

Supplemental Materials

Molecular Biology of the Cell

Linder et al.

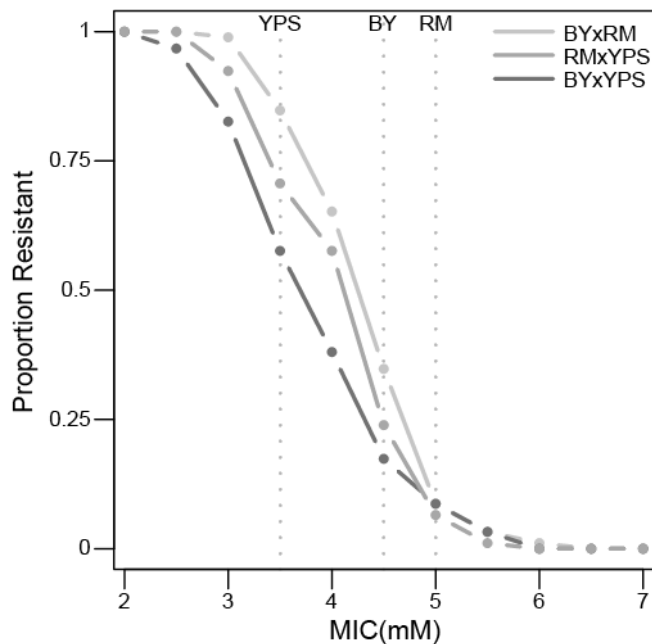


Figure S1. Distribution of hydrogen peroxide resistance among parents and cross progeny. YPS was most sensitive to hydrogen peroxide: the MIC of YPS was 3.5 mM, while BY and RM showed MICs of 4.5 and 5 mM, respectively (depicted as dashed vertical lines above). For each of the three pairwise crosses of the three strains, we generated 864 recombinants using random spore techniques (Methods). We screened these recombinants across six concentrations of hydrogen peroxide and found that the trait was transgressive in every cross. Furthermore, minimal and maximal trait values that were approximately the same were observed in each of the crosses (minima \approx 2 mM and maxima \approx 7 mM), although the proportion of progeny with intermediate phenotypes varied. These results suggest that BY, RM, and YPS each carry a mixture of resistance and sensitivity alleles.

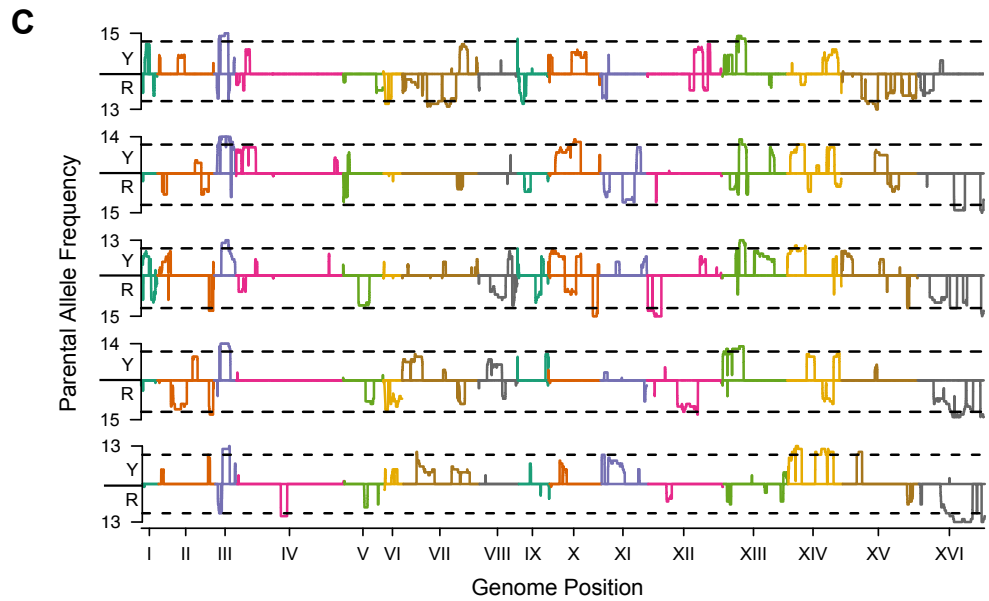
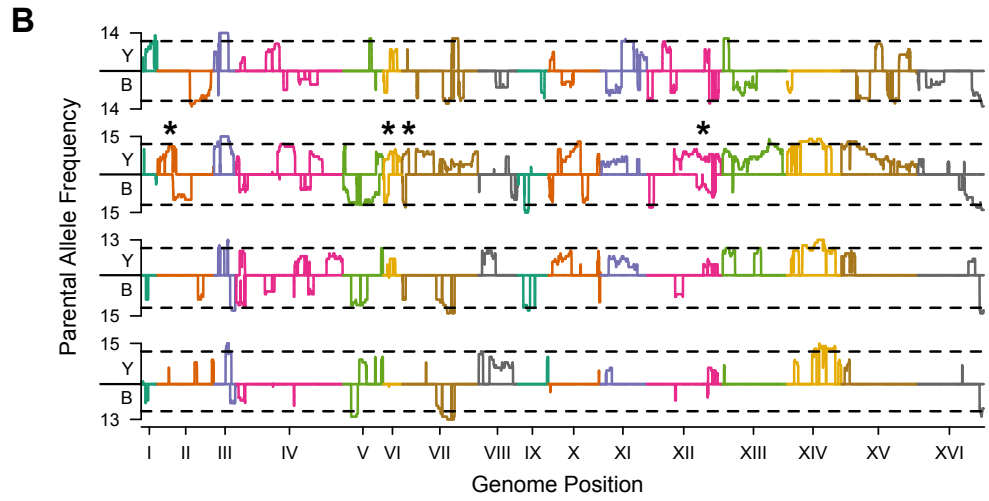
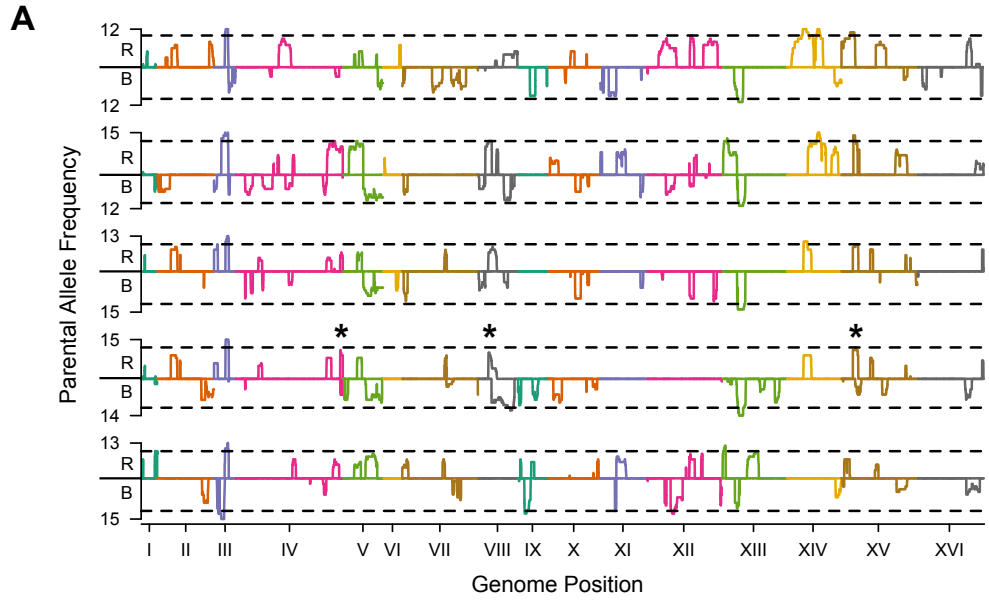


Figure S2. Genome-wide allele frequency plots of all families for each cross, with families from a cross ordered by their founding segregant. The BYxRM, BYxYPS, and RMxYPS crosses are shown in A, B, and C, respectively. Dashed horizontal lines represent nominal significance ($p \leq 0.05$) in one-tailed binomial tests. The number of F_2B_3 segregants that carry the non-backcross parental allele is depicted on the y-axis, with 'B', 'R', and 'Y' indicating BY, RM, and YPS, respectively. Regions supporting transient aneuploidy during early rounds of backcrossing are indicated with asterisks. These sites were identified because the sites segregate in both backcrosses derived from their founding segregant. Under a scenario in which aneuploidy does not occur, regions that segregate in one family derived from a given segregant should not segregate with the other family derived from that segregant.

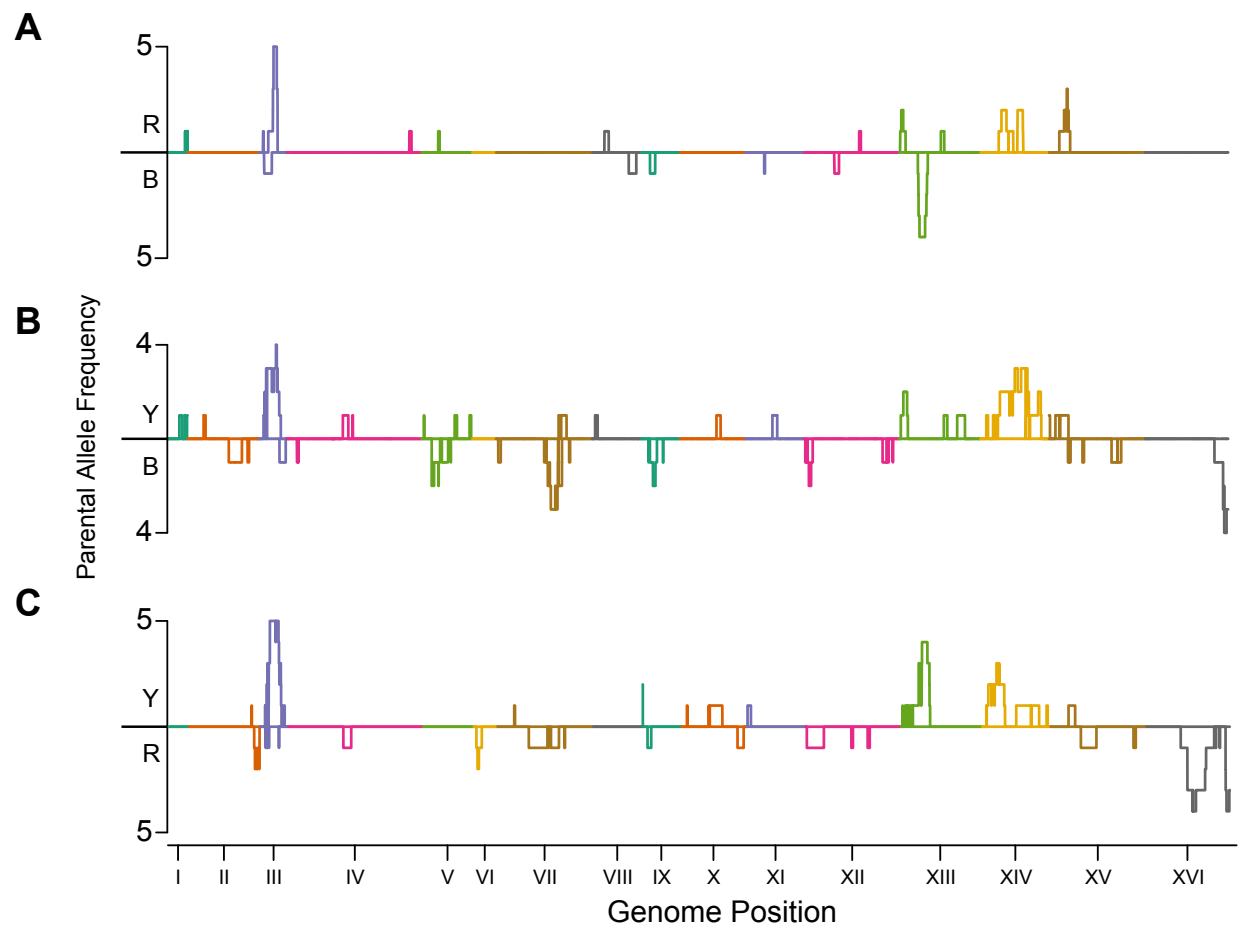


Figure S3. Detection of nominally significant loci ($p \leq 0.05$) in multiple advanced backcross families and crosses. The BYxRM, BYxYPS, and RMxYPS crosses are shown in A, B, and C, respectively. The y-axis depicts the number of advanced backcross families that were significant at a given genomic position.

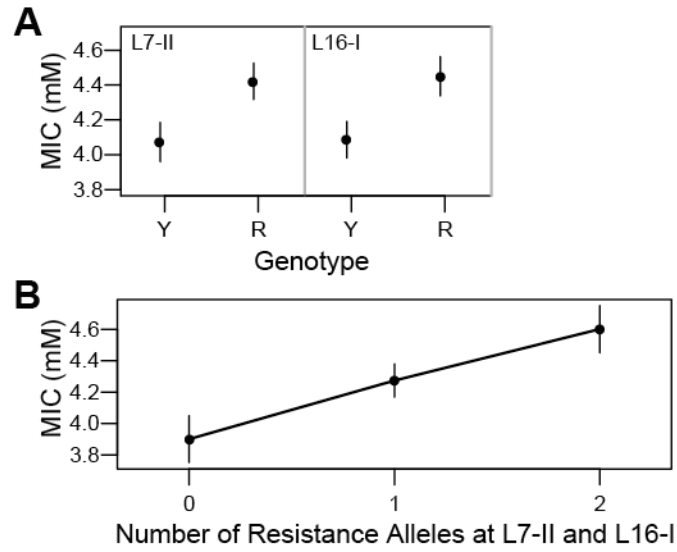


Figure S4. L7-II and L16-I act additively. 470 RMxYPS F₂ segregants were phenotyped and genotyped at L7-II and L16-I. The 95% confidence intervals of MIC for each genotype are shown in A, while the additive regression model for MIC as a function of haploid combinations of the two loci is provided in B.

