

Table S1. Correlations between the regulation of ϵ LCY and carotenoid levels in plants.

Species	Tissue	Genetic Locus Impaired	Exogenous Gene OE	β -car level	Carotenoids Accumulated (other than β -car)	Carotenoids Reduced (other than β -car)	ϵ LCY transcription	Ref.
Tomato (<i>Delta</i>)	Ripe fruit	Del (ϵ LCY allele)	-	∨	δ -car, α -car, Lut	Lyc	^ in fruit	Ronen 1999
Tomato (<i>Ailsa Craig</i>)	Fruit	-	<i>CrtI</i>	∨ in mature green fruit, ^ in ripe fruit	Ripe fruit: Neo, Vio; Leaves: Vio	Ripe and green fruits: All <i>cis</i> -car; Leaves: Total Chl, Lut, Neo	^ in 3 days post breaker fruit	Enfissi et al 2017
Tomato (<i>tangerine</i> ³¹⁸³)	Fruit	<i>CRTISO</i>	<i>CrtI</i>	∨ in mature green fruit, ^ in ripe fruit	Ripe fruit: Lyc, Lut, Neo, Vio; Leaves: Vio	Ripe and green fruits: All <i>cis</i> -car, Leaves; Lut, Neo	^ in 3 days post breaker fruit	Enfissi et al 2017
Tomato (<i>old gold crimson</i>)	Fruit	<i>CYCB</i> (β LCY)	<i>CrtI</i>	^ in ripe fruit	Ripe fruit: Lut	Ripe fruit: Phy, Phf	^ in 3 days post breaker fruit	Enfissi et al 2017
Arabidopsis	Etiolated Seedlings	<i>CRTISO</i> (<i>ccr2</i>) ϵ LCY (RNAi)	-	absent	<i>cis</i> -carotenes	All	∨	Cuttriss et al., 2007
Canola	Seeds	ϵ LCY (RNAi)	-	^	Zea, Vio, and Lut	N/A	∨ (RNAi)	Yu 2008
Sweet potato	Transgenic calli	ϵ LCY (RNAi)	-	^	All β -branch car, ABA	Lut	∨ (RNAi)	Kim 2013
Potato	Tubers	ϵ LCY (Tuber specific RNAi)	-	^	Zea, Ant, Vio and Neo,	N/A	∨ (RNAi)	Diretto 2006
Maize	Kernels	ϵ LCY	-	^	N/A	N/A	Mutated (Variable positions incl. 5'TE)	Harjes 2008
Maize	Kernels	ϵ LCY & <i>crtRB1</i> (<i>BCH1</i>)	-	^	N/A	N/A	Mutated (5'TE)	Muthusamy 2015
Maize	Kernels	ϵ LCY	-	^	N/A	N/A	Mutated (5'TE)	Zunjare 2018
Melon	Mature fruit	<i>CmOr</i> ϵ LCY (RNAi)	-	^	ζ -car	N/A	∨	Chayut et al., 2015
Tobacco	Leaves	ϵ LCY (RNAi)	-	^	Vio, Neo, Chl-b, Chl-a	N/A	∨ (RNAi)	Shi 2015
Sweet potato	Tubers	ϵ LCY (RNAi)	-	^	Zea, β -cry	α -car	∨ (RNAi)	Ke 2019
Wheat (ssp. durum)	Leaves	<i>LCYE-A1</i> , W437	-	^	N/A	N/A	Mutated (TILLING)	Richaud 2018

Abbreviations: ABA, abscisic acid; Ant, Antheraxanthin; Chl-a, Chlorophyll-a; Chl-b, Chlorophyll-b; *cis*-car, *cis*-carotenoids; Lut, Lutein; Lyc, Lycopene; Neo, Neoxanthin; Overexpressed, OE; Phy, Phytoene; Phyf, Phytofluene; Ref, references; RNAi, RNA interference; TE, transposon Insertion; Vio, Violaxanthin; Zea, Zeaxanthin; α -car, Alpha-carotene; β -cry, β -cryptoxanthin; δ -car, Delta-carotene; ζ -Car, ζ - Carotene; “∨”, decreased; “^”, increased; “N/A”, not available/unknown.

