

Genome wide association study and genomic prediction for stover quality traits in tropical maize (*Zea mays* L.)

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**Supplementary table 1a. Significant SNP associations for trait IVOMD through MLM**

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                                                                                      | P-Value  | Proportion of Variance Explained | Minor Allele (Test Allele) | Minor Allele Frequency | Allele effect |
|--------------|------|------|---------------|---------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------|------------------------|---------------|
| S1_4724733   | 1    | 1.01 | 4724733       | GRMZM2G105436_T01                                                                                                               | 3.15E-04 | 0.027                            | G                          | 0.292                  | 0.281         |
| S1_8113222   | 1    | 1.01 | 8113222       | GRMZM2G475059_T01,<br>GRMZM2G475059_T02                                                                                         | 5.89E-04 | 0.025                            | A                          | 0.387                  | 0.241         |
| S1_12727343  | 1    | 1.02 | 12727343      |                                                                                                                                 | 4.16E-04 | 0.026                            | T                          | 0.150                  | 0.482         |
| S1_27401555  | 1    | 1.02 | 27401555      | AC197545.3_FGT002                                                                                                               | 8.52E-04 | 0.024                            | C                          | 0.246                  | -0.210        |
| S1_36832408  | 1    | 1.03 | 36832408      | GRMZM2G072492_T01                                                                                                               | 8.04E-04 | 0.024                            | A                          | 0.182                  | -0.353        |
| S1_92465338  | 1    | 1.05 | 92465338      | GRMZM2G094639_T01                                                                                                               | 5.81E-04 | 0.025                            | T                          | 0.161                  | -0.255        |
| S1_157239188 | 1    | 1.05 | 157239188     |                                                                                                                                 | 9.83E-04 | 0.023                            | G                          | 0.295                  | -0.230        |
| S1_173234207 | 1    | 1.05 | 173234207     | GRMZM2G003509_T01,<br>GRMZM2G003509_T02                                                                                         | 2.69E-04 | 0.028                            | G                          | 0.496                  | -0.243        |
| S1_179925407 | 1    | 1.06 | 179925407     | AC212323.4_FGT002                                                                                                               | 5.38E-04 | 0.025                            | G                          | 0.227                  | -0.325        |
| S1_192402808 | 1    | 1.06 | 192402808     | GRMZM2G096585_T03,<br>GRMZM2G096585_T02,<br>GRMZM2G096585_T01,<br>GRMZM2G096585_T04,<br>GRMZM2G096585_T05,<br>GRMZM2G096585_T06 | 9.99E-04 | 0.023                            | A                          | 0.104                  | 0.408         |
| S1_192402818 | 1    | 1.06 | 192402818     | GRMZM2G096585_T03,<br>GRMZM2G096585_T02,<br>GRMZM2G096585_T01,<br>GRMZM2G096585_T04,<br>GRMZM2G096585_T05,<br>GRMZM2G096585_T06 | 9.99E-04 | 0.023                            | A                          | 0.104                  | 0.408         |
| S1_197059006 | 1    | 1.06 | 197059006     | GRMZM2G175280_T01                                                                                                               | 7.62E-04 | 0.024                            | G                          | 0.297                  | -0.391        |
| S1_226456940 | 1    | 1.07 | 226456940     | GRMZM2G131817_T01,<br>GRMZM2G131817_T02                                                                                         | 2.29E-04 | 0.029                            | C                          | 0.248                  | 0.296         |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                                                                | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S1_255835560 | 1    | 1.09 | 255835560     | GRMZM2G026346_T02,<br>GRMZM2G026346_T01                                                                   | 9.82E-04 | 0.023                                  | G                             | 0.202                     | -0.386           |
| S1_268880779 | 1    | 1.1  | 268880779     | GRMZM2G044569_T01,<br>GRMZM2G044569_T02,<br>GRMZM2G044569_T03,<br>GRMZM2G044569_T04,<br>GRMZM2G044569_T06 | 6.51E-04 | 0.025                                  | T                             | 0.281                     | -0.321           |
| S1_278665426 | 1    | 1.1  | 278665426     | GRMZM2G014955_T01                                                                                         | 7.91E-04 | 0.024                                  | A                             | 0.116                     | 0.591            |
| S1_293629690 | 1    | 1.11 | 293629690     | GRMZM2G368886_T02,<br>GRMZM2G368886_T01                                                                   | 7.85E-04 | 0.024                                  | A                             | 0.145                     | 0.470            |
| S1_294085083 | 1    | 1.11 | 294085083     |                                                                                                           | 4.33E-04 | 0.026                                  | G                             | 0.493                     | -0.242           |
| S1_294135460 | 1    | 1.11 | 294135460     | GRMZM2G045781_T01,<br>GRMZM2G045781_T02,<br>GRMZM2G045781_T03                                             | 6.42E-04 | 0.025                                  | A                             | 0.159                     | 0.370            |
| S1_297861352 | 1    | 1.11 | 297861352     |                                                                                                           | 2.43E-04 | 0.029                                  | T                             | 0.063                     | 0.432            |
| S1_298273257 | 1    | 1.12 | 298273257     | GRMZM2G159353_T01                                                                                         | 3.78E-04 | 0.027                                  | T                             | 0.103                     | -0.513           |
| S2_6333612   | 2    | 2.02 | 6333612       |                                                                                                           | 3.73E-04 | 0.027                                  | A                             | 0.257                     | -0.308           |
| S2_10337822  | 2    | 2.02 | 10337822      | GRMZM2G005310_T01,<br>GRMZM2G005310_T02                                                                   | 6.07E-04 | 0.025                                  | T                             | 0.359                     | 0.180            |
| S2_12243893  | 2    | 2.02 | 12243893      |                                                                                                           | 2.68E-04 | 0.028                                  | C                             | 0.450                     | -0.232           |
| S2_12243894  | 2    | 2.02 | 12243894      |                                                                                                           | 1.45E-04 | 0.031                                  | G                             | 0.348                     | -0.267           |
| S2_14805724  | 2    | 2.02 | 14805724      | GRMZM2G076771_T01                                                                                         | 8.33E-04 | 0.024                                  | A                             | 0.134                     | -0.490           |
| S2_16870117  | 2    | 2.03 | 16870117      |                                                                                                           | 8.08E-04 | 0.024                                  | A                             | 0.262                     | 0.285            |
| S2_24450868  | 2    | 2.03 | 24450868      | GRMZM2G064124_T01                                                                                         | 7.34E-04 | 0.024                                  | A                             | 0.076                     | 0.496            |
| S2_27581494  | 2    | 2.03 | 27581494      |                                                                                                           | 9.83E-04 | 0.023                                  | T                             | 0.442                     | -0.338           |
| S2_28726272  | 2    | 2.03 | 28726272      |                                                                                                           | 6.57E-04 | 0.025                                  | A                             | 0.194                     | -0.307           |
| S2_29834342  | 2    | 2.04 | 29834342      |                                                                                                           | 2.66E-04 | 0.028                                  | G                             | 0.266                     | -0.363           |
| S2_30907772  | 2    | 2.04 | 30907772      | GRMZM2G352129_T01                                                                                         | 1.04E-04 | 0.032                                  | C                             | 0.251                     | -0.338           |
| S2_30909931  | 2    | 2.04 | 30909931      | GRMZM2G352129_T01                                                                                         | 5.44E-04 | 0.025                                  | G                             | 0.313                     | -0.314           |
| S2_30909942  | 2    | 2.04 | 30909942      | GRMZM2G352129_T01                                                                                         | 1.27E-04 | 0.031                                  | T                             | 0.229                     | -0.338           |
| S2_30910013  | 2    | 2.04 | 30910013      | GRMZM2G352129_T01                                                                                         | 9.88E-04 | 0.023                                  | C                             | 0.229                     | -0.304           |
