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| Table S2. QTLs detected by high-density mapping in 2016. |
| Trait | Chr | Position | Locus-start |  | Locus-stop | LOD | *A* | *R*2 |
| HD | 1 | 36.46–36.89  | Marker37048 | – | Marker37507 | 8.136  | 1.652  | 3.625  |
| HD | 3 | 6.70–7.07  | Marker449892 | – | Marker450216 | 13.802  | 3.438  | 15.699  |
| HD | 3 | 112.12–148.93  | Marker601419 | – | Marker639860 | 5.935  | 2.178  | 6.300  |
| HD | 7 | 49.81–89.48  | Marker1170181 | – | Marker1252077 | 4.062  | 2.021  | 5.428  |
| HD | 8 | 38.33–38.51  | Marker1330696 | – | Marker1330654 | 33.683  | -5.153  | 35.278  |
| PL | 1 | 251.30–257.86  | Marker203467 | – | Marker210876 | 3.199  | -0.750  | 4.468  |
| PL | 2 | 92.41–93.09  | Marker321151 | – | Marker321614 | 7.948  | 1.112  | 9.823  |
| PL | 3 | 13.08–13.08  | Marker453435 | – | Marker453430 | 3.695  | 0.734  | 4.277  |
| PL | 3 | 167.47–168.06  | Marker650944 | – | Marker650998 | 2.828  | 0.741  | 4.360  |
| PL | 4 | 1.60–4.68  | Marker652983 | – | Marker654342 | 3.088  | -0.544  | 2.348  |
| PL | 6 | 67.62–68.41  | Marker1039580 | – | Marker1060572 | 4.257  | 0.782  | 4.860  |
| NPB | 1 | 30.61–30.97  | Marker21788 | – | Marker23887 | 5.923  | 0.536  | 6.162  |
| NPB | 2 | 96.46–96.81  | Marker322881 | – | Marker324653 | 9.013  | 0.643  | 8.855  |
| NPB | 2 | 153.04–160.95  | Marker409991 | – | Marker424309 | 2.926  | -0.300  | 1.935  |
| NPB | 3 | 8.36–8.73  | Marker451487 | – | Marker451733 | 4.677  | 0.516  | 5.708  |
| NPB | 5 | 181.14–181.68  | Marker967411 | – | Marker968183 | 2.628  | -0.391  | 3.278  |
| NPB | 6 | 38.00–38.00  | Marker997522 | – | Marker997753 | 3.409  | 0.517  | 5.724  |
| NPB | 9 | 48.01–53.08  | Marker1544953 | – | Marker1550971 | 2.596  | -0.355  | 2.704  |
| NPB | 11 | 6.23–21.19  | Marker1746140 | – | Marker1760926 | 3.217  | 0.520  | 5.784  |
| NPB | 12 | 13.82–15.20  | Marker1923666 | – | Marker1924881 | 3.282  | 0.517  | 5.724  |
| NSB | 1 | 36.46–36.89  | Marker37048 | – | Marker37507 | 16.932  | 5.203  | 17.547  |
| NSB | 1 | 239.62–239.62  | Marker186061 | – | Marker184661 | 2.632  | 2.318  | 3.482  |
| NSB | 2 | 96.46–96.81  | Marker322881 | – | Marker324653 | 12.626  | 3.765  | 9.191  |
| NSB | 3 | 164.09–168.06  | Marker650125 | – | Marker650998 | 7.526  | 3.432  | 7.637  |
| NSB | 6 | 57.68–58.46  | Marker1026956 | – | Marker1047721 | 9.172  | 3.706  | 8.906  |
| NSB | 7 | 134.25–141.20  | Marker1306637 | – | Marker1310253 | 3.217  | -0.599  | 0.232  |
| NGPP | 1 | 36.46–36.89  | Marker37048 | – | Marker37507 | 15.801  | 20.183  | 15.833  |
| NGPP | 2 | 96.46–96.81  | Marker322881 | – | Marker324653 | 11.931  | 16.564  | 10.665  |
| NGPP | 3 | 167.47–167.87  | Marker650944 | – | Marker651334 | 6.562  | 12.953  | 6.521  |
| NGPP | 6 | 51.08–94.26  | Marker1013169 | – | Marker1109064 | 5.853  | 12.468  | 6.042  |
| NPPP | 1 | 29.28–29.64  | Marker20132 | – | Marker21929 | 5.619  | -0.872  | 6.460  |
