

New duplicate factor pair for lemon white endosperm/seedling, *lw5* and *lw6*.

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In the course of propagating the Neuffer pale yellow endosperm/albino seedling (lemon white) mutant *w*-NI76* (MGCSC stock number 3507G), we noticed that the trait segregated 15:1 for nonmutant (yellow endosperm/green seedling) : lemon white in F2 selfed ears made following the outcross of the original Neuffer source to our M14/W23 standard. Since the only other known duplicate factor pair for lemon white is *lw3 lw4*, we performed a test of allelism of *w*-NI76* by self-pollinating plants grown from yellow kernels from segregating ears of *w*-NI76* and outcrossing these plants to known heterozygotes for *lw3 lw4*. All outcrosses of plants carrying *w*-NI76* to the *lw3 lw4* heterozygotes produced yellow kernels only, and sand bench seedling tests of kernels from these outcross ears produced only green seedlings. We therefore conclude that *w*-NI76* is not allelic to the duplicate factor pair *lw3 lw4* and represents a new duplicate factor pair for lemon white endosperm which we have named *lw5 lw6*.

To further characterize *lw5 lw6*, we planted yellow kernels from 15:1 segregating ears, self-pollinated the resulting plants, and counted the numbers of yellow and lemon white kernels on the resulting ears. Confirmation of the lemon white phenotype was made by sand bench plantings of samples of separated yellow and lemon kernels from segregating ears. In all cases, yellow kernels gave rise to green seedlings and lemon kernels gave rise to albino seedlings. Kernel counts and chi-square calculations for 3:1 and 15:1 ratios of yellow : lemon white kernels from segregating ears are presented in Table 1. In all cases, the segregation ratios conformed to either a 3:1 or a 15:1 ratio. For a duplicate factor pair, the ratio of ears bearing yellow kernels only to ears bearing a 3:1 segregation ratio to ears bearing a 15:1 segregation ratio is expected to be 7: 4 : 4. We observed a ratio of 9 : 5 : 10. Although this is a small sample number, it still conforms statistically to the expected ratio (chi-square = 2.763, df = 2, p > 0.1, no significant difference). Thus, the behavior of *w*-NI76* in the F3 generation is consistent with duplicate factor inheritance. We have named the two lemon white mutant alleles from the *w*-NI76* stock *lw5-NI76A* and *lw6-NI76B*.

To date, specific gene candidates (based on the B73 reference genome, version 2) have not been assigned to the lemon white loci of maize, but in a separate Maize Newsletter article, we speculate on possible gene candidates for these loci based on a map-based approach (Stinard, P. Data-mining the B73 genome sequence for carotenoid biosynthesis gene candidates. MNL in press) and suggest that the other known maize lemon white factors (*lw1*, *lw2*, *lw3*, *lw4*, *y10*, and *cl1*) correspond to genes in the DOXP/MEP isoprenoid biosynthetic pathway. We were able to associate known maize lemon white loci with all DOXP/MEP pathway genes except for CDP-ME synthase (ISPD), for which we predicted the existence of a duplicate factor pair, GRMZM5G856881 on 3L and GRMZM2G172032 on 8L. We are in the process of isolating stocks of the separated *lw5* and *lw6* factors and once we have done so, we will

attempt to map them with B-A translocations selected to uncover these two gene candidates. Results should soon be forthcoming.

Table 1. Counts of yellow (+) and lemon white (lw) kernels from self-pollinated ears of plants grown from yellow kernels from 15:1 segregating self-pollinated ears of w^*-NI76 .

ear	+	lw	3:1 chi-square	15:1 chi-square
2012-426-1	406	31	74.73	0.53
2012-426-5	327	92	2.07	176.42
2012-426-6	481	29	101.46	0.28
2012-426-9	427	32	79.56	0.41
2012-426-11	452	31	88.94	0.02
2012-427-1	358	112	0.34	247.90
2012-427-3	73	20	0.61	36.94
2012-427-7	491	31	101.15	0.09
2012-427-9	429	30	83.46	0.06
2012-427-10	351	112	0.16	254.32
2012-427-11	520	35	103.44	0.00
2012-429-1	365	28	66.97	0.51
2012-429-7	390	151	2.45	433.23
2012-429-8	429	28	86.82	0.01
2012-429-10	140	6	33.98	1.14

$p > 0.1$ (no significant difference from indicated ratio)