Table S1. Sampling parameters for canopy experiment. Leaf discs were collected from individual plants on 7/27/21 from 12-2:30pm; a sunny day with passing clouds towards end of sampling. Ambient temperature ranged from 32°-34°C. Light conditions (Photosynthetic Photon Flux Density and red:far-red light ratios (R:FR)) were measured using a LI-180 and photosynthetic parameters (ϕPSII - photosynthetic efficiency of Photosystem II) were collected with a LI-600.

REPLICATE	CANOPY POSITION	DEV STAGE	LEAF	PPFD	R:FR	Φ PSII
1	T	V16/R2	15	1616.93	1.2403	0.53139
2	T	V17/R2	15	1841.22	1.3151	0.42066
3	T	V17/R2	15	1839.61	1.2842	0.44938
4	T	V16/R2	14	1830.5	1.2987	0.44802
5	T	V17/R2	15	1883.89	1.268	0.33845
6	T	V17/R2	15	1862.68	1.3338	0.48879
7	T	V17/R2	15	1891.36	1.2978	0.40808
8	T	V17/R2	15	1699.53	1.3248	0.4298
1	M	V16/R2	8	35.198	0.1178	0.77024
2	M	V17/R2	8	55.4041	0.1485	0.76882
3	M	V17/R2	8	100.181	0.2576	0.79365
4	M	V16/R2	8	157.913	0.3385	0.79312
5	M	V17/R2	8	92.2181	0.2744	0.77164
6	M	V17/R2	8	50.9813	0.1672	0.76665
7	M	V17/R2	8	64.4415	0.1882	0.78699
8	M	V17/R2	8	67.0297	0.1937	0.78027
1	B	V16/R2	5	9.80836	0.0736	0.77284
2	B	V17/R2	5	42.1772	0.1518	0.7984
3	B	V17/R2	5	36.8395	0.165	0.75849
4	B	V16/R2	5	42.932	0.1927	0.79822
5	B	V17/R2	5	63.2125	0.2058	0.76373
6	B	V17/R2	5	5.08524	0.0479	0.77006
7	B	V17/R2	5	29.2653	0.1202	0.79973
8	B	V17/R2	5	33.7278	0.1634	0.78031

Table S2. **Sampling parameters for lower canopy sun/shade experiment.**
Leaf discs for pigment analysis were collected from individual plants on 7/27/23 from 11-1:30pm; a sunny day with ambient temperatures ranging from 32°-35°C. Light conditions (Photosynthetic Photon Flux Density and red:far-red light ratios (R:FR)) were measured using a LI-180. "Bottom edge" indicates sun-exposed leaf and "bottom inner" indicates shaded leaf.

REPLICATE	CANOPY POSITION	DEV STAGE	LEAF #	PPFD	R:FR
1	Bottom Edge	R2/V12	4	1773	1.2994
2	Bottom Edge	R2/V12	7	1394	1.2565
3	Bottom Edge	R2/V12	4	1980	1.2351
4	Bottom Edge	R2/V12	5	1417	1.2702
5	Bottom Edge	R2/V13	6	1810	1.2651
6	Bottom Edge	R2/V13	6	1836	1.2617
1	Bottom Inner	R2/V12	7	171.8	0.4866
2	Bottom Inner	R2/V12	5	141.6	0.4658
3	Bottom Inner	R2/V12	5	24	0.1438
4	Bottom Inner	R2/V12	6	189	0.4285
5	Bottom Inner	R2/V13	5	112.3	0.3271
6	Bottom Inner	R2/V13	5	69	0.2142

Table S3. Pigment profiles of lower canopy sun/shade leaves from *G. max*.
α-xanthophylls and β-xanthophylls present in leaves from the lower canopy oriented toward the shade or exposed to full sun. Values are normalized to total chlorophyll content and are displayed as (mmol/mol total chlorophyll). Neo, neoxanthin; Vio, violaxanthin; Ant, antheraxanthin; Zea, zeaxanthin; β Car, beta-carotene; chl *a:b,* ratio of chlorophyll a to chlorophyll b; β-xan DES, the de-epoxidation state of the beta-xanthophyll pool; Lx, lutein epoxide; Lut, lutein; α Car, alpha-carotene; α-xan DES, the de-epoxidation state of the alpha-xanthophyll pool; total DES, the de-epoxidation state of the total xanthophyll pool; n/d, not detected (n=6, error bars ±SD).