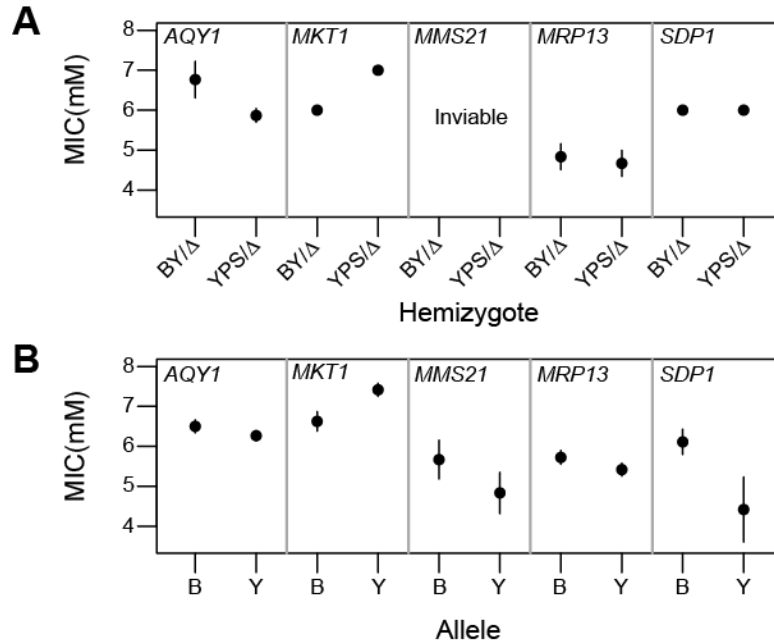


Figure S5. RH and allele replacement results for the five BYxYPS loci described in Figure 4. In A, RH successfully identified *AQY1* (Chromosome XVI) and *MKT1* (Chromosome XIV) as quantitative trait genes. In B, allele replacements confirmed that *AQY1* and *MKT1* are quantitative genes, and showed that *MMS21* (Chromosome V), *MRP13* (Chromosome VII), and *SDP1* (Chromosome IX) are causal. As we discuss in the main text, the causal variant at *SDP1* is located in the intergenic region between this gene and *POR2*. All plots show 95% confidence intervals for MIC, with ‘B’ and ‘Y’, indicating BY and YPS, respectively.

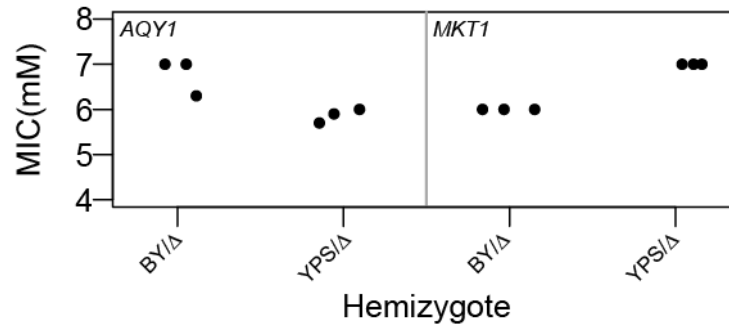


Figure S6. Raw data plotted for the RH results depicted in the previous figure.

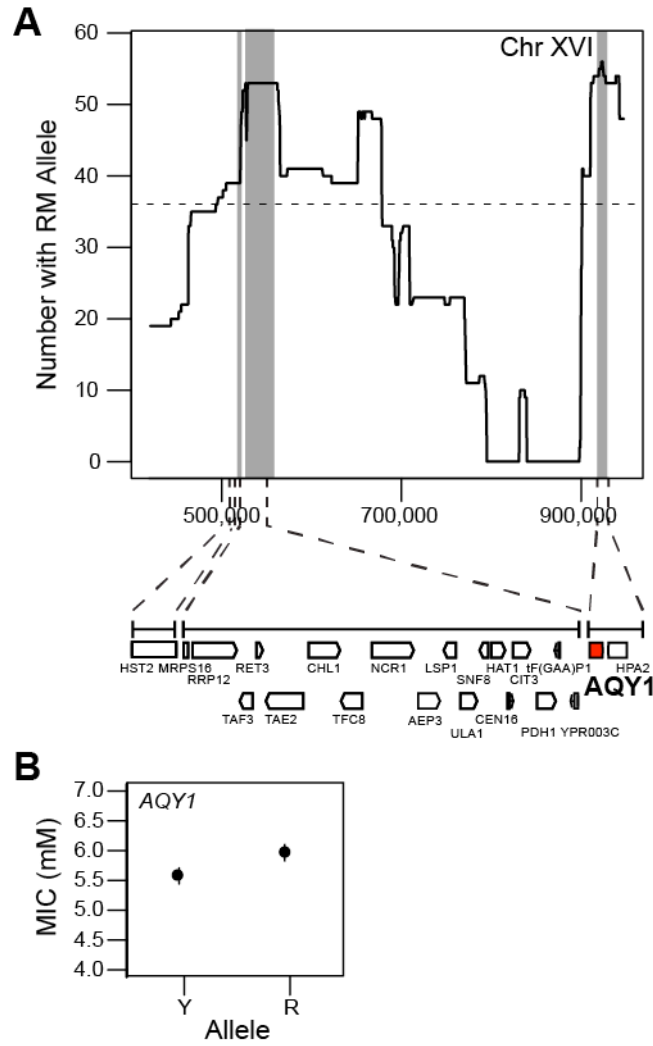


Figure S7. Cloning of *AQY1* in the RMxYPS cross. In A and B, allele replacements in a relevant RMxYPS F_2B_3 segregant were used to show that *AQY1* is the causal gene underlying the locus at the distal end of Chromosome XVI. ‘R’ and ‘Y’ refer to RM and YPS, respectively. 95% confidence intervals for MIC are provided in B.

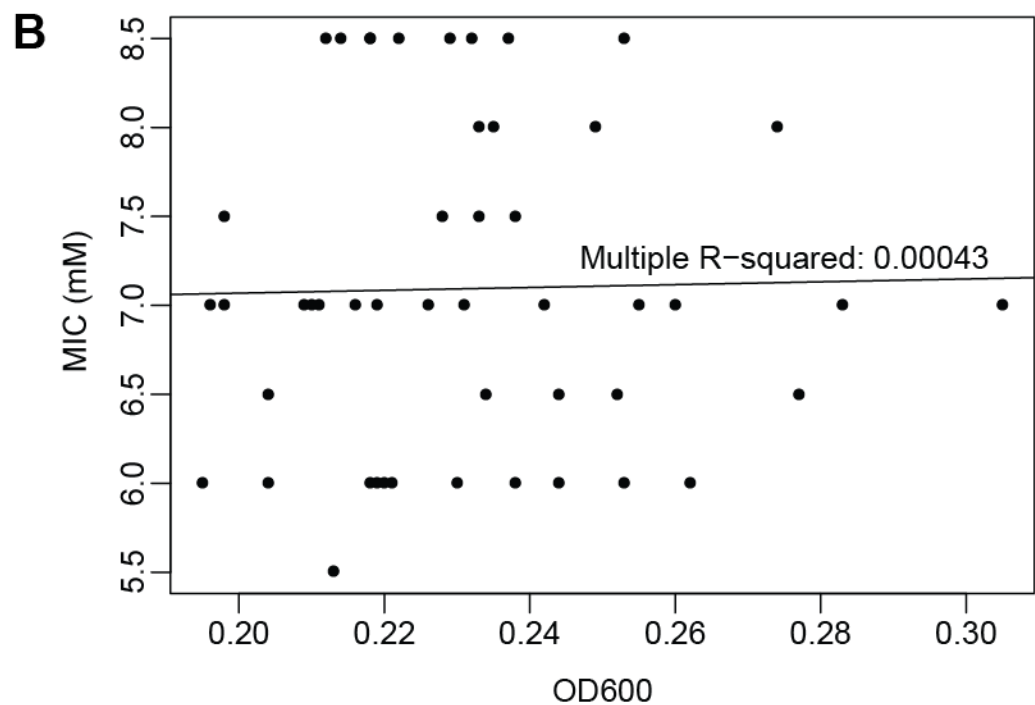
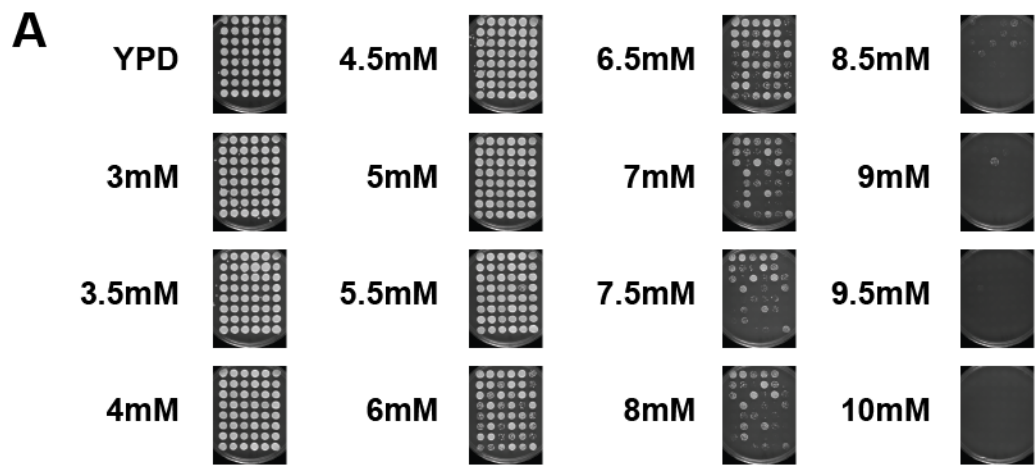


Figure S8. The correlation between MIC and OD600 values for 48 haploid strains. In A, a representative set of images depicting 48 F_2B_3 segregants that were pinned across a range of doses of hydrogen peroxide is shown. The OD600 values of the cultures these strains were pinned from were measured just prior to pinning. As can be seen in B, for this experimental setup, there is virtually no correlation between the MIC of these strains and the OD600 values of the cultures they were pinned from.

Table S1. Phenotype data for all F₂ progenitor strains as well as all F₂B₃ segregants used in this study.

Strain Name	Description	MIC (mM)
2A4	BYxRM F₂ Families 1 and 6 progenitor	7.5
2C12	BYxRM F₂ Families 2 and 7 progenitor	7.5
4E12	BYxRM F₂ Families 3 and 8 progenitor	6.5
3C9	BYxRM F₂ Families 4 and 9 progenitor	6.5
3C11	BYxRM F₂ Families 5 and 10 progenitor	6.5
5H4	RMxYPS F₂ Families 11 and 16 progenitor	>8
1E11	RMxYPS F₂ Families 12 and 17 progenitor	7.5
5E4	RMxYPS F₂ Families 13 and 18 progenitor	7
4E12	RMxYPS F₂ Families 14 and 19 progenitor	7
5C12	RMxYPS F₂ Families 15 and 20 progenitor	7
8A5	BYxYPS F₂ Families 21 and 26 progenitor	7
7H4	BYxYPS F₂ Families 22 and 28 progenitor	7

8H3	BYxYPS F₂ Families 23 and 29 progenitor	7
8A6	BYxYPS F₂ Families 24 and 27 progenitor	8
7H12	BYxYPS F₂ Families 25 and 30 progenitor	8
1bC2	BYxRMxBY F₂B₃	7
1bD10	BYxRMxBY F₂B₃	7
1bG5	BYxRMxBY F₂B₃	7
1dC3	BYxRMxBY F₂B₃	7
1dD9	BYxRMxBY F₂B₃	7
1dE10	BYxRMxBY F₂B₃	7
1dE12	BYxRMxBY F₂B₃	7
1dF6	BYxRMxBY F₂B₃	8
1gB11	BYxRMxBY F₂B₃	6
1gB12	BYxRMxBY F₂B₃	6
1gC11	BYxRMxBY F₂B₃	6
1gC12	BYxRMxBY F₂B₃	7
2aC8	BYxRMxBY F₂B₃	6
2aC9	BYxRMxBY F₂B₃	7
2aD11	BYxRMxBY F₂B₃	7
2aE9	BYxRMxBY F₂B₃	7
2aF9	BYxRMxBY F₂B₃	7
2bD9	BYxRMxBY F₂B₃	7
2bE12	BYxRMxBY F₂B₃	7
2cD10	BYxRMxBY F₂B₃	7
2cD12	BYxRMxBY F₂B₃	7
2cF11	BYxRMxBY F₂B₃	7
2gB11	BYxRMxBY F₂B₃	7
2gE7	BYxRMxBY F₂B₃	7
2gE8	BYxRMxBY F₂B₃	7
2gE9	BYxRMxBY F₂B₃	7
2gG11	BYxRMxBY F₂B₃	<8
3cC10	BYxRMxBY F₂B₃	6

3cC11	BYxRMxBY F₂B₃	6
3cC9	BYxRMxBY F₂B₃	6
3cD10	BYxRMxBY F₂B₃	6
3cD11	BYxRMxBY F₂B₃	6
3cD12	BYxRMxBY F₂B₃	6
3cD7	BYxRMxBY F₂B₃	5
3cD8	BYxRMxBY F₂B₃	5
3cD9	BYxRMxBY F₂B₃	7
3dD9	BYxRMxBY F₂B₃	6
3eA4	BYxRMxBY F₂B₃	5
3eB7	BYxRMxBY F₂B₃	6
3eC7	BYxRMxBY F₂B₃	5
4aB5	BYxRMxBY F₂B₃	6
4aC9	BYxRMxBY F₂B₃	6
4aD9	BYxRMxBY F₂B₃	6
4aE5	BYxRMxBY F₂B₃	5
4aE9	BYxRMxBY F₂B₃	6
4fA11	BYxRMxBY F₂B₃	6
4fB10	BYxRMxBY F₂B₃	7
4fB11	BYxRMxBY F₂B₃	6
4fB12	BYxRMxBY F₂B₃	5
4fC10	BYxRMxBY F₂B₃	6
4gB11	BYxRMxBY F₂B₃	6
4gE10	BYxRMxBY F₂B₃	5
4gF10	BYxRMxBY F₂B₃	5
4gF11	BYxRMxBY F₂B₃	5
4gG5	BYxRMxBY F₂B₃	6
5bB11	BYxRMxBY F₂B₃	<5
5bE4	BYxRMxBY F₂B₃	6
5gA2	BYxRMxBY F₂B₃	6
5gA6	BYxRMxBY F₂B₃	5
5gB2	BYxRMxBY F₂B₃	5
5gB5	BYxRMxBY F₂B₃	5
5gD2	BYxRMxBY F₂B₃	5
5gE2	BYxRMxBY F₂B₃	6
5gE4	BYxRMxBY F₂B₃	6
5gF1	BYxRMxBY F₂B₃	5