| S2_39751613  | 2    | 2.04 | 39751613      | GRMZM2G479018_T01                                                                                         | 4.24E-04 | 0.026                                  | C                             | 0.082                     | -0.463           |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                                                                | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S2_44721856  | 2    | 2.04 | 44721856      | GRMZM2G355906_T02,<br>GRMZM2G355906_T01,<br>GRMZM2G355906_T04,<br>GRMZM2G355906_T03,<br>GRMZM5G834459_T01 | 2.48E-04 | 0.028                                  | A                             | 0.054                     | -0.619           |
| S2_44721885  | 2    | 2.04 | 44721885      | GRMZM2G355906_T02,<br>GRMZM2G355906_T01,<br>GRMZM2G355906_T04,<br>GRMZM2G355906_T03,<br>GRMZM5G834459_T01 | 7.59E-04 | 0.024                                  | C                             | 0.136                     | -0.496           |
| S2_45603676  | 2    | 2.04 | 45603676      | GRMZM2G441748_T01,<br>GRMZM2G143891_T01                                                                   | 9.33E-04 | 0.023                                  | T                             | 0.060                     | -0.491           |
| S2_50808880  | 2    | 2.04 | 50808880      | GRMZM2G155626_T01                                                                                         | 6.01E-04 | 0.025                                  | T                             | 0.068                     | -0.588           |
| S2_52834504  | 2    | 2.04 | 52834504      | GRMZM2G541230_T01                                                                                         | 6.27E-04 | 0.025                                  | T                             | 0.063                     | -0.611           |
| S2_83268098  | 2    | 2.05 | 83268098      | GRMZM2G177575_T02,<br>GRMZM2G177575_T03,<br>GRMZM2G177575_T01,<br>GRMZM2G177575_T04                       | 2.61E-04 | 0.028                                  | T                             | 0.080                     | -0.638           |
| S2_100778676 | 2    | 2.05 | 100778676     |                                                                                                           | 3.23E-04 | 0.027                                  | A                             | 0.070                     | 0.633            |
| S2_131425963 | 2    | 2.05 | 131425963     | AC211746.3_FGT006                                                                                         | 1.34E-05 | 0.040                                  | C                             | 0.291                     | -0.327           |
| S2_131425968 | 2    | 2.05 | 131425968     | AC211746.3_FGT006                                                                                         | 6.92E-05 | 0.033                                  | G                             | 0.295                     | -0.294           |
| S2_201966646 | 2    | 2.07 | 201966646     | GRMZM2G113794_T01,<br>GRMZM5G858373_T01                                                                   | 3.42E-04 | 0.027                                  | A                             | 0.209                     | 0.337            |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                                                                | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S2_202275566 | 2    | 2.07 | 202275566     | GRMZM2G179505_T06,<br>GRMZM2G179505_T04,<br>GRMZM2G179505_T05,<br>GRMZM2G179505_T01,<br>GRMZM2G179505_T02 | 6.32E-04 | 0.025                                  | C                             | 0.077                     | 0.692            |
| S2_210393678 | 2    | 2.08 | 210393678     | GRMZM2G180950_T01                                                                                         | 5.47E-04 | 0.025                                  | C                             | 0.065                     | 0.607            |
| S2_217097445 | 2    | 2.08 | 217097445     | GRMZM2G030646_T01                                                                                         | 3.01E-04 | 0.028                                  | A                             | 0.405                     | -0.379           |
| S2_218460160 | 2    | 2.08 | 218460160     | GRMZM2G129209_T01                                                                                         | 4.24E-04 | 0.026                                  | G                             | 0.261                     | 0.371            |
| S2_235226296 | 2    | 2.09 | 235226296     | GRMZM2G178136_T01                                                                                         | 3.64E-05 | 0.036                                  | C                             | 0.307                     | -0.446           |
| S2_235226332 | 2    | 2.09 | 235226332     | GRMZM2G178136_T01                                                                                         | 9.36E-05 | 0.032                                  | C                             | 0.298                     | -0.441           |
| S3_3112002   | 3    | 3.01 | 3112002       | GRMZM2G062076_T01,<br>GRMZM2G062076_T02                                                                   | 1.60E-04 | 0.030                                  | C                             | 0.181                     | 0.476            |
| S3_32033758  | 3    | 3.04 | 32033758      | GRMZM2G049895_T01,<br>GRMZM2G049895_T02                                                                   | 8.31E-04 | 0.024                                  | G                             | 0.479                     | 0.135            |
| S3_32033817  | 3    | 3.04 | 32033817      | GRMZM2G049895_T01,<br>GRMZM2G049895_T02                                                                   | 3.72E-04 | 0.027                                  | A                             | 0.314                     | -0.241           |
| S3_149247409 | 3    | 3.05 | 149247409     | GRMZM5G833593_T03,<br>GRMZM5G833593_T04,<br>GRMZM5G833593_T05,<br>GRMZM5G833593_T01,<br>GRMZM5G833593_T02 | 3.01E-04 | 0.028                                  | T                             | 0.158                     | 0.323            |
| S3_159817712 | 3    | 3.05 | 159817712     | GRMZM2G133428_T02,<br>GRMZM2G133428_T01,<br>GRMZM2G133483_T01                                             | 9.26E-04 | 0.023                                  | T                             | 0.324                     | -0.247           |
| S3_168012590 | 3    | 3.05 | 168012590     | GRMZM2G392710_T01,<br>GRMZM2G392710_T02                                                                   | 1.79E-04 | 0.030                                  | C                             | 0.396                     | -0.219           |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                    | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|---------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S3_168838080 | 3    | 3.06 | 168838080     | GRMZM2G156861_T03,<br>GRMZM2G156861_T01,<br>GRMZM2G458554_T01 | 4.29E-04 | 0.026                                  | A                             | 0.062                     | 0.502            |
| S3_175163368 | 3    | 3.06 | 175163368     |                                                               | 7.80E-04 | 0.024                                  | A                             | 0.351                     | 0.211            |
| S3_175163403 | 3    | 3.06 | 175163403     |                                                               | 6.45E-04 | 0.025                                  | T                             | 0.352                     | 0.217            |
| S3_178154505 | 3    | 3.06 | 178154505     |                                                               | 7.96E-04 | 0.024                                  | T                             | 0.275                     | 0.291            |
| S3_194011353 | 3    | 3.07 | 194011353     | GRMZM2G320013_T01                                             | 5.55E-04 | 0.025                                  | G                             | 0.411                     | -0.161           |
| S3_194011374 | 3    | 3.07 | 194011374     | GRMZM2G320013_T01                                             | 9.60E-04 | 0.023                                  | A                             | 0.483                     | -0.138           |
| S3_201625485 | 3    | 3.07 | 201625485     | GRMZM2G025860_T01                                             | 2.49E-04 | 0.028                                  | A                             | 0.098                     | 0.572            |
| S3_208969852 | 3    | 3.08 | 208969852     | GRMZM2G423193_T01,<br>GRMZM2G423202_T01                       | 8.58E-04 | 0.024                                  | T                             | 0.446                     | 0.462            |
| S3_211531740 | 3    | 3.08 | 211531740     |                                                               | 3.98E-04 | 0.027                                  | A                             | 0.088                     | 0.551            |
| S3_212406341 | 3    | 3.08 | 212406341     | GRMZM5G822563_T03,<br>GRMZM5G822563_T02,<br>GRMZM5G822563_T01 | 2.32E-04 | 0.029                                  | T                             | 0.071                     | -0.462           |
| S3_212415853 | 3    | 3.08 | 212415853     | GRMZM5G822563_T03,<br>GRMZM5G822563_T02,<br>GRMZM5G822563_T01 | 8.23E-04 | 0.024                                  | G                             | 0.056                     | -0.480           |
| S3_213559820 | 3    | 3.08 | 213559820     | GRMZM2G022311_T01                                             | 7.33E-04 | 0.024                                  | A                             | 0.479                     | 0.103            |
| S3_227586235 | 3    | 3.09 | 227586235     | GRMZM2G035785_T01                                             | 5.39E-04 | 0.025                                  | G                             | 0.176                     | -0.455           |
| S3_228449827 | 3    | 3.09 | 228449827     | GRMZM2G409312_T01,<br>GRMZM5G862442_T01                       | 8.05E-04 | 0.024                                  | T                             | 0.321                     | -0.203           |
| S3_229253208 | 3    | 3.09 | 229253208     | GRMZM2G002999_T01                                             | 9.67E-04 | 0.023                                  | T                             | 0.128                     | -0.253           |
| S3_229678492 | 3    | 3.09 | 229678492     | GRMZM2G109618_T03,<br>GRMZM2G109618_T02,<br>GRMZM2G109618_T01 | 7.90E-04 | 0.024                                  | T                             | 0.373                     | 0.206            |
| S3_230442595 | 3    | 3.09 | 230442595     | GRMZM2G353103_T01                                             | 4.89E-04 | 0.026                                  | A                             | 0.098                     | -0.396           |
| S3_230442601 | 3    | 3.09 | 230442601     | GRMZM2G353103_T01                                             | 2.84E-04 | 0.028                                  | C                             | 0.214                     | -0.216           |