	Neo	**Vio**	**Ant**	**Zea**	**β-car**	**Chl *a:b***	**β-xan DES**
SUN	32.3 ±1.7	42.8 ±4.0	5.6 ±1.9	6.8 ±2.4	44.1 ±5.9	3.9 ±0.1	0.17 ±0.06
SHADE	37.8 ±2.3	42.9 ±5.1	2.1 ±0.6	1.2 ±0.6	37.9 ±3.8	3.5 ±0.2	0.05 ±0.02
	Lx	**Lut**	**α-car**	**α-xan DES**	**total DES**		
SUN	1.8 ±1.4	70.3 ±3.2	0.8 ±0.3	0.97 ±0.02	0.38 ±0.03		
SHADE	3.5 ±0.5	72.2 ±2.4	1.0 ±0.5	0.95 ±0.01	0.33 ±0.02		

Table S4. Pigment profiles of epoxidases from *G. max* expressed transiently in *N. benthamiana.* GUS was used as a negative control to account for the background effect of *Agrobacterium tumefaciens* infection on pigment accumulation. Values are normalized to total chlorophyll content and are displayed as (mmol/mol total chlorophyll; n=3, error bars ±SD). Neo, neoxanthin; Vio, violaxanthin; Ant, antheraxanthin; Zea, zeaxanthin; β Car, beta-carotene; chl *a:b,* ratio of chlorophyll a to chlorophyll b; β-xan DES, the de-epoxidation state of the beta-xanthophyll pool; Lx, lutein epoxide; Lut, lutein; α Car, alpha-carotene; α-xan DES, the de-epoxidation state of the alpha-xanthophyll pool; total DES, the de-epoxidation state of the total xanthophyll pool; n/d, not detected.

	Neo	**Vio**	**Ant**	**Zea**	**β-car**	**Lx**	**Lut**	**α-car**	**Chl *a:b***	**total DES**
GUS	27.7 ±5.3	29.9 ±3.0	n/d	n/d	38.2 ±3.6	n/d	77.5 ±2.1	n/d	3.6 ±0.1	0.36 ±0.01
GmLEP9	26.9 ±5.8	25.8 ±0.4	n/d	n/d	38.4 ±2.1	41.1 ±1.0	33.5 ±1.3	n/d	3.5 ±0.04	0.21 ±0.01
GmZEP11	27.7 ±2.5	29 ±3.2	n/d	n/d	38.9 ±1.3	0.9 ±1.5	72 ±3.4	n/d	3.5 ±0.1	0.36 ±0.02
GmZEP17	29.6 ±1.6	25.2 ±2.0	n/d	n/d	40 ±1.2	0.7 ±1.2	72.2 ±1.4	n/d	3.6 ±0.04	0.37 ±0.02

Table S6. Pigment profiles of epoxidases from *M. truncatula* expressed transiently in *N. benthamiana.* GUS was used as a negative control to account for the background effect of *Agrobacterium tumefaciens* infection on pigment accumulation. Values are normalized to total chlorophyll content and are displayed as (mmol/mol total chlorophyll; n=3, error bars ±SD). Neo, neoxanthin; Vio, violaxanthin; Ant, antheraxanthin; Zea, zeaxanthin; β Car, beta-carotene; chl *a:b,* ratio of chlorophyll a to chlorophyll b; β-xan DES, the de-epoxidation state of the beta-xanthophyll pool; Lx, lutein epoxide; Lut, lutein; α Car, alpha-carotene; α-xan DES, the de-epoxidation state of the alpha-xanthophyll pool; total DES, the de-epoxidation state of the total xanthophyll pool; n/d, not detected.

	Neo	**Vio**	**Ant**	**Zea**	**β-car**	**Lx**	**Lut**	**α-car**	**Chl *a:b***	**total DES**
GUS	27.8 ±2.6	30 ±1.4	n/d	n/d	40 ±0.9	n/d	78 ±1.5	n/d	3.6 ±0.03	0.37 ±0.00
MtLEP4	28.4 ±0.4	27.6 ±1.1	n/d	n/d	39.1 ±1.4	26.7 ±5.1	49.6 ±4.12	n/d	3.5 ±0.04	0.28 ±0.02
MtZEP5	30 ±1.8	29 ±1.2	n/d	n/d	40 ±1.3	n/d	75.8 ±2.6	n/d	3.5 ±0.03	0.36 ±0.00

Table S7. Primers used in this study. Green font indicates portions of a FLAG tag that were added during cloning. Lowercase indicates sequence derived from the attB adapter sequences and black uppercase sequence is complementary to the gene being amplified. FLAG tags were added using a 2-step PCR method.

attb1-GmZEP9 F	ggggacaagtttgtacaaaaaagcaggctATGGCTTCTGTGCAAATCC
GmZEP9+Flag R1	ATCATCATCATCCTTATAATCCCACAACCCATGGCCAGCAATC
attb1-GmZEP17 F	ggggacaagtttgtacaaaaaagcaggctATGGCTACTACCTTATGTTAC
GmZEP17+Flag R1	ATCATCATCATCCTTATAATCTACTCCCTGCAAAGCTAGTGTGC
attb1-GmZEP11 F	ggggacaagtttgtacaaaaaagcaggctATGGCTCCTACCTTGACATGC
GmZEP11+Flag R1	ATCATCATCATCCTTATAATCTACTTTCTGATAAAGTTTTGTTCC
attb1-MtZEP5.2 F	ggggacaagtttgtacaaaaaagcaggctATGGTTTCTACTTTGTCTC
attb1-MtLEP4 F	ggggacaagtttgtacaaaaaagcaggctATGGCTTCTATGCAAATCC
attb2+FLAG R2	ggggaccactttgtacaagaaagctgggtTTACTTATCATCATCATCCTTATAATC