122 | 9.2 | 95 | 120 | 5.94 |
| IC311934 | 1 | 71 | 133 | 7.18 | 73 | 116 | 7.88 | 93 | 123 | 3.91 | 93 | 145 | 6.55 |
| IC342229 | 1 | 100 | 130 | 7.18 | 90 | 129 | 9.65 | 63 | 120 | 4.7 | 91 | 121 | 5.43 |
| IC342242 | 1 | 87 | 132 | 8.25 | 84 | 130 | 8.54 | 60 | 123 | 7.45 | 73 | 122 | 7.85 |

| | | | | | | | | | | | | | |
|----------|---|-----|-----|------|----|-----|------|-----|-----|-------|-----|-----|-------|
| IC343841 | 1 | 98 | 122 | 8.02 | 90 | 137 | 7.18 | 86 | 123 | 4.58 | 95 | 118 | 5.84 |
| IC350127 | 1 | 70 | 122 | 7.95 | 73 | 112 | 7.98 | 86 | 122 | 6.27 | 92 | 118 | 5.27 |
| IC350374 | 1 | 100 | 130 | 7.05 | 89 | 129 | 8.54 | 82 | 120 | 5.84 | 98 | 121 | 6.32 |
| IC350791 | 1 | 99 | 122 | 7.05 | 92 | 139 | 7.25 | 82 | 120 | 4.48 | 90 | 146 | 4.22 |
| IC351534 | 1 | 101 | 134 | 8.26 | 90 | 136 | 7.08 | 82 | 115 | 7.7 | 74 | 116 | 6.4 |
| IC352853 | 1 | 94 | 122 | 8.95 | 89 | 125 | 7.58 | 52 | 122 | 11.31 | 89 | 129 | 5.98 |
| IC352931 | 1 | 89 | 122 | 7.95 | 85 | 120 | 7.95 | 81 | 122 | 4.79 | 91 | 118 | 3.4 |
| IC352944 | 1 | 76 | 121 | 9.03 | 79 | 125 | 7.08 | 82 | 98 | 5.55 | 71 | 118 | 6.09 |
| IC353877 | 1 | 75 | 133 | 7.98 | 78 | 128 | 8.02 | 82 | 120 | 5.41 | 92 | 122 | 2.91 |
| IC369607 | 1 | 75 | 136 | 7.05 | 76 | 112 | 7.98 | 82 | 115 | 6.01 | 93 | 156 | 6.75 |
| IC373406 | 1 | 80 | 130 | 8.19 | 77 | 128 | 8.54 | 86 | 122 | 5.3 | 96 | 153 | 5.88 |
| IC423374 | 1 | 79 | 129 | 7.98 | 84 | 128 | 7.98 | 64 | 123 | 11 | 89 | 147 | 6.28 |
| IC426778 | 1 | 76 | 130 | 7.18 | 80 | 124 | 7.82 | 86 | 122 | 6.14 | 78 | 138 | 7.17 |
| IC426783 | 1 | 96 | 130 | 9.16 | 90 | 131 | 7.98 | 85 | 125 | 4.94 | 87 | 128 | 6.14 |
| IC426789 | 1 | 74 | 130 | 9.16 | 78 | 128 | 8.54 | 52 | 123 | 6.09 | 92 | 148 | 6.81 |
| IC433853 | 1 | 81 | 128 | 8.61 | 81 | 126 | 7.82 | 67 | 122 | 4.63 | 72 | 125 | 3.83 |
| IC435833 | 1 | 74 | 130 | 8.02 | 82 | 132 | 7.65 | 69 | 114 | 3.88 | 87 | 148 | 6.2 |
| IC449234 | 1 | 72 | 119 | 7.65 | 77 | 122 | 7.76 | 62 | 113 | 2.68 | 71 | 127 | 7.2 |
| IC521177 | 1 | 81 | 128 | 9.14 | 85 | 128 | 8.69 | 66 | 87 | 5.45 | 71 | 123 | 4.59 |
| IC552970 | 1 | 74 | 130 | 7.19 | 81 | 128 | 8.65 | 123 | 137 | 4.73 | 112 | 121 | 5.87 |
| IC552977 | 1 | 71 | 109 | 8.96 | 72 | 110 | 7.98 | 70 | 115 | 7.2 | 72 | 126 | 6.86 |
| IC552995 | 1 | 90 | 133 | 7.05 | 84 | 130 | 8.65 | 123 | 137 | 3.95 | 144 | 122 | 5.72 |
| IC554711 | 1 | 69 | 116 | 9.56 | 76 | 121 | 8.94 | 86 | 126 | 5.73 | 88 | 116 | 5.77 |
| IC557283 | 1 | 71 | 128 | 8.06 | 83 | 127 | 8.27 | 66 | 128 | 8.14 | 71 | 128 | 5.71 |
| IC557317 | 1 | 101 | 130 | 7.05 | 92 | 138 | 7.18 | 62 | 123 | 9.52 | 69 | 118 | 10.79 |