5gF2	BYxRMxBY F₂B₃	6
5gG3	BYxRMxBY F₂B₃	5
5gG6	BYxRMxBY F₂B₃	5
6bC2	BYxRMxRM F₂B₃	8
6bD10	BYxRMxRM F₂B₃	8
6bD2	BYxRMxRM F₂B₃	10
6bD4	BYxRMxRM F₂B₃	9
6bD8	BYxRMxRM F₂B₃	8
6bE8	BYxRMxRM F₂B₃	10
6cB8	BYxRMxRM F₂B₃	8
6dD11	BYxRMxRM F₂B₃	10
6dE11	BYxRMxRM F₂B₃	7
6dF10	BYxRMxRM F₂B₃	9
6gF1	BYxRMxRM F₂B₃	9
6gG11	BYxRMxRM F₂B₃	9
7aE3	BYxRMxRM F₂B₃	8
7aE8	BYxRMxRM F₂B₃	8
7aG12	BYxRMxRM F₂B₃	9
7aG9	BYxRMxRM F₂B₃	8
7bE10	BYxRMxRM F₂B₃	9
7bE11	BYxRMxRM F₂B₃	8
7bE3	BYxRMxRM F₂B₃	10
7bE4	BYxRMxRM	8

	F₂B₃	
7bE9	BYxRMxRM F₂B₃	8
7bF11	BYxRMxRM F₂B₃	7
7bF12	BYxRMxRM F₂B₃	7
7bF9	BYxRMxRM F₂B₃	8
8aD9	BYxRMxRM F₂B₃	8
8aE9	BYxRMxRM F₂B₃	8
8bB11	BYxRMxRM F₂B₃	8
8bC11	BYxRMxRM F₂B₃	8
8cB5	BYxRMxRM F₂B₃	8
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8cE3	BYxRMxRM F₂B₃	7
8cE5	BYxRMxRM F₂B₃	8
8eC10	BYxRMxRM F₂B₃	8
8eD10	BYxRMxRM F₂B₃	8
8eD3	BYxRMxRM F₂B₃	8
8eE1	BYxRMxRM F₂B₃	7
8eE2	BYxRMxRM F₂B₃	7
8eE3	BYxRMxRM F₂B₃	7
9aC11	BYxRMxRM F₂B₃	9
9aC4	BYxRMxRM F₂B₃	8

9aC8	BYxRMxRM F₂B₃	10
9aD10	BYxRMxRM F₂B₃	9
9aD2	BYxRMxRM F₂B₃	8
9aD9	BYxRMxRM F₂B₃	9
9bC9	BYxRMxRM F₂B₃	9
9bD8	BYxRMxRM F₂B₃	9
9bE11	BYxRMxRM F₂B₃	8
9bG8	BYxRMxRM F₂B₃	9
9cE10	BYxRMxRM F₂B₃	9
9cF11	BYxRMxRM F₂B₃	9
9cF9	BYxRMxRM F₂B₃	9
9cG8	BYxRMxRM F₂B₃	9
10bH7	BYxRMxRM F₂B₃	7
10cD9	BYxRMxRM F₂B₃	7
10cE8	BYxRMxRM F₂B₃	7
10cE9	BYxRMxRM F₂B₃	8
10cF9	BYxRMxRM F₂B₃	8
10eE2	BYxRMxRM F₂B₃	8
10eE4	BYxRMxRM F₂B₃	8.5
10eF1	BYxRMxRM F₂B₃	7
10eF4	BYxRMxRM F₂B₃	8
10eG3	BYxRMxRM	8

	F₂B₃	
10gC8	BYxRMxRM F₂B₃	7
10gD7	BYxRMxRM F₂B₃	7
10gF7	BYxRMxRM F₂B₃	7
10gG7	BYxRMxRM F₂B₃	7
10gG9	BYxRMxRM F₂B₃	8
11aC12	RMxYPSxRM F₂B₃	9
11aE11	RMxYPSxRM F₂B₃	9
11bC2	RMxYPSxRM F₂B₃	8
11bC5	RMxYPSxRM F₂B₃	8
11bD4	RMxYPSxRM F₂B₃	8
11dA4	RMxYPSxRM F₂B₃	8
11dB2	RMxYPSxRM F₂B₃	8
11dB3	RMxYPSxRM F₂B₃	7
11dB4	RMxYPSxRM F₂B₃	8
11dB5	RMxYPSxRM F₂B₃	7
11dC2	RMxYPSxRM F₂B₃	7
11dC3	RMxYPSxRM F₂B₃	6
11dC4	RMxYPSxRM F₂B₃	7
11dC5	RMxYPSxRM F₂B₃	8
11fC3	RMxYPSxRM F₂B₃	7
12aD8	RMxYPSxRM F₂B₃	7

12aE8	RMxYPSxRM F₂B₃	7
12aG7	RMxYPSxRM F₂B₃	8
12bB5	RMxYPSxRM F₂B₃	8
12bB6	RMxYPSxRM F₂B₃	7
12bC5	RMxYPSxRM F₂B₃	7
12bG7	RMxYPSxRM F₂B₃	7
12cC10	RMxYPSxRM F₂B₃	7
12cD10	RMxYPSxRM F₂B₃	7
12cD11	RMxYPSxRM F₂B₃	7
12eD9	RMxYPSxRM F₂B₃	7
12eE9	RMxYPSxRM F₂B₃	7
12fF2	RMxYPSxRM F₂B₃	7
12fG2	RMxYPSxRM F₂B₃	7
13aB12	RMxYPSxRM F₂B₃	7
13aC12	RMxYPSxRM F₂B₃	8
13aD11	RMxYPSxRM F₂B₃	7
13gD11	RMxYPSxRM F₂B₃	8
13gD3	RMxYPSxRM F₂B₃	7
13gD4	RMxYPSxRM F₂B₃	8
13gD5	RMxYPSxRM F₂B₃	7
13gE3	RMxYPSxRM F₂B₃	7
13gF2	RMxYPSxRM	8

	F₂B₃	
13gF3	RMxYPSxRM F₂B₃	7
13gG2	RMxYPSxRM F₂B₃	8
13gG3	RMxYPSxRM F₂B₃	7
13gG4	RMxYPSxRM F₂B₃	7
14aD2	RMxYPSxRM F₂B₃	7
14aD3	RMxYPSxRM F₂B₃	6
14aD4	RMxYPSxRM F₂B₃	7
14bD2	RMxYPSxRM F₂B₃	7
14bE3	RMxYPSxRM F₂B₃	7
14cC4	RMxYPSxRM F₂B₃	7
14cD2	RMxYPSxRM F₂B₃	6
14cD5	RMxYPSxRM F₂B₃	7
14cE2	RMxYPSxRM F₂B₃	7
14cF1	RMxYPSxRM F₂B₃	7
14cF2	RMxYPSxRM F₂B₃	7
14eB11	RMxYPSxRM F₂B₃	7
14fE10	RMxYPSxRM F₂B₃	7
14fF3	RMxYPSxRM F₂B₃	8
15aC3	RMxYPSxRM F₂B₃	7
15aD1	RMxYPSxRM F₂B₃	7
15aD2	RMxYPSxRM F₂B₃	7

15eB2	RMxYPSxRM F₂B₃	7
15eB3	RMxYPSxRM F₂B₃	7
15eB4	RMxYPSxRM F₂B₃	6
15eC3	RMxYPSxRM F₂B₃	6
15eC5	RMxYPSxRM F₂B₃	7
15eD12	RMxYPSxRM F₂B₃	6
15eD5	RMxYPSxRM F₂B₃	6
15eE10	RMxYPSxRM F₂B₃	7
15eE3	RMxYPSxRM F₂B₃	6
15eF2	RMxYPSxRM F₂B₃	7
15eF3	RMxYPSxRM F₂B₃	7
15eF9	RMxYPSxRM F₂B₃	6
16aF3	RMxYPSxYPS F₂B₃	5
16bD7	RMxYPSxYPS F₂B₃	<5
16bE7	RMxYPSxYPS F₂B₃	<5
16bF8	RMxYPSxYPS F₂B₃	<5
16bF9	RMxYPSxYPS F₂B₃	<5
16dB12	RMxYPSxYPS F₂B₃	<5
16dC11	RMxYPSxYPS F₂B₃	<5
16eB7	RMxYPSxYPS F₂B₃	5
16eD7	RMxYPSxYPS F₂B₃	5
16fB5	RMxYPSxYPS	5

	F₂B₃	
16fH6	RMxYPSxYPS F₂B₃	5
16gD12	RMxYPSxYPS F₂B₃	4
16gE11	RMxYPSxYPS F₂B₃	<4
17aA4	RMxYPSxYPS F₂B₃	6
17aA5	RMxYPSxYPS F₂B₃	7
17aB4	RMxYPSxYPS F₂B₃	4
17aC11	RMxYPSxYPS F₂B₃	5
17aC5	RMxYPSxYPS F₂B₃	5
17aC7	RMxYPSxYPS F₂B₃	5
17aD3	RMxYPSxYPS F₂B₃	6
17aD9	RMxYPSxYPS F₂B₃	5
17aE6	RMxYPSxYPS F₂B₃	5
17aF4	RMxYPSxYPS F₂B₃	5
17bB11	RMxYPSxYPS F₂B₃	5
17bD1	RMxYPSxYPS F₂B₃	5
17bD2	RMxYPSxYPS F₂B₃	5
17cA10	RMxYPSxYPS F₂B₃	5
17cB8	RMxYPSxYPS F₂B₃	<4
18cA4	RMxYPSxYPS F₂B₃	5
18cA5	RMxYPSxYPS F₂B₃	6
18cB11	RMxYPSxYPS F₂B₃	6

18cB8	RMxYPSxYPS F₂B₃	6
18cC8	RMxYPSxYPS F₂B₃	6
18cE12	RMxYPSxYPS F₂B₃	5
18cF2	RMxYPSxYPS F₂B₃	6
18fC12	RMxYPSxYPS F₂B₃	5
18fD4	RMxYPSxYPS F₂B₃	5
18gB11	RMxYPSxYPS F₂B₃	5
18gB4	RMxYPSxYPS F₂B₃	5
18gC8	RMxYPSxYPS F₂B₃	6
18gD8	RMxYPSxYPS F₂B₃	5
18gF2	RMxYPSxYPS F₂B₃	5
18gF7	RMxYPSxYPS F₂B₃	6
19eB9	RMxYPSxYPS F₂B₃	6
19eC10	RMxYPSxYPS F₂B₃	6
19eF8	RMxYPSxYPS F₂B₃	6
19eF9	RMxYPSxYPS F₂B₃	6
19fA1	RMxYPSxYPS F₂B₃	<5
19fB1	RMxYPSxYPS F₂B₃	6
19fC1	RMxYPSxYPS F₂B₃	5
19fC4	RMxYPSxYPS F₂B₃	5
19fD9	RMxYPSxYPS F₂B₃	6
19fG2	RMxYPSxYPS	5

	F₂B₃	
19fG4	RMxYPSxYPS F₂B₃	5
19fG6	RMxYPSxYPS F₂B₃	5
19gC11	RMxYPSxYPS F₂B₃	8
19gD1	RMxYPSxYPS F₂B₃	6
19gE11	RMxYPSxYPS F₂B₃	5
20cC2	RMxYPSxYPS F₂B₃	5
20cC8	RMxYPSxYPS F₂B₃	5
20cD12	RMxYPSxYPS F₂B₃	5
20cD7	RMxYPSxYPS F₂B₃	5
20cF3	RMxYPSxYPS F₂B₃	4
20dB11	RMxYPSxYPS F₂B₃	6
20dC11	RMxYPSxYPS F₂B₃	5
20dD4	RMxYPSxYPS F₂B₃	6
20dF10	RMxYPSxYPS F₂B₃	5
20eA5	RMxYPSxYPS F₂B₃	6
20eC2	RMxYPSxYPS F₂B₃	6
20eD1	RMxYPSxYPS F₂B₃	5
20eD2	RMxYPSxYPS F₂B₃	5
21aA10	BYxYPSxBY F₂B₃	6
21aB5	BYxYPSxBY F₂B₃	5
21aC5	BYxYPSxBY F₂B₃	6
21aE2	BYxYPSxBY F₂B₃	6
21aF7	BYxYPSxBY F₂B₃	6

21aF8	BYxYPSxBY F₂B₃	6
21bC11	BYxYPSxBY F₂B₃	6
21bC3	BYxYPSxBY F₂B₃	6
21cB10	BYxYPSxBY F₂B₃	5
21cB5	BYxYPSxBY F₂B₃	6
21cE2	BYxYPSxBY F₂B₃	5
21cE8	BYxYPSxBY F₂B₃	6
21dC5	BYxYPSxBY F₂B₃	6
21dF3	BYxYPSxBY F₂B₃	6
22cC2	BYxYPSxBY F₂B₃	8
22cC3	BYxYPSxBY F₂B₃	8
22cD3	BYxYPSxBY F₂B₃	8
22cD4	BYxYPSxBY F₂B₃	8
22cE3	BYxYPSxBY F₂B₃	7
22cE4	BYxYPSxBY F₂B₃	7
22cF4	BYxYPSxBY F₂B₃	7
22cF5	BYxYPSxBY F₂B₃	7
22cF8	BYxYPSxBY F₂B₃	7
22dE12	BYxYPSxBY F₂B₃	8
22dE3	BYxYPSxBY F₂B₃	7
22dF5	BYxYPSxBY F₂B₃	8
22dG4	BYxYPSxBY F₂B₃	7
23dC11	BYxYPSxBY F₂B₃	7
23dF3	BYxYPSxBY F₂B₃	7
23fB2	BYxYPSxBY F₂B₃	7
23fB3	BYxYPSxBY F₂B₃	7
23fC11	BYxYPSxBY F₂B₃	7
23fE1	BYxYPSxBY F₂B₃	7
23fE7	BYxYPSxBY F₂B₃	7
23fF7	BYxYPSxBY F₂B₃	7
23fF8	BYxYPSxBY F₂B₃	6
23fF9	BYxYPSxBY F₂B₃	7
23gD11	BYxYPSxBY F₂B₃	7
23gD9	BYxYPSxBY F₂B₃	7
23gE8	BYxYPSxBY F₂B₃	6
23gF10	BYxYPSxBY F₂B₃	7
23gG3	BYxYPSxBY F₂B₃	7