| S3_230442640 | 3    | 3.09 | 230442640     | GRMZM2G353103_T01                                             | 6.56E-04 | 0.025                                  | A                             | 0.100                     | -0.366           |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                                                                | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S4_181889201 | 4    | 4.08 | 181889201     | GRMZM2G041959_T01,<br>GRMZM2G041959_T03,<br>GRMZM2G041959_T05,<br>GRMZM2G041959_T04                       | 9.33E-04 | 0.023                                  | T                             | 0.322                     | 0.267            |
| S4_182947054 | 4    | 4.08 | 182947054     | GRMZM2G011469_T01,<br>GRMZM2G011469_T02                                                                   | 8.90E-04 | 0.023                                  | T                             | 0.069                     | -0.303           |
| S4_183405219 | 4    | 4.08 | 183405219     | GRMZM2G111720_T01                                                                                         | 7.90E-04 | 0.024                                  | T                             | 0.352                     | 0.240            |
| S4_202279376 | 4    | 4.08 | 202279376     | GRMZM2G100423_T01                                                                                         | 6.69E-04 | 0.025                                  | G                             | 0.106                     | 0.454            |
| S4_238275507 | 4    | 4.1  | 238275507     |                                                                                                           | 5.38E-04 | 0.025                                  | C                             | 0.261                     | -0.417           |
| S4_238275508 | 4    | 4.1  | 238275508     |                                                                                                           | 5.38E-04 | 0.025                                  | A                             | 0.261                     | -0.415           |
| S4_238275759 | 4    | 4.1  | 238275759     |                                                                                                           | 5.10E-04 | 0.026                                  | T                             | 0.479                     | -0.309           |
| S4_238275784 | 4    | 4.1  | 238275784     |                                                                                                           | 4.47E-04 | 0.026                                  | G                             | 0.492                     | -0.315           |
| S4_238275785 | 4    | 4.1  | 238275785     |                                                                                                           | 8.19E-04 | 0.024                                  | A                             | 0.482                     | -0.300           |
| S4_238357174 | 4    | 4.1  | 238357174     | GRMZM2G423137_T02,<br>GRMZM2G423137_T01,<br>GRMZM5G878640_T02,<br>GRMZM5G878640_T01                       | 2.90E-04 | 0.028                                  | A                             | 0.170                     | 0.429            |
| S5_2188003   | 5    | 5    | 2188003       | GRMZM2G085336_T01,<br>GRMZM2G085336_T02                                                                   | 1.84E-04 | 0.030                                  | G                             | 0.402                     | -0.362           |
| S5_2400437   | 5    | 5    | 2400437       | GRMZM2G002765_T04,<br>GRMZM2G002765_T02,<br>GRMZM2G002765_T03,<br>GRMZM2G002765_T01,<br>GRMZM5G860816_T01 | 1.05E-04 | 0.032                                  | A                             | 0.391                     | -0.314           |
| S5_67509001  | 5    | 5.03 | 67509001      | GRMZM2G089836_T01,<br>GRMZM2G089836_T02                                                                   | 4.82E-04 | 0.026                                  | C                             | 0.167                     | -0.393           |
| S5_69456424  | 5    | 5.03 | 69456424      | GRMZM5G854880_T01                                                                                         | 6.92E-04 | 0.024                                  | C                             | 0.431                     | 0.288            |
| S5_196142106 | 5    | 5.06 | 196142106     | GRMZM2G045977_T01,<br>GRMZM2G045977_T02                                                                   | 8.38E-04 | 0.024                                  | G                             | 0.390                     | -0.189           |
| S5_199230694 | 5    | 5.06 | 199230694     |                                                                                                           | 6.54E-04 | 0.025                                  | C                             | 0.339                     | -0.282           |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                                          | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|-------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S5_199984828 | 5    | 5.06 | 199984828     |                                                                                     | 5.62E-04 | 0.025                                  | T                             | 0.065                     | -0.609           |
| S5_200435108 | 5    | 5.06 | 200435108     | GRMZM2G325019_T01                                                                   | 6.47E-05 | 0.034                                  | A                             | 0.308                     | -0.297           |
| S5_200437468 | 5    | 5.06 | 200437468     | GRMZM2G325019_T01                                                                   | 7.28E-04 | 0.024                                  | C                             | 0.372                     | -0.270           |
| S5_209722095 | 5    | 5.07 | 209722095     | GRMZM2G101613_T01                                                                   | 2.84E-04 | 0.028                                  | G                             | 0.499                     | -0.236           |
| S5_210747392 | 5    | 5.07 | 210747392     | GRMZM2G104920_T03                                                                   | 5.26E-04 | 0.025                                  | A                             | 0.061                     | -0.570           |
| S5_213915805 | 5    | 5.08 | 213915805     | GRMZM2G469142_T01,<br>AC191361.4_FGT004                                             | 8.90E-04 | 0.023                                  | T                             | 0.059                     | -0.498           |
| S5_214287165 | 5    | 5.08 | 214287165     | GRMZM2G178887_T01                                                                   | 9.32E-04 | 0.023                                  | C                             | 0.485                     | -0.294           |
| S5_215020212 | 5    | 5.08 | 215020212     | GRMZM2G150932_T01,<br>GRMZM2G150932_T02                                             | 9.04E-04 | 0.023                                  | A                             | 0.409                     | 0.289            |
| S5_215984446 | 5    | 5.09 | 215984446     | GRMZM2G364172_T03,<br>GRMZM2G364172_T02                                             | 3.79E-04 | 0.027                                  | C                             | 0.317                     | -0.183           |
| S6_2043652   | 6    | 6    | 2043652       | GRMZM2G009627_T01                                                                   | 1.10E-04 | 0.032                                  | C                             | 0.311                     | -0.250           |
| S6_35895666  | 6    | 6.01 | 35895666      | GRMZM2G035741_T02,<br>GRMZM2G035741_T03,<br>GRMZM2G035741_T01,<br>GRMZM2G035741_T05 | 8.94E-04 | 0.023                                  | C                             | 0.346                     | 0.307            |
| S6_44821882  | 6    | 6.01 | 44821882      |                                                                                     | 1.15E-04 | 0.031                                  | C                             | 0.395                     | -0.303           |
| S6_44821884  | 6    | 6.01 | 44821884      |                                                                                     | 1.28E-04 | 0.031                                  | G                             | 0.396                     | -0.301           |
| S6_44821885  | 6    | 6.01 | 44821885      |                                                                                     | 1.28E-04 | 0.031                                  | C                             | 0.396                     | -0.301           |
| S6_44821886  | 6    | 6.01 | 44821886      |                                                                                     | 1.28E-04 | 0.031                                  | C                             | 0.396                     | -0.301           |
| S6_44821933  | 6    | 6.01 | 44821933      |                                                                                     | 1.28E-04 | 0.031                                  | C                             | 0.396                     | -0.301           |
| S6_45183186  | 6    | 6.01 | 45183186      | GRMZM2G124617_T02,<br>GRMZM2G124617_T01                                             | 2.38E-04 | 0.029                                  | G                             | 0.380                     | -0.306           |
| S6_46776160  | 6    | 6.01 | 46776160      | GRMZM2G008202_T02,<br>GRMZM2G008202_T03,<br>GRMZM2G008202_T01,<br>GRMZM5G860077_T01 | 8.09E-04 | 0.024                                  | G                             | 0.251                     | 0.229            |
| S6_69394399  | 6    | 6.01 | 69394399      | GRMZM2G172122_T01                                                                   | 6.65E-05 | 0.034                                  | A                             | 0.417                     | 0.376            |
| S6_73507199  | 6    | 6.01 | 73507199      |                                                                                     | 6.95E-04 | 0.024                                  | T                             | 0.459                     | 0.190            |
| S6_73801877  | 6    | 6.01 | 73801877      | AC209946.4_FGT002                                                                   | 6.67E-04 | 0.025                                  | T                             | 0.473                     | -0.262           |
| S6_93495717  | 6    | 6.02 | 93495717      | GRMZM2G161666_T01                                                                   | 2.72E-04 | 0.028                                  | C                             | 0.179                     | 0.408            |
| S6_102597111 | 6    | 6.03 | 102597111     | GRMZM2G043310_T01                                                                   | 6.47E-04 | 0.025                                  | C                             | 0.104                     | 0.660            |

