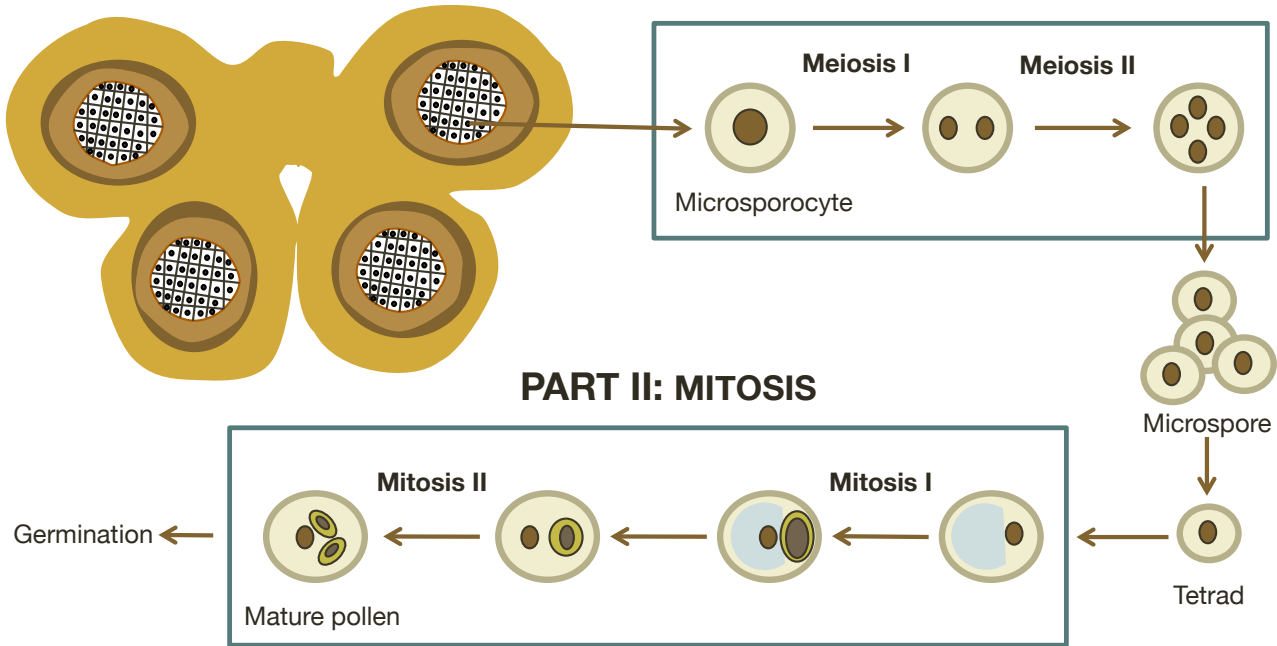
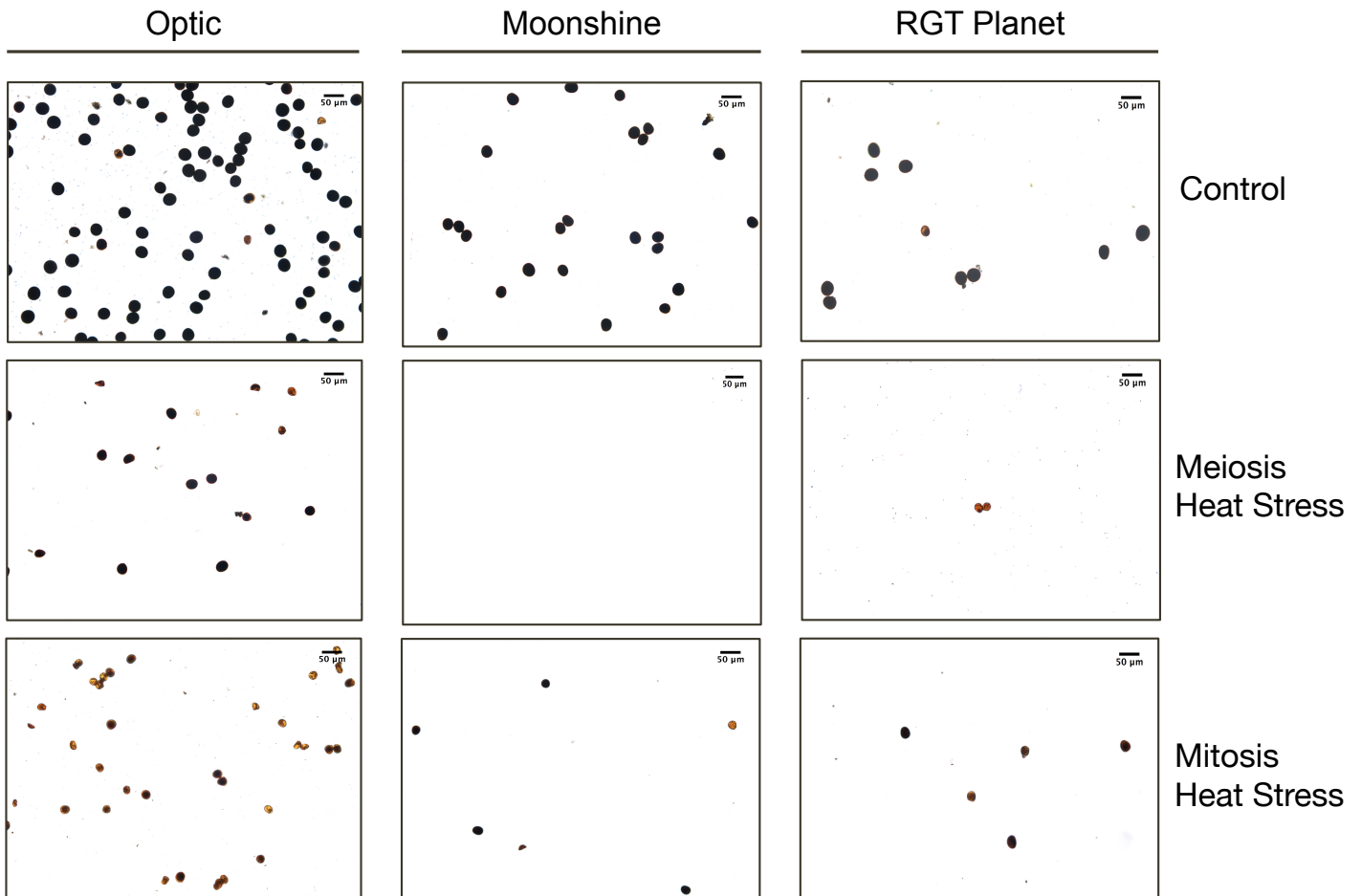