Table S2. Carotenoid percent composition in rosette leaf tissues from *ccr2* lines harboring *35Senh::SSU-PaCrtI*

Germplasm	Line #	Chl a/b Ratio	Percentage Carotenoid Composition						Segregation
			Neoxanthin	Violaxanthin	Antheraxanthin	Lutein	Zeaxanthin	β-carotene	Chi ² p-value
<i>ccr2 PaCrtI</i>	5	2.8	11.3	27.0	7.3	15.5	2.2	36.7	0.64
<i>ccr2 PaCrtI</i>	9	2.6	12.0	29.8	7.7	16.6	2.0	31.9	0.68
<i>ccr2 PaCrtI</i>	11	2.7	11.9	30.4	7.2	16.1	2.0	32.4	0.70
<i>ccr2 PaCrtI</i>	26	2.9	10.4	34.6	5.6	14.1	1.6	33.6	0.72
<i>ccr2 PaCrtI</i>	Average	2.7	11.8	29.1	7.4	16.0	2.1	33.6	
<i>ccr2</i>	2.1	2.6	11.7	29.9	6.8	17.1	1.9	32.6	

Chi² P-value >0.05 reveals lines that show 3:1 segregation of green to white seedlings.

Table S3. Primers used for qPCR, cloning, and 5'Rapid Amplification of cDNA Ends

	Primer Name	Gene Name	Accession	Sequence (5' to 3')
qPCR	AtCycloProm-cc1F	Cyclophilin (Promoter)	AT2G29960	TCCTCTGACCTCTCTTTGTTGCC
	AtCycloProm-cc1R	Cyclophilin (Promoter)	AT2G29960	TCCAATGCTAACATACGCTGG
	AtPP2A-cc1F	Protein Phosphatase 2A	AT1G13320	CTTGGTGAGTATCGCTTCTC
	AtPP2A-cc1R	Protein Phosphatase 2A	AT1G13320	ATTGGAGAGCTTGATTTGCG
	AtLUC-cc1F	Firefly Luciferase	-	TGGAACCGCTGGAGAGCAAC
	AtLUC-cc2R	Firefly Luciferase	-	CGCAACTGCAACTCCGATAA
	AtεLCY-cc1F	εLCY	AT5G57030	TCGGTTTGTAGTGTCAAGAGC
	AtεLCY-cc1R	εLCY	AT5G57030	AAGGCTAAACCAGCAGGACC
	AtLHCB2-F	Light Harvesting Complex	AT1G29930	CAGCTATCCAACAATCCTCCTTCG
	AtLHCB2-R	Light Harvesting Complex	AT1G29930	TTCTCCGAGAAATGGTCCCAAGTAC
	AtRBCS1a-F	Rubisco Small Subunit	AT1G67090	TACCTTCTGACCTTACCGATTCT
	AtRBCS1a-R	Rubisco Small Subunit	AT1G67090	CGATGATCCTAATGAAGGCATTG
	TIP41-cc1F	TIP41-like family protein	AT4g34270	CAACGCCATACTGTGGAAGTG
	TIP41-cc1R	TIP41-like family protein	AT4g34270	AAATCGCAAGAGGAGGAACC
Cloning	M13F	pGEM-T		GTAACACGACGCGCCAGT
	M13R	pGEM-T		CACACAGGAACAGCTATGACCATG
	HindIII_T35_F1	CaMV35s enhancer		AAGCTTCCATTGCCAGC
	HindIII+XbaI_T35_R1	CaMV35s enhancer		AAGCTTtctagaGTCTCTCCA
	1F_Mut5UTR			tctagaATTTTGAGATTTTTTTC
	1R_Mut5UTR			cctaggTTTCTCCTCAAATAATTCGAATACAGCGAGAACTTACACC