25cA2	BYxYPSxYPS F₂B₃	6
25cA5	BYxYPSxYPS F₂B₃	6
25cB4	BYxYPSxYPS F₂B₃	6
25cC4	BYxYPSxYPS F₂B₃	6
25cC8	BYxYPSxYPS F₂B₃	6
25cE2	BYxYPSxYPS F₂B₃	6
25cF2	BYxYPSxYPS F₂B₃	6
25eA10	BYxYPSxYPS F₂B₃	6
25eA11	BYxYPSxYPS F₂B₃	6
25eA12	BYxYPSxYPS F₂B₃	6
25eB10	BYxYPSxYPS F₂B₃	6
25eB9	BYxYPSxYPS F₂B₃	6
25eD10	BYxYPSxYPS F₂B₃	6
25eE2	BYxYPSxYPS F₂B₃	6
25eF2	BYxYPSxYPS F₂B₃	6
26aC10	BYxYPSxYPS F₂B₃	6
26aE1	BYxYPSxYPS F₂B₃	6
26aF7	BYxYPSxYPS F₂B₃	6
26bC9	BYxYPSxYPS F₂B₃	5
26bD11	BYxYPSxYPS F₂B₃	6
26eA1	BYxYPSxYPS F₂B₃	6
26eC7	BYxYPSxYPS	7

	F₂B₃	
26eE10	BYxYPSxYPS F₂B₃	7
26eG11	BYxYPSxYPS F₂B₃	7
26gA7	BYxYPSxYPS F₂B₃	8
26gB2	BYxYPSxYPS F₂B₃	6
26gD10	BYxYPSxYPS F₂B₃	6
26gD7	BYxYPSxYPS F₂B₃	6
26gG11	BYxYPSxYPS F₂B₃	6
28aC2	BYxYPSxYPS F₂B₃	6
28bB4	BYxYPSxYPS F₂B₃	6
28bC5	BYxYPSxYPS F₂B₃	6
28bH6	BYxYPSxYPS F₂B₃	6
28cD5	BYxYPSxYPS F₂B₃	7
28cD7	BYxYPSxYPS F₂B₃	6
28cE1	BYxYPSxYPS F₂B₃	6
28cH8	BYxYPSxYPS F₂B₃	6
28dA4	BYxYPSxYPS F₂B₃	6
28dC9	BYxYPSxYPS F₂B₃	6
28dD7	BYxYPSxYPS F₂B₃	6
28fB2	BYxYPSxYPS F₂B₃	6
28fB6	BYxYPSxYPS F₂B₃	6
28fC2	BYxYPSxYPS F₂B₃	6

28fD9	BYxYPSxYPS F₂B₃	6
29eB3	BYxYPSxYPS F₂B₃	6
29eC6	BYxYPSxYPS F₂B₃	7
29eD2	BYxYPSxYPS F₂B₃	5
29eD4	BYxYPSxYPS F₂B₃	6
29eE7	BYxYPSxYPS F₂B₃	6
29fA3	BYxYPSxYPS F₂B₃	6
29fB3	BYxYPSxYPS F₂B₃	6
29fD12	BYxYPSxYPS F₂B₃	6
29fG12	BYxYPSxYPS F₂B₃	6
29gB3	BYxYPSxYPS F₂B₃	6
29gC1	BYxYPSxYPS F₂B₃	7
29gD2	BYxYPSxYPS F₂B₃	4
29gD9	BYxYPSxYPS F₂B₃	6
29gF7	BYxYPSxYPS F₂B₃	5
29gG7	BYxYPSxYPS F₂B₃	6
30aD4	BYxYPSxYPS F₂B₃	6
30bB12	BYxYPSxYPS F₂B₃	6
30bB4	BYxYPSxYPS F₂B₃	6
30cB4	BYxYPSxYPS F₂B₃	6
30cD8	BYxYPSxYPS F₂B₃	6
30eB2	BYxYPSxYPS	5

	F₂B₃	
30eC12	BYxYPSxYPS F₂B₃	5
30eE4	BYxYPSxYPS F₂B₃	6
30eE9	BYxYPSxYPS F₂B₃	5
30fE2	BYxYPSxYPS F₂B₃	5
30fE4	BYxYPSxYPS F₂B₃	5
30gC1	BYxYPSxYPS F₂B₃	5
30gF1	BYxYPSxYPS F₂B₃	5

Table S2. All putative QTL and associated genes.

Cross	Family	Backcross_Parent	Chromosome	Pos_Start	Pos_End	Q-value	Gene(s)
BYxRM	5	BY	1	203222	229104	0.491374926	YAR053W, IMD1, FLO1, YAR060C, YAR069C, YAR068W, YAR075W, YAR066W, YAR070C, PHO11, YAR064W
BYxYPS	21	BY	1	195677	206489	0.010700326	FLO1, SWH1, YAR047C
RMxYPS	15	RM	2	711791	713780	0.063778622	ENP1, RRT2
RMxYPS	18	YPS	2	741096	801523	0.018056481	MAL33, CHK1, SAF1, VBA2, YBR284W, BIT2, MRPL37, SUL1, YBR287W, SDH8, UBX7, BSD2, SSH1, RIF1, DPB3, EFM2, SNF5, PCA1, APE3, MRPL27, PPS1, PHO89, CTP1, PAF1, APM3, YBR292C, YBR296C-A, HSM3, DUG2, YBR285W, YBR277C
RMxYPS	19	YPS	2	751853	799717	0.007614068	SAF1, VBA2, YBR284W, SUL1, YBR287W, BSD2, SSH1, RIF1, DPB3, SNF5, PCA1, APE3, MRPL27, PPS1, PHO89, CTP1, PAF1, APM3, YBR292C, DUG2, YBR285W, YBR277C
BYxYPS	22	BY	2	183084	204924	0.125418612	YBL012C, FUS3, POP8, FMT1, PEP1, ACH1, APN2, RRN6, RFT1, SCT1
BYxYPS	26	YPS	2	489432	496917	0.055277584	ATG14, TPS1, OPY1, SHE3, VMA2, YBR126W-B, YBR126W-A
BYxYPS	26	YPS	2	683414	699559	0.155461499	YBR232C, ABD1, YBR238C, PBP2, ERT1, PRP5, DAD3, ARC40, VHC1
BYxRM	3	BY	3	46486	51491	0.253092233	MGR1, YCL046W, GLK1, EMC1, YCL042W, YCL041C, PDI1
BYxRM	10	RM	3	105047	145017	0.002878526	ADY2, CIT2, ADP1, LDB16, MRPL32, STP22, PGK1, YCR013C, CDC10, YCL007C, YCL001W-B, YCL001W-A, RVS161, POL4, YCR001W, YCL002C, PGS1, YCR015C, ILV6, SAT4, YCR007C, RER1, YCR016W, YCP4, YCR006C, VMA9, CWH43
BYxRM	2	BY	3	157998	201190	0.003769973	TAF2, RRP43, BPH1, RBK1, MATALPHA1, RIM1, YCR023C, SNT1, ELO2, RPS14A, YCR025C, BUD5, SLM5, YCR041W, MATALPHA2, YCR038W-A, PHO87, RHB1, FEN2, SYP1, NPP1, PMP1, YCR024C-B
BYxRM	1	BY	3	167725	201259	0.008827553	TAF2, RRP43, BPH1, RBK1, MATALPHA1, RIM1, SNT1, ELO2, RPS14A, BUD5, YCR041W, MATALPHA2, YCR038W-A, PHO87, RHB1, FEN2, SYP1
BYxRM	4	BY	3	167725	204898	0.001477316	TAF2, RRP43, BPH1, RBK1, MATALPHA1, RIM1, SNT1, ELO2, RPS14A, BUD5, YCR041W, MATALPHA2, YCR038W-A, PHO87, RHB1, FEN2, SYP1
BYxRM	3	BY	3	188419	204751	0.007469736	TAF2, RRP43, RBK1, MATALPHA1, SNT1, ELO2, BUD5, YCR041W, MATALPHA2, YCR038W-A, PHO87
BYxRM	5	BY	3	193829	201190	0.049211775	TAF2, RBK1, MATALPHA1, BUD5, YCR041W, MATALPHA2, YCR038W-

							A, PHO87
RMxYPS	20	YPS	3	57843	95149	0.081297613	LEU2, FRM2, HBN1, AGP1, YCL019W, GFD2, KCC4, RRP7, YCL023C, DCC1, MXR2, YCL022C, HIS4, NFS1, GRX1, YCL021W-A, BIK1, YCL020W, STE50, RNQ1, FUS1, SRO9, LSB5
RMxYPS	12	RM	3	81816	233246	0.000807773	LEU2, ADY2, HSP30, CIT2, TAF2, RRP43, SRD1, BPH1, YCR018C-A, SGF29, PWP2, YCR045W-A, YCL019W, ADP1, RBK1, LDB16, PET18, YCR061W, RRT12, GBP2, RSC6, KCC4, YCR051W, YCR064C, RAD18, MRPL32, STP22, MATALPHA1, RIM1, YCR023C, ARE1, SNT1, PGK1, HTL1, DCC1, YIH1, YCR013C, BUD31, YCR022C, ELO2, SED4, CDC10, YCR050C, YCL022C, NFS1, YCR043C, YCL007C, THR4, YCL001W-B, YCL001W-A, RVS161, RPS14A, POL4, YCR001W, YCR025C, YCL021W-A, CTR86, IMG1, BUD3, YCL002C, PGS1, BUD5, YCL020W, YCR015C, ILV6, YCR049C, SLM5, SAT4, HCM1, YCR007C, YCR041W, MATALPHA2, RER1, YCR038W-A, YCR047W-A, YCR016W, PHO87, RHB1, TAH1, YCL012C, MAK32, FEN2, PER1, YCP4, YCR006C, VMA9, SYP1, CWH43, NPP1, BUD23, MAK31, PMP1, YCR024C-B
RMxYPS	14	RM	3	93902	209649	0.000775724	ADY2, HSP30, CIT2, TAF2, RRP43, SRD1, BPH1, YCR018C-A, SGF29, YCR045W-A, ADP1, RBK1, LDB16, PET18, RRT12, GBP2, MRPL32, STP22, MATALPHA1, RIM1, YCR023C, SNT1, PGK1, HTL1, DCC1, YCR013C, YCR022C, ELO2, CDC10, NFS1, YCR043C, YCL007C, YCL001W-B, YCL001W-A, RVS161, RPS14A, POL4, YCR001W, YCR025C, BUD3, YCL002C, PGS1, BUD5, YCR015C, ILV6, SLM5, SAT4, YCR007C, YCR041W, MATALPHA2, RER1, YCR038W-A, YCR016W, PHO87, RHB1, YCL012C, MAK32, FEN2, PER1, YCP4, YCR006C, VMA9, SYP1, CWH43, NPP1, MAK31, PMP1, YCR024C-B
RMxYPS	11	RM	3	152950	201983	0.001049241	HSP30, TAF2, RRP43, BPH1, RBK1, PET18, MATALPHA1, RIM1, YCR023C, SNT1, HTL1, YCR022C, ELO2, RPS14A, YCR025C, BUD5, SLM5, YCR041W, MATALPHA2, YCR038W-A, PHO87, RHB1, MAK32, FEN2, SYP1, NPP1, MAK31, PMP1, YCR024C-B
RMxYPS	13	RM	3	165408	206234	0.003780424	TAF2, RRP43, BPH1, RBK1, MATALPHA1, RIM1, SNT1, ELO2, RPS14A, BUD5, YCR041W, MATALPHA2, YCR038W-A, PHO87, RHB1, FEN2, SYP1, NPP1
RMxYPS	15	RM	3	201027	207706	0.001132588	TAF2, YCR043C, YCR041W, PER1
RMxYPS	16	YPS	3	208955	209911	0.178486112	YCR045W-A, RRT12

							LEU2, ADY2, HSP30, CIT2, TAF2, RRP43, SRD1, AGP1, BPH1, YCR018C-A, SGF29, YCL019W, ADP1, RBK1, LDB16, PET18, GBP2, KCC4, MRPL32, STP22, MATALPHA1, RIM1, YCR023C, YCL023C, SNT1, PGK1, HTL1, DCC1, YCR013C, YCR022C, ELO2, CDC10, YCL022C, NFS1, YCL007C, YCL001W-B, YCL001W-A, RVS161, RPS14A, POL4, YCR001W, YCR025C, YCL021W-A, BUD3, YCL002C, PGS1, BUD5, YCL020W, YCR015C, ILV6, SLM5, SAT4, YCR007C, YCR041W, MATALPHA2, RER1, YCR038W-A, YCR016W, PHO87, RHB1, YCL012C, MAK32, FEN2, YCP4, YCR006C, VMA9, SYP1, CWH43, NPP1, MAK31, PMP1, YCR024C-B
BYxYPS	21	BY	3	77849	201190	0.00096418	
BYxYPS	22	BY	3	95658	205887	0.001740149	ADY2, HSP30, CIT2, TAF2, RRP43, SRD1, BPH1, YCR018C-A, SGF29, ADP1, RBK1, LDB16, PET18, GBP2, MRPL32, STP22, MATALPHA1, RIM1, YCR023C, SNT1, PGK1, HTL1, DCC1, YCR013C, YCR022C, ELO2, CDC10, YCL007C, YCL001W-B, YCL001W-A, RVS161, RPS14A, POL4, YCR001W, YCR025C, BUD3, YCL002C, PGS1, BUD5, YCR015C, ILV6, SLM5, SAT4, YCR007C, YCR041W, MATALPHA2, RER1, YCR038W-A, YCR016W, PHO87, RHB1, YCL012C, MAK32, FEN2, YCP4, YCR006C, VMA9, SYP1, CWH43, NPP1, MAK31, PMP1, YCR024C-B
BYxYPS	25	BY	3	187854	211349	0.002028799	TAF2, RRP43, YCR045W-A, RBK1, RRT12, MATALPHA1, SNT1, ELO2, YCR043C, IMG1, BUD5, YCR041W, MATALPHA2, YCR038W-A, YCR047W-A, PHO87, PER1, BUD23
BYxYPS	23	BY	3	197218	201628	0.003984867	TAF2, MATALPHA1, BUD5, YCR041W, MATALPHA2, YCR038W-A
BYxYPS	28	YPS	3	252270	303525	0.008591062	HMRA2, HMRA1, KIN82, TUP1, YCR081C-A, CDC39, TRX3, YCR099C, GIT1, MSH3, ABP1, YCR101C, SRB8, YCR085W, YCR095W-A, PTC6, CDC50, CSM1, YCR097W-A, YCR087W, OCA4, PAT1, YCR100C, FIG2, AHC2, YCR087C-A, YCR090C
BYxRM	2	BY	4	1394088	1417873	0.107647236	YDR476C, TRS31, SDC1, SNF1, YDR467C, DIG2, PRP3, PKH3, UGO1, TLG1, JIP4, RPL27B, RMT2, PEX29, SNM1
RMxYPS	20	YPS	4	625474	714612	0.022125027	YDR114C, YDR102C, BMH2, TRM1, YDR090C, YDR094W, FOB1, YDR124W, INO2, TRS85, YDR109C, TMA64, TMN2, DPB4, COX26, ARP10, MTC5, SPO71, RLI1, ECM18, PDS1, STE5, MRPL1, TVP15, UBC13, SAC6, GIS1, ALT2, KIN1, IRC2, SWF1, VBA4, TMS1, YDR118W-A, DNF2, YDR115W, GRX3, ARX1,