| Marker       | Chr. | bin  | Position (bp) | Gene Model                                                    | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|--------------|------|------|---------------|---------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S6_107882211 | 6    | 6.04 | 107882211     | GRMZM2G392700_T02,<br>GRMZM2G392700_T01                       | 8.35E-04 | 0.024                                  | T                             | 0.095                     | -0.540           |
| S6_111022510 | 6    | 6.04 | 111022510     | GRMZM2G138842_T01                                             | 9.47E-04 | 0.023                                  | T                             | 0.459                     | -0.297           |
| S6_129471473 | 6    | 6.05 | 129471473     | GRMZM2G131749_T01                                             | 9.93E-04 | 0.023                                  | T                             | 0.236                     | 0.305            |
| S6_129471492 | 6    | 6.05 | 129471492     | GRMZM2G131749_T01                                             | 9.93E-04 | 0.023                                  | G                             | 0.236                     | 0.305            |
| S6_146218985 | 6    | 6.05 | 146218985     | GRMZM2G080848_T01                                             | 2.46E-04 | 0.028                                  | C                             | 0.499                     | -0.236           |
| S6_147868122 | 6    | 6.05 | 147868122     |                                                               | 7.20E-04 | 0.024                                  | G                             | 0.272                     | -0.340           |
| S6_147880140 | 6    | 6.05 | 147880140     | GRMZM2G018971_T01                                             | 2.39E-04 | 0.029                                  | T                             | 0.470                     | 0.290            |
| S6_165945806 | 6    | 6.07 | 165945806     | GRMZM2G520927_T01,<br>GRMZM2G062738_T01                       | 4.52E-04 | 0.026                                  | C                             | 0.440                     | -0.231           |
| S7_69997119  | 7    | 7.02 | 69997119      |                                                               | 7.25E-05 | 0.033                                  | T                             | 0.159                     | -0.397           |
| S7_129344449 | 7    | 7.03 | 129344449     | GRMZM2G115304_T01,<br>GRMZM2G115304_T02                       | 4.38E-04 | 0.026                                  | A                             | 0.388                     | -0.313           |
| S7_131438148 | 7    | 7.03 | 131438148     | GRMZM2G018108_T01,<br>GRMZM2G018108_T02                       | 3.07E-05 | 0.037                                  | A                             | 0.130                     | 0.554            |
| S7_132107595 | 7    | 7.03 | 132107595     | GRMZM2G478160_T01                                             | 4.85E-04 | 0.026                                  | A                             | 0.251                     | 0.452            |
| S7_132169495 | 7    | 7.03 | 132169495     |                                                               | 4.63E-04 | 0.026                                  | G                             | 0.104                     | 0.596            |
| S7_151404619 | 7    | 7.03 | 151404619     |                                                               | 2.46E-04 | 0.028                                  | C                             | 0.215                     | -0.306           |
| S7_153655433 | 7    | 7.03 | 153655433     | GRMZM2G167591_T01,<br>GRMZM2G167591_T02                       | 7.51E-04 | 0.024                                  | G                             | 0.397                     | 0.241            |
| S7_165798736 | 7    | 7.04 | 165798736     |                                                               | 2.63E-05 | 0.037                                  | T                             | 0.217                     | -0.372           |
| S7_165798738 | 7    | 7.04 | 165798738     |                                                               | 8.31E-04 | 0.024                                  | C                             | 0.208                     | -0.307           |
| S7_167348106 | 7    | 7.04 | 167348106     | GRMZM2G158130_T01                                             | 1.90E-04 | 0.029                                  | A                             | 0.101                     | 0.493            |
| S7_167634171 | 7    | 7.04 | 167634171     |                                                               | 1.52E-04 | 0.030                                  | T                             | 0.257                     | -0.337           |
| S8_3662555   | 8    | 8.01 | 3662555       | GRMZM2G074857_T01,<br>GRMZM2G074857_T02                       | 9.33E-04 | 0.023                                  | T                             | 0.386                     | -0.212           |
| S8_16557289  | 8    | 8.02 | 16557289      | GRMZM2G175334_T01                                             | 8.16E-04 | 0.024                                  | T                             | 0.132                     | 0.605            |
| S8_68087278  | 8    | 8.03 | 68087278      |                                                               | 3.47E-04 | 0.027                                  | A                             | 0.061                     | 0.634            |
| S8_135452250 | 8    | 8.05 | 135452250     |                                                               | 7.49E-04 | 0.024                                  | C                             | 0.211                     | -0.264           |
| S8_142226742 | 8    | 8.05 | 142226742     | GRMZM2G050485_T01                                             | 3.70E-04 | 0.027                                  | C                             | 0.299                     | 0.315            |
| S8_160609980 | 8    | 8.06 | 160609980     | GRMZM2G447406_T01                                             | 7.09E-04 | 0.024                                  | A                             | 0.076                     | -0.545           |
| S8_164974058 | 8    | 8.06 | 164974058     | GRMZM2G340319_T01                                             | 8.90E-04 | 0.023                                  | C                             | 0.496                     | 0.344            |
| S8_165158360 | 8    | 8.06 | 165158360     | GRMZM2G316214_T01                                             | 4.48E-04 | 0.026                                  | G                             | 0.274                     | 0.330            |
| S8_165183086 | 8    | 8.06 | 165183086     | GRMZM2G316362_T01,<br>GRMZM2G316362_T02,<br>GRMZM2G316362_T03 | 2.93E-04 | 0.028                                  | T                             | 0.382                     | -0.301           |

