

TG183, 42 cM, Chromosome 7

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Introduction

The goal for this research was to develop a co-dominant CAPS or SCAR marker for the *I3* gene, which corresponds to resistance to *Fusarium oxysporum* f. sp. *lycopersici* race 3. PCR primers for markers in the chromosomal region between the molecular markers CT226 and TG572 (Hemming et al., 2004) were evaluated on homozygous susceptible, and homozygous resistant tomato inbred lines as well as heterozygous F1 hybrids obtained from J. W. Scott, University of Florida, R. Gardner, North Carolina State University or commercial hybrids. The TG183 primers were co-dominant with some resistant lines and with other resistant lines these primers gave the *S. lycopersicum* size PCR fragment. This is because different resistant tomato lines have different length of introgressions from *S. pennellii* (Hemming et al., 2004).

Reference:

Hemming, M. N., S. Basuki, D. J. McGrath, B. J. Carroll, and D. A. Jones. 2004. Fine mapping of the tomato *I-3* gene for *Fusarium* wilt resistance and elimination of a co-segregating resistance gene analogue as a candidate for *I-3*. *Theor. Appl. Gen.* 109:409-418.

Primers

Table 1. PCR primers from Hemming et al., 2004

Primer Name	Primer Sequence (5'-3')
PTG183F1	CTACTTGTCTGCCAAGGATTAC
PTG183R2	CGTGCCGTTCAAGAAGAGTG

*PCR at an annealing temperature of 53°C (TGEN53), ~1090 bp fragment.

Sequence

Purple Russian, i3/i3 (Partial Sequence); Purple Russian is a heritage tomato (OP) from Seed Savers Exchange, Decorah, Iowa

GENBANK ACCESSION NUMBER: EU926657

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1      CAATTTACTC TTATTGAAAA ATTGTATAGA GGTAAGCCTA ATGGATGAGA TGAGGGAAGT
61     CTTATTAGAC AACTTCAGTT GATTGGGTAT GTGAAGATTG CTATCAACAT GTCTACTTAG
121    ATTTCACTAA TGAGGTGGAC TATAACCATG TTCTCTCTAA AGAATTTGTG GAAATTGATA
181    AATACCCTAT GAAAATACTC AAGTGGATTG CGAATTTCAA ACTGGATGAG GAAACATCTA
241    TAGCCCCTGT GTGGATTCTA GTCCATCAAT TACCATGGCA TCTATTCAAG TGGCGTATCA
301    TCTCCAAATT AGTAAGTCTT GTGGTAATGT TGCTAAAGTT AAGGTCAAAA TAGATCTACT
361    TAAACGAAGA TCAGATAAAA ATCTGGTTAG TATTTTCATAG ATTGGATGGG TCTGAAGATG
421    CTAGGTGGCT AAAAAAAGT ATGAAAAAGT ACAAAGTTAT AGTCTTTTAT GCAATATCCA
481    AGGCCATCTC GAATCTCAAT GCAGAAACAA AGCAAGGGAC GACAAAGTTA AAGCTCAAAA
541    GGAAGAACAT AACATGAAA GAAACAGAAAT GATCAGACAA TGGTTATTCC TTTGTTTGGG
601    TTGTGGCATA TAATGAGAGT TCACAAGCCT CATTCTTTCA CCTCTTCTAT CATTGGACA
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661 AAAATTCCTT TCAAGATATC ATCTGTTATG CTTAGATGCT GGAAAATAAA ATTCATACAG
721 ATGTTGCTCT CAAAAAAGT GAAAGTTCCTA TCCCCTCAAT ACTCATGCAG ACGAAACTAC
781 TATGCATTTT TTTGGTAGTA GTCAGATTGC TTATCAAGTT TGGTCTTACT TTTGTTCAAG
841 TTGTTGGCGTC CCTCTTAAAT TTGGCAACAT TAGAAAAATC GTTTTGTCTT GTGGCTTGCT
901 AAAACTAAGA ATAAGATTCA CAAAGCTTTC ATACAATGTT TGCCTACTAT AATTAGCTGG
961 CGAATTTGGA AGAGTTAGTA GATATAGTGC TAGATTTGAT AATACGTGAG ATGTCTGCTA
1021 ACTTTATTAG TAAACAGGTG ACCAAGAAAA TGCATATGTC CTTCAACAGC TTCTC

