**Table S6** Effects of KAVs in the four QTL regions. In QTL regions of order 1 and 2, both positive and negative effects were observed for identified KAVs.

| **QTL Order1** | **SNPID** | **Effect2** | **Chr** | **Pos** |
| --- | --- | --- | --- | --- |
| 1 | 1\_7955757 | -0.224 | 1 | 7955757 |
|  | 1\_9123081 | -0.256 | 1 | 9123081 |
|  | 1\_12354035 | 0.519 | 1 | 12354035 |
|  | 1\_14416971 | -0.474 | 1 | 14416971 |
|  | 1\_14416985 | -0.547 | 1 | 14416985 |
|  | 1\_14416985 | -0.547 | 1 | 14416985 |
|  | 1\_14559018 | -0.311 | 1 | 14559018 |
|  | 1\_15518012 | -0.541 | 1 | 15518012 |
|  | 1\_15518012 | -0.541 | 1 | 15518012 |
|  | 1\_19106106 | -0.821 | 1 | 19106106 |
|  | 1\_21388395 | -0.791 | 1 | 21388395 |
|  | 1\_21903297 | -0.507 | 1 | 21903297 |
|  | 1\_22688691 | -0.614 | 1 | 22688691 |
|  | 1\_22857943 | -0.763 | 1 | 22857943 |
|  | 1\_23668218 | -0.253 | 1 | 23668218 |
|  | 1\_23925988 | -0.7 | 1 | 23925988 |
|  | 1\_24022557 | -0.64 | 1 | 24022557 |
|  | 1\_24052372 | -0.639 | 1 | 24052372 |
|  | 1\_25401487 | -0.667 | 1 | 25401487 |
|  | 1\_25422726 | -0.592 | 1 | 25422726 |
|  | 1\_27193154 | -0.377 | 1 | 27193154 |
|  | 1\_27193157 | -0.377 | 1 | 27193157 |
|  | 1\_27193158 | -0.377 | 1 | 27193158 |
|  | 1\_27193272 | -0.377 | 1 | 27193272 |
|  | 1\_27193273 | -0.416 | 1 | 27193273 |
|  | 1\_27193281 | -0.377 | 1 | 27193281 |
|  | 1\_27205707 | -0.788 | 1 | 27205707 |
|  | 1\_27890100 | -0.817 | 1 | 27890100 |
|  | 1\_29025146 | -0.227 | 1 | 29025146 |
|  | 1\_33124922 | -0.709 | 1 | 33124922 |
|  | 1\_33222163 | -0.27 | 1 | 33222163 |
|  | 1\_34263565 | 0.301 | 1 | 34263565 |
|  | 1\_34263565 | 0.301 | 1 | 34263565 |
|  | 1\_34403118 | -0.668 | 1 | 34403118 |
|  | 1\_34403270 | -0.513 | 1 | 34403270 |
|  | 1\_35539800 | -0.705 | 1 | 35539800 |
| 2 | 1\_204555503 | -0.848 | 1 | 204555503 |
|  | 1\_206983710 | -0.432 | 1 | 206983710 |
|  | 1\_209034237 | -0.816 | 1 | 209034237 |
|  | 1\_209748680 | 0.23 | 1 | 209748680 |
| 3 | 5\_15138938 | 0.594 | 5 | 15138938 |
|  | 5\_15322714 | 0.439 | 5 | 15322714 |
|  | 5\_15613717 | 0.631 | 5 | 15613717 |
|  | 5\_15769522 | 0.959 | 5 | 15769522 |
|  | 5\_16418530 | 0.695 | 5 | 16418530 |
|  | 5\_16418599 | 0.6 | 5 | 16418599 |
|  | 5\_16418978 | 0.632 | 5 | 16418978 |
|  | 5\_16420194 | 0.704 | 5 | 16420194 |
|  | 5\_16434811 | 0.686 | 5 | 16434811 |
|  | 5\_18628601 | 1.002 | 5 | 18628601 |
|  | 5\_18633669 | 0.493 | 5 | 18633669 |
|  | 5\_18633670 | 0.493 | 5 | 18633670 |
|  | 5\_19050196 | 0.476 | 5 | 19050196 |
|  | 5\_19131028 | 0.895 | 5 | 19131028 |
|  | 5\_19198790 | 0.78 | 5 | 19198790 |
|  | 5\_19237019 | 1.059 | 5 | 19237019 |
|  | 5\_19679770 | 0.846 | 5 | 19679770 |
|  | 5\_19679964 | 0.806 | 5 | 19679964 |
|  | 5\_19937357 | 0.492 | 5 | 19937357 |
|  | 5\_19939090 | 0.495 | 5 | 19939090 |
|  | 5\_20051330 | 1.02 | 5 | 20051330 |
|  | 5\_20909503 | 0.48 | 5 | 20909503 |
|  | 5\_20971239 | 0.482 | 5 | 20971239 |
|  | 5\_21702241 | 0.5 | 5 | 21702241 |
|  | 5\_22193960 | 0.53 | 5 | 22193960 |
|  | 5\_22995651 | 0.504 | 5 | 22995651 |
|  | 5\_23016602 | 0.505 | 5 | 23016602 |
