‘Mountain Majesty’: A Tomato Spotted Wilt Virus-resistant Fresh-market Hybrid Tomato and Its Parents NC 714 and NC 1CS

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‘Mountain Majesty’ is a large-fruited, fresh-market hybrid tomato (Solanum lycopersicum L.) developed by crossing NC 714 × NC 1CS. It is resistant to verticillium wilt (Verticillium dahliae Kleb) (race 1), fusarium wilt [Fusarium oxysporum Fsp. lycopersici (Sacc.) Snyder and Hansen] (races 1 and 2), and tomato spotted wilt virus (TSWV).

Origin

‘Mountain Majesty’, the F1 hybrid of NC 714 × NC 1CS (Fig. 1), resulted from a tomato breeding effort to develop a superior large-fruited hybrid tomato with improved fruit color based on the crimson (‘og’) gene combined with fusarium wilt, verticillium wilt, and TSWV resistances adapted to vine-ripe production in North Carolina (NC).

NC 714 resulted from selfing NC 03113, the F1 hybrid of Fla 8044 × NC 00318-15(x)-1 (Fig. 1). Fla 8044 is a large-fruited, high-temperature fruit set line with desirable horticultural traits and multiple disease resistance genes obtained from the University of Florida tomato breeding program. NC 00318-15(x)-1 is an F2 selection obtained by crossing a male sterile version of NC 84173 with an F3 generation line derived from selfing the North Carolina State University (NCSU)-released hybrid ‘Mountain Crest’ (NC 84173 × NC 1 IrINEC) (Gardner, 2006). The crimson gene in NC 714 was derived from the NC IrINEC parent of ‘Mountain Crest’ and Fla 8044.

The objective of breeding NC 714 was to incorporate desirable fruit characteristics and superior combining ability from NC 84173 (Gardner, 1992) together with the crimson gene for increased red fruit color and lycopene content. Single plant selections were made for large fruit size, high yield, and other desirable horticultural traits in the F2 through F5 generations derived from selfing NC 03113.

NC 1 CS resulted from selfing NC 056, the F1 hybrid of NC 123S × NC 0255(x)-1 (Fig. 1). NC 123S, which combines single dominant gene resistances to TSWV, fusarium wilt race 3, and nematodes (Sw-3, I-3, M1 genes) and was released from the NC breeding program. ‘Amelia’ F1 hybrid, from which NC 123S was developed, is a codeveloped hybrid using NC 111F-2(98) as a source of the I-3 gene for fusarium wilt race 3 resistance crossed with a Clause Seed Company proprietary line having the Sw-5 and M1 genes. NC 0255(x)-1 is an outstanding large-fruited selection with the crimson gene that traces its pedigree back to breeding lines and cultivars developed in the NC tomato breeding program over a 25-year period (Fig. 1). The source of the crimson gene in NC 0255(x)-1 is ‘Suncoast’, an inbred cultivar released from the University of Florida breeding program.

Description

‘Mountain Majesty’ has a vigorous determinate growth habit (op gene) similar in height to that of ‘Mountain Fresh’. Foliage provides good cover for fruit protection. ‘Mountain Majesty’ has homoygous resistance (Ve gene) to Verticillium dahliae, resistance (I, I-2 genes) to races 1 and 2 of Fusarium oxysporum Fsp. lycopersici (Sacc.) Snyder and Hansen, and heterozygous resistance to TSWV (Sw-5 gene). Total and marketable yields of ‘Mountain Majesty’ were significantly higher than ‘Mountain Fresh’ in 2008 when there was TSWV infection in the field (Table 1). Fruit of ‘Mountain Majesty’ have been free of graywall in grower plantings where fruit of ‘Mountain Fresh’ exhibited some graywall symptoms. Graywall is a disorder in where fruit of ‘Mountain Fresh’ exhibited some graywall symptoms. Graywall is a disorder in...
higher than most of the other entries in trial (Table 2). Considering its superior yield, large fruit size, and good combining ability, it is being used as a parent in additional crosses. NC 714 is not intended for use as a cultivar but solely as a parent for its contribution of large fruit size, the crimson gene, and other desirable horticultural traits and disease resistance genes when used as a parent in F1 hybrids. NC 714 is the first line developed for release from the NCSU tomato breeding program that combines the crimson gene with the large ball-shaped trait. It is intended for crossing with other lines having the recessive crimson gene so the hybrids will be homozygous for crimson and express improved red color and increased lycopene content.