NC EBR-8, I3/I3 (Partial Sequence), inbred from R. Gardner

GENBANK ACCESSION NUMBER: EU926656

1 GCCAGCNTGC AATTTACTCT TATTGAAAAA TTGTATAGAG GTAAGCCTAA TGGATGAGAT
61 GAGGGAAGTC TTATTAGACA ACTTCAGTTG ATTGGGTATG TGAAGATTGC TATCAACATG
121 TCTACTTAGA TTTCACATAAT GAGGTGGACT ATAACCATGT TCTCTCTAAA GAATTTGTGG
181 AAATTGATAA ATACCCTATG AAAATACTCA AGTGGATTGC GAATTTCAA CTGGATGAGG
241 AAACATCTAT AGCCCCTGTG TGGATTCTAG TCCATCAATT ACCATGGCAT CTATTCAAGT
301 GCGTATCAT CTCCAAATTA GTAAGTCTTG TGGTAATGTT GCTAAAGTTA AGGTCAAAAT
361 AGATCTACTT AAACGAAGAT CAGATAAAAA TCTGGTTAGT ATTTTCATAGA TTGGATGGGT
421 CTGAAGATGC TAGGTGGCTA AAAAAAGTA TGAAAAAGTA CAAAGTTATA CTTTATTG
481 CAATATCCAA GGCCATCTCG AATCTCAATG CAGAAACAAA GCAAGGGACG ACAAAGTTAA
541 AGCTCAAAAG GAAGAACATA ACATGAAAGA AACAGAAATG ATCAGACAAT GGTTATTCCT
601 TTGTTTGGAT TGTGGCATAT AATGAGAGTT CACAAGCCTC ATTCTTTCAC CTCTTCTATC
661 ATTTGGACAA AAATTCCTTT CAAGATATCA TCTGTTATGC TTAGATGCTG GAAAATAAAA
721 TTCATACAGA TGTGCTCTC AAAAACTGG AAGTTCCTAT CCCCTCAATA CTCATGCAGA
781 CGAACTACT ATGCATTTCT TTGGTAGTAG TCAGATTGCT TATCAAGTTT GGTCTTACTT
841 TTGTTCAAGT TGTGGCGTCC CTCTTAAATT TGGCAACATT AGAAAAATCG TTTTGTCTTG
901 TGGCTTGCTA AAACAAAGAA TAAGATTCAC AAAGCTTTC AACAATGTTT GCCTACTATA
961 ATTAGCTGGC GAATTTGGAA GAGTTAGTAG ATATAGTGCT AGATTTGATA ATACGTGAGA
1021 TGTCTGCTAA CTTTATTAGT AAACAGGTGA CCAAGAAAAT GCATATGTCC TTCAACAGCT
1081 TC

NC123S, I3/I3 (Partial Sequence)