							ARO1, YDR095C, APC4, YDR098C-B, YDR098C-A, MSH6
BYxYPS	28	YPS	4	115568	130869	0.031997294	RPL41A, YDL185C-A, RPL35A, PPH22, ARF1, VMA1, RBS1, YDL186W, UFD2, YDL187C, NUS1
BYxYPS	22	BY	4	637466	751285	0.125418612	YDR114C, YDR102C, BMH2, DOP1, TRM1, FOB1, VPS61, TAF12, YDR124W, INO2, TRS85, YDR109C, TMA64, TMN2, PEX7, DPB4, YCF1, COX26, ARP10, MTC5, SPO71, ECM18, MTQ2, PDS1, STE5, SWI5, YDR131C, MRPL1, TVP15, SAC6, GIS1, ALT2, KIN1, IRC2, SWF1, SAN1, YDR134C, RUB1, VBA4, TMS1, YDR118W-A, FIN1, YDR132C, YDR115W, GRX3, ARX1, RGP1, MKC7, ARO1, APC4, YDR098C-B, YDR098C-A, MSH6, YDR133C, HPR1
BYxRM	2	BY	5	190283	206003	0.107647236	SRB4, YER023C-A, GPA2, ISC1, PRO3, GCD11, RPN3, SPC25, YAT2, SBH2, AFG3
BYxYPS	22	BY	5	28649	29909	0.125418612	AVT2, SIT1
BYxYPS	29	YPS	5	116577	334274	0.087365008	ZRG8, EAF5, PIC2, THO1, HEM14, SAH1, URA3, SRB4, NOP16, UTP7, GIM4, MEI4, YER006C-A, YEL020C, VAB2, MXR1, ICP55, GIP2, MMS21, CHZ1, MNN1, GPP2, KRE29, YEL020C-B, YEL010W, SER3, WBP1, RNR1, YER023C-A, YER039C-A, JHD1, FMP52, MIG3, ACA1, YER079C-A, GPA2, UBC8, YEL008C-A, ARG5,6, PRE1, YER077C, YEL008W, RPS24A, EDC3, CEM1, ISC1, PCL6, YER087C-A, YER084W, IRC22, ERG28, PRO3, HOM3, ILV1, FCY21, VAC8, YER068C-A, PMI40, GCD11, PRP22, FIR1, RPL34A, YER078W-A, YER076W-A, PET117, VTC1, PHM8, HMF1, MOT2, YER053C-A, NUG1, DOT6, CHO1, SAP1, YER010C, PMP2, GTT3, YER084W-A, TMA20, MIT1, RGI1, YEL018C-A, SMB1, YND1, YER067C-A, RPN3, ISD11, GCN4, SPO73, ALD5, TIR1, YER034W, YER079W, YER085C, YEA6, YER046W-A, RSM18, RRT13, YEL014C, SPC25, HIS1, YPT31, BIM1, GET2, YEA4, YEL009C-A, HVG1, YAT2, YEN1, TDA2, NTF2, EDC2, GLC3, AIM9, PTP3, SBH2, TPA1, SEC3, FAA2, YER066C-A, FCY2, AIM10, PAC2, GAL83, AFG3, ARB1, YER038W-A, GLN3, CAJ1, YER076C, SBH1, FCY22, BUD25, VHR2, YOS1, TIM9, ICL1, NPP2
BYxYPS	30	YPS	5	117889	193525	0.001861178	EAF5, HEM14, NOP16, GIM4, YER006C-A, YEL020C, VAB2, MMS21, MNN1, YEL010W, WBP1, FMP52, UBC8, YEL008C-A, PRE1, YEL008W, EDC3, ISC1, IRC22, VAC8, PMI40, PRP22, NUG1, YER010C, PMP2, GTT3, TMA20, MIT1, YEL018C-A, YND1, GCN4, TIR1, YEA6, YEL014C, SPC25, BIM1, YEA4,

							YEL009C-A, NTF2, GLC3, SEC3, FAA2, PAC2, AFG3, BUD25, NPP2
BYxYPS	21	BY	5	379332	402268	0.033741162	KAP123, SPR6, TMN3, SWI4, YER119C-A, AVT6, BOI2, SHO1, RPL23B, SCS2, SLX8, LSM4
BYxYPS	23	BY	5	547317	564921	0.245655034	YER186C, PDA1, FAU1, ISC10, FMP10, YER181C, SLO1, TOG1, DMC1, PUG1
RMxYPS	16	YPS	6	30312	74155	0.063848262	OTU1, RPL22B, MOB2, SEC53, YFL051C, TUB2, FMP32, RPO41, RGD2, ACT1, YFL040W, EMP47, YPT1, FET5, SWP82, ALR2, YFL042C, YFL034W, YFL041W-A, RIM15
RMxYPS	19	YPS	6	43492	58329	0.028072187	OTU1, SEC53, TUB2, ACT1, YFL040W, YPT1, FET5, YFL042C, YFL041W-A
RMxYPS	15	RM	7	190640	197152	0.020837377	YGL165C, YRB30, RAD54, CUP2
RMxYPS	16	YPS	7	363327	678868	0.038924507	TAM41, ALG13, GEP7, PNC1, SEC9, MSB2, TYW3, PRP18, YGR079W, TRP5, RSC1, CAX4, VMA7, MPO1, ALG2, PMC1, TPC1, MRP13, YGR066C, YGR054W, ALK1, PMA1, TFC4, YGR042W, PEX8, CUL3, DST1, RRP46, UGA1, YGR051C, YGL063C-A, PYC1, NMA2, SLX9, GSC2, STT3, PUF4, RPL7A, DBF2, RNA15, SPT4, LST7, MST27, PAC10, YGR017W, ECT1, PDR1, MUP1, CDH1, RAD6, YGL074C, YGR039W, YGR025W, IMO32, ERG25, PRP31, RPL24A, RPL11B, BUD9, SDS23, HEM2, YGR067C, YGL036W, YGR073C, YGR018C, YGR038C-A, YGR038C-B, SNU71, YGR050C, PUS2, TOM20, CWH41, YGR021W, YGR035C, RPB9, ATE1, AGA2, UPF3, BRP1, SPR3, RIM8, YGR064W, MIG1, MRPL25, MNP1, LEU1, YGL052W, AFT1, NQM1, ERG4, SCW11, RPN14, NPY1, HNM1, YGR045C, ORM1, YGR026W, PIL1, YGR027W-A, YGR027W-B, VAS1, PIB2, PRP38, PDC6, OLE1, RME1, YGL041C, ART5, YGL039W, YGL006W-A, CKB1, PEX31, RPT6, YGR016W, YGL024W, RPL26B, CTT1, HSF1, KAP122, YGL007C-A, YGR022C, RPL30, UTP22, ADE6, YGR035W-A, YGL069C, YGR015C, EFM5, PKP2, KSS1, ERG26, YGR012W, YGR053C, STF2, YGL014C-A, YBP2, PEF1, YGL041W-A, ASK10, VHT1, GET1, POP6, PRM8, ENV11, SGF73, NAG1, YGL034C, JAC1, SCM4, TFG2, TIF4632, YGR011W, CGR1, SCL1, COG7, MPS2, ACB1, RPS25A, MRH4, HOP2, DRN1, COX18, TWF1, YGR068W-A, SMD1, MSP1, ROM1, ERV14, YGL041C-B, SWC4, YGL042C, OCH1, GCD2, YGR069W, ERP6, FMP48, UFD1, THG1, DUO1, ERV1, PGD1, NNF2, MTL1, YGL015C, TIM21, YGL072C
RMxYPS	16	YPS	7	761881	768254	0.178486112	LSB1, YGR137W, TPO2, CBF2, YGR139W, PRE9

BYxYPS	29	YPS	7	42652	52589	0.035015252	YGL239C, KAP114, YGL242C, CSE1, TAD1, RTF1, DOC1
BYxYPS	26	YPS	7	627366	667124	0.113087961	YGR079W, MRP13, PEX8, SLX9, PAC10, PRP31, RPL11B, YGR073C, TOM20, UPF3, MRPL25, PIL1, PRP38, PDC6, CTT1, UTP22, ENV11, TWF1, SMD1, ROM1, GCD2, YGR069W, NNF2
BYxYPS	30	YPS	7	645458	739655	0.000322546	MEP1, TPC1, SPT6, MRP13, TEL2, RRP46, DAM1, SRB5, DBF2, NOP7, PRP31, YGR117C, RPL11B, CLD1, ESP1, VOA1, CLB1, COG2, GTF1, RPS23A, YGR114C, PIL1, VAS1, CLB6, NUP57, PDC6, MDR1, CTT1, PPT1, UTP22, YGR111W, YGR122C-A, YGR115C, ASK10, PCP1, YGR109W-B, YGR109W-A, DRN1, VMA21, SHY1, GCD2, YGR122W, YGR107W, YGR121W-A, NNF2
BYxYPS	28	YPS	7	645497	750922	0.002065011	MEP1, TPC1, SPT6, MRP13, TEL2, UTP8, RRP46, DAM1, YGR125W, SRB5, DBF2, NOP7, PRP31, YGR117C, RPL11B, CLD1, ESP1, VOA1, CLB1, COG2, YGR126W, GTF1, SYF2, RPS23A, YGR114C, PIL1, VAS1, CLB6, NUP57, ASN2, PDC6, MDR1, CTT1, PPT1, UTP22, YGR111W, YGR122C-A, YGR115C, ASK10, PCP1, YGR127W, YGR109W-B, YGR109W-A, DRN1, VMA21, SHY1, GCD2, YGR122W, YGR107W, YGR121W-A, NNF2
BYxYPS	21	BY	7	718809	801320	0.033741162	RPL24B, FHN1, LSB1, YGR151C, MEP1, SPT6, UTP8, ECL1, CCM1, DAM1, CYS4, YGR125W, PHB1, BTN2, YGR117C, ENP2, YGR137W, COG2, YGR126W, PEX4, TPO2, SYF2, RPS23A, YGR114C, VPS62, PTI1, NUP57, ASN2, CAF130, PPT1, TH14, YGR122C-A, YGR115C, CBF2, RSR1, NAT2, YGR149W, YGR130C, YGR139W, YGR146C-A, YGR127W, PRE9, SKN1, YGR122W, YGR121W-A, YGR153W, GTO1
BYxYPS	26	YPS	7	833108	843710	0.155461499	CLC1, LSO2, PSD2, PUS6, YGR168C, MSM1, YIP1
BYxRM	2	BY	8	144394	192125	0.107647236	ERC1, RPN1, BCD1, PUT2, BRL1, ECM12, SRB2, YHR020W, YHR028W-A, DAP2, THR1, RRM3, YHR033W, MSC7, VMA10, NCP1, SLT2, RRF1, YHR022C-A, VMA16, MYO1, MAS2, YHR032W-A, RPS27B, YHI9, NEL1, YHR032C-A, YHR022C, PIH1
BYxRM	9	RM	8	457581	483296	0.104940603	GND1, STB5, YHR182W, PFS1, SVP26, SSP1, YHR180W-A, GPI16, YHR177W, IKI1, YHR180C-B, YHR182C-A, KOG1, OYE2, YHR180W
BYxYPS	25	BY	8	37676	66281	0.073334861	SPO11, ECM29, NPR3, RIM4, GOS1, SNF6, YHL026C, OCA5, YHL030W-A, RIM101, GUT1, OPI1, AIM17, WSC4
BYxRM	10	RM	9	102974	126569	0.042293767	RRT14, AYR1, TAO3, STH1, KGD1, MET18, ASG1
RMxYPS	11	RM	9	83	996	0.025494016	YIL177C, YIL177W-A

RMxYPS	13	RM	9	83	996	0.31547553	YIL177C, YIL177W-A
RMxYPS	16	YPS	9	70698	90546	0.063848262	AXL2, TMA108, YIL141W, ATG32, SLN1, NDC80, YIL142C-A, PAN6, REV7, CCT2, TPM2, SSL2
BYxYPS	29	YPS	9	108378	150602	0.001715324	PRM5, RRT14, AYR1, HIS5, TAO3, QDR2, YIL115W-A, STH1, RHO3, SDP1, KGD1, SIM1, MET18, QDR1, NUP159, POR2, RPI1, POG1
BYxYPS	28	YPS	9	145698	170435	0.008591062	PFK26, YIL108W, SLM1, COX5B, MOB1, HPM1, SDP1, HOS4, SHQ1, YIL105W-A, NUP159, SEC24, POR2
BYxYPS	28	YPS	9	247035	250908	0.031997294	VHR1, RGI2, YIL058W
RMxYPS	13	RM	10	61893	67457	0.31547553	UBP12, YJL197C-A, PHO90
RMxYPS	12	RM	10	373527	388629	0.007353678	BET4, SNX4, YJL032W, IRC18, LOH1, KAR2, HCA4, MAD2, NUP192, VPS53, TAD2
RMxYPS	18	YPS	10	639618	692808	0.000385758	SGM1, IBA57, TIM8, YJR115W, HIR3, STR2, MET5, RSF2, XPT1, RPS5, YJR124C, JHD2, YJR120W, EFM3, YJR128W, TTI2, NMD5, HOM6, ENT3, STE24, YJR140W-A, MCM22, ILM1, ATP2, TDA4, MNS1, IML1, VPS70
BYxYPS	22	BY	10	422597	461507	0.043052729	YJR011C, COX16, AVT1, MHO1, YJR012C, APL1, CTK2, CYR1, OST1, LSO1, SAG1, PRE3, GPI14, YJR003C, MET3, SUI2, SYS1, MPP10, SPC1, TDH2, YJL007C, POL31
BYxRM	10	RM	11	212878	221687	0.096694763	PRR1, YKL118W, SRP21, SBA1, VPH2, DGR2, OAC1
RMxYPS	15	RM	11	6098	43246	0.063778622	YRA2, MCH2, DOA1, JEN1, COS9, SAC1, SRY1, URA1, TRP3, OXP1, STE6, FRE2, UBA1
BYxYPS	21	BY	11	306549	361056	0.109238733	YKL044W, MPE1, NUP100, ASK1, MDM35, TMA19, YKL065W-A, YKL068W-A, VPS24, MNR2, YKL063C, TOA2, FBA1, SFK1, PRI2, YET1, OAR1, SPC42, YKL050C, DCW1, BLI1, YKL069W, YKL066W, ELM1, DEF1, MSN4, YKL053W, PHD1, YNK1, YKL070W, CSE4, NUP120, ANR2
BYxRM	10	RM	12	362425	388904	0.042293767	YLR120W-A, YLR112W, YLR108C, CFT2, YLR111W, YPS1, MDN1, AHP1, AVL9, CLF1, REX3, YPS3, SRN2, CCW12, HOG1, YLR118C, MSL5
BYxRM	1	BY	12	627007	645539	0.143349655	MCP2, SSP120, IRC20, NDL1, ERF2, SYM1, YLR252W, RCK2, YEF3
RMxYPS	18	YPS	12	111423	207072	0.000385758	RAD5, UBR2, SSK1, PPR1, RLP24, DNM1, BPT1, RPL15A, LOT6, NOC3, SSL1, YEH1, AAT2, SPO75, YLR001C, BRE2, PAM18, YLR012C, IZH3, COX17, THI73, ORC3, YLR030W, PML1, ADE16, POM34, SFI1, PUF3, YLL006W-A, DRS1, SDO1, GAT3, PSR1, YLL007C, MEU1, SED5, NSE1, RTT109, EMC6, SNF7, CMS1, TEN1, YLR031W, MMM1, YEH2, DPS1, IRC25, PSR2, SOF1
RMxYPS	19	YPS	12	520774	538387	0.028072187	SKG3, MMR1, MDL1, TOS4, YLR184W, ATG26, RPL37A, PEX13, EMG1
RMxYPS	19	YPS	12	722344	729605	0.007614068	YLR299C-A, EXG1, YLR297W, ATP14, YHC1, YLR296W, ECM38

