

Table S5 Probabilities for the genotypes of the pair of individuals at a single autosomal locus, at generation F_k in the formation of four-way RIL by sibling mating

Prototype	No. states	Probability of each
$AA \times AA$	4	$\frac{1}{4} + \frac{1}{4} \left(\frac{1}{2}\right)^k - \frac{1}{20} \left(\frac{1}{4}\right)^k - \left(\frac{9+4\sqrt{5}}{40}\right) \left(\frac{1+\sqrt{5}}{4}\right)^k - \left(\frac{9-4\sqrt{5}}{40}\right) \left(\frac{1-\sqrt{5}}{4}\right)^k$
$AA \times AB$	4	$\frac{1}{6} \left(-\frac{1}{4}\right)^k + \frac{1}{10} \left(\frac{1}{4}\right)^k - \frac{1}{6} \left(\frac{1}{2}\right)^k - \left(\frac{1-\sqrt{5}}{20}\right) \left(\frac{1+\sqrt{5}}{4}\right)^k - \left(\frac{1+\sqrt{5}}{20}\right) \left(\frac{1-\sqrt{5}}{4}\right)^k$
$AA \times AC$	8	$-\frac{1}{12} \left(-\frac{1}{4}\right)^k + \frac{1}{20} \left(\frac{1}{4}\right)^k - \frac{1}{6} \left(\frac{1}{2}\right)^k + \frac{1}{10} \left[\left(\frac{1+\sqrt{5}}{4}\right)^k + \left(\frac{1-\sqrt{5}}{4}\right)^k \right]$
$AA \times BB$	2	$\frac{1}{3} \left(-\frac{1}{4}\right)^k - \frac{2}{15} \left(-\frac{1}{8}\right)^k + \frac{1}{30} \left(\frac{1}{4}\right)^k - \frac{1}{30} \left(\frac{1}{2}\right)^k - \left(\frac{2-\sqrt{5}}{20}\right) \left(\frac{1+\sqrt{5}}{4}\right)^k - \left(\frac{2+\sqrt{5}}{20}\right) \left(\frac{1-\sqrt{5}}{4}\right)^k$
$AA \times BC$	8	$-\frac{1}{12} \left(-\frac{1}{4}\right)^k + \frac{2}{15} \left(-\frac{1}{8}\right)^k - \frac{1}{12} \left(\frac{1}{4}\right)^k + \frac{1}{30} \left(\frac{1}{2}\right)^k$
$AA \times CC$	4	$-\frac{1}{6} \left(-\frac{1}{4}\right)^k + \frac{1}{30} \left(-\frac{1}{8}\right)^k + \frac{1}{60} \left(\frac{1}{4}\right)^k - \frac{1}{30} \left(\frac{1}{2}\right)^k + \left(\frac{3-\sqrt{5}}{40}\right) \left(\frac{1+\sqrt{5}}{4}\right)^k + \left(\frac{3+\sqrt{5}}{40}\right) \left(\frac{1-\sqrt{5}}{4}\right)^k$
$AA \times CD$	4	$\frac{1}{6} \left(-\frac{1}{4}\right)^k - \frac{1}{5} \left(-\frac{1}{8}\right)^k + \frac{1}{30} \left(\frac{1}{2}\right)^k$
$AB \times AB$	2	$-\frac{2}{3} \left(-\frac{1}{4}\right)^k + \frac{2}{15} \left(-\frac{1}{8}\right)^k + \frac{1}{15} \left(\frac{1}{4}\right)^k - \frac{2}{15} \left(\frac{1}{2}\right)^k + \left(\frac{3-\sqrt{5}}{10}\right) \left(\frac{1+\sqrt{5}}{4}\right)^k + \left(\frac{3+\sqrt{5}}{10}\right) \left(\frac{1-\sqrt{5}}{4}\right)^k$
$AB \times AC$	8	$\frac{1}{6} \left(-\frac{1}{4}\right)^k - \frac{2}{15} \left(-\frac{1}{8}\right)^k - \frac{1}{6} \left(\frac{1}{4}\right)^k + \frac{2}{15} \left(\frac{1}{2}\right)^k$
$AB \times CD$	1	$\frac{2}{3} \left(-\frac{1}{8}\right)^k + \frac{1}{3} \left(\frac{1}{4}\right)^k$
$AC \times AC$	4	$\frac{1}{3} \left(-\frac{1}{4}\right)^k - \frac{1}{30} \left(-\frac{1}{8}\right)^k + \frac{1}{30} \left(\frac{1}{4}\right)^k - \frac{2}{15} \left(\frac{1}{2}\right)^k - \left(\frac{2-2\sqrt{5}}{20}\right) \left(\frac{1+\sqrt{5}}{4}\right)^k - \left(\frac{2+2\sqrt{5}}{20}\right) \left(\frac{1-\sqrt{5}}{4}\right)^k$
$AC \times AD$	4	$-\frac{1}{3} \left(-\frac{1}{4}\right)^k + \frac{1}{5} \left(-\frac{1}{8}\right)^k + \frac{2}{15} \left(\frac{1}{2}\right)^k$
$AC \times BD$	2	$-\frac{1}{3} \left(-\frac{1}{8}\right)^k + \frac{1}{3} \left(\frac{1}{4}\right)^k$