A**PART I: MEIOSIS****B**

Supplementary Figure S1 Schematic of heat stress treatments during pollen development for barley varieties and pollen viability in barley cultivars Optic, Moonshine and RGT Planet. (A) Two pots with four plants each of the three varieties were submitted to either meiosis heat stress during meiosis I and II of pollen development, or mitosis heat stress during mitosis I and II of pollen development. (B) Pollen viability is shown from a randomly selected floret right before anthesis from heat stressed plants and control plants. Black pollen is viable, while yellow/brown pollen is not viable; low numbers of pollen reflect the lack of pollen in the mature anthers.

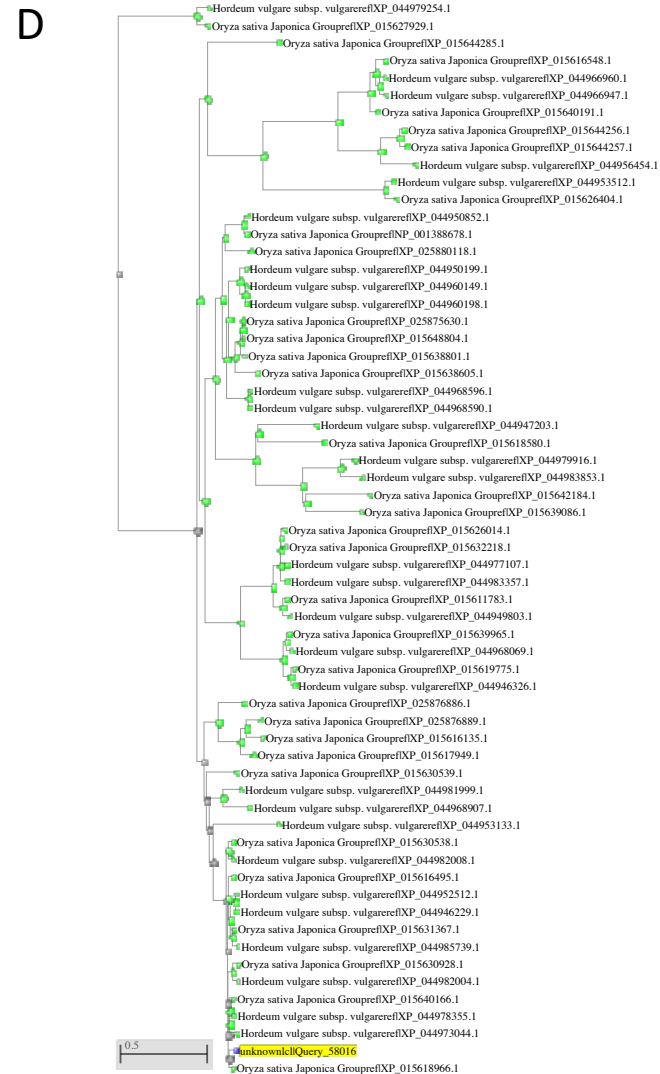