| IC567233 | 1 | 81 | 124 | 7.64 | 82 | 122 | 7.08 | 117 | 134 | 4.21 | 98 | 119 | 5.77 |
| IC569073 | 1 | 72 | 124 | 8.47 | 76 | 114 | 9.58 | 62 | 122 | 4.09 | 67 | 110 | 4.66 |
| IC569120 | 1 | 92 | 130 | 8.49 | 85 | 128 | 7.95 | 119 | 135 | 4.25 | 89 | 119 | 5.26 |
| IC621844 | 1 | 91 | 124 | 8.65 | 87 | 130 | 8.27 | 59 | 95 | 7.02 | 99 | 119 | 6.04 |

| Sub-population 1 Mean | | 80.85 | 125.74 | 8.15 | 80.87 | 123.40 | 8.03 | 74.32 | 118.66 | 5.75 | 82.43 | 124.15 | 5.93 |
|------------------------------|---|--------------|---------------|-------------|--------------|---------------|-------------|--------------|---------------|-------------|--------------|---------------|-------------|
| EC114075 | 2 | 73 | 133 | 7.05 | 78 | 126 | 7.4 | 86 | 122 | 4.72 | 67 | 112 | 5.93 |
| EC18183 | 2 | 71 | 104 | 7.25 | 79 | 112 | 6.45 | 47 | 108 | 6.11 | 63 | 109 | 5.91 |
| EC615195 | 2 | 68 | 119 | 8.75 | 70 | 109 | 7.54 | 62 | 112 | 5.67 | 65 | 108 | 4.32 |
| EC934343 | 2 | 71 | 104 | 8.21 | 81 | 127 | 7.26 | 66 | 104 | 2.19 | 71 | 104 | 5.51 |
| IC112381 | 2 | 71 | 133 | 9.27 | 77 | 126 | 8.76 | 62 | 95 | 1.9 | 67 | 103 | 4 |
| IC112383 | 2 | 76 | 129 | 9.65 | 78 | 124 | 6.45 | 57 | 95 | 6.27 | 65 | 116 | 6.43 |
| IC116113 | 2 | 74 | 114 | 7.58 | 76 | 120 | 8.58 | 57 | 90 | 4.13 | 64 | 112 | 5.74 |
| IC129038 | 2 | 70 | 126 | 7.19 | 76 | 120 | 7.95 | 62 | 105 | 7.64 | 65 | 118 | 5.46 |
| IC137205 | 2 | 76 | 119 | 7.25 | 81 | 123 | 8.69 | 59 | 111 | 5.33 | 67 | 94 | 5.69 |
| IC140810 | 2 | 81 | 96 | 8.62 | 82 | 120 | 8.69 | 58 | 95 | 4.58 | 70 | 125 | 6.57 |
| IC144695 | 2 | 76 | 133 | 7.95 | 79 | 126 | 7.95 | 58 | 92 | 6.2 | 65 | 122 | 6.06 |
| IC2074 | 2 | 66 | 130 | 7.61 | 68 | 108 | 8.69 | 62 | 115 | 6.19 | 65 | 108 | 4.41 |
| IC2567 | 2 | 78 | 120 | 8.54 | 82 | 120 | 8.34 | 61 | 112 | 4.06 | 70 | 110 | 5.77 |
| IC26962 | 2 | 75 | 109 | 7.26 | 77 | 112 | 7.95 | 62 | 123 | 4.84 | 63 | 106 | 6.2 |
| IC316123 | 2 | 76 | 114 | 8.25 | 78 | 114 | 8.27 | 71 | 123 | 6.65 | 65 | 109 | 3.9 |
| IC326994 | 2 | 81 | 112 | 8.25 | 81 | 120 | 8.13 | 62 | 105 | 6.16 | 67 | 114 | 5.99 |
| IC343929 | 2 | 73 | 122 | 8.02 | 78 | 123 | 7.99 | 62 | 112 | 7.88 | 92 | 118 | 5.09 |
| IC362094 | 2 | 82 | 133 | 5.65 | 82 | 136 | 7.98 | 62 | 123 | 2.41 | 65 | 102 | 2.98 |
| IC369230 | 2 | 78 | 123 | 7.31 | 80 | 125 | 7.82 | 82 | 120 | 5.27 | 70 | 125 | 5.47 |
| IC384034 | 2 | 76 | 108 | 8.19 | 77 | 112 | 8.25 | 83 | 121 | 6.74 | 64 | 104 | 6.05 |
| IC469185 | 2 | 72 | 124 | 7.25 | 72 | 123 | 7.58 | 57 | 115 | 4.27 | 63 | 100 | 6.07 |
| IC521039 | 2 | 84 | 130 | 7.45 | 82 | 125 | 7.64 | 61 | 61 | 4.57 | 66 | 121 | 6.15 |