GENBANK ACCESSION NUMBER: FJ004839

1 GCCCAGATGC AATTTACTCT TATTGAAAAG TTGTATAGAG GTAAGCCTAA TGGATGAGAT
61 AAGGGAAGTC TTATTAGACA ATTTTCAGTTG ATTGGGTATG TGAAGATTGC TATCAACATG
121 TCTACTTAGA TTTCACATAAT GAGGTGGACT ATAACCATGT TCTCTCTAAA AAATTTGTGG
181 AAATTGATAA ATACCCTATG AAAATACTCA AGTGGATTGC GAATTTCAA CTGGATGAGG
241 AAACATCTAT AGCCCCTGTG TGGATTCTAG TCCATCAATT ACCATGGCAT CTATTCAAGT
301 GGCATATCAT CTCCACGTTA GTAAGTCTTG TGGTAATGTT GCTAAAAGTTA AGGTCAAAAT
361 AGATCTACTT AAACGAAGAT CAGATAAAAT CTGGTTAGCA TTTCATAGAT TGGATGGGTC
421 TGAAGATGCT AGGTGGCTAA AAAACATCTA TAGCCCCTCA ATGTGTTCTT GCTGCAATAC
481 TCATGTTGAC GAAACTACTA TGCATTTCTT TGGTAGTAGT CAGATTGCTT ATCAAGTTTGT
541 GTCTTACTTT TGTTCAGTT GTGGAGTCCC TCTTAAATTT GGCAACATTA GAAAAATCGT
601 TTTGCTTTGT GGCTTGCTAA AACTTAGAAT AAGATTCCT TTGCCTACTA TAATTAGCTG
661 GCGAATTTGG AAGAGTTAGT AGATATAGTG CTAGATTTGA TAATACTAAG ATGTCTGCTA
721 ACTTTATTAG TAAACAGGTG ACCAAGACAA TGCATATGTC CTTCAACAGT CTTTCTCTAT
781 CTTTAACT CTTCTTGAAC GGCACG

Comparison of Purple Russian (top sequence) with NC EBR-8 (middle) and NC123S (bottom sequence)