							MHT1, VPS13, YLL058W, MMP1, JLP1, YLL047W, GRC3, YLL054C, FPS1, RIX7, YLL053C, PRP19, GPI13, RNP1, COF1, YLL032C, YLL059C, GTT2, ATG10, LDB18, UBI4, YCT1, YLL037W, ENT4, AYT1, RPL8B, FRE6, IRC19, YBT1, YLL056C, SDH2, YLL044W, AQY2
BYxYPS	26	YPS	12	13986	79672	0.155461499	
BYxYPS	29	YPS	12	35854	85632	0.035015252	RRT7, VPS13, YLL047W, FRA1, GRC3, FPS1, RIX7, YLL053C, PRP19, GPI13, RNP1, COF1, TPO1, YLL032C, ATG10, LDB18, UBI4, YLL037W, ENT4, RPL8B, FRE6, IRC19, YBT1, SDH2, YLL044W, AQY2
BYxYPS	26	YPS	12	893373	904916	0.113087961	REH1, ECM19, RPS29A, SWC7, CCW14, STE23, ART10, VAC14
BYxRM	5	BY	13	37888	46262	0.172241211	CTK3, ATR1, DAT1, TAF8, VAN1
BYxRM	2	BY	13	70163	73368	0.083462688	TSL1, YML100W-A
BYxRM	8	RM	13	225572	310534	0.00485162	YMR013W-A, YAP1, PSP2, ERG5, ADI1, MIX17, YMR001C-A, UNG1, PLB2, YMR013C-A, YML012C-A, YMR010W, MRPL39, BUD22, AIM34, SEC59, PPZ1, GLO1, OST6, YMR018W, SPO20, TRM12, APT1, YPT7, TAF11, YMR007W, RAD33, YML018C, CLU1, MVP1, NSE5, RPS17A, YML007C-A, YML002W, PLB1, CDC5, SOK2, YML020W, UBX2, GIS4, TRM9, YML009C-A, HXT2, TAF4, ERV25, YML003W, ERG6, SPT5, YML009W-B
BYxRM	6	RM	13	232662	291877	0.056693699	YAP1, PSP2, ADI1, MIX17, YMR001C-A, PLB2, YML012C-A, YMR010W, MRPL39, AIM34, PPZ1, GLO1, OST6, TRM12, YPT7, TAF11, YMR007W, RAD33, YML018C, CLU1, MVP1, YML007C-A, YML002W, PLB1, CDC5, YML020W, UBX2, GIS4, TRM9, YML009C-A, HXT2, TAF4, ERV25, YML003W, ERG6, SPT5, YML009W-B
BYxRM	7	RM	13	243473	298845	0.069492625	YMR013W-A, YAP1, ADI1, MIX17, YMR001C-A, PLB2, YMR013C-A, YML012C-A, YMR010W, MRPL39, AIM34, SEC59, GLO1, TRM12, YPT7, YMR007W, RAD33, CLU1, MVP1, YML007C-A, YML002W, PLB1, CDC5, UBX2, GIS4, TRM9, YML009C-A, HXT2, TAF4, ERV25, YML003W, ERG6, SPT5, YML009W-B
BYxRM	9	RM	13	244141	298845	0.001481259	YMR013W-A, YAP1, ADI1, MIX17, YMR001C-A, PLB2, YMR013C-A, YML012C-A, YMR010W, MRPL39, AIM34, SEC59, GLO1, TRM12, YPT7, YMR007W, RAD33, CLU1, MVP1, YML007C-A, YML002W, PLB1, CDC5, UBX2, GIS4, YML009C-A, HXT2, TAF4, ERV25, YML003W, ERG6, SPT5, YML009W-B
BYxRM	5	BY	13	478297	516134	0.491374926	SHH3, YMR122C, FOL3, PKR1, SPG4, YMR114C, YMR122W-A, HFD1, RPL15B, MYO5, ILV2, ASC1, ADE17, YMR119W-A, MGR3, YMR111C, MED11, YKU80, EPO1,

							ASI1, SPC24
RMxYPS	11	RM	13	215391	274252	0.004766449	YAP1, PSP2, MIX17, YMR001C-A, TSA1, UNG1, YML012C-A, NDC1, MRPL39, AIM34, RPS18B, USA1, PP21, GLO1, OST6, TRM12, APT1, YPT7, TAF11, RCF1, YOX1, RAD33, YML018C, MVP1, NSE5, RPS17A, YML007C-A, YML002W, YML6, CDC5, YML020W, UBX2, GIS4, TRM9, YML009C-A, ERV25, YML003W, ERG6, SPT5, YML009W-B
RMxYPS	12	RM	13	247126	283371	0.007353678	YAP1, MIX17, YMR001C-A, PLB2, MRPL39, AIM34, GLO1, TRM12, YPT7, YMR007W, RAD33, MVP1, YML007C-A, YML002W, PLB1, CDC5, GIS4, YML009C-A, TAF4, YML003W, ERG6, SPT5, YML009W-B
RMxYPS	14	RM	13	247466	305906	0.007061165	YMR013W-A, YAP1, ERG5, ADI1, MIX17, YMR001C-A, PLB2, YMR013C-A, YMR010W, MRPL39, BUD22, AIM34, SEC59, GLO1, TRM12, YPT7, YMR007W, CLU1, MVP1, YML007C-A, YML002W, PLB1, CDC5, SOK2, GIS4, YML009C-A, HXT2, TAF4, YML003W, ERG6, SPT5, YML009W-B
RMxYPS	13	RM	13	253616	305303	0.003780424	YMR013W-A, YAP1, ERG5, ADI1, MIX17, YMR001C-A, PLB2, YMR013C-A, YMR010W, BUD22, AIM34, SEC59, GLO1, TRM12, YPT7, YMR007W, CLU1, MVP1, YML002W, PLB1, CDC5, SOK2, GIS4, HXT2, TAF4, YML003W
BYxYPS	21	BY	13	24474	93961	0.033741162	RPM2, YML119W, SEC65, CTK3, YML122C, ZDS2, YML094C-A, YML089C, ATR1, GIM5, TSL1, GTR1, YML101C-A, YML099W-A, YML116W-A, NUP188, DAT1, ARG81, MDM1, YML090W, YML100W-A, YML108W, VPS9, NAB6, PML39, COQ5, TAF13, UTP14, NDI1, TAF8, CAC2, BUL2, NGL3, YML096W, URA5, PHO84, CUE4, RAD10, VAN1, UFO1, PRE8
BYxYPS	23	BY	13	51084	102554	0.245655034	RPM2, SEC65, YML082W, ZDS2, YML094C-A, YML089C, ALO1, GIM5, TSL1, YML101C-A, YML099W-A, NUP188, YML083C, ARG81, MDM1, YML090W, YML100W-A, YML108W, VPS9, TUB1, PML39, AIM33, TAF13, UTP14, CAC2, YML084W, YML096W, URA5, CUE4, RAD10, UFO1, PRE8
BYxYPS	23	BY	13	512216	551554	0.245655034	STO1, ERG29, PKR1, CIN4, DLT1, RRB1, RPL13B, YMR135W-A, GID8, RIM11, JLP2, YMR141C, YMR141W-A, POM152, GAT2, SIP5, EPO1, REC114, PSO2, YMR130W, ECM16, SAS2
BYxYPS	22	BY	13	672760	674283	0.01357787	PFK2
BYxRM	1	BY	14	231035	282033	0.008827553	YNL203C, RRG9, SPS18, YNL195C, RIO2, YNL217W, YNL208W, GCR2,

							ADE12, MER1, YNL194C, SPS19, PEX17, YNL193W, YNL211C, YNL198C, RTT106, MGS1, WHI3, IES2, PSY2, CHS1, YNL205C, ALG9, SLZ1, VID27, SSB2, YNL200C, RAP1, POP1, DUG3
BYxRM	3	BY	14	244309	298111	0.120168868	YNL203C, RRG9, SPS18, IPI3, SRP1, YNL195C, RIO2, YNL208W, UBP10, YNL190W, SWT21, GCR2, MER1, YNL194C, SPS19, PEX17, NPR1, YNL193W, YNL211C, YNL198C, RTT106, WHI3, IES2, PSY2, YNL184C, CHS1, YNL205C, KAR1, SLZ1, VID27, SSB2, YNL200C, MRPL19, DUG3
BYxRM	1	BY	14	441346	467221	0.008827553	PHO23, YPT53, APP1, RHO2, TCB2, YNL089C, YNL095C, YNL097W-A, NST1, RPS7B, SNN1, TOP2, YNL092W, MKT1
BYxRM	2	BY	14	445768	467221	0.003769973	YPT53, APP1, RHO2, TCB2, YNL089C, YNL095C, NST1, SNN1, TOP2, YNL092W, MKT1
RMxYPS	15	RM	14	116882	145579	0.001132588	TOF1, PIK1, MET2, ALP1, LYP1, GOR1, YNL266W, IST1, BNI1, SEC2, BOR1, PDR17, YNL276C, BSC4
RMxYPS	13	RM	14	119277	265691	0.138936379	YNL203C, RRG9, YNL228W, CSL4, SPS18, TOF1, MPA43, LAP3, GIS2, CNM67, NAR1, ATG2, YTP1, RIO2, YNL217W, YNL208W, PIK1, CWC25, YNL235C, NRD1, GCR2, BNI4, ALP1, LYP1, ADE12, MER1, ZWF1, SPS19, PEX17, GOR1, YNL266W, RPA49, SQS1, FOL1, YNL211C, YNL234W, RTT106, MGS1, POL2, ATG4, SUI1, MRPL17, IES2, PSY2, IST1, BNI1, SIP3, YNL247W, JJJ1, ELA1, URE2, SEC2, YNL205C, ALG9, DSL1, BOR1, ORC5, SLA2, TEX1, VID27, PDR16, PDR17, SSB2, YIF1, SSU72, KEX2, RTC4, SIN4, YNL200C, RAP1, BSC4, ATX1, LTO1, POP1, RAD50, YNL226W, VPS75
RMxYPS	12	RM	14	149055	256858	0.088672194	RRG9, YNL228W, CSL4, MPA43, LAP3, GIS2, CNM67, NAR1, ATG2, YTP1, RIO2, YNL217W, YNL208W, CWC25, YNL235C, NRD1, BNI4, ADE12, MER1, ZWF1, PEX17, RPA49, SQS1, FOL1, YNL211C, YNL234W, RTT106, MGS1, POL2, ATG4, SUI1, MRPL17, IES2, SIP3, YNL247W, JJJ1, ELA1, URE2, ALG9, DSL1, ORC5, SLA2, TEX1, VID27, PDR16, SSB2, SSU72, KEX2, RTC4, SIN4, RAP1, ATX1, LTO1, POP1, RAD50, YNL226W, VPS75
RMxYPS	15	RM	14	481385	579135	0.004028506	RNH201, YDJ1, HHT2, BOP3, LAP2, YNL028W, RPL9B, APJ1, RPL16B, COG5, YNL035C, MSK1, MTQ1, SIW14, POR1, COX5A, MLF3, FKH2, OCA2, NCE103, YNL054W-B, YNL054W-A, YIP3, GPI15, YNL042W-B, SUN4, TOM7, YNL040W, MSG5, IMP4, YNL033W, YNL058C, GCD10, SLM2, COG6, AQR1, HHF2, LAT1, YNL057W,