| Marker        | Chr. | bin   | Position (bp) | Gene Model                                                                          | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Allele<br>effect |
|---------------|------|-------|---------------|-------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|------------------|
| S8_171150791  | 8    | 8.08  | 171150791     | GRMZM5G806622_T01                                                                   | 5.13E-04 | 0.026                                  | G                             | 0.414                     | -0.409           |
| S8_171275175  | 8    | 8.08  | 171275175     |                                                                                     | 1.10E-04 | 0.032                                  | A                             | 0.214                     | -0.421           |
| S8_172895746  | 8    | 8.08  | 172895746     | GRMZM2G468132_T01                                                                   | 8.73E-04 | 0.024                                  | A                             | 0.239                     | 0.346            |
| S9_13150160   | 9    | 9.02  | 13150160      | GRMZM2G116491_T01                                                                   | 4.58E-04 | 0.026                                  | G                             | 0.376                     | 0.392            |
| S9_37295487   | 9    | 9.03  | 37295487      | GRMZM2G010637_T02,<br>GRMZM2G010637_T01                                             | 8.80E-04 | 0.023                                  | C                             | 0.069                     | 0.624            |
| S9_118393797  | 9    | 9.04  | 118393797     | GRMZM2G367985_T01                                                                   | 1.59E-04 | 0.030                                  | A                             | 0.067                     | 0.432            |
| S9_137288860  | 9    | 9.06  | 137288860     | GRMZM2G700014_T01,<br>GRMZM2G700014_T02                                             | 3.56E-04 | 0.027                                  | G                             | 0.309                     | -0.409           |
| S9_151654313  | 9    | 9.07  | 151654313     | GRMZM2G127072_T01                                                                   | 4.48E-04 | 0.026                                  | G                             | 0.410                     | 0.273            |
| S9_151819648  | 9    | 9.07  | 151819648     | GRMZM2G010017_T02,<br>GRMZM2G010017_T01,<br>GRMZM2G010017_T03,<br>GRMZM2G311232_T01 | 6.80E-04 | 0.024                                  | T                             | 0.075                     | 0.688            |
| S9_152760384  | 9    | 9.07  | 152760384     | GRMZM5G820791_T01,<br>GRMZM5G841893_T01,<br>GRMZM5G841893_T02                       | 4.01E-04 | 0.027                                  | G                             | 0.260                     | 0.419            |
| S9_155570200  | 9    | 9.08  | 155570200     | GRMZM2G079066_T02,<br>GRMZM2G079066_T01                                             | 1.64E-04 | 0.030                                  | A                             | 0.051                     | 0.847            |
| S9_155597023  | 9    | 9.08  | 155597023     | GRMZM2G161905_T01                                                                   | 5.24E-04 | 0.026                                  | A                             | 0.053                     | 0.497            |
| S10_9213023   | 10   | 10.02 | 9213023       | GRMZM2G544539_T01                                                                   | 9.70E-04 | 0.023                                  | T                             | 0.411                     | -0.237           |
| S10_11602603  | 10   | 10.02 | 11602603      | GRMZM2G413943_T01                                                                   | 6.86E-04 | 0.024                                  | A                             | 0.307                     | -0.130           |
| S10_102133795 | 10   | 10.04 | 102133795     |                                                                                     | 9.55E-04 | 0.023                                  | G                             | 0.059                     | 0.586            |
| S10_136883293 | 10   | 10.05 | 136883293     |                                                                                     | 7.32E-04 | 0.024                                  | C                             | 0.307                     | 0.325            |
| S10_144682500 | 10   | 10.07 | 144682500     | GRMZM2G136960_T01                                                                   | 2.29E-04 | 0.029                                  | A                             | 0.148                     | 0.331            |
| S10_144932244 | 10   | 10.07 | 144932244     |                                                                                     | 7.26E-04 | 0.024                                  | A                             | 0.200                     | -0.282           |
| S10_144934801 | 10   | 10.07 | 144934801     |                                                                                     | 6.47E-04 | 0.025                                  | T                             | 0.476                     | 0.301            |

