

Table 3. Conditional probabilities (π_j) of QTL genotypes upon marker genotypes for \mathcal{M}_1 and \mathcal{M}_2 in the F_2 and its endosperm tissue

Marker genotype	$\pi_j \cdot p_{k_1 k_2}$ in the F_2			
	QQ	Qq	qq	qqq
$M_1 M_1 M_2 M_2$	$(1-r)^2/4$	$r_1 r_2 (1-r_1)(1-r_2)/2$	$r_1^2 r_2^2/4$	$r_1 r_2 (1-r_1-r_2+3r_1 r_2)/8$
$M_1 M_1 M_2 m_2$	$(1-r)r/2$	$r_1(1-r_1)(1-2r_2+2r_2^2)/2$	$r_1^2 r_2(1-r_2)/2$	$r_1(1+6r_1 r_2-2r_2-r_1+2r_2^2-6r_1 r_2^2)/8$
$M_1 M_1 m_2 m_2$	$r^2/4$	$r_1 r_2(1-r_1)(1-r_2)/2$	$r_1^2(1-r_2)^2/4$	$r_1(1-r_2)(r_2-3r_1 r_2+2r_1)/8$
$M_1 m_1 M_2 M_2$	$(1-r)r/2$	$r_2(1-r_2)(1-2r_1+2r_1^2)/2$	$r_1 r_2^2(1-r_1)/2/8$	$r_2(2r_1^2-2r_1-r_2+6r_1 r_2-6r_1^2 r_2+1)/8$
$M_1 m_1 M_2 m_2$	$(1-2r+2r^2)/2$	$(1-2r_1+2r_1^2)(1-2r_2+2r_2^2)/2$	$r_1 r_2(1-r_1)(1-r_2)$	$r_1 r_2(1-r_1)(1-r_2)+(1-2r_2+2r_2^2)(2r_1^2-2r_1+1)/8$
$M_1 m_1 m_2 m_2$	$(1-r)r/2$	$r_2(1-r_2)(1-r_1)/2$	$r_1(1-r_1)(1-r_2)^2/4$	$(1-r_2)(6r_1^2 r_2-6r_1 r_2+r_2-4r_1^2+4r_1)/8$
$m_1 M_1 M_2 M_2$	$r^2/4$	$r_1 r_2(1-r_1)(1-r_2)/2$	$r_1^2(1-r_2)^2/4$	$r_2(1-r_1)(r_1-3r_1 r_2+2r_2)/8$
$m_1 M_1 M_2 m_2$	$r(1-r)/2$	$r_1(1-r_1)(1-2r_2+2r_2^2)/2$	$r_2(1-r_1)^2(1-r_2)/2$	$(1-r_1)(6r_1 r_2-6r_1 r_2+r_1-4r_2^2+4r_2)/8$
$m_1 m_1 m_2 m_2$	$(1-r)^2/4$	$r_1 r_2(1-r_1)(1-r_2)/2$	$(1-r_1)^2(1-r_2)^2/4$	$(1-r_1)(1-r_2)(3r_1 r_2-2r_1+2-2r_2)/8$
Marker genotype	$\pi_j \cdot p_{k_1 k_2}$ in the endosperm of the F_2			
	QQQ	QQq	qQq	qqq
$M_1 M_1 M_2 M_2$	$(1-r_1)(1-r_2)(3r_1 r_2-2r_1-2r_2+2)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$r_1 r_2(1-r_1-r_2)/8$	$r_1 r_2(1-r_1-r_2+3r_1 r_2)/8$
$M_1 M_1 M_2 m_2$	$(1-r_1)(6r_1 r_2^2-6r_1 r_2+r_1-4r_2^2+4r_2)/8$	$r_1(1-r_1)(1-2r_2+2r_2^2)/8$	$r_1(1-r_1)(1-2r_2+2r_2^2)/8$	$r_1(1+6r_1 r_2-2r_2-r_1+2r_2^2-6r_1 r_2^2)/8$
$M_1 M_1 m_2 m_2$	$r_2(1-r_1)(r_1-3r_1 r_2+2r_2)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$r_1(1-r_2)(r_2-3r_1 r_2+2r_1)/8$
$M_1 m_1 M_2 M_2$	$(1-r_2)(6r_1^2 r_2-6r_1 r_2+r_2-4r_1^2+4r_1)/8$	$r_2(1-r_2)(1-2r_1+2r_1^2)/8$	$r_2(1-r_2)(1-2r_1+2r_1^2)/8$	$r_2(2r_1^2-2r_1-r_2+6r_1 r_2-6r_1^2 r_2+1)/8$
$M_1 m_1 M_2 m_2$	$r_1 r_2(1-r_1)(1-r_2)+(1-2r_2+2r_2^2)(2r_1^2-2r_1+1)/8$	$(1-2r_1+2r_1^2)(1-2r_2+2r_2^2)/8$	$(1-2r_1+2r_1^2)(1-2r_2+2r_2^2)/8$	$r_1 r_2(1-r_1)(1-r_2)+(1-2r_2+2r_2^2)(2r_1^2-2r_1+1)/8$
$M_1 m_1 m_2 m_2$	$r_2(2r_1^2-2r_1-r_2+6r_1 r_2-6r_1^2 r_2+1)/8$	$r_2(1-r_2)(1-2r_1+2r_1^2)/8$	$r_2(1-r_2)(1-2r_1+2r_1^2)/8$	$(1-r_2)(6r_1^2 r_2-6r_1 r_2+r_2-4r_1^2+4r_1)/8$
$m_1 M_1 M_2 M_2$	$r_1(1-r_2)(r_2-3r_1 r_2+2r_1)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$r_2(1-r_1)(r_1-3r_1 r_2+2r_2)/8$
$m_1 M_1 M_2 m_2$	$r_1(1+6r_1 r_2-2r_2-r_1+2r_2^2-6r_1 r_2^2)/8$	$r_1(1-r_1)(1-2r_2+2r_2^2)/8$	$r_1(1-r_1)(1-2r_2+2r_2^2)/8$	$(1-r_1)(6r_1 r_2-6r_1 r_2+r_1-4r_2^2+4r_2)/8$
$m_1 m_1 m_2 m_2$	$r_1 r_2(1-r_1-r_2+3r_1 r_2)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$r_1 r_2(1-r_1)(1-r_2)/8$	$(1-r_1)(1-r_2)(3r_1 r_2-2r_1+2-2r_2)/8$

$p_{k_1 k_2}$ is the genotype frequency of two-locus marker genotype $k_1 k_2$ at markers \mathcal{M}_1 and \mathcal{M}_2 . r_1 , r_2 and r are the recombination fractions between marker \mathcal{M}_1 and the QTL, between the QTL and marker \mathcal{M}_2 , and between the two flanking markers.