Plant growth habit of NC 1CS is vigorous, determinate with attractive, heavy foliage cover. Fruit are deep oblate to flattened globe in shape, are smooth, and have jointed pedicels. Immature fruit are uniform light green (u gene). Ripe fruit are firm and develop exceptionally bright red exterior and interior color as a result of the crimson gene. NC 1CS is resistant to Table 1. Average performance of ‘Mountain Majesty’ and its parents, NC 714 and NC 1CS, compared with standard hybrids in 2008 at Mills River, NC, where tomato spotted wilt virus was present.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Non-graded yield (t ha⁻¹)</th>
<th>Graded yield (t ha⁻¹)</th>
<th>Marketable (%)</th>
<th>Fruit wt (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fletcher</td>
<td>100</td>
<td>60</td>
<td>61</td>
<td>285</td>
</tr>
<tr>
<td>Mountain Fresh</td>
<td>102</td>
<td>62</td>
<td>60</td>
<td>320</td>
</tr>
<tr>
<td>Mountain Glory</td>
<td>99</td>
<td>68</td>
<td>69</td>
<td>283</td>
</tr>
<tr>
<td>Mountain Majesty</td>
<td>130</td>
<td>86</td>
<td>66</td>
<td>321</td>
</tr>
<tr>
<td>NC 1CS</td>
<td>123</td>
<td>77</td>
<td>62</td>
<td>318</td>
</tr>
<tr>
<td>NC 714</td>
<td>121</td>
<td>50</td>
<td>42</td>
<td>337</td>
</tr>
<tr>
<td>Least significant difference (0.05)</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>20</td>
</tr>
</tbody>
</table>

Fig. 1. Pedigree of ‘Mountain Majesty’ hybrid tomato.
verticillum wilt (Ve gene), races 1 and 2 of fusarium wilt (I, I-2 genes), and TSWV (Sw-5 gene). Details of these genes can be found at http://tgrc.ucdavis.edu/Data/Acc/Genes.aspx. Fruit are highly resistant to graywall and cracking. In 2007, in replicated vine-ripe and mature-green harvest trials where TSWV was severe, NC 1Cs produced higher total and marketable grade yields than susceptible cultivars and was free of TSWV. In replicated vine-ripe harvest trials in 2008, where TSWV was present, NC 1 CS produced high total and U.S. combination grade yields compared with other entries and had large fruit size (Table 1). NC 1 CS continued to perform well in early- and late-season vine-ripe harvest trials in 2008 to 2010 (Table 2) and has exhibited good combining ability in numerous experimental hybrids using it as a parent. Color images of NC 714 and NC 1CS are available at the following web site: <http://www.ces.ncsu.edu/fletcher/programs/tomato/releases/seedlines.html>.

### Use

‘Mountain Majesty’ provides growers in North Carolina and other regions with similar growing conditions a high-yielding, TSWV-resistant, fresh-market, large-fruited tomato cultivar with improved color and fruit size comparable to ‘Mountain Fresh’. The addition of resistance to TSWV, large fruit size, fruit smoothness, and high yielding potential are extremely useful to tomato growers in NC and other states. NC 714 and NC 1CS provide tomato breeders with superior fruit quality and yield potential and should be useful in breeding as a parent in other F1 hybrids.

### Availability

We plan to license ‘Mountain Majesty’ to a private seed company on an exclusive basis for seed production and sales. It is expected that commercial seed should be available in 2013. Distribution of seed of NC 714 and NC 1CS to other breeders requires a signed material transfer agreement, which can be downloaded at the following web site address: <http://www.mountainhort.ncsu.edu/programs/tomato/releases/tomato-seed-transfer-agreement.pdf>. Small trial samples of ‘Mountain Majesty’ are available from D.R. Panthee (dilip_panthee@ncsu.edu), MHCREC, 455 Research Drive, Mills River, NC 28759.

### Literature Cited