**Supplementary table 1b. Significant SNP associations for trait ME through MLM**

| Marker       | Chr | bin  | Position<br>(bp) | Gene Model                                                                                                | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Alleleic<br>effect |
|--------------|-----|------|------------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|--------------------|
| S1_4724733   | 1   | 1.01 | 4724733          | GRMZM2G105436_T01                                                                                         | 8.46E-05 | 0.033                                  | G                             | 0.292                     | 0.050              |
| S1_173234207 | 1   | 1.05 | 173234207        | GRMZM2G003509_T01,<br>GRMZM2G003509_T02                                                                   | 1.87E-04 | 0.030                                  | G                             | 0.496                     | -0.043             |
| S1_226456940 | 1   | 1.07 | 226456940        | GRMZM2G131817_T01,<br>GRMZM2G131817_T02                                                                   | 2.08E-04 | 0.029                                  | C                             | 0.248                     | 0.048              |
| S1_298273257 | 1   | 1.12 | 298273257        | GRMZM2G159353_T01                                                                                         | 2.57E-04 | 0.028                                  | T                             | 0.103                     | -0.088             |
| S2_12243893  | 2   | 2.02 | 12243893         |                                                                                                           | 3.03E-04 | 0.028                                  | C                             | 0.450                     | -0.038             |
| S2_12243894  | 2   | 2.02 | 12243894         |                                                                                                           | 1.80E-04 | 0.030                                  | G                             | 0.348                     | -0.044             |
| S2_24450868  | 2   | 2.03 | 24450868         | GRMZM2G064124_T01                                                                                         | 3.23E-04 | 0.027                                  | A                             | 0.076                     | 0.091              |
| S2_30907772  | 2   | 2.04 | 30907772         | GRMZM2G352129_T01                                                                                         | 3.61E-04 | 0.027                                  | C                             | 0.251                     | -0.048             |
| S2_30909942  | 2   | 2.04 | 30909942         | GRMZM2G352129_T01                                                                                         | 3.75E-04 | 0.027                                  | T                             | 0.229                     | -0.049             |
| S2_39751613  | 2   | 2.04 | 39751613         | GRMZM2G479018_T01                                                                                         | 2.91E-04 | 0.028                                  | C                             | 0.082                     | -0.077             |
| S2_44721856  | 2   | 2.04 | 44721856         | GRMZM2G355906_T02,<br>GRMZM2G355906_T01,<br>GRMZM2G355906_T04,<br>GRMZM2G355906_T03,<br>GRMZM5G834459_T01 | 2.19E-04 | 0.029                                  | A                             | 0.054                     | -0.100             |
| S2_83268098  | 2   | 2.05 | 83268098         | GRMZM2G177575_T02,<br>GRMZM2G177575_T03,<br>GRMZM2G177575_T01,<br>GRMZM2G177575_T04                       | 2.96E-04 | 0.028                                  | T                             | 0.080                     | -0.109             |
| S2_100778676 | 2   | 2.05 | 100778676        |                                                                                                           | 3.50E-04 | 0.027                                  | A                             | 0.070                     | 0.106              |
| S2_104735236 | 2   | 2.05 | 104735236        | GRMZM2G149708_T02,<br>GRMZM2G149708_T01,<br>AC210605.3_FGT003                                             | 3.31E-04 | 0.027                                  | C                             | 0.167                     | -0.080             |
| S2_131425963 | 2   | 2.05 | 131425963        | AC211746.3_FGT006                                                                                         | 8.70E-06 | 0.042                                  | C                             | 0.291                     | -0.054             |
| S2_131425968 | 2   | 2.05 | 131425968        | AC211746.3_FGT006                                                                                         | 4.60E-05 | 0.035                                  | G                             | 0.295                     | -0.049             |
| S2_201966646 | 2   | 2.07 | 201966646        | GRMZM2G113794_T01,<br>GRMZM5G858373_T01                                                                   | 2.99E-04 | 0.028                                  | A                             | 0.209                     | 0.055              |
| S2_235226296 | 2   | 2.09 | 235226296        | GRMZM2G178136_T01                                                                                         | 9.58E-05 | 0.032                                  | C                             | 0.307                     | -0.070             |
| S2_235226332 | 2   | 2.09 | 235226332        | GRMZM2G178136_T01                                                                                         | 2.39E-04 | 0.029                                  | C                             | 0.298                     | -0.069             |

