‘Mountain Crest’ Hybrid Tomato and its Parent, NC 1 rinEC

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‘Mountain Crest’ is a fresh-market tomato (*Lycopersicon esculentum* Mill.) hybrid with extended shelf life resulting from the ripening inhibitor gene (*rin*) in heterozygous condition.

Origin

‘Mountain Crest’, the F₁ hybrid of NC 84173PVP × NC 1 rinEC, resulted from a breeding program to develop an extended-shelf-life tomato cultivar adapted to vine-ripe production in North Carolina. Cultivars with extended shelf life based on use of the recessive

ripening inhibitor gene (*rin*) are now widely used for vine-ripe harvest in production areas outside the U.S. The *rin* gene in homozygous condition eliminates the production of ethylene in tomatoes thus inhibiting ripening of fruit. When used in the heterozygous condition in firm-fruited backgrounds, *rin* slows fruit ripening and softening resulting in extended shelf life. *Rin* extended-shelf-life hybrids are grown for vine-ripe harvest in Mexico during the winter for export to the U.S. and have competed strongly with Florida for markets. Florida ships primarily mature green harvested fruit subjected to ethylene to stimulate ripening. Although North Carolina growers have cultivars with adequate shelf life well adapted to vine-ripe production, some retail handlers of

tomatoes have indicated that they would prefer to market the extended-shelf-life *rin* hybrids on a year-round basis if such tomatoes were available because of less fruit loss (shrinkage) of these hybrids compared to normal ripening hybrids.

Commercial *rin* hybrid cultivars have not shown good adaptability to production in North Carolina in the summer. In addition to having defects in fruit quality characteristics such as fruit cracking and misshapen fruit, there are often problems with poor flavor and failure to attain a deep red color. Efforts over the last several years in the North Carolina tomato breeding program have focused on the development of improved *rin* hybrids with better color and flavor and adaptability to North Carolina growing conditions.

The *rin* gene used in developing NC 1rinEC, the male parent of ‘Mountain Crest’, was obtained from open-pollinated seed of an unknown F₁ hybrid, fruit of which were purchased from a local supermarket. An F₂ generation selection homozygous for the *rin* gene derived from this hybrid was crossed to NC 134G-2(94), a line with intense red color having the recessive crimson gene (*og^c*), (Fig. 1). In the F₂ generation from the resultant hybrid, NC 9584, selection was made for plants homozygous for both the *rin* and *og^c* genes. Among the plants in this F₂ population, some were identified with more intense interior and exterior color than seen in the original *rin* plant obtained from selfing the unknown hybrid and

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Fig. 1. Pedigrees of ‘Mountain Crest’ F₁ hybrid tomato and its parent line, NC 1 rinEC.

Table 1. Comparison of ‘Mountain Crest’^z with standard tomato cultivars in staked, vine-ripe harvest trials at Fletcher, N.C.

Cultivar	Yield (t·ha ⁻¹)			Fruit wt (g)
	Early season ^y nongraded	Total season		
		Nongraded	U.S. combination ^x grade	
Mountain Crest	33	112	84	294
Mountain Spring	34	102	65	361
Mountain Fresh	26	114	89	317
LSD _{0.01}	6	NS	16	21

^zBased on eight replicated trials conducted over a 4-year period (1999–2002).

^yFirst 2 weeks of harvest.

^xU.S. No. 1 and No. 2 grade fruit.

in other known lines with the *rin* gene. In numerous segregating populations from crosses with NC 1 rinEC, deep yellowish-orange exterior color of *rin* homozygous plants has been associated with a single, incompletely dominant gene distinct from *ogc*. The combination of this gene with homozygous *ogc* in *rin* plants results in considerable red color scattered throughout the interocular walls in addition to the more intense orange exterior color. The improved color in NC 1 rinEC is likely derived from either 'Suncoast' (Scott et al, 1985), the source of *ogc* in NC 1 rin EC, or NC 8276 PVP (Fig. 1). This improvement of color in homozygous *rin* lines is being termed *rin* enhanced color, abbreviated as rinEC. NC 1 rinEC was crossed with NC 84173 PVP (Gardner, 1992), a line with excellent combining ability, which is used as a parent in several North Carolina State University-named hybrids and in several commercial seed company hybrids. The resultant hybrid was tested as NC 98100 before its naming and release in 2002.

