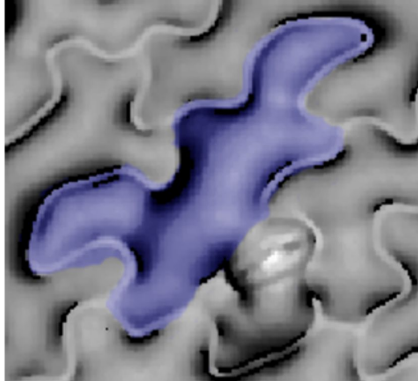
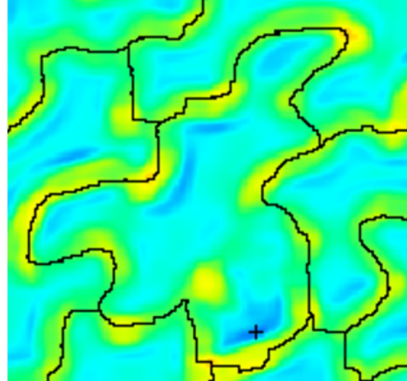


Supp. Figure 1. Change in Surface Area of a Wilting Leaf over Time. The surface area drops and from 118 to 112 within the first 10 minutes of abscission. After 50 min, the surface area increases, most likely due to the cells developing dales (valleys) that increase area in the z-dimension.



