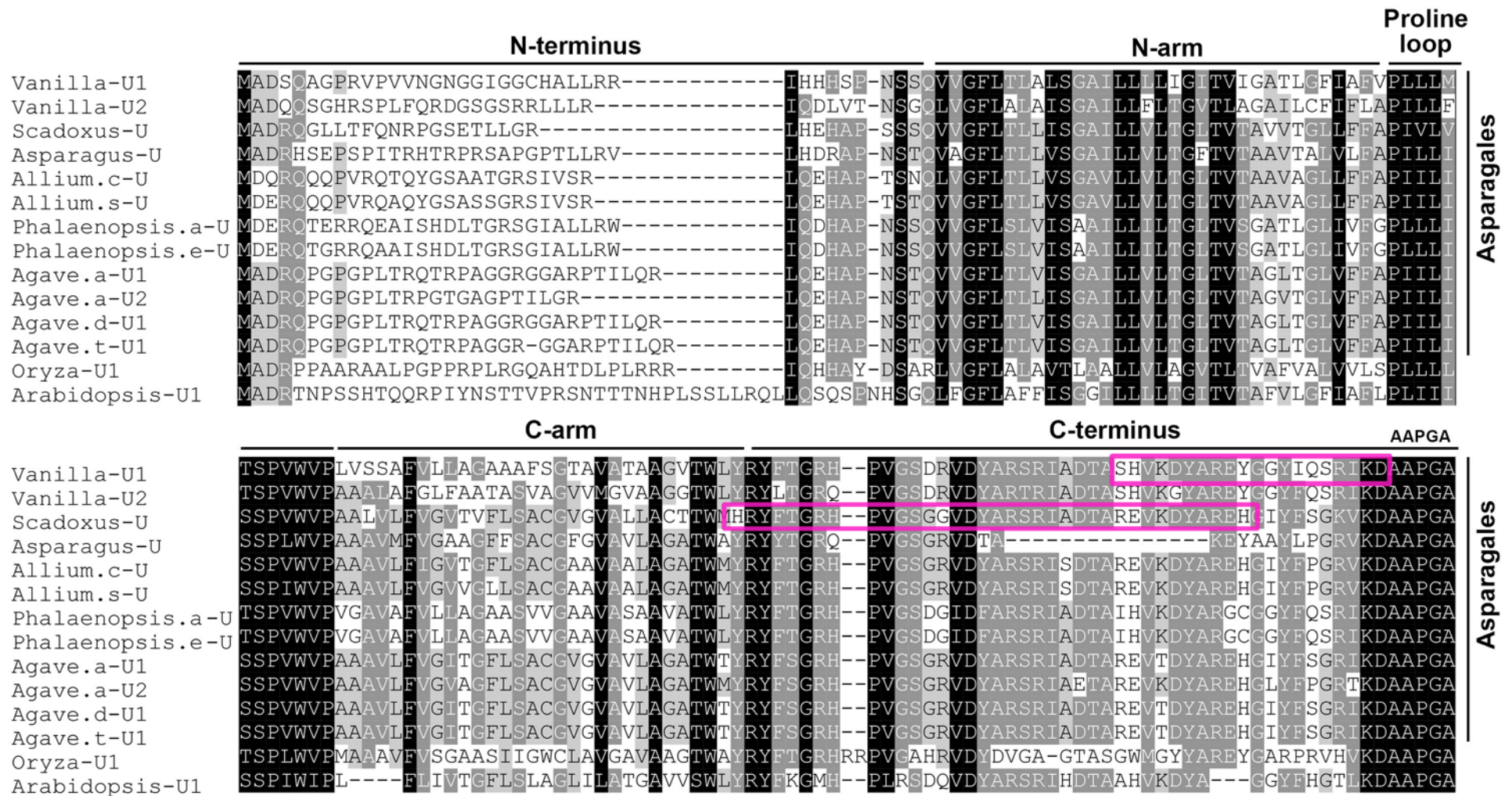


**Figure S1. Light microscopy of leaf epidermis and mesophyll cells of Asparagales and other monocot species.**

The samples were stained with Nile red for LDs. Each pair of images shows the cells with Nile red staining and Differential Interference Contrast (DIC). In *Vanilla*, *Scadoxus* and *Aloe* of Asparagales, LDs were present in epidermis cells but absent in mesophyll cells. Arrows point to the dense or loose LD clusters. *Vanilla* epidermis had both loose and tight LD clusters, and the tight LD cluster was usually adjacent to the nucleus (N). *Agave* (also in Asparagales) and the phylogenetically distant *Lilium* and *Commelina* did not have LDs in epidermis or mesophyll cells. All scale bars represent 10  $\mu\text{m}$ .



**Figure S2. Pileup of the sequences of U oleosins of Asparagales species.**

The variable N-terminal sequence, the conserved hairpin (divided into N-arm, Proline loop, and C-arm) and the conserved C-terminal sequences are indicated. Black and grey colors highlight the highly and moderately conserved residues, respectively. The U1-oleosin sequences of vanilla and *Scadoxus* used for constructing synthetic peptides for rabbit antibodies production are boxed. One U oleosin of the model dicot (*Arabidopsis*) and monocot (*Oryza*) are shown for comparison.