Description

'Mountain Crest' was rated outstanding in observational plots in 1998 at Fletcher, N.C., and has been tested in replicated trials at Fletcher since 1999. In eight replicated trials conducted over a 4-year period, 'Mountain Crest' produced as well as 'Mountain Fresh' (Gardner, 1999) in yield of U.S. combination grade (U.S. no. 1 + U.S. no. 2 fruit) and exceeded 'Mountain Spring' in yield of U.S. combination grade fruit (Table 1). 'Mountain Crest' was as early as 'Mountain Spring' in maturity and earlier than 'Mountain Fresh'. Average fruit weight of 'Mountain Crest' was less than that for 'Mountain Spring' and 'Mountain Fresh' but still acceptable (Table 1).

Fruit of 'Mountain Crest' develop deep red color and are very firm in the fully ripened

stage. Flavor of 'Mountain Crest', based on numerous subjective ratings, is equivalent to that of 'Mountain Spring'. Like other hybrids with the *rin* gene, fruit texture of 'Mountain Crest' remains crisp and does not soften when ripe as does the texture of normal hybrids. Immature fruit have a glossy, uniform green color (*u*). Fruit pedicels are jointed. The fruit are deep oblate to flattened globe in shape with generally smooth blossom end scars and have good resistance to fruit cracking and weather check. 'Mountain Crest' has performed well in many observational trials in research station and grower fields throughout the mountains and piedmont of North Carolina and in spring plantings in the coastal area of South Carolina. 'Mountain Crest' was received favorably by growers who produced it in large-scale trial plantings in 2001–03 and in commercial field production in 2004.

'Mountain Crest' has a vigorous determinate plant (*sp*) similar in height to that of 'Mountain Fresh' when staked. Foliage has slight leaf curl and provides adequate, but not dense, cover for fruit protection. 'Mountain Crest' has resistance (*Ve* gene) to *Verticillium dahliae* Kleb. and resistance (*I* and *I-2* genes) to races 1 and 2 of *Fusarium oxysporum* f.sp. *lycopersici* (Sacc.) Snyder and Hans.

NC 1 rinEC has a vigorous determinate plant with moderately heavy foliage, which exhibits slight leaf curl. Fruit are uniform ripening (*u*) with jointed fruit pedicels and are deep oblate to flattened globe in shape. Fruit of NC 1 rinEC develop a deep orange exterior color when mature. The fruit interior has red streaks scattered throughout the flesh. A color image of NC 1 rinEC can be viewed at the website www.ces.ncsu.edu/fletcher/programs/tomato. Fruit of NC 1 rinEC have smooth blossom end scars and have shown good resistance to fruit cracking and weather check. It has the *I-2* gene for resistance to race 2 of fusarium wilt. NC 1 rinEC has not been tested for other

disease resistances nor has it been harvested to measure yield, fruit grade, or fruit size. It has been observed in many observational plantings to produce a heavy set of uniformly large fruit.

Use

'Mountain Crest' is the first extended-shelf-life cultivar with the *rin* gene released from the North Carolina State University fresh-market tomato breeding program. It will provide growers in North Carolina and other production areas with similar growing conditions an adapted *rin* heterozygous cultivar for customers who want this type of tomato. NC 1 rinEC is intended for use as a parent in the production of F_1 hybrids and as a source of improved color for further breeding with *rin* tomatoes.

Availability

'Mountain Crest' was released on an exclusive basis for seed production and sales to Sunseeds (now Nunhems) and commercial seed have been available since 2004. Small samples of 'Mountain Crest' and NC 1 rinEC are available from R.G. Gardner, MHCRC, 455 Research Drive, Fletcher, NC 28732. Recipients of NC 1 rinEC will be required to sign a seed transfer agreement before receiving seed.

Literature Cited

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