A

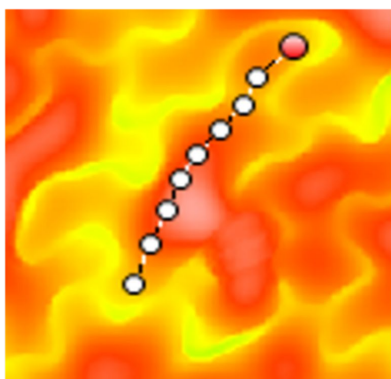


B

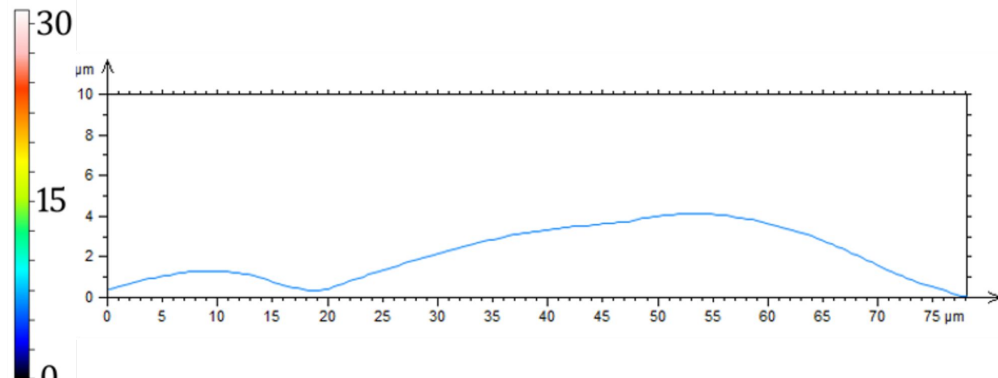


C

40 μm

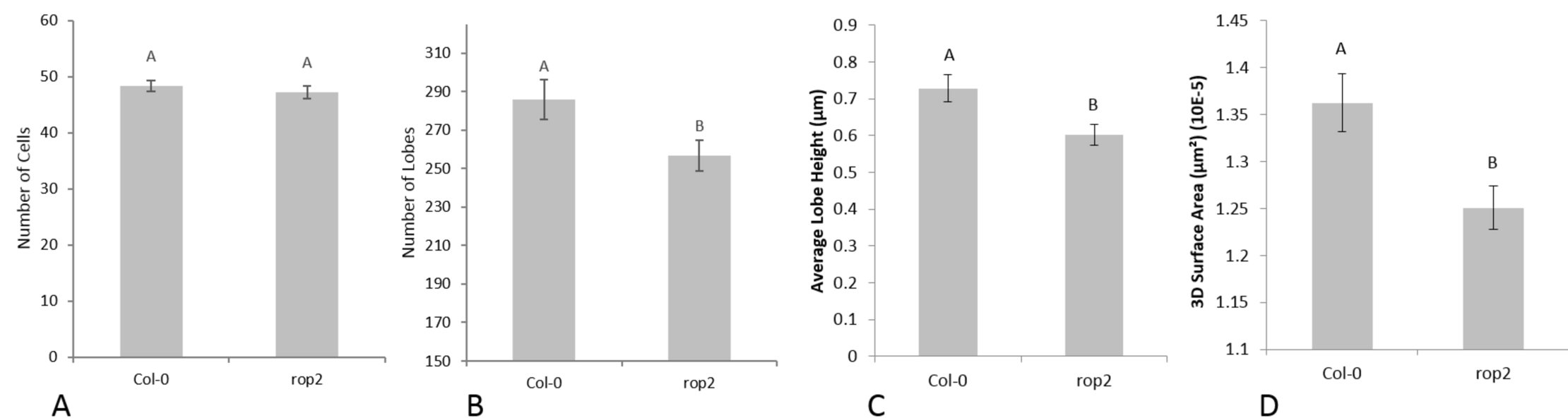


D

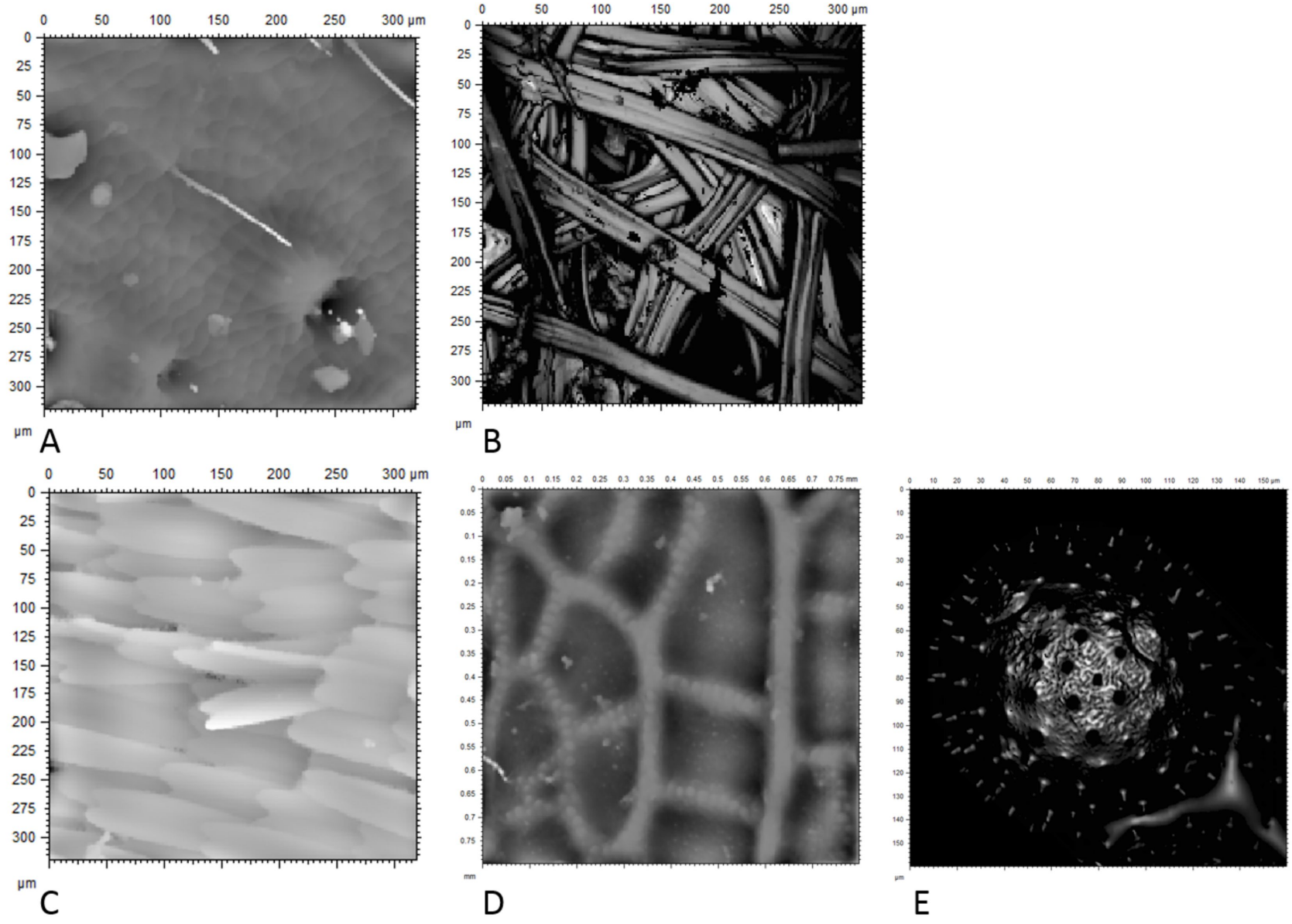


E

Supp. Figure 2. Motif Operator Identifies both Cells and Lobes in *rop2* mutants. A) Reflective intensity of *rop2* epidermis with false color of a single cell. B) Motif operator identification of the cell using relaxed parameters. C) Motif operator identification of lobes within the cell using conservative parameters. D) Transect measuring height across the cell. Color bar indicates height in μm . E) Graph of difference in height along transect.



Supp. Figure 3. Confirmation of Cell Morphology *rop2* Mutant Phenotypes using OT. All analyses used a t-test with $\alpha = 0.05$; $n = 12$, error bars, s.e.m. A) The number of pavement cells do not change significantly. There was significant difference for B) lobe number, C) average lobe height, and D) the 3D surface area of the total measurement.



Supp. Figure 4. Topography of A) bee pollen collectors on *Bambus griseocolis* hind leg at 50x, B) Silk of cultivated silk worm (*Lepidoptera*) at 50x, C) *Lepidoptera* wing at 50x, D) *Caelifera* first wing at 20x, E) *Cucurbita* pollen at 100x.

Table S1. Isotropy and most significant directions of samples from Figure 4.

Time (min)	Isotropy (%)	First Direction (°)	Second Direction (°)	Third Direction (°)
0	85.5	0.142	116	26.5
10	77.4	116	90	135
20	61.7	26.5	45	0.172
30	48.9	26.5	45	18.5