**Supplementary table 1b. Significant SNP associations for trait ME through MLM**

| Marker       | Chr | bin  | Position (bp) | Gene Model                                                                                                | P-Value  | Proportion of Variance Explained | Minor Allele (Test Allele) | Minor Allele Frequency | Alleleic effect |
|--------------|-----|------|---------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------|------------------------|-----------------|
| S3_149247409 | 3   | 3.05 | 149247409     | GRMZM5G833593_T03,<br>GRMZM5G833593_T04,<br>GRMZM5G833593_T05,<br>GRMZM5G833593_T01,<br>GRMZM5G833593_T02 | 2.38E-04 | 0.029                            | T                          | 0.158                  | 0.055           |
| S3_168012590 | 3   | 3.05 | 168012590     | GRMZM2G392710_T01,<br>GRMZM2G392710_T02                                                                   | 2.27E-04 | 0.029                            | C                          | 0.396                  | -0.034          |
| S3_168838080 | 3   | 3.06 | 168838080     | GRMZM2G156861_T03,<br>GRMZM2G156861_T01,<br>GRMZM2G458554_T01                                             | 3.74E-04 | 0.027                            | A                          | 0.062                  | 0.085           |
| S3_212406341 | 3   | 3.08 | 212406341     | GRMZM5G822563_T03,<br>GRMZM5G822563_T02,<br>GRMZM5G822563_T01                                             | 1.48E-04 | 0.030                            | T                          | 0.071                  | -0.076          |
| S3_227586232 | 3   | 3.09 | 227586232     | GRMZM2G035785_T01                                                                                         | 2.28E-04 | 0.029                            | C                          | 0.172                  | -0.083          |
| S3_227586233 | 3   | 3.09 | 227586233     | GRMZM2G035785_T01                                                                                         | 2.97E-04 | 0.028                            | G                          | 0.174                  | -0.084          |
| S3_227586235 | 3   | 3.09 | 227586235     | GRMZM2G035785_T01                                                                                         | 9.13E-05 | 0.032                            | G                          | 0.176                  | -0.084          |
| S3_227586237 | 3   | 3.09 | 227586237     | GRMZM2G035785_T01                                                                                         | 2.28E-04 | 0.029                            | A                          | 0.172                  | -0.083          |
| S4_182947054 | 4   | 4.08 | 182947054     | GRMZM2G011469_T01,<br>GRMZM2G011469_T02                                                                   | 3.89E-04 | 0.027                            | T                          | 0.069                  | -0.051          |
| S4_238275507 | 4   | 4.1  | 238275507     |                                                                                                           | 1.71E-04 | 0.030                            | C                          | 0.261                  | -0.075          |
| S4_238275508 | 4   | 4.1  | 238275508     |                                                                                                           | 1.71E-04 | 0.030                            | A                          | 0.261                  | -0.075          |
| S4_238275759 | 4   | 4.1  | 238275759     |                                                                                                           | 3.53E-04 | 0.027                            | T                          | 0.479                  | -0.052          |
| S4_238275784 | 4   | 4.1  | 238275784     |                                                                                                           | 2.38E-04 | 0.029                            | G                          | 0.492                  | -0.054          |
| S4_238357174 | 4   | 4.1  | 238357174     | GRMZM2G423137_T02,<br>GRMZM2G423137_T01,<br>GRMZM5G878640_T02,<br>GRMZM5G878640_T01                       | 2.30E-04 | 0.029                            | A                          | 0.170                  | 0.070           |
| S5_2188003   | 5   | 5    | 2188003       | GRMZM2G085336_T01,<br>GRMZM2G085336_T02                                                                   | 2.69E-04 | 0.028                            | G                          | 0.402                  | -0.057          |

**Supplementary table 1b. Significant SNP associations for trait ME through MLM**

| Marker       | Chr | bin  | Position (bp) | Gene Model                                                                                                | P-Value  | Proportion of Variance Explained | Minor Allele (Test Allele) | Minor Allele Frequency | Alleleic effect |
|--------------|-----|------|---------------|-----------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------|------------------------|-----------------|
| S5_2400437   | 5   | 5    | 2400437       | GRMZM2G002765_T04,<br>GRMZM2G002765_T02,<br>GRMZM2G002765_T03,<br>GRMZM2G002765_T01,<br>GRMZM5G860816_T01 | 6.31E-05 | 0.034                            | A                          | 0.391                  | -0.054          |
| S5_200435108 | 5   | 5.06 | 200435108     | GRMZM2G325019_T01                                                                                         | 2.14E-05 | 0.038                            | A                          | 0.308                  | -0.053          |
| S5_200437468 | 5   | 5.06 | 200437468     | GRMZM2G325019_T01                                                                                         | 1.54E-04 | 0.030                            | C                          | 0.372                  | -0.050          |
| S5_215984446 | 5   | 5.09 | 215984446     | GRMZM2G364172_T03,<br>GRMZM2G364172_T02                                                                   | 3.26E-04 | 0.027                            | C                          | 0.317                  | -0.031          |
| S6_2043652   | 6   | 6    | 2043652       | GRMZM2G009627_T01                                                                                         | 1.18E-04 | 0.031                            | C                          | 0.311                  | -0.042          |
| S6_44821882  | 6   | 6.01 | 44821882      |                                                                                                           | 2.42E-04 | 0.029                            | C                          | 0.395                  | -0.049          |
| S6_44821884  | 6   | 6.01 | 44821884      |                                                                                                           | 2.81E-04 | 0.028                            | G                          | 0.396                  | -0.049          |
| S6_44821885  | 6   | 6.01 | 44821885      |                                                                                                           | 2.81E-04 | 0.028                            | C                          | 0.396                  | -0.049          |
| S6_44821886  | 6   | 6.01 | 44821886      |                                                                                                           | 2.81E-04 | 0.028                            | C                          | 0.396                  | -0.049          |
| S6_44821933  | 6   | 6.01 | 44821933      |                                                                                                           | 2.81E-04 | 0.028                            | C                          | 0.396                  | -0.049          |
| S6_45183186  | 6   | 6.01 | 45183186      | GRMZM2G124617_T02,<br>GRMZM2G124617_T01                                                                   | 3.51E-04 | 0.027                            | G                          | 0.380                  | -0.051          |
| S6_73801877  | 6   | 6.01 | 73801877      | AC209946.4_FGT002                                                                                         | 3.80E-04 | 0.027                            | T                          | 0.473                  | -0.045          |
| S6_93495717  | 6   | 6.02 | 93495717      | GRMZM2G161666_T01                                                                                         | 1.29E-04 | 0.031                            | C                          | 0.179                  | 0.069           |
| S6_147868122 | 6   | 6.05 | 147868122     |                                                                                                           | 2.04E-04 | 0.029                            | G                          | 0.272                  | -0.062          |
| S6_165945806 | 6   | 6.07 | 165945806     | GRMZM2G520927_T01,<br>GRMZM2G062738_T01                                                                   | 1.62E-04 | 0.030                            | C                          | 0.440                  | -0.042          |
| S7_69997119  | 7   | 7.02 | 69997119      |                                                                                                           | 1.56E-04 | 0.030                            | T                          | 0.159                  | -0.061          |
| S7_131438148 | 7   | 7.03 | 131438148     | GRMZM2G018108_T01,<br>GRMZM2G018108_T02                                                                   | 2.95E-05 | 0.037                            | A                          | 0.130                  | 0.090           |
| S7_132169495 | 7   | 7.03 | 132169495     |                                                                                                           | 2.56E-04 | 0.028                            | G                          | 0.104                  | 0.102           |
| S7_151404619 | 7   | 7.03 | 151404619     |                                                                                                           | 2.50E-04 | 0.028                            | C                          | 0.215                  | -0.048          |
| S7_165798736 | 7   | 7.04 | 165798736     |                                                                                                           | 9.39E-05 | 0.032                            | T                          | 0.217                  | -0.061          |
| S7_167348106 | 7   | 7.04 | 167348106     | GRMZM2G158130_T01                                                                                         | 1.13E-04 | 0.032                            | A                          | 0.101                  | 0.082           |
| S8_68087278  | 8   | 8.03 | 68087278      |                                                                                                           | 1.52E-04 | 0.030                            | A                          | 0.061                  | 0.111           |
| S8_101506781 | 8   | 8.03 | 101506781     |                                                                                                           | 3.30E-04 | 0.027                            | C                          | 0.426                  | -0.033          |
| S8_142226742 | 8   | 8.05 | 142226742     | GRMZM2G050485_T01                                                                                         | 2.51E-04 | 0.028                            | C                          | 0.299                  | 0.053           |