							IDH1, BDP1, NOP2, YNL034W, ARP5, YNL043C, YNL050C, ALG11, KTR5, MKS1, YNL067W-A, YNL046W, YNL067W-B, VAC7, SFB2
RMxYPS	14	RM	14	739359	751723	0.106963807	YNR062C, YNR061C, FRE4, YNR065C, YNR064C, YNR063W
BYxYPS	22	BY	14	70598	90032	0.125418612	YNL295W, PUS4, CLA4, YNL296W, MSB3, MON2, RFC3, RIM21, PCL1, MID1
BYxYPS	22	BY	14	318592	488761	0.01357787	PHO23, MET4, FMP41, RPC19, INN1, YNL122C, YNL114C, RIA1, YNL162W-A, MFA2, YPT53, MLS1, YAF9, APJ1, FAR11, EOS1, NIS1, YNL109W, TPM1, CPT1, ALF1, CUZ1, MIC27, THO2, AAH1, MSK1, NMA111, YGP1, END3, NCS2, YNL134C, YNL146W, APP1, MLF3, LEU4, TEP1, RPC31, DBP2, SAL1, BNI5, PGA2, SRV2, YCK2, AVT4, RHO2, IBD2, DMA2, DGR1, NAF1, PGA1, TCB2, FYV6, YNL089C, YNL095C, ASI2, YNL144W-A, CBK1, YNL150W, RRT16, CYB5, IMP4, NRK1, YNL144C, YNL120C, YNL097W-A, DCP2, IGO1, FPR1, NAM9, LSM7, NST1, YNL097C-B, YNL165W, RPL42A, ESBP6, YNL115C, MEP2, YNL146C-A, RAS2, PMS1, SKO1, KRE33, RPS7B, GIM3, YNL143C, POL1, SWS2, TOM70, YSF3, SNN1, YNL103W-A, EAF7, NSG2, YNL140C, TOP2, YNL092W, NOP15, MKS1, SPC98, INP52, OCA1, MKT1, YNL108C, TOM22
BYxYPS	23	BY	14	442650	532222	0.003984867	RNH201, YD11, YPT53, RPL9B, APJ1, RPL16B, EOS1, NIS1, TPM1, MSK1, MTQ1, POR1, END3, COX5A, APP1, MLF3, FKH2, SAL1, OCA2, YNL054W-B, YNL054W-A, RHO2, SUN4, TOM7, MSG5, TCB2, YNL089C, YNL095C, IMP4, YNL058C, GCD10, NST1, AQR1, LAT1, YNL057W, PMS1, RPS7B, SWS2, NOP2, ARP5, SNN1, TOP2, YNL092W, MKS1, YNL067W-A, YNL067W-B, VAC7, MKT1
BYxYPS	25	BY	14	466586	468490	0.002028799	SNN1, MKT1
BYxYPS	23	BY	14	660540	689793	0.245655034	ATP23, TIM23, RCF2, YNR021W, MPP6, YNR029C, ARE2, HUB1, PPG1, BUD17, SEC12, ALG12, CPR8, SNF12, ABZ1, ACC1, MRPL50, YNR025C, SSK2
BYxRM	1	BY	15	125569	184291	0.032620126	YOL099C, TPT1, ADH1, MSH2, MPD2, TRM10, IZH4, ATG34, RFC4, HAL9, WRS1, DUF1, REX4, YPQ1, PKH2, PHM7, YOL085C, YOL083C-A, IRA2, YOL079W, YOL085W-A, COQ3, YOL097W-A, SPO21, ITR2, MHF1, YOL098C, HMI1, ATG19, AVO1
BYxRM	2	BY	15	172956	195072	0.013560214	ATP19, MDM20, YOL075C, THP1, REX4, IRA2, YOL079W, BRX1, DSC2, AVO1
BYxRM	4	BY	15	202012	212987	0.339183462	CRT10, MET22, PRS5, INP54, APM4, RIB2, RTG1

BYxRM	3	BY	15	202087	240094	0.253092233	MAM3, ARG1, GAL11, GPD2, CRT10, MET22, PSH1, PRS5, INP54, DDR2, YOL057W, APM4, AIM39, RIB2, GPM3, GSH2, SPE2, RTG1, YOL050C, THI20
RMxYPS	15	RM	15	232036	274962	0.063778622	SMC5, YOL046C, GAL11, YOL029C, NGL1, MSE1, RPP2A, LAG2, YOL037C, RRT8, YOL038C-A, LDS2, OPI10, PEX15, YAP7, NTG2, MIM1, YOL036W, RPS15, GSH2, SIL1, PRE6, SPE2, MDM38, YOL035C, PSK2, YOL050C, GAS5, NOP12
RMxYPS	16	YPS	15	496695	521081	0.006706095	NUP1, YOR093C, YOR102W, RPS7A, VAM3, RKI1, RAS1, ECM3, YOR105W, CRC1, ARF3, OST2, KTR1, PIN2, YOR097C
RMxYPS	18	YPS	15	943688	969591	0.065974632	UBC11, MRS2, RPA190, ALA1, VMA4, RPA43, YOR342C, YOR338W, KRE5, YOR333C, YOR343C, YOR335W-A, YOR331C, TEA1
BYxYPS	22	BY	15	170	10912	0.125418612	YOL163W, YOL166C, YOL162W, AAD15, YOL166W-A, BDS1, YOL164W-A
BYxYPS	22	BY	15	88581	216399	0.043052729	YOL099C, MAM3, MDY2, TPT1, YOL118C, ADH1, MSH2, CRT10, MPD2, ATP19, MET22, MDM20, TRM10, IZH4, MSB4, ATG34, INO4, YOL106W, RFC4, YOL075C, PRS5, HAL9, THP1, HST1, HRP1, WSC3, MCH4, WRS1, DUF1, ZEO1, INP54, SDH5, REX4, RRI2, MSN1, APM4, NUF2, SMF1, YPQ1, PKH2, SKM1, PHM7, RIB2, YOL085C, YOL083C-A, IRA2, YOL114C, YOL079W, YOL103W-B, YOL103W-A, YOL085W-A, NDJ1, COQ3, YOL097W-A, RPL18A, NBA1, SPO21, ITR2, BRX1, MHF1, RTG1, YOL098C, SHR5, RPS19A, YOL107W, HMI1, PAP2, DSC2, ATG19, AVO1
BYxYPS	26	YPS	15	215865	244803	0.155461499	MAM3, YOL046C, ARG1, GAL11, GPD2, PSH1, DDR2, YOL057W, RRT8, LDS2, AIM39, GPM3, GSH2, SPE2, PSK2, YOL050C, THI20
BYxYPS	26	YPS	15	380731	397645	0.155461499	EXO1, HMS1, CIN5, YOR032W-A, CRS5, BUB3, YOR034C-A, YOR029W, AKR2, DFG16, STI1
BYxYPS	26	YPS	15	764185	768822	0.113087961	HER1, MCP1, WTM2
RMxYPS	18	YPS	16	465889	562779	0.065974632	ISM1, YPL039W, RMI1, PMA2, RET3, PDH1, NCR1, SGF11, YPL044C, SRL4, SUV3, VTC3, ULP1, SNF8, NOP4, EGD1, SMA1, RQC2, HST2, CIT3, ERG10, MET12, YPL038W-A, TAF3, AEP3, SSN3, ELC1, YPR002C-A, TRM44, CHL1, SWI1, HAT1, YPL034W, RRP12, LSP1, SKS1, YPL025C, PHO85, RAD1, MET31, YPL041C, CTF19, YPL035C, ECM23, YPR003C, TFC8, IRC15, SVL3, VPS16, YPL014W, ULA1, MRPS16
RMxYPS	19	YPS	16	501341	611686	0.002425991	YPR015C, RMI1, RET3, PDH1, NCR1, YPR011C, YPR010C-A, VTC3, ULP1,

							ICL2, SNF8, ATP20, TIF6, RQC2, HST2, CIT3, EAF3, YPR012W, YME1, MET12, CMR3, HAL1, TAF3, AEP3, DSS4, YPR002C-A, CHL1, SWI1, SUT2, HAT1, RRP12, AIM45, LSP1, YPR022C, RLF2, SKS1, YPL025C, RAD1, HAA1, YPR014C, CTF19, ECM23, YPR003C, TFC8, IRC15, YPR016W-A, AGC1, MCM4, RPA135, YPL014W, ULA1, REC8, MRPS16
RMxYPS	20	YPS	16	504837	747971	0.000456378	TIF5, YPR015C, YPR084W, NHP6A, CCL1, TAH18, YPR109W, ARP7, RDS3, RET3, SEC8, FHL1, PDH1, NCR1, YPR063C, LTP1, SRO7, YPR011C, YPR010C-A, VTC3, ULP1, ICL2, SNF8, MED1, HOS1, MDM36, TFB4, ATP20, VMA13, TIF6, UBA3, IRC16, RQC2, HST2, CIT3, SNT309, EAF3, HTS1, YMC1, FCY1, TIP41, COG4, YPR012W, YME1, VPS69, YPR053C, YPR074W-A, MET12, SYT1, YPR089W, CMR3, OPY2, HAL1, TAF3, AEP3, DIB1, YPR098C, DSS4, YPR027C, ERV2, TKL1, MRPL51, MSF1, YPR002C-A, YPR039W, YPR096C, RPL11A, CHL1, SWI1, YPR078C, NVJ2, SUT2, HAT1, ROX1, CSR2, YPR071W, RPL43A, YPR050C, SUA7, THP3, DBF20, SRP54, APL4, YPR092W, RRP12, AIM45, LSP1, YPR076W, GRS2, YPR059C, YPR022C, RLF2, JID1, RPN7, BRR1, RAD1, MRL1, NOT5, HAA1, YPR064W, NTO1, MCM16, SMK1, ASA1, ATH1, ATG11, YPR099C, YPR014C, CTF19, ECM23, YPR097W, PRE2, YPR003C, TFC8, IRC15, YPR016W-A, ISR1, TEF1, SPE3, MAK3, YPR108W-A, GLN1, AGC1, ARO7, MCM4, RPC40, PUF2, OPI11, RPA135, SPO24, YPL014W, YOP1, ASR1, YTH1, ULA1, YPR077C, ISA2, REC8, MRPS16
RMxYPS	17	YPS	16	526392	677025	0.003060262	TIF5, YPR015C, NHP6A, CCL1, TAH18, ARP7, RET3, SEC8, PDH1, NCR1, SRO7, YPR011C, YPR010C-A, ICL2, SNF8, TFB4, ATP20, VMA13, TIF6, IRC16, RQC2, HST2, CIT3, EAF3, HTS1, YMC1, TIP41, YPR012W, YME1, YPR053C, CMR3, HAL1, TAF3, AEP3, DSS4, YPR027C, ERV2, MSF1, YPR002C-A, YPR039W, CHL1, SUT2, HAT1, CSR2, RPL43A, YPR050C, THP3, APL4, RRP12, AIM45, LSP1, YPR059C, YPR022C, RLF2, JID1, BRR1, HAA1, NTO1, MCM16, SMK1, ATH1, ATG11, YPR014C, YPR003C, TFC8, YPR016W-A, MAK3, GLN1, AGC1, ARO7, MCM4, PUF2, OPI11, RPA135, SPO24, YPL014W, YOP1, ULA1, REC8, MRPS16
RMxYPS	19	YPS	16	787032	792213	0.028072187	ANT1, CTR1, YLH47, YPR126C, YPR127W

RMxYPS	20	YPS	16	832297	837009	0.081297613	PIN3, YPR153W, URN1, NCA2
RMxYPS	19	YPS	16	900008	947540	0.002425991	RPC82, PZF1, YPR203W, YPR202W, HPA2, DPM1, OPT2, SKI3, RPO26, YPR197C, ARR2, SGE1, ARR3, AQY1, MLC2, YPR196W, YPR204C-A, QCR2, ARR1, ATG13, YPR204W, YPR195C, GDB1, SMX3
RMxYPS	20	YPS	16	901087	923983	0.000456378	RPC82, PZF1, HPA2, DPM1, SKI3, RPO26, AQY1, MLC2, QCR2, ATG13, GDB1
RMxYPS	17	YPS	16	919896	924612	0.003060262	HPA2, OPT2, AQY1, QCR2
RMxYPS	18	YPS	16	922561	927175	0.000385758	HPA2, OPT2, AQY1
BYxYPS	28	YPS	16	898150	942359	0.002065011	RPC82, PZF1, HPA2, DPM1, OPT2, SKI3, RPO26, YPR197C, ARR2, SGE1, ARR3, AQY1, SEC23, MLC2, YPR196W, QCR2, ARR1, ATG13, YPR195C, GDB1, SMX3
BYxYPS	30	YPS	16	914217	918565	0.001861178	RPC82, SKI3
BYxYPS	29	YPS	16	914775	946418	0.00922265	RPC82, YPR203W, YPR202W, HPA2, OPT2, SKI3, YPR197C, ARR2, SGE1, ARR3, AQY1, YPR196W, QCR2, ARR1, YPR204W, YPR195C
BYxYPS	26	YPS	16	922477	946418	0.055277584	YPR203W, YPR202W, HPA2, OPT2, YPR197C, ARR2, SGE1, ARR3, AQY1, YPR196W, ARR1, YPR204W, YPR195C

This table shows all loci genome-wide that reached at least nominal significance within all three crosses using a one-tailed exact binomial test. The bounds of each interval were determined by the nominal significance cut-off for each family. All open reading frames, confirmed and dubious, are provided.

Table S3. Phenotype data for reciprocal hemizyosity and marked allele replacement assays.