PURPLE_RUSSIAN	.....CAATTACTCTTATTGAAAAATTGTATAGAGGTAAGCCTAATGGATGAGAT	51
NC EBR-8	GCCCAGATGCAATTTACTCTTATTGAAAAATTGTATAGAGGTAAGCCTAATGGATGAGAT	60
NC123S	GCCCAGATGCAATTTACTCTTATTGAAAA G TTGTATAGAGGTAAGCCTAATGGATGAGAT	60
Consensus	caatttactcttatttgaaaa ttgtatagaggtaagcctaattggatgagat	
PURPLE_RUSSIAN	GAGGGAAGTCTTATTAGACAACCTTCAGTTGATTGGGTATGTGAAGATTGCTATCAACATG	111
NC EBR-8	GAGGGAAGTCTTATTAGACAACCTTCAGTTGATTGGGTATGTGAAGATTGCTATCAACATG	120
NC123S	A GAGGGAAGTCTTATTAGACA A TTTCAGTTGATTGGGTATGTGAAGATTGCTATCAACATG	120
Consensus	aggggaagtcttatttagacaa ttcagttgattgggtatgtgaagattgctatcaacatg	
PURPLE_RUSSIAN	TCTACTTAGATTTCACCTAATGAGGTGGACTATAACCATGTTCTCTCTAAAGAATTTGTGG	171
NC EBR-8	TCTACTTAGATTTCACCTAATGAGGTGGACTATAACCATGTTCTCTCTAAAGAATTTGTGG	180
NC123S	TCTACTTAGATTTCACCTAATGAGGTGGACTATAACCATGTTCTCTCTAA A AATTTGTGG	180
Consensus	tctacttagatttcactaatgaggtggactataaccatgttctctctctaa aatltgtgg	
PURPLE_RUSSIAN	AAATTGATAAAATACCCCTATGAAAATACTCAAGTGGATTGCGAATTTCAAACCTGGATGAGG	231
NC EBR-8	AAATTGATAAAATACCCCTATGAAAATACTCAAGTGGATTGCGAATTTCAAACCTGGATGAGG	240
NC123S	AAATTGATAAAATACCCCTATGAAAATACTCAAGTGGATTGCGAATTTCAAACCTGGATGAGG	240
Consensus	aaattgataaaataccctatgaaaatactcaagtggattgccaatttcaaactggatgagg	
PURPLE_RUSSIAN	AAACATCTATAGCCCCTGTGTGGATTCTAGTCCATCAATTACCATGGCATCTATTCAAGT	291
NC EBR-8	AAACATCTATAGCCCCTGTGTGGATTCTAGTCCATCAATTACCATGGCATCTATTCAAGT	300
NC123S	AAACATCTATAGCCCCTGTGTGGATTCTAGTCCATCAATTACCATGGCATCTATTCAAGT	300
Consensus	aaacatctatagcccctgtgtggattctagtccatcaattaccatggcatctattcaagt	
PURPLE_RUSSIAN	GGCGTATCATCTCCAAATTAGTAAGTCTGTGGTAATGTGCTAAAGTTAAGGTCAAAT	351
NC EBR-8	GGCGTATCATCTCCAAATTAGTAAGTCTGTGGTAATGTGCTAAAGTTAAGGTCAAAT	360
NC123S	GGC A TATCATCTCC A GTTAGTAAGTCTGTGGTAATGTGCTAAAGTTAAGGTCAAAT	360
Consensus	ggc tatcatctcca ttagtaagtctgtggtaatgttgctaaagttaaggtcaaata	
PURPLE_RUSSIAN	AGATCTACTTAAACGAAGATCAGATAAAAATCTGGTTAGTATTTATAGATTGGATGGGT	411
NC EBR-8	AGATCTACTTAAACGAAGATCAGATAAAAATCTGGTTAGTATTTATAGATTGGATGGGT	420
NC123S	AGATCTACTTAAACGAAGATCAGAT .AAAATCTGGTTAG C ATTTATAGATTGGATGGGT	419
Consensus	agatctacttaaacgaagatcagat aaaatctggttag atttcatagattggatgggt	
PURPLE_RUSSIAN	CTGAAGATGCTAGGTGGCTAAAAAAGTATGAAAAAGTACAAAGTTATAGTCTTTATTG	471
NC EBR-8	CTGAAGATGCTAGGTGGCTAAAAAAGTATGAAAAAGTACAAAGTTATAGTCTTTATTG	480
NC123S	CTGAAGATGCTAGGTGGCTAAAAA A CATCTATAGCCCTC.....	459
Consensus	ctgaagatgctaggtggctaaaaaa a a t	
PURPLE_RUSSIAN	CAATATCCAAGGCCATCTCGAATCTCAATGCAGAAACAAGCAAGGGACGACAAAGTTAA	531
NC EBR-8	CAATATCCAAGGCCATCTCGAATCTCAATGCAGAAACAAGCAAGGGACGACAAAGTTAA	540
NC123S	.....	459
Consensus		
PURPLE_RUSSIAN	AGCTCAAAGGAAGAACATAACATGAAAGAAACAGAAATGATCAGACAATGGTTATTCTCT	591
NC EBR-8	AGCTCAAAGGAAGAACATAACATGAAAGAAACAGAAATGATCAGACAATGGTTATTCTCT	600
NC123S	.....	459
Consensus		
PURPLE_RUSSIAN	TTGTTTGGATTGTGGCATATAATGAGAGTTTCACAAGCCTCATTCTTTACCTCTCTATC	651
NC EBR-8	TTGTTTGGATTGTGGCATATAATGAGAGTTTCACAAGCCTCATTCTTTACCTCTCTATC	660
NC123S	.....	459
Consensus		
PURPLE_RUSSIAN	ATTTGGACAAAAATTCCTTTCAAGATATCATCTGTTATGCTTAGATGCTGGAAAAATAAAA	711
NC EBR-8	ATTTGGACAAAAATTCCTTTCAAGATATCATCTGTTATGCTTAGATGCTGGAAAAATAAAA	720
NC123S	.....	459
Consensus		
PURPLE_RUSSIAN	TTCATAACAGATGTTGCTCTCAAAAAACTGGAAGTTCCCTATCCCCTCAATACTCATGCAGA	771
NC EBR-8	TTCATAACAGATGTTGCTCTCAAAAAACTGGAAGTTCCCTATCCCCTCAATACTCATGCAGA	780
NC123S	.....AATGTGTTCTTGTCTCAATACTCATG T TGA	489
Consensus	aa t t t c caaactcatg ga	