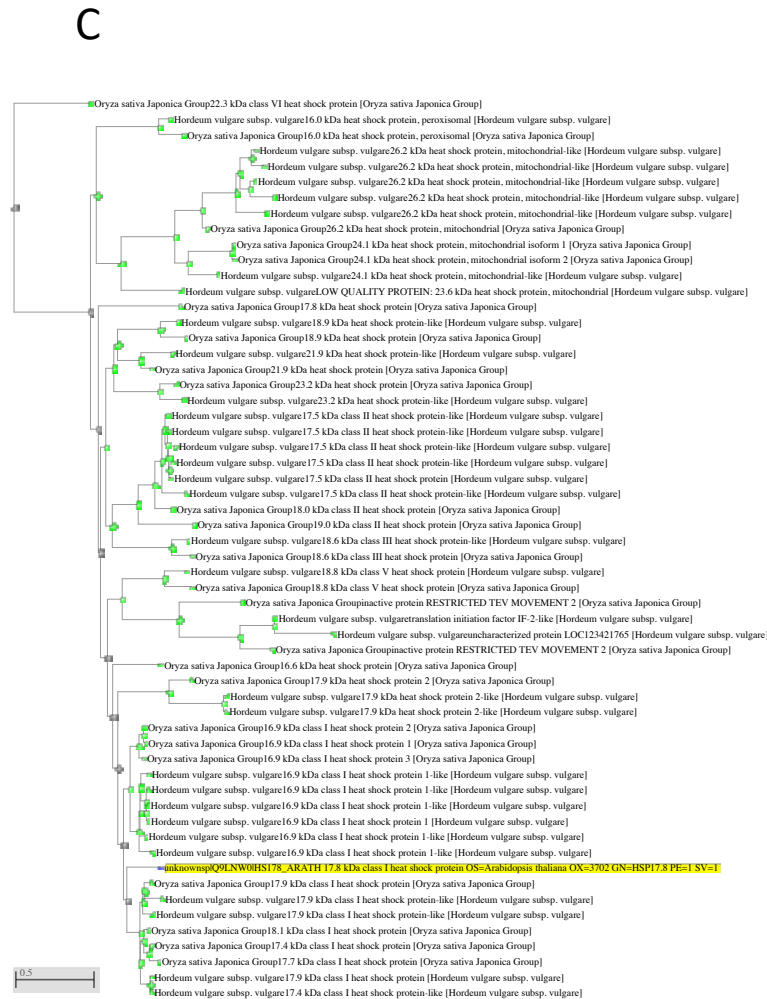
A

	1	10	20	30	40	50	60
OsHSP17.8		MSLIRRSN-	VFDPFSLD	LWDPFDGFPF	GS	GSRS	SSGSIFPS
HvHSP17.8		MSLIRRSN-	VFDPFSLD	FDPFDGFPF	GS	GS	SNSGG--SLVPR
AtHSP17.8		MSLIPSEF	GNNRRSNS	IFDPPSLD	VWDPFK	ELQF	PS-----L
	70	80	90	100	110	120	
OsHSP17.8	ARIDWKET	PEAHVFKADVP	GGLKKEEVKVEVED	GNVLQISGER	SK	EQEEKT	DKWHRVERSSG
HvHSP17.8	ARIDWKET	PEAHVFKADVP	GGLKKEEVKVEVED	GNILQISGER	NK	EQEEKT	DTWHRVERSSG
AtHSP17.8	ARVDWKET	AEAHVFKADLP	GMKKEEVKVEIED	DSVLKISGER	HV	EKEEKQ	DTWHRVERSSG
	130	140	150	160	170		
OsHSP17.8	KFLRRFRLPENT	KPEQIKASME	NGVLTVTVPK	--E	EPKKPD	VKSIIQVTG	
HvHSP17.8	KFLRRFRLPEN	AKAEQVKASME	NGVLTVTVPK	--E	EAKNPE	VKAIQISG	
AtHSP17.8	QFSRKFKLPEN	VKMDQVKASME	NGVLTVTVPK	VE	EAKKK	AQVKSIDISG	

