

基于 SSR 分子标记的葡萄 F₁ 代杂交群体鉴定及灰霉病抗性遗传评价

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Identification of F₁ Hybrid Population in Grape Using SSR Molecular Markers and Genetic Evaluation of Resistance to Gray Mold

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附表 1 SSR 引物序列

Supplementary table 1 SSR primer sequence

序号	引物名称	退火 温度 T _m (°C)	正向引物 Forward primer (5'-3')	反向引物 Reverse primer (5'-3')
1	VVMD2	58	ACAATTCAATGAAAAGAGAGAGAGAG A	TCATCAATTTTCGTATCTCTATTGCT G
2	VVMD3	58	GGAAAGATGGGATGACTCGC	TATGATTTTTTAGGGGGTGAGG
3	VVMD27	58	TACCAGATCTGAATACATCCGTAAGT	ACGGGTATAGAGCAAACGGTGT
4	VrZAG79	58	AGATTGTGGAGGAGGGAACAAACCG	TGCCCCCATTTTCAAACCTCCCTTCC
5	VVMD7	58	AGAGTTGCGGAGAACAGGAT	CGAACCTTCACACGCTTGAT
6	VrZAG62	58	GGTGAAATGGGCACCGAACACACGC	CCATGTCTCTCCTCAGCTTCTCAGC
7	VVMD25	56	TTCCGTTAAAGCAAAAGAAAAAGG	TTGGATTTGAAATTTATTGAGGGG
8	VVS2	56	CAGCCCGTAAATGTATCCATC	AAATTCAAAATTCTAATTCAACTGG
9	VVMD5	56	CTAGAGCTACGCCAATCCAA	TATACCAAAAATCATATTCCTAAA
10	VMCNG2E1	60	TTGTGCTTCACTGTTCTGTTCTG	TATGGAGGGAGACCGTTGTTTC
11	VVMD32	58	GGAAAGATGGGATGACTCGC	TATGATTTTTTAGGGGGTGAGG
12	VMC8A7	63	GCAGCAACTCTCTTACACACCG	GTGGGAGCACTCGTTGCTTTAG
13	VMC7G3	60	TTACTAGTGCTGTCTGCTCCA	TGCTTCTCTCTTTCAACTTTCA
14	VMC5G7	60	CATTTGCTGGTGACTTTC	ACTACCTCTCTTTCTCGC
15	VMC2C10.1	60	CCATGTTTCTATAGTTCCTCGGC	GATGTCCATATATTGGGTCCTG
16	VMC8F10	60	TATGAAAGATGAATGGCTGCTC	AAGGGTGCTTGAAGGTTTATGT
17	VVIN31	60	GTTGAATAGTGTCATGTTGTG	GGATAGAATCACATTGTAGCG
18	VMCA12	59	ATGTAATTACCGGTCATGAGTT	TTCTTGTTTTGCCTATCTATCC

19	VRZAG62	58	GGTGAAATGGGCACCGAACACACGC	CCATGTCTCTCCTCAGCTTCTCAGC
20	VVS4	50	CCATCAGTGATAAACCTAATGCC	CCCACCTTGCCCTTAGATGTTA
21	Vvc6	57	GGTTGAGGACTGACCATTGAC	ACAATCCAAGAAGCATCCTAT
22	Vvc34	57	AGGATGAAATGACATGGATG	ACCCATGTTGATGAGTTTAC
23	VrZAG15	61	GGATTTTGGCTGTAGTTTGTGAAG	ATCTCAAGCTGGGCTGTATTACAAT
24	VMC4C6	51	CTCCATCCCTATCTCATCAG	CTCTAACACCCAATCTCACA
25	VMC4A1	54	ATGCGACCTTAATAAATTGGGAA	AAGCTAGGCTTGTATGAGGGGAGA
26	VMC3C7	48	AATTTGGCTAAGAAAGGA	AATATTCAGAAAATTTGTGTC
27	VVIB66	56	CCACTAGTGGTCAGAAAAGAAG	TTGTATTGTGTGCCTCTTCTCA
28	VMC1C10	56	CACAGCTGTTCGAAGTCCCA	ACAAGCCTTCCGCCACTCTC
29	Vchr3a	56	CAATCATATGAGCAAGGCATGT	GCTTCCTGAAATTTGTGTCCA
30	Vchr4a	56	CAACTGGGATCCAAGACCTC	CAACTGGGATCCAAGACCTC
31	Vchr8a	56	ACCCACTGCCACTCTCTCAT	AAATCTCCGGGATCCTTTTG
32	Vchr18a	56	TTCCCACCCGGTAAATATGA	CATCCAAACATCACGCTGAG
33	Vchr9b	56	AGCGTCATGACAGGTATCAGAA	AAAGAATTAATCATTACCATTTCAC G
34	Vchr13b	56	TAAGCATTCTGGGCTTTTCC	TCGTCTATATGCGACCTTGG
35	Vchr13c	60	AGACCCAAGGGCAAGGTACT	AACACCGTTAGGCATACTCCA
36	VVMD28	58	ACAATTCAATGAAAAGAGAGAGAG A	TCATCAATTTCTGTATCTCTATTGCT G
37	VMC4F8	58	CATTTTCATAGGGTTTTCACAGC	CTGCCAGTATACTGATTCTCTC
38	VVMD21	56	GGTTGTCTATGGAGTTGATGTTGC	GCTTCAGTAAAAAGGGATTGCG
39	VrZAG67	56	ACCTGGCCCCGACTCCTTGTATGC	TCCTGCCGGCGATAACCAAGCTATG
40	VMC4F3-1	56	AAAGCACTATGGTGGGTGTAAA	AACCAATACATGCATCAAGGA
41	VMC5G8	56	CATGCACATCTTGTTCACCTCT	CATCATTGCTTCCAAAAGTCTC
42	Vchr16a	56	TTCATGTGTGACACCCCTTT	AATGTCCATGCTTCAAAATACC
43	Vchr17a	56	AGGAAGAGGATTGATCACCA	GTGCCAACCCCTTGCACTATT
44	Vchr18a	56	TTCCCACCCGGTAAATATGA	CATCCAAACATCACGCTGAG
45	SCU06	58	CCTAATGCCAGGAAGGTGTC	CCCTAGTCTCTCTACCTATCCATG
46	VVIP31	56	TATCCAAGAGACAAATCCCAC	TTCTCTTGTTTCTGCAAAATGG
47	Vchr19b	56	TTTGTTAGGTGTTGTTACCCGTTA	ATCTTCTGGCCATGTGGTTC
48	Z3M12	56	AACCTACGTCTTCAGACCGAC	GAGAGGTCAACAGTTCCTCCAG
49	M13	56	TGTAAAACGACGGCCAGT	