PURPLE_RUSSIAN	CGAAACTACTATGCATTTCTTTGGTAGTAGTCAGATTGCTTATCAAGTTTGGTCTTACTT	831
NC EBR-8	CGAAACTACTATGCATTTCTTTGGTAGTAGTCAGATTGCTTATCAAGTTTGGTCTTACTT	840
NC123S	CGAAACTACTATGCATTTCTTTGGTAGTAGTCAGATTGCTTATCAAGTTTGGTCTTACTT	549
Consensus	cgaactactatgcatttctttggtagtagtcagattgcttatcaagtttggcttactt	
PURPLE_RUSSIAN	TTGTTCAAGTTGTGGCGTCCCTCTTAAATTTGGCAACATTAGAAAAATCGTTTTGTCTTG	891
NC EBR-8	TTGTTCAAGTTGTGGCGTCCCTCTTAAATTTGGCAACATTAGAAAAATCGTTTTGTCTTG	900
NC123S	TTGTTCAAGTTGTGGAGTCCCTCTTAAATTTGGCAACATTAGAAAAATCGTTTTGTCTTG	609
Consensus	ttgttcaagttgtgg gtccctcttaaatttggcaacattagaaaaatcgTTTTGTCTTG	
PURPLE_RUSSIAN	TGGCTTGCTAAAAC TAAGAATAAGATTACAAAGCTTTCATACAATGTTTGCCTACTATA	951
NC EBR-8	TGGCTTGCTAAAAC TAAGAATAAGATTACAAAGCTTTCATACAATGTTTGCCTACTATA	960
NC123S	TGGCTTGCTAAAAC TAGAATAAGATTAC.....TTTGCCTACTATA	652
Consensus	tgcttgctaaaact agaataagattcac tttgcctactata	
PURPLE_RUSSIAN	ATTAGCTGGCGAATTTGGAAGAGTTAGTAGATATAGTGCTAGATTTGATAACTAAGAT	1011
NC EBR-8	ATTAGCTGGCGAATTTGGAAGAGTTAGTAGATATAGTGCTAGATTTGATAACTAAGAT	1020
NC123S	ATTAGCTGGCGAATTTGGAAGAGTTAGTAGATATAGTGCTAGATTTGATAACTAAGAT	712
Consensus	attagctggcgaatTTGGAAGAGTTAGTAGATATAGTGCTAGATTTGATAACTAAGAT	
PURPLE_RUSSIAN	GTCTGCTAACTTTATTAGTAAACAGGTGACCAAGAAAATGCATATGTCCTTCAACAG...	1068
NC EBR-8	GTCTGCTAACTTTATTAGTAAACAGGTGACCAAGAAAATGCATATGTCCTTCAACAG...	1077
NC123S	GTCTGCTAACTTTATTAGTAAACAGGTGACCAAGAAATGCATATGTCCTTCAACAGTCT	772
Consensus	gtctgctaactttattagtaaacaggtgaccaaga aatgcatatgctcttcaacag	
PURPLE_RUSSIAN	.....	1068
NC EBR-8	.....	1077
NC123S	TTTTCTATCTTTAACACTCTTCTTGAACGGCAGC	806
Consensus		

Comments

Partial sequence was obtained for four samples, Purple Russian, F2 plant of Llanero, NC EBR-8, and NC123S. Sequences of Purple Russian and NC EBR-8 were identical, as well as to L40, an F2 plant from Llanero. Therefore, only NC123S has an introgression from *S. pennellii* in that chromosomal region.

For the sequence of Purple Russian and NC EBR-8, there was a 77% nt identity with clone LE_HBa-53M2 (chromosome 4) and at 82% nt identity with clones C08HBa0034F03 and C08HBa0091A10 (chromosome 8) for sequences at GenBank site. NC123S also matched with clone LE_HBa-53M2 at 69% nt identity, and with clones C08HBa0034F03 and C08HBa0091A10 at 77% nt identity. Purple Russian also matched with clone LE_HBa0073G16_SP6_16830 (DU034689) at 99% nt identity. NC EBR-8 matched the same clone with a 98% nt identity, as well as NC123S with a 97% nt identity.