B

	1	10	20	30	40	50	60	70	80	90
AtHSP70	MAGK	KG	GPAIG	IDL	GTTY	SCVGV	QHDRVE	I	IAND	QGNRTTPSYVA
HvHSP70	MAAK	KG	DGPAIG	IDL	GTTY	SCVGV	QHDRVE	I	IAND	QGNRTTPSYVA
OsHSP70	MAGK	KG	GPAIG	IDL	GTTY	SCVGV	QHDRVE	I	IAND	QGNRTTPSYVA
	100	110	120	130	140	150	160	170	180	
AtHSP70	PFKV	VS	GPGEKPM	IVV	NH	KGE	EKFSAEE	ISS	SMVL	IKMRE
HvHSP70	PFKV	VAG	PGDKPM	IVV	NH	KGE	EKFSAEE	ISS	SMVL	IKMRE
OsHSP70	PFKV	IAG	PGDKPM	IVV	NH	KGE	EKFSAEE	ISS	SMVL	IKMRE
	190	200	210	220	230	240	250	260	270	
AtHSP70	YGLD	KKAS	SVGEKNVL	IFDL	GGGT	FDVSL	LTIEEG	IFEV	KATAGD	THLGG
HvHSP70	YGLD	KKAS	SVGEKNVL	IFDL	GGGT	FDVSL	LTIEEG	IFEV	KATAGD	THLGG
OsHSP70	YGLD	KKAS	SVGEKNVL	IFDL	GGGT	FDVSL	LTIEEG	IFEV	KATAGD	THLGG
	280	290	300	310	320	330	340	350	360	370
AtHSP70	LSSTA	QTTIE	IDSL	FE	GIDFY	TTITR	ARFE	ELNMDL	FRK	CMEP
HvHSP70	LSSTA	QTTIE	IDSL	FE	GIDFY	TTITR	ARFE	ELNMDL	FRK	CMEP
OsHSP70	LSSTA	QTTIE	IDSL	FE	GIDFY	TTITR	ARFE	ELNMDL	FRK	CMEP
	380	390	400	410	420	430	440	450	460	
AtHSP70	EAVAY	GAAV	QAA	IL	SGE	GNEK	VQD	LL	LDV	TPL
HvHSP70	EAVAY	GAAV	QAA	IL	SGE	GNEK	VQD	LL	LDV	TPL
OsHSP70	EAVAY	GAAV	QAA	IL	SGE	GNEK	VQD	LL	LDV	TPL
	470	480	490	500	510	520	530	540	550	
AtHSP70	ELSG	IP	PAPR	GV	PQIT	VC	FD	ID	ANG	IL
HvHSP70	ELSG	IP	PAPR	GV	PQIT	VC	FD	ID	ANG	IL
OsHSP70	ELSG	IP	PAPR	GV	PQIT	VC	FD	ID	ANG	IL
	560	570	580	590	600	610	620	630	640	651
AtHSP70	IKDE	KI	ASKL	DA	AD	KKK	I	EDA	ID	CA
HvHSP70	IKDE	KI	ASKL	PA	AD	KKK	I	EEA	IDA	AI
OsHSP70	IKDE	KI	ASKL	PA	AD	KKK	I	EDA	ID	CA

Supplementary Figure S2 Phylogenetic analysis of rice, Arabidopsis and barley HSP17.8 (A) and HSP70 orthologs (B). The alignments were constructed using the Geneious alignment method and the Blosum62 cost matrix in Geneious. **(C & D) Phylogenetic tree of Arabidopsis BLAST analysis HSP17.8 (C) and HSP70 (D).**