Supplementary table 1b. Significant SNP associations for trait ME through MLM

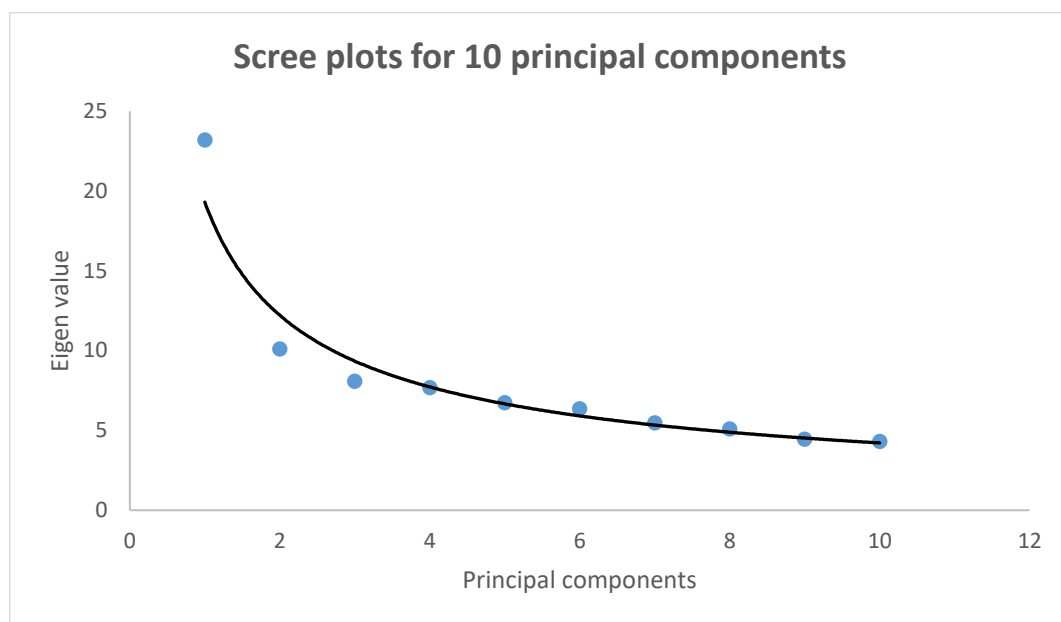
| Marker       | Chr | bin  | Position<br>(bp) | Gene Model                                                    | P-Value  | Proportion<br>of Variance<br>Explained | Minor Allele<br>(Test Allele) | Minor Allele<br>Frequency | Alleleic<br>effect |
|--------------|-----|------|------------------|---------------------------------------------------------------|----------|----------------------------------------|-------------------------------|---------------------------|--------------------|
| S8_165183086 | 8   | 8.06 | 165183086        | GRMZM2G316362_T01,<br>GRMZM2G316362_T02,<br>GRMZM2G316362_T03 | 2.72E-04 | 0.028                                  | T                             | 0.382                     | -0.050             |
| S8_171150791 | 8   | 8.08 | 171150791        | GRMZM5G806622_T01                                             | 3.65E-04 | 0.027                                  | G                             | 0.414                     | -0.068             |
| S8_171275175 | 8   | 8.08 | 171275175        |                                                               | 1.53E-04 | 0.030                                  | A                             | 0.214                     | -0.069             |
| S9_13150160  | 9   | 9.02 | 13150160         | GRMZM2G116491_T01                                             | 2.63E-04 | 0.028                                  | G                             | 0.376                     | 0.066              |
| S9_118393797 | 9   | 9.04 | 118393797        | GRMZM2G367985_T01                                             | 2.70E-04 | 0.028                                  | A                             | 0.067                     | 0.073              |
| S9_155570200 | 9   | 9.08 | 155570200        | GRMZM2G079066_T02,<br>GRMZM2G079066_T01                       | 1.61E-04 | 0.030                                  | A                             | 0.051                     | 0.143              |

**SupplementaryTable 2. Predicted values of the two traits IVOMD and ME for the DH lines based on the prediction model set of 156,884 SNPs for the two traits**

| Parameter             | IVOMD (%)      | ME (MJ/Kg)   |
|-----------------------|----------------|--------------|
| Mean of top 50        | 48.9           | 7.22         |
| Range of top 50       | 48.79 to 49.27 | 7.20 to 7.27 |
| Mean of bottom 50     | 47.63          | 7.02         |
| Range of bottom 50    | 47.22 to 47.8  | 6.96 to 7.05 |
| Mean of all DH lines  | 48.43          | 7.15         |
| Range of the DH lines | 47.22 to 49.27 | 6.96 to 7.27 |

**Supplementary table 3. Prediction accuracy between high and low group as determined by Pearson's coefficient between predicted value estimated at different marker density (sampled 20 times) and the observed phenotype using the training set of advanced related breeding lines**

| Marker density (SNPs) | IVOMD (%) |      | ME (MJ/Kg) |      |
|-----------------------|-----------|------|------------|------|
|                       | Low       | High | Low        | High |
| 200                   | 0.00      | 0.15 | 0.07       | 0.17 |
| 500                   | 0.06      | 0.19 | 0.00       | 0.17 |
| 1000                  | 0.00      | 0.24 | 0.05       | 0.36 |
| 3000                  | 0.02      | 0.29 | 0.08       | 0.26 |
| 5000                  | 0.06      | 0.31 | 0.05       | 0.30 |
| 10000                 | 0.08      | 0.39 | 0.05       | 0.36 |
| 50000                 | 0.08      | 0.55 | 0.07       | 0.47 |
| 100000                | 0.08      | 0.57 | 0.05       | 0.51 |
| 156884                | 0.08      | 0.57 | 0.06       | 0.52 |



**Supplementary figure 1. Scree plot representing 10 principal components**