	4F_Mut5UTR			tctagaATTTTGAGATTTTTTCCAATAATTACAAAATAAATAATTAGATgCCTCTTTCTGCTTGCTATACCTT
	6F_Mut5UTR			tctagaATTTTGAGATTTTTTCCAATAATTACAAAATAAATAATTAGATTCCTCTTTCTGCTTGCTATACCTT
	eLCYProm-cc4F	εLCY Promoter (450 bp)	AT5G57030	GGCTCTAGACGTGTGCGAGTTCATGG
	eLCYProm-cc1R	εLCY Promoter (450 bp)	AT5G57030	CATGCCATGGTTTCTCTCCAAATAATTTGG
	eLCY 5'UTR-cc1R	eLCY 5'UTR 3'deletion (401 bp)	AT5G57030	CATGCCATGGTTATATTGTTCTATCAAGGATAGC
	eLCY 5'UTR-cc1F	eLCY 5'UTR (133 bp)	AT5G57030	CCCAAGCTTATTTTGAGATTTTTTCCAATAATTAC
	35enh-cc1F	CaMV35s enhancer		CCCAAGCTTCCATTGCCAGCTATCTGTC
	35enh-cc1R	CaMV35s enhancer		CCCAAGCTTGTCTCTCCAATGAATGAAC
5'RACE	NosTmod1-cc1F	Modified NosTerminator		CAAGATCTGCTCATGAATTTCCCTAGGATCGTTCAAACTTTGGC
	NosTmod-cc1R	Modified NosTerminator		CAAGATCTGCAGGAATTATTC
	GeneRacer™ 5'			CGACTGGAGCAGGAGGACACTGA
	GeneRacer™ 5' Nested			GGACACTGACATGACTGAAGGAGTA
	eLCY-cc2R			CAGCGAAATCTTCTCTCACC
	eLCY-5'RACE R-primer1 (Nested)			ACCGCGATTGCTGCGAAATTCCT
	PDS3-5'RACE R-primer1			TCGCGCGAGAAACATCCCCAAC
	PDS3-5'RACE R-primer2(Nested)			CCGCGAGAAACATTCCAAACACAACC
	ZDS-5'RACE R-primer1			GGCTCTGGAGGAAATAACCCCTTTGG
	ZDS-5'RACE R-primer2 (Nested)			AACCCCTTTGGAGCGTTAACACTC
	ZISO-5'RACE R-primer1			GGTCGAGTTTCCGAGGCGAGGAT
	ZISO-5'RACE R-primer2 Nested			CGAGGCGAGGATGAGCTGGGATAC
	CRTISO-5'RACE R-primer1			CCAGAACCAGATAACAATGGCGTCGT
	CRTISO-5'RACE R-primer2 (Nested)			GGCGTCGTACAGACTCTCTCTCCA
	bLCY-5'RACE R-primer1			GCCCTTTTCTTACACCAAGCCTAACCC
	bLCY-5'RACE R-primer2 (Nested)			TCGAGCTGTGTTGGGTGTTTTCAACAG
	DXS-5'RACE R-primer1			TGTTGTTGGGTTTCAACATGGTGATGG
	DXS-5'RACE R-primer2 (Nested)			TCGACATGGTGATGGAAGATCTGTAAC
	PTOX-5'RACE R-primer1			GAGCTGTACGAAACGCGGCTCT
	PTOX-5'RACE R-primer2 (Nested)			ACGGCGGCTCTAGAGCGTCGAAG
	DXR-5'RACE R-primer1			CCTCTCCTTGATTCTCTCTCTCA
	DXR-5'RACE R-primer2 (Nested)			CCCACCTGAGAGTTTAGGGATTGGA
	HDR-5'RACE R-primer1			GCCAGACGAGCACCGACTGATA
	HDR-5'RACE R-primer2 (Nested)			AATCGGCTGAATTGGAGCGCAAC
	PSY-5'RACE R-primer1			GCGCAAACTTCAACCGCATCG
	PSY-5'RACE R-primer2			CCCACAATTGTTCAITGGGTCTGG