| NPPP | 2 | 45.74–46.10  | Marker271084 | – | Marker272133 | 9.394  | 0.967  | 7.940  |
| NPPP | 2 | 103.50–104.11  | Marker328970 | – | Marker333155 | 3.693  | -0.004  | 0.000  |
| NPPP | 3 | 0.00–5.76  | Marker444789 | – | Marker449058 | 3.471  | -0.835  | 5.928  |
| NPPP | 6 | 108.09–108.66  | Marker1121715 | – | Marker1121710 | 3.037  | 0.591  | 2.964  |
| NPPP | 8 | 36.28–39.06  | Marker1330552 | – | Marker1330714 | 2.806  | 0.608  | 3.142  |
| NFGPP | 1 | 38.74  | Marker37508 | – | Marker37508 | 10.902  | 117.782  | 12.309  |
| NFGPP | 2 | 40.74–41.46  | Marker267225 | – | Marker270018 | 11.715  | 124.759  | 13.810  |
| NFGPP | 3 | 4.92–48.64  | Marker448514 | – | Marker479366 | 4.963  | 87.604  | 6.809  |
| NFGPP | 3 | 84.13–112.33  | Marker533726 | – | Marker602568 | 3.719  | 82.276  | 6.006  |
| NFGPP | 3 | 161.33–161.80  | Marker649280 | – | Marker649626 | 6.342  | 91.385  | 7.410  |
| NFGPP | 6 | 110.72–110.72  | Marker1123143 | – | Marker1123146 | 2.537  | 44.168  | 1.731  |
| NFGPP | 7 | 105.63–116.28  | Marker1274047 | – | Marker1286195 | 3.556  | 81.154  | 5.843  |
| SSR | 1 | 50.18–50.89  | Marker38706 | – | Marker38705 | 6.011  | 7.272  | 10.573  |
| SSR | 2 | 37.36–105.01  | Marker261592 | – | Marker336271 | 4.488  | 5.472  | 5.986  |
| SSR | 3 | 14.54–15.01  | Marker455664 | – | Marker453950 | 6.170  | 6.274  | 7.870  |
| SSR | 3 | 123.82–124.36  | Marker613845 | – | Marker614445 | 6.225  | 6.319  | 7.982  |
| SSR | 4 | 164.11–169.03  | Marker779713 | – | Marker789266 | 2.608  | 4.319  | 3.729  |
| SSR | 5 | 162.84–170.22  | Marker956807 | – | Marker960514 | 2.987  | 4.428  | 3.920  |
| SSR | 7 | 140.06–144.80  | Marker1309708 | – | Marker1313587 | 4.056  | 5.318  | 5.654  |
| SSR | 9 | 127.28–134.93  | Marker1604838 | – | Marker1608063 | 2.784  | -4.256  | 3.622  |
| GYPP | 1 | 38.74  | Marker37508 | – | Marker37508 | 6.119  | 2.719  | 10.505  |
| GYPP | 2 | 36.57–39.63  | Marker261586 | – | Marker262123 | 5.574  | 2.012  | 5.756  |
| GYPP | 3 | 30.76  | Marker465530 | – | Marker465530 | 5.216  | 2.452  | 8.543  |
| GYPP | 3 | 117.42–125.63  | Marker607329 | – | Marker615204 | 4.107  | 2.134  | 6.474  |
| GYPP | 3 | 154.57–162.06  | Marker645679 | – | Marker649891 | 3.890  | 1.881  | 5.027  |
| GYPP | 4 | 172.65–179.19  | Marker791790 | – | Marker795626 | 2.988  | 1.717  | 4.192  |
| GYPP | 5 | 154.43–173.52  | Marker946309 | – | Marker963334 | 4.472  | 1.739  | 4.301  |
| GYPP | 7 | 100.96–116.28  | Marker1265411 | – | Marker1286195 | 3.521  | 1.897  | 5.113  |
| GYPP | 9 | 134.93–134.93  | Marker1608062 | – | Marker1608063 | 2.766  | -1.452  | 2.997  |

HD, Heading date; PL, Panicle length; NPB, Number of primary branches; NSB, Number of secondary branches; NGPP, Number of grains per panicle; NPPP, Number of panicles per plant; NFGPP, Number of filled grains per panicle; SSR, Seed-setting rate; GYPP, Grain yield per plant; *A*, Additive effect of replacing a Huannghuazhan allele with a JZ1560 allele; *R*2, Proportion of the phenotypic variation explained by the QTL.