

## Description of Acylsugar Breeding Lines from Martha Mutschler

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**CU17NBL** (*LA5346*) is an acylsugar benchmark breeding line, which was developed to replace the former benchmark line, CU071026. CU071026 had reproductive limitations, setting fruit in the Ithaca NY area only when sown in November or December in the greenhouse. When sown from May to about October, and grown in greenhouse or field (in summer) CU071026 flowers but either does not set any fruit, or sets very few fruit with little seed. Seed of CU071026 also have lower germination percentages than standard tomato. CU17NBL produces essentially the same type of acylsugar, at the same level, as CU071026, however CU17NBL sets fruit and seed normally year round and its seed has normal germination. The creation of the major Cornell acylsugar lines including CU071026 and CU17NBL is reviewed in Mutschler (2021).

CU17NBL has 5 *S. pennellii* introgressions which combined are ca. 11% of the CU17NBL genome. The locations and sizes of these locations using the 2.5 genome build are:

- Chromosome 2: the Chr2 introgression, from 53,792,960 - 55,238,304 bp: Therefore, 1,445,344 bp in length
- Chromosome 3: the Chr3 introgression, from 2,143,744 - 64,451,474 bp: Therefore 62,307,730 bp length
- Chromosome 7: the Chr7 introgression, from 65,554,074 – 65,801,666 bp: Therefore 1,445,344 bp in length
- Chromosome 8: the Chr8 introgression, from 60,843,834 – 63,384,503 bp: Therefore 1,445,344 bp in length
- Chromosome 10: the Chr10U introgression, from 0 - 1,916,909 bp: Therefore 1,445,344 bp in length

CU17NBL is the background into which a series of lines has been created and deposited into the USDA germplasm collection. This series of lines was created by transferring 1 to 3 additional *S. pennellii* introgressions into CU17NBL from a line of the set of lines previously created in the CU071026 set of acylsugar lines.

**QTL6/CU17NBL** (*LA5347*) is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring the QTL6 introgressions, which increases acylsugar level and increases the density of Type IV trichomes which produce and exude acylsugars. The source of the QTL6 and the Sw-5 containing introgressions to create QTL6/CU17NBL and QTL6/Sw-5/CU17NBL lines was the analogous line in CU071026, QTL6/Sw-5/ CU071026. The QTL6/CU17NBL and QTL6/Sw-5/CU17NBL lines are very similar in acylsugar level and acylsugar types to that of their analogous lines in CU071026 background: QTL6/ CU071026 and QTL6/Sw-5/ CU071026 lines. The impacts of increased acylsugar level of QTL6/ CU071026 and QTL6/Sw-5/ CU071026 lines on Bemisia whitefly oviposition is in Leckie et al (2012).

**QTL6/Sw-5/CU17NBL** (*LA5348*) is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring the QTL6 introgressions, which increases acylsugar level and increases the density of Type IV trichomes which produce and exude acylsugars. The only difference between Sw-5/CU17NBL and QTL6/CU17NBL is the absence and presence of the Sw-5 containing introgression. The immediate source of the QTL6 and the Sw-5 containing

introgressions to create QTL6/CU17NBL and QTL6/Sw-5/CU17NBL lines was the analogous line in CU071026, QTL6/Sw-5/ CU071026.

**ModQTL6/Sw-5/CU17NBL (LA5349)** is a related line in which the distal end of the QTL6 introgression has been shortened, which appears to increase seed production. The ModQTL6/Sw-5/CU17NBL and QTL6/Sw-5/CU17NBL lines are very similar in acylsugar level and acylsugar types to each other and to that of their analogous lines in CU071026 background: QTL6/Sw-5/ CU071026 lines.

**Sw-5/CU17NBL (LA5350)** is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring an introgression containing the Sw-5 gene for resistance to TSWV. The Sw-5/CU17NBL line was created as an additional line from the segregating population used to create the lines QTL6/CU17NBL and QTL6/Sw-5/CU17NBL. The immediate source of the Sw-5 containing introgression to create the Sw-5/CU17NBL lines was the line in CU071026, QTL6/Sw-5/CU071026.

**CU17NBL/NO 8 (LA5351)** is a variant of CU17NBL that lacks one introgression, that is on chromosome 8. The acylsugars produced by CU17NBL/NO 8 are similar to those in CU17NBL, although the level of acylsugars in CU17NBL/NO 8 is less than that in CU17NBL.

**FA2/CU17NBL (LA5352)** is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring the FA2 introgression into CU17NBL. The FA2 QTL modifies the fatty acid chains of the acylsugars produced, increasing the length of branched chain fatty acids from the original 4 or 5 carbons, by 6 to 8 additional carbons. The FA2QTL containing introgression was transferred into the prior benchmark line, CU071026, as described in Smeda (2016), and the epistatic interaction of FA2 with the FA7 QTL, which also affects acylsugar fatty acid side chains, was described in Smeda et al (2017).

**FA7/CU17NBL (LA5353)** is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring the FA7 introgression into CU17NBL. The FA7QTL containing introgression was transferred into the prior benchmark line, CU071026, as described in Smeda et al (2016), and the epistatic interaction of FA7 with the FA2 QTL, which also affects acylsugar fatty acid side chains, was described in Smeda et al (2017).

**FA2/FA7/CU17NBL (LA5354)** is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring both the FA2 and FA7 containing introgressions into CU17NBL background. As shown by Leckie et al (2014), the FA2 QTL modifies the fatty acid chains of the acylsugars produced, increasing the length of branched chain fatty acids from the original 4 or 5 carbons, by 6 to 8 additional carbons. The FA7 QTL modifies the fatty acid chains of the acylsugars produced, decreasing the length of moderate length fatty acids from by 2 carbons.

**FA5/CU17NBL (LA5355)** is a line derived in the CU17NBL acylsugar benchmark breeding line by transferring the FA5 containing introgression. As shown by Smeda et al. (2016), the FA5 introgression essentially shuts down acylsugar production, despite having the five acylsugar QTL introgressions in CU17NBL. This line thus serves as a negative control for acylsugar production.

**CU071026 (LA5356)** is the acylsugar benchmark breeding line from which CU17NBL was selected. It has the same introgressions as CU17NBL.

Each of the lines in the CU17NBL background are very similar in acylsugar level and acylsugar types to that of their analogous lines in the CU071026 background.

**To request seed:** fill out and sign this [MTA](#) and email to [mam13@cornell.edu](mailto:mam13@cornell.edu).

#### Literature

1. Leckie, BM, DeJong, DM, and M.A. Mutschler (2012) Quantitative trait loci increasing acylsugars in tomato breeding lines and their impacts on silverleaf whiteflies. *Molecular Breeding* 30 (4): 1621-1634. <https://link.springer.com/article/10.1007/s11032-012-9746-3>
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3. Mutschler, MA (2021) Breeding for Acylsugar Mediated Control of Insects and Insect Transmitted Virus in Tomato. IN: Plant Breeding Review vol 45. Goldman I ed. <https://doi.org/10.1002/9781119828235.ch9>
4. Smeda JR, AL Schillmiller, TA Anderson, S Ben-Mahmoud, DE Ullman, TM Chappell A Kessler, MA Mutschler (2018) Combination of Acylglucose QTL Reveals Additive and Epistatic Genetic Interactions and Impacts Insect Oviposition and Virus Infection. *Molecular Breeding* 38: 3. <https://doi.org/10.1007/s11032-017-0756-z>
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