附表 2 葡萄灰霉病病症等级分级

Supplementary table 2 Rating scale for gray mold disease severity in grapevine

级别	病情严重度
Grade	Disease severity (%)
1 级	0.1-20.0
2 级	20.0-33.3
3 级	33.0-50.0
4 级	50.0-66.7
5 级	>66.7

附表 3 葡萄灰霉病程度分级

Supplementary table 3 Grading of gray mold severity in grapevine

等级	抗病程度	感病指数
Grade	Disease resistance level	Disease index
1	高抗	0–5.0
2	抗病	5.1–25.0
3	中抗	25.1–30.0
4	感病	30.1–50.0
5	高感	50.1–100.0

附表 4 亲本及杂交群体病斑面积

Supplementary table 4 Lesion area of parents and hybrid populations

编号	平均值±标准误	编号	平均值± SE	编号	平均值± SE
Number	Mean ± SE (%)	Number	Mean ± SE (%)	Number	Mean ± SE (%)
北冰红	1.97 ± 0.48	30	3.79 ± 0.75	64	19.52 ± 1.58
赤霞珠	23.25 ± 2.38	31	3.07 ± 0.44	65	4.99 ± 0.39
1	46.96 ± 4.54	33	3.81 ± 0.62	66	5.89 ± 0.13
2	9.90 ± 2.49	34	5.36 ± 1.78	67	3.49 ± 0.86
3	21.53 ± 15.15	35	8.03 ± 1.86	68	11.66 ± 2.51
4	11.27 ± 2.57	36	9.60 ± 0.83	69	15.94 ± 4.68
5	29.71 ± 7.20	37	1.96 ± 0.35	70	7.63 ± 0.31
6	18.26 ± 2.43	38	4.71 ± 1.06	71	9.54 ± 4.38
7	6.24 ± 1.80	39	2.28 ± 0.60	72	7.04 ± 4.58
8	14.58 ± 4.38	40	3.16 ± 0.69	73	13.62 ± 2.94
9	13.16 ± 4.11	41	2.80 ± 0.39	75	9.19 ± 1.36
10	40.43 ± 4.16	42	18.63 ± 1.42	76	6.06 ± 1.27
11	6.01 ± 1.59	43	6.12 ± 0.65	77	5.21 ± 0.68
12	7.75 ± 4.16	45	7.82 ± 1.20	78	24.14 ± 5.69
13	14.56 ± 1.31	46	23.47 ± 0.79	79	35.82 ± 5.17
14	22.03 ± 9.74	47	3.65 ± 0.21	81	11.38 ± 5.11
15	28.06 ± 3.53	49	9.60 ± 2.14	83	3.45 ± 0.70
16	4.08 ± 0.64	50	6.73 ± 1.42	84	10.04 ± 2.85
17	4.12 ± 0.85	51	11.97 ± 0.71	85	7.85 ± 1.20
18	2.84 ± 0.57	52	5.06 ± 0.66	86	19.63 ± 4.71
19	5.47 ± 0.79	53	6.30 ± 0.81	87	10.56 ± 3.33
20	12.18 ± 8.76	54	8.62 ± 1.25	88	8.82 ± 2.74
21	21.35 ± 3.70	55	27.82 ± 8.11	89	21.06 ± 2.64
22	10.21 ± 2.91	56	21.87 ± 2.04	90	6.92 ± 1.08
23	16.10 ± 2.09	57	8.04 ± 0.28	91	13.92 ± 2.92
24	20.14 ± 3.36	58	20.56 ± 4.67	92	8.30 ± 1.64
25	18.44 ± 3.55	59	17.46 ± 3.98	93	6.50 ± 2.16
26	2.91 ± 0.35	60	6.71 ± 1.51	94	3.01 ± 1.18
27	3.58 ± 0.62	61	11.20 ± 1.62	95	11.47 ± 2.04
28	4.71 ± 1.29	62	5.90 ± 1.15	96	11.26 ± 2.03

29	9.50 ± 1.09	63	4.78 ± 1.34	97	4.27 ± 1.23
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附表 5 杂交群体抗灰霉病表型相关性分析

Supplementary table 5 Correlation analysis of gray mold resistance phenotypes in the hybrid population

变量	第 1 次病斑面积	First lesion	第 2 次病斑面积	Second lesion	第 3 次病斑面积	Third lesion
Variable	area		area		area	
第一次病斑面积	First lesion area	1				
第二次病斑面积	Second lesion area	0.797**	1			
第三次病斑面积	Third lesion area	0.731**	0.903**	1		

注: ** $P < 0.01$

Note: ** $P < 0.01$