Table S2. Depth and area for each species with Tukey's assigned values ($\alpha = 0.05$).

SPECIES	DEPTH (μm)	TUKEY _{DEPTH}	AREA (μm^2)	TUKEY _{AREA}
<i>Adansonia digitata</i>	4.2	B	1023.1	DEFG
<i>Asplenium nidus</i>	3.9	B	1425.8	BCD
<i>Camptotheca acuminata</i>	2.0	BCD	585.7	GH
<i>Carica papaya (SunUp)</i>	-5.4	FG	390.6	H
<i>Cyanotis somaliensis</i>	3.0	B	1578.3	ABC
<i>Fouquieria fasciculata</i>	-1.6	DEF	800.6	EFGH
<i>Hedychium gardnerium</i>	2.7	B	1243.3	CDE
<i>Homalocadium platycladium</i>	-1.2	CDE	460.3	H
<i>Hoya curtisii</i>	8.3	A	597.5	GH
<i>Mangifera indica</i>	2.6	BC	479.4	H
<i>Manihot esculenta</i>	-8.9	G	706.1	FGH
<i>Mimosa pudica</i>	-5.4	FG	1141.7	CDEF
<i>Opuntia letocaulis</i>	-4.8	DEF	1728.7	AB
<i>Oreeopanax sanderianus</i>	-54.1	J	1034.4	DEFG
<i>Schlumbergera bridgesii</i>	5.8	AB	2007.7	A
<i>Stangeria eriopus</i>	14.1	H	1730.8	AB
<i>Uncarina grandidieri</i>	8.4	A	481.7	H
<i>Vasconcella pubescens</i>	3.6	B	1552.4	ABC
<i>Welwitschia mirabilis</i>	-23.2	I	1880.4	AB

Table S3. Physiological features for characterizing *Mariosousa* and *Senegalia* herbarium specimen.

Species	Spines	Trichomes	Cell Morphology	Stomata
<i>Mariososa centralis</i>	No	None	Single lobed	Abaxial
<i>Mariososa mannifera</i>	No	Both	Small, circular	Abaxial
<i>Mariososa willardiana</i>	No	Very few on adaxial	Single lobed on adaxial Circular on abaxial	Amphistomatous, sunken
<i>Senegalia berlandiara</i>	Yes	Few on adaxial Many on abaxial	Single lobed	Abaxial
<i>Senegalia visco</i>	Yes	Abaxial	Small, circular	Amphistomatous