**Table S1. Levels of different oleosin transcripts in transcriptomes of Asparagales and Lauraceae species.** Oleosins are categorized into phylogenetic lineages of U (universal in seed plants), SL (seed low molecular weight), SH (seed high molecular weight) and M (mesocarp) oleosins. Most information was retrieved from transcriptomes produced with RNA-seq of the indicated species from NCBI (<http://ncbi.nlm.nih.gov/>). *Scadoxus* transcriptome was produced by us. Data on *Phalaenopsis equestris* (from genome sequence) and *Phalaenopsis aphrodite* (from EST) are shown with + to indicate existence of the various genes or transcripts encoding oleosins. Some Asparagales species had 2 U oleosins, which are named U1 and U2 oleosins arbitrarily. Leaf oleosins of the model dicot (*Arabidopsis*) and monocot (*Oryza*) are shown for comparison. \* indicates oleosins with incomplete sequences, and their levels in RPKMs are only approximations. Vanilla data, already shown in Fig. 3A, are included in this table for comparative purposes.

Species and organs	Transcript of oleosin (RPKMs)										
	U1	U2	U3	SL1	SL2	SL3	SH1	SH2	SH3	SH4	M
<b>Asparagales</b>											
<i>Vanilla planifolia</i>											
seed											
5-month-old	13	14		34	1295		183				
6-month-old	12	13		346	1876		94				
leaf	18	0		12	0		4				
shoot	28	0		6	0		3				
root	10	0		4	0		1				
<i>Scadoxus multiflorus</i>											
leaf	20										
<i>Agapanthus praecox</i>											
mixed organs	57	32		8			295				
<i>Allium sativum</i>											
dormant veg. bud	133			166			38	441	120		
sprouting veg. bud	14			6			0	43	3		
<i>Allium cepa</i>											
seedling	35			31	39		106	143	508	261	
leaf	50			0	0		0	1	2	0	
<i>Phalaenopsis equestris</i>	+			+	+		+				
<i>Phalaenopsis aphrodite</i>	+			+	+		+				
<i>Agave americana</i>											
leaf	3	3		18	7		0	8			
root	27	21		45	0		2	0			
<i>Agave deserti</i>											
leaf	23	66*		18	7		0	8			
root	17	23*		45	0		2	0			
<i>Agave tequilana</i>											
leaf	19	13*		1							
root	44	21*		2							
<b>Lauraceae</b>											
<i>Persea americana</i>											
mesocarp											
stage I	2										92
stage II	1										201
stage III	5										287
stage IV	3										273
Stage V	0										484
<i>Litsea cubeba</i>											
fruit	20			421	151	49	14	1254			399
<i>Lindera glauca</i>											
sarcocarp	19			0							221
kernel	8			2							89
<b>Model plants for comparison</b>											
<i>Arabidopsis thaliana</i>											
leaf	0	0	0	1	0		1	0	0		
<i>Oryza sativa</i>											
leaf	0	0		0	0		0	0			

**Table S2. Primers used for RT-PCR.**

Primer name	Sequence (5'→3')
<b>vanilla</b>	
<i>oleo SL1-F</i>	ATGTCGGAATACGTCCGAGG
<i>oleo SL1-R</i>	ACAAGTTCCTGACGCAGCTTC
<i>oleo U1-F</i>	CTGACCTTGGCTCTCTCAGGC
<i>oleo U1-R</i>	TCGAGCATAATCCTTCACATGG
<i>oleo U2-F</i>	CATCTCCGGTGCTATCCTCCT
<i>oleo U2 -R</i>	GCCACCCACGAACCTAAACAC
<i>actin-F</i>	CGTCGCACTTGATTACGAGC
<i>actin-R</i>	GAAGGGCCAGATTTCATCGTAC
<b>avocado</b>	
<i>oleo X-F</i>	GCCGTGGAGTGTGGAAAAAGTT
<i>oleo X-R</i>	TCCTTGGGGCTCCACTATGTA
<i>oleo U-F</i>	ATGGCAGAACGCCAGCCAGG
<i>oleo U-R</i>	TCAAGCACCAGGGGCCGCA
<i>actin-F</i>	TTCACCACCACTGCTGAGAGG
<i>actin-R</i>	CAACCAGACAACATGCAACCA
<b><i>Litsea cubeba</i></b>	
<i>oleo X-F</i>	CCCGAGACCATCAAACAAACG
<i>oleo X-R</i>	GCCTCATTGGAGGGTTCATATG
<i>oleo SL1-F</i>	AACGTA CTCAATGGCGGAACA
<i>oleo SL1-R</i>	CCTGCTGCTTG TACTGCTCAGC
<i>oleo U-F</i>	ATGGCGGAACGGCAGCCC
<i>oleo U-R</i>	TCAAGCACCAGGGGCCGCA
<i>actin-F</i>	ACTCGGGTGATGGTGT TAGCC
<i>actin-R</i>	AACACGACCACATGACCTGAGC