Supplementary Figure S2 Phylogenetic analysis of rice, Arabidopsis and barley HSP17.8 (A) and HSP70 orthologs (B). The alignments were constructed using the Geneious alignment method and the Blosum62 cost matrix in Geneious. **(C & D) Phylogenetic tree of Arabidopsis BLAST analysis HSP17.8 (C) and HSP70 (D).**

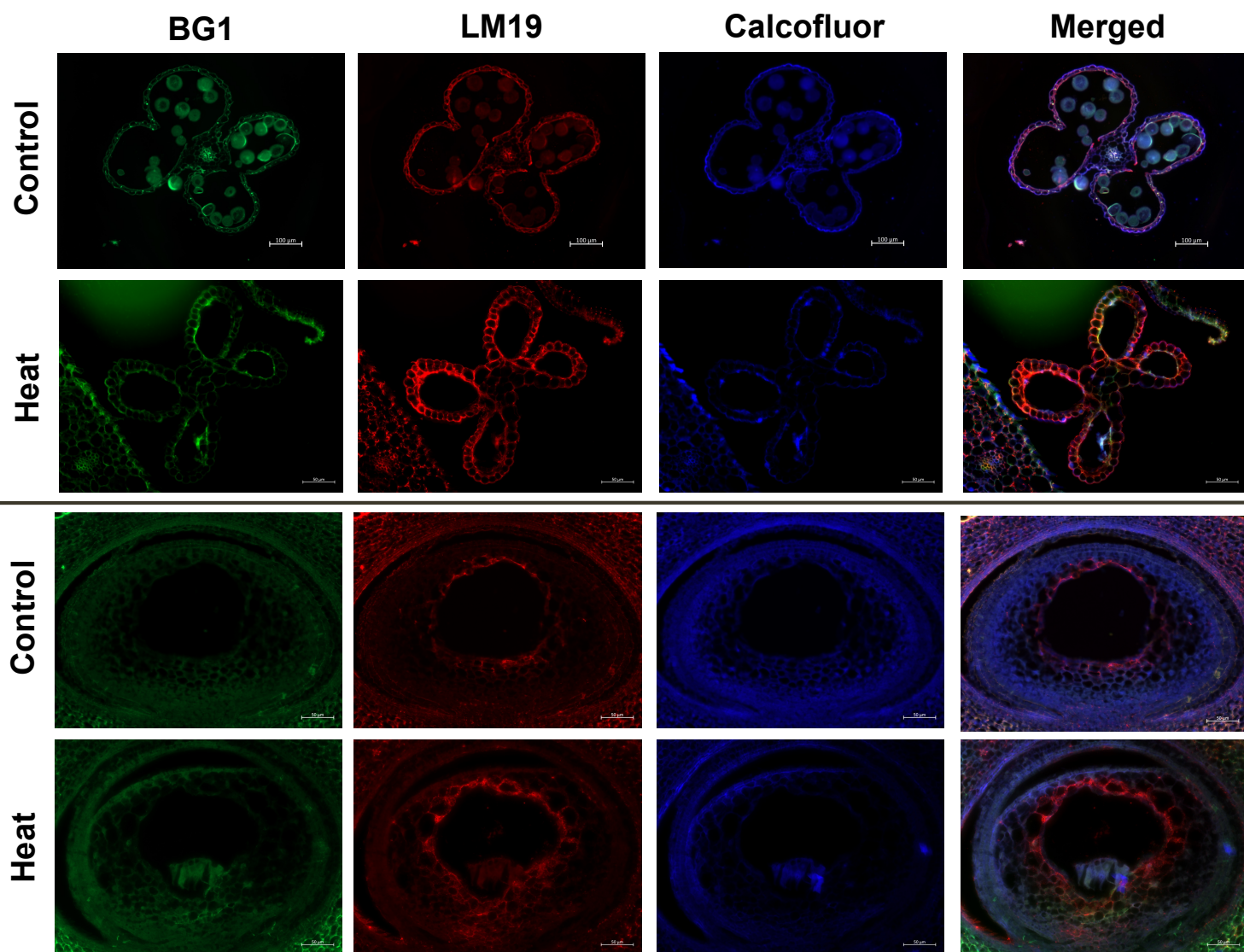
CONTROL



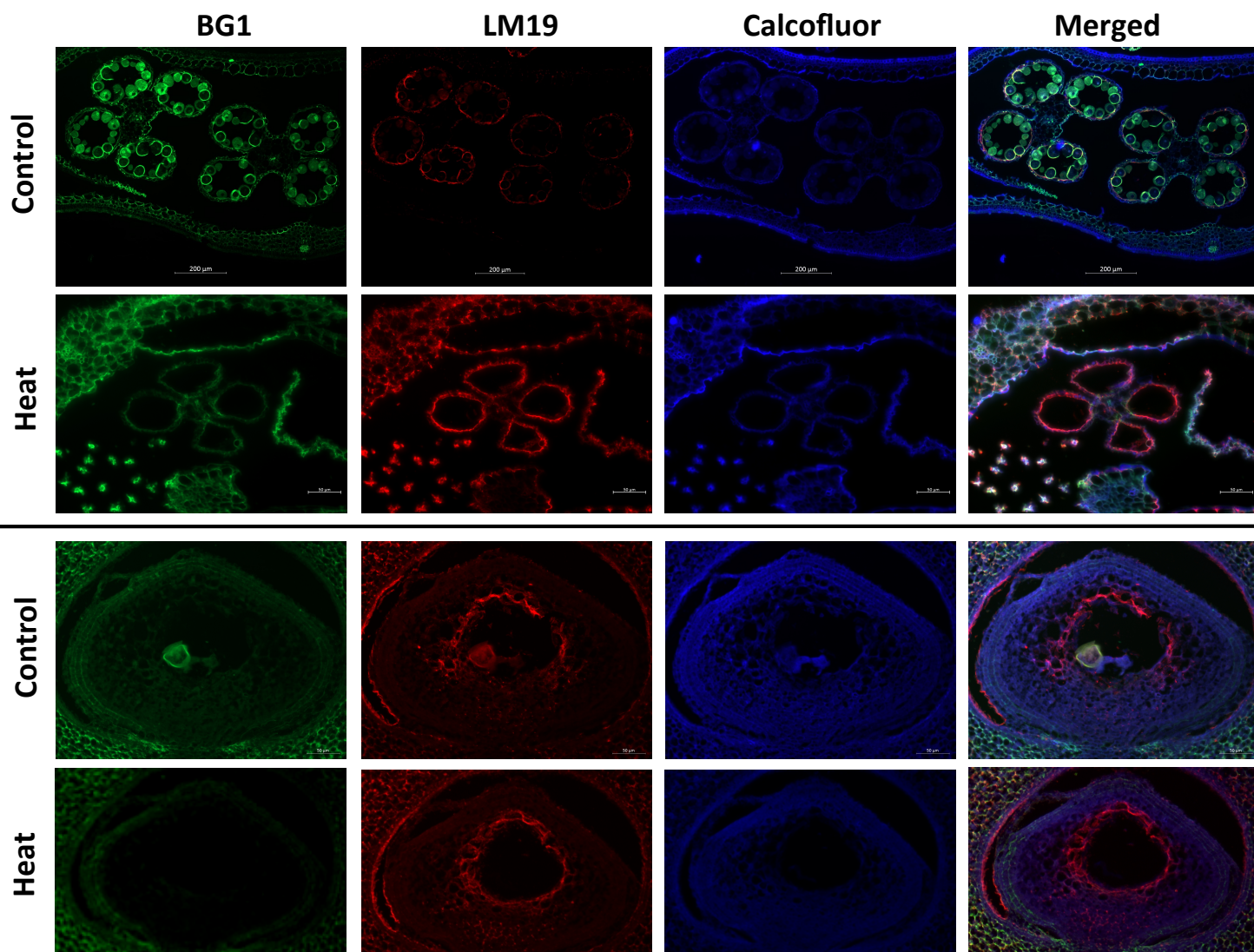
MEIOSIS



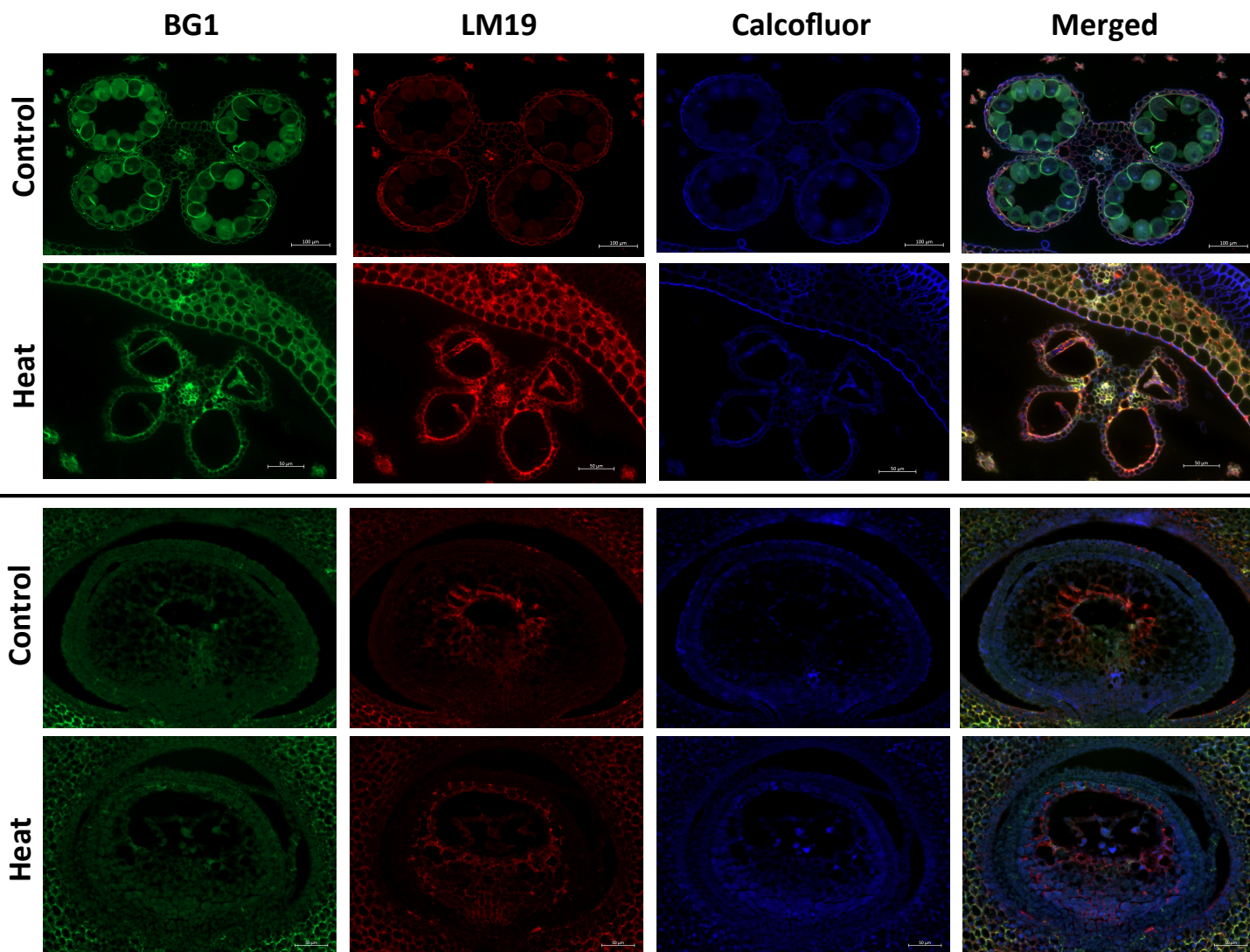
Supplementary Figure S3 X-ray CT images of anther and carpel development in control and heat stress conditions for Moonshine. X-ray images of the anthers and carpels obtained by X-ray CT are compared for control environment and heat stress environment (heat stress during meiosis of pollen development) right before anthesis.



Supplementary Figure S4 Immunolabelling of cell wall components in anthers and ovules in Optic. Comparison of control and heat stressed anthers and ovules in barley florets of the variety RGT Planet. Antibodies include BG1 (1,3;1,4- β -glucan, green) and LM19 (low methylesterified pectin, red). Calcofluor White counterstain was used to detect cellulose and mixed-linkage glucan (blue).



Supplementary Figure S5 Immunolabelling of cell wall components in anthers and ovules in Moonshine. Comparison of control and heat stressed anthers and ovules in barley florets of the variety RGT Planet. Antibodies include BG1 (1,3;1,4- β -glucan, green) and LM19 (low methylesterified pectin, red). Calcofluor White counterstain was used to detect cellulose and mixed-linkage glucan (blue).



Supplementary Figure S6 Immunolabelling of cell wall components in anthers and ovules in