Technique	Date	Strain *	MIC(mM)	Chr	Cross
M.A.R.	1/14/15	AEP3(Y-R)15a	5	16	RxY
M.A.R.	1/14/15	AEP3(Y-R)15b	5	16	RxY
M.A.R.	1/14/15	AEP3(Y-R)19a	4.5	16	RxY
M.A.R.	1/14/15	AEP3(Y-R)19b	4.5	16	RxY
M.A.R.	1/14/15	AEP3(Y-R)19c	4.5	16	RxY
M.A.R.	1/14/15	20dD4aa	5	NA	RxY
M.A.R.	1/14/15	20dD4ab	5.5	NA	RxY
M.A.R.	1/14/15	20dD4ac	5.5	NA	RxY
M.A.R.	1/14/15	20dD4ba	5.5	NA	RxY
M.A.R.	1/14/15	20dD4bb	6	NA	RxY
M.A.R.	2/4/2015	SDP1(Y-B)5a	3.5	9	BxY
M.A.R.	2/4/2015	SDP1(Y-B)5b	3.5	9	BxY
M.A.R.	2/4/2015	SDP1(Y-B)5c	3.5	9	BxY
M.A.R.	2/4/2015	SDP1(Y-B)12a	5.5	9	BxY
M.A.R.	2/4/2015	SDP1(Y-B)12b	5.5	9	BxY
M.A.R.	2/4/2015	SDP1(Y-B)12c	5	9	BxY
M.A.R.	2/4/2015	29gC1aa	6	NA	BxY
M.A.R.	2/4/2015	29gC1ab	6	NA	BxY
M.A.R.	2/4/2015	29gC1ac	6	NA	BxY
M.A.R.	2/4/2015	29gC1ba	5.5	NA	BxY
M.A.R.	2/4/2015	29gC1bb	5.5	NA	BxY
M.A.R.	2/4/2015	29gC1bc	6	NA	BxY
M.A.R.	2/4/2015	29gC1ca	6.5	NA	BxY
M.A.R.	2/4/2015	29gC1cb	6.5	NA	BxY
M.A.R.	2/4/2015	29gC1cc	7	NA	BxY
M.A.R.	1/19/15	CTT1(Y-R)14a	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)14b	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)14c	5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)16a	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)16b	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)16c	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)6a	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)6b	4.5	7	RxY
M.A.R.	1/19/15	CTT1(Y-R)6c	4.5	7	RxY
M.A.R.	1/19/15	16eD7aa	5.5	NA	RxY
M.A.R.	1/19/15	16eD7ab	5	NA	RxY
M.A.R.	1/19/15	16eD7ac	5.5	NA	RxY
M.A.R.	1/19/15	16eD7ba	4.5	NA	RxY

M.A.R.	1/19/15	16eD7bb	5	NA	RxY
M.A.R.	1/19/15	16eD7bc	5	NA	RxY
M.A.R.	1/19/15	MMS21(Y-B)11a	5	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)11b	5.5	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)11c	5.5	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)13a	5	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)13b	5.5	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)13c	5.5	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)6a	4	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)6b	4	5	BxY
M.A.R.	1/19/15	MMS21(Y-B)6c	3.5	5	BxY
M.A.R.	1/19/15	29gC1aa	5	NA	BxY
M.A.R.	1/19/15	29gC1ab	6.5	NA	BxY
M.A.R.	1/19/15	29gC1ac	5.5	NA	BxY
M.A.R.	1/19/15	29gC1ba	5	NA	BxY
M.A.R.	1/19/15	29gC1bb	6	NA	BxY
M.A.R.	1/19/15	29gC1bc	6	NA	BxY
M.A.R.	1/26/15	MRP13(Y-B)15a	5.5	7	BxY
M.A.R.	1/26/15	MRP13(Y-B)15b	5.5	7	BxY
M.A.R.	1/26/15	MRP13(Y-B)15c	5.5	7	BxY
M.A.R.	1/26/15	MRP13(Y-B)3a	5	7	BxY
M.A.R.	1/26/15	MRP13(Y-B)3b	5.5	7	BxY
M.A.R.	1/26/15	MRP13(Y-B)3c	5.5	7	BxY
M.A.R.	1/26/15	29gC1aa	5.5	NA	BxY
M.A.R.	1/26/15	29gC1ab	6	NA	BxY
M.A.R.	1/26/15	29gC1ac	5.5	NA	BxY
M.A.R.	1/26/15	29gC1ba	6	NA	BxY
M.A.R.	1/26/15	29gC1bb	6	NA	BxY
M.A.R.	1/26/15	29gC1bc	6	NA	BxY
M.A.R.	1/26/15	29gC1ca	5.5	NA	BxY
M.A.R.	1/26/15	29gC1cb	5.5	NA	BxY
M.A.R.	1/26/15	29gC1cc	5.5	NA	BxY
M.A.R.	3/8/15	AQY1(Y-B)10a	6	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)10b	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)10c	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)12a	6	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)12b	6	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)12c	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)15a	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)15b	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)15c	6	16	BxY

M.A.R.	3/8/15	AQY1(Y-B)17a	6	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)17b	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)17c	6	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)20a	6.5	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)20b	6	16	BxY
M.A.R.	3/8/15	AQY1(Y-B)20c	6.5	16	BxY
M.A.R.	3/8/15	29gC1_a1	6	NA	BxY
M.A.R.	3/8/15	29gC1_a2	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_a3	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_b1	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_b2	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_b3	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_c1	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_c2	6.5	NA	BxY
M.A.R.	3/8/15	29gC1_c3	7	NA	BxY
M.A.R.	3/8/15	AQY1(Y-R)12a	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)12b	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)12c	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)14a	6	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)14b	5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)14c	6	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)15a	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)15b	5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)15c	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)16a	6	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)16b	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)16c	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)18a	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)18b	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)18c	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)19a	5.5	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)19b	6	16	RxY
M.A.R.	3/8/15	AQY1(Y-R)19c	5.5	16	RxY
M.A.R.	3/8/15	20dD4a_1	5.5	NA	RxY
M.A.R.	3/8/15	20dD4a_2	6	NA	RxY
M.A.R.	3/8/15	20dD4a_3	6	NA	RxY
M.A.R.	3/8/15	20dD4b_1	6	NA	RxY
M.A.R.	3/8/15	20dD4b_2	5.5	NA	RxY
M.A.R.	3/8/15	20dD4b_3	6	NA	RxY
M.A.R.	3/8/15	20dD4c_1	6	NA	RxY
M.A.R.	3/8/15	20dD4c_2	6.5	NA	RxY

M.A.R.	3/8/15	20dD4c_3	6	NA	RxY
M.A.R.	3/8/15	MKT1(B-Y)15a	7	14	BxY
M.A.R.	3/8/15	MKT1(B-Y)15b	6.5	14	BxY
M.A.R.	3/8/15	MKT1(B-Y)17a	6.5	14	BxY
M.A.R.	3/8/15	MKT1(B-Y)17b	6.5	14	BxY
M.A.R.	3/8/15	22F2B2s_a1	7.5	NA	BxY
M.A.R.	3/8/15	22F2B2s_a2	7.5	NA	BxY
M.A.R.	3/8/15	22F2B2s_a3	7	NA	BxY
M.A.R.	3/8/15	22F2B2s_b1	7.5	NA	BxY
M.A.R.	3/8/15	22F2B2s_b2	7.5	NA	BxY
M.A.R.	3/8/15	22F2B2s_b3	7.5	NA	BxY
RH	7/2/14	MKT1(B)a	6	14	BxY
RH	7/2/14	MKT1(B)b	6	14	BxY
RH	7/2/14	MKT1(B)c	6	14	BxY
RH	7/2/14	MKT1(Y)a	7	14	BxY
RH	7/2/14	MKT1(Y)b	7	14	BxY
RH	7/2/14	MKT1(Y)c	7	14	BxY
RH	7/26/14	AQY1(B)1	6.3	16	BxY
RH	7/26/14	AQY1(B)2	7	16	BxY
RH	7/26/14	AQY1(B)3	7	16	BxY
RH	7/26/14	AQY1(Y)1	5.9	16	BxY
RH	7/26/14	AQY1(Y)2	6	16	BxY
RH	7/26/14	AQY1(Y)3	5.7	16	BxY
RH	11/19/14	AQY1(R)a	5.5	16	RxY
RH	11/19/14	AQY1(R)b	6	16	RxY
RH	11/19/14	AQY1(R)c	6.5	16	RxY
RH	11/19/14	AQY1(Y)a	5	16	RxY
RH	11/19/14	AQY1(Y)b	5.5	16	RxY
RH	11/19/14	AQY1(Y)c	5.5	16	RxY
RH	11/19/14	MRP13(B)a	5	7	BxY
RH	11/19/14	MRP13(B)b	4.5	7	BxY
RH	11/19/14	MRP13(B)c	5	7	BxY
RH	11/19/14	MRP13(Y)a	4.5	7	BxY
RH	11/19/14	MRP13(Y)b	4.5	7	BxY
RH	11/19/14	MRP13(Y)c	5	7	BxY
RH	6/14/14	SDP1(B)aa	6	9	BxY
RH	6/14/14	SDP1(B)ab	6	9	BxY
RH	6/14/14	SDP1(B)ac	6	9	BxY
RH	6/14/14	SDP1(B)ba	6	9	BxY
RH	6/14/14	SDP1(B)bb	6	9	BxY
RH	6/14/14	SDP1(B)bc	6	9	BxY

RH	41804	SDP1(B)ca	6	9	BxY
RH	41804	SDP1(B)cb	6	9	BxY
RH	41804	SDP1(B)cc	6	9	BxY
RH	41804	SDP1(Y)aa	6	9	BxY
RH	41804	SDP1(Y)ab	6	9	BxY
RH	41804	SDP1(Y)ac	6	9	BxY
RH	41804	SDP1(Y)ba	6	9	BxY
RH	41804	SDP1(Y)bb	6	9	BxY
RH	41804	SDP1(Y)bc	6	9	BxY
RH	41804	SDP1(Y)ca	6	9	BxY
RH	41804	SDP1(Y)cb	6	9	BxY
RH	41804	SDP1(Y)cc	6	9	BxY

*20dD4 is the F₂B₃ RMxYPSxYPS strain in which M.A.R. was performed on *AEP3* and *AQY1*, 29gC1 is the F₂B₃ BYxYPSxYPS strain in which M.A.R. was performed on *SDP1*, *MMS21*, *MRP13* and *AQY1*, 16eD7 is the F₂B₃ RMxYPSxRM strain in which M.A.R. was performed on *CTT1*, while 22F2B2s is the F₂B₂ BYxYPSxBY strain in which M.A.R. was performed on *MKT1*; these 4 strains served as controls for the allele swaps that were performed in them.

Table S4. Phenotype and normalized OD600 data for a representative panel of 48 F₂B₃ segregants screened for high resistance to hydrogen peroxide exposure.

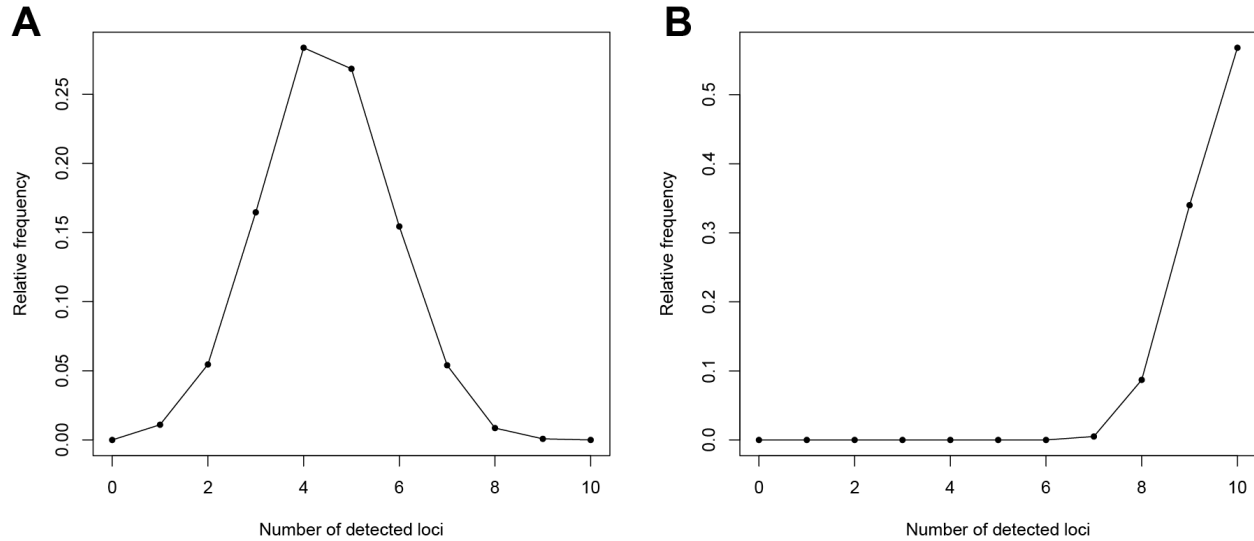
Well *	MIC (mM)	OD600 **
A1	8.5	0.253
A2	8.5	0.218
A3	8	0.233
A4	8.5	0.222
A5	8.5	0.237
A6	6	0.221
B1	8	0.235
B2	7	0.211
B3	6.5	0.234
B4	8.5	0.232
B5	7	0.21
B6	6	0.244
C1	7.5	0.228
C2	6.5	0.204
C3	8.5	0.229
C4	7	0.231
C5	8.5	0.212
C6	7	0.242
D1	6.5	0.244
D2	8.5	0.218
D3	6.5	0.252
D4	7	0.209
D5	5.5	0.213
D6	8	0.249
E1	6	0.253
E2	7	0.216
E3	7	0.26
E4	7	0.283
E5	7	0.255
E6	6	0.238
F1	6	0.204
F2	7.5	0.233
F3	6	0.218
F4	8.5	0.214
F5	7	0.219
F6	6.5	0.277
G1	7	0.305
G2	7.5	0.238

G3	6	0.219
G4	6	0.22
G5	7	0.196
G6	6	0.195
H1	6	0.262
H2	6	0.23
H3	7	0.226
H4	7.5	0.198
H5	7	0.198
H6 ***	8	0.274

* The F_2B_3 segregants screened in this panel are from the (RxY Seg3)xY family.

** O.D. 600 data was generated using a BioTek ELx808 plate reader. Wells with only media were used as blanks.

*** This position contains the F_2 from which this family was derived.



Note S1. Statistical power of the genetic mapping strategy in this paper. We simulated the genetic mapping strategy described in this paper under a commonly used genetic architecture model: 10 additive loci with equal effects that collectively explain half of the phenotypic variance. The other half of the phenotypic variance was attributed to random environmental effects. In these simulations, we generated 900 F_2 progeny from a cross. We then picked the most resistant F_2 and backcrossed it, examining 100 offspring from the first backcross. The second backcross was repeated in the same manner as the first backcross. Finally, in the third backcross, we examined 700 total individual and tested whether we detected segregating loci using a binomial test applied to allele frequencies in the 15 most resistant F_2B_3 s. 5,000 individual F_2B_3 families and 1,000 sets of five F_2B_3 families were simulated. We describe these results in two ways: the number of the 10 loci that were detected in single F_2B_3 families (A) and the total number of the 10 loci that were detected at least once in five replicate F_2B_3 families descended from the same F_2 cross (B). As shown in A, 4 or 5 loci are typically identified in individual F_2B_3 families, though a range between 1 and 9 was seen. In contrast, when five F_2B_3 families were generated from the same F_2 cross, more than half of the time, all of the detected loci were identified at least once. These results imply that although individual F_2B_3 families provide lower statistical power than other mapping strategies (see Ehrenreich et al. 2010. *Nature*. and Bloom et al. 2013. *Nature*), statistical power can be recovered by conducting the procedure multiple times in parallel, as we have done in the current paper. When multiple F_2B_3 families are generated, the statistical power of our method can approach 100% under the model we have employed.

Note S2. We observed karyotype instability in F_2B_3 families derived from one of the $BY \times YPS$ F_2 segregants. Each segregant in this family possessed different combinations of aneuploidies, which precluded efforts to perform genetic mapping. We also found that aneuploidy had occurred at some stage of advanced backcrossing for F_2B_3 segregants derived from one $BY \times RM$ and two other $BY \times YPS$ F_2 s. This was identified because both alleles at certain loci were detectable in the backcross families, as highlighted by the asterisks in Figure S2. However, sequencing data showed that these F_2B_3 s were entirely haploid; thus, these individuals were included in our analyses.