| IC521146 | 2 | 83 | 132 | 8.41 | 81 | 130 | 7.82 | 62 | 107 | 5.18 | 66 | 110 | 6.44 |
| IC521156 | 2 | 74 | 119 | 7.79 | 76 | 115 | 7.18 | 62 | 108 | 3.75 | 66 | 118 | 4.73 |
| IC521224 | 2 | 84 | 144 | 8.14 | 86 | 135 | 7.98 | 76 | 113 | 7.79 | 72 | 112 | 6.75 |
| IC521356 | 2 | 70 | 113 | 8.16 | 75 | 115 | 9.65 | 63 | 84 | 4.63 | 68 | 116 | 6.37 |
| IC545607 | 2 | 71 | 112 | 7.96 | 72 | 113 | 8.65 | 123 | 137 | 4.82 | 118 | 114 | 5.89 |

| | | | | | | | | | | | | | |
|------------------------------|---|--------------|---------------|-------------|--------------|---------------|-------------|--------------|---------------|-------------|--------------|---------------|-------------|
| IC551632 | 2 | 82 | 128 | 7.05 | 78 | 123 | 7.25 | 66 | 113 | 4.18 | 70 | 128 | 5.56 |
| IC551711 | 2 | 81 | 128 | 8.17 | 81 | 129 | 8.18 | 67 | 133 | 4.67 | 72 | 117 | 7.48 |
| IC552979 | 2 | 76 | 111 | 8.24 | 79 | 119 | 8.13 | 122 | 136 | 4.23 | 113 | 114 | 5.76 |
| IC564865 | 2 | 100 | 131 | 7.05 | 90 | 136 | 7.98 | 122 | 136 | 4.99 | 98 | 121 | 3.96 |
| IC621805 | 2 | 81 | 129 | 7.19 | 81 | 125 | 7.48 | 60 | 101 | 4.15 | 67 | 121 | 5.86 |
| Sub-population 2 Mean | | 76.56 | 121.31 | 7.83 | 78.53 | 121.59 | 7.96 | 69.44 | 110.22 | 5.07 | 71.53 | 112.84 | 5.58 |
| EC16167 | 3 | 89 | 127 | 7.02 | 84 | 127 | 7.18 | 48 | 107 | 3.48 | 65 | 110 | 7 |
| EC18261 | 3 | 101 | 140 | 7.05 | 90 | 139 | 8.25 | 48 | 107 | 5.74 | 53 | 73 | 4.15 |
| EC615198 | 3 | 80 | 121 | 8.12 | 78 | 126 | 9.65 | 62 | 52 | 6.71 | 55 | 90 | 7.25 |
| EC934368 | 3 | 52 | 70 | 8.55 | 81 | 124 | 8.32 | 49 | 70 | 1.86 | 52 | 70 | 3.77 |
| EC934417 | 3 | 45 | 67 | 8.62 | 66 | 106 | 8.36 | 44 | 67 | 1.76 | 45 | 67 | 3.26 |
| IC116118 | 3 | 70 | 112 | 8.96 | 70 | 114 | 7.95 | 57 | 60 | 4.04 | 64 | 106 | 5.21 |
| IC137169 | 3 | 73 | 119 | 8.65 | 79 | 119 | 8.69 | 59 | 64 | 2.89 | 55 | 106 | 4.79 |
| IC144685 | 3 | 80 | 116 | 7.98 | 78 | 120 | 8.29 | 60 | 101 | 5.04 | 63 | 114 | 5.63 |
| IC144701 | 3 | 78 | 109 | 8.68 | 77 | 113 | 8.27 | 58 | 111 | 5.8 | 67 | 118 | 5.45 |
| IC19351 | 3 | 73 | 122 | 7.15 | 76 | 116 | 8.59 | 57 | 114 | 4.88 | 72 | 122 | 7.19 |
| IC351508 | 3 | 78 | 118 | 8.54 | 80 | 121 | 8.31 | 52 | 113 | 2.19 | 55 | 80 | 5.5 |
| IC469177 | 3 | 71 | 124 | 7.28 | 87 | 122 | 8.18 | 62 | 91 | 4.7 | 55 | 74 | 5.24 |
| IC538983 | 3 | 71 | 114 | 8.74 | 71 | 112 | 9.64 | 61 | 113 | 5.2 | 65 | 100 | 6.12 |
| IC564858 | 3 | 101 | 131 | 8.49 | 79 | 118 | 7.25 | 117 | 134 | 4.72 | 113 | 121 | 5.87 |
| IC618587 | 3 | 78 | 131 | 7.98 | 80 | 130 | 7.18 | 61 | 92 | 5.17 | 63 | 102 | 6.04 |
| Sub-population 3 Mean | | 76 | 114.73 | 8.12 | 78.40 | 120.46 | 8.27 | 59.66 | 93.07 | 4.28 | 62.80 | 96.87 | 5.50 |