|  | 5\_23184913 | 0.513 | 5 | 23184913 |
|  | 5\_23468707 | 0.526 | 5 | 23468707 |
|  | 5\_25873169 | 0.843 | 5 | 25873169 |
|  | 5\_25986065 | 0.522 | 5 | 25986065 |
|  | 5\_39871266 | 0.802 | 5 | 39871266 |
|  | 5\_39877758 | 0.818 | 5 | 39877758 |
|  | 5\_39938029 | 0.886 | 5 | 39938029 |
|  | 5\_50037509 | 0.54 | 5 | 50037509 |
|  | 5\_50038035 | 0.54 | 5 | 50038035 |
|  | 5\_50040843 | 0.54 | 5 | 50040843 |
|  | 5\_50041035 | 0.54 | 5 | 50041035 |
|  | 5\_50042596 | 0.54 | 5 | 50042596 |
|  | 5\_50042843 | 0.54 | 5 | 50042843 |
|  | 5\_50042912 | 0.54 | 5 | 50042912 |
|  | 5\_50086739 | 0.54 | 5 | 50086739 |
|  | 5\_50088075 | 0.54 | 5 | 50088075 |
|  | 5\_50088542 | 0.54 | 5 | 50088542 |
|  | 5\_50122418 | 0.841 | 5 | 50122418 |
|  | 5\_50623759 | 0.663 | 5 | 50623759 |
|  | 5\_60007798 | 0.376 | 5 | 60007798 |
|  | 5\_60284489 | 0.584 | 5 | 60284489 |
|  | 5\_60485447 | 0.957 | 5 | 60485447 |
|  | 5\_60769418 | 0.744 | 5 | 60769418 |
|  | 5\_66681445 | 0.463 | 5 | 66681445 |
|  | 5\_73984414 | 0.542 | 5 | 73984414 |
|  | 5\_74911414 | 0.574 | 5 | 74911414 |
|  | 5\_75940016 | 0.873 | 5 | 75940016 |
|  | 5\_75999175 | 0.903 | 5 | 75999175 |
|  | 5\_76246287 | 0.666 | 5 | 76246287 |
|  | 5\_76257893 | 0.744 | 5 | 76257893 |
|  | 5\_76783510 | 0.864 | 5 | 76783510 |
|  | 5\_77260782 | 0.58 | 5 | 77260782 |
|  | 5\_77265300 | 0.579 | 5 | 77265300 |
|  | 5\_77433351 | 0.621 | 5 | 77433351 |
|  | 5\_77748023 | 0.539 | 5 | 77748023 |
|  | 5\_77760584 | 0.547 | 5 | 77760584 |
|  | 5\_78768354 | 0.536 | 5 | 78768354 |
|  | 5\_79232533 | 0.568 | 5 | 79232533 |
|  | 5\_81687612 | 1.197 | 5 | 81687612 |
| 4 | 10\_121407133 | 0.418 | 10 | 121407133 |
|  | 10\_121407735 | 0.341 | 10 | 121407735 |
|  | 10\_121413888 | 0.293 | 10 | 121413888 |
|  | 10\_128572776 | 0.632 | 10 | 128572776 |
|  | 10\_130320984 | 0.39 | 10 | 130320984 |
|  | 10\_133324106 | 0.56 | 10 | 133324106 |
|  | 10\_133505410 | 0.917 | 10 | 133505410 |
|  | 10\_135043790 | 0.937 | 10 | 135043790 |
|  | 10\_136075874 | 0.999 | 10 | 136075874 |
|  | 10\_136247205 | 0.489 | 10 | 136247205 |
|  | 10\_137100359 | 0.461 | 10 | 137100359 |
|  | 10\_137500425 | 0.497 | 10 | 137500425 |
|  | 10\_137673874 | 0.499 | 10 | 137673874 |
|  | 10\_137881930 | 0.968 | 10 | 137881930 |
|  | 10\_137903044 | 0.525 | 10 | 137903044 |
|  | 10\_137943511 | 0.741 | 10 | 137943511 |
|  | 10\_137951908 | 0.767 | 10 | 137951908 |
|  | 10\_137955409 | 0.72 | 10 | 137955409 |
|  | 10\_137989336 | 0.503 | 10 | 137989336 |
|  | 10\_137998831 | 0.893 | 10 | 137998831 |
|  | 10\_138019385 | 0.522 | 10 | 138019385 |
|  | 10\_138075548 | 0.704 | 10 | 138075548 |
|  | 10\_138887410 | 0.479 | 10 | 138887410 |
|  | 10\_139738117 | 0.948 | 10 | 139738117 |
|  | 10\_140167940 | 0.63 | 10 | 140167940 |
|  | 10\_141272862 | 0.652 | 10 | 141272862 |
|  | 10\_141509779 | 0.883 | 10 | 141509779 |
|  | 10\_141509800 | 0.996 | 10 | 141509800 |
|  | 10\_141962266 | 0.632 | 10 | 141962266 |

1 QTL order was the same as in Table S3.

2 KAV effects were calculated by using B73 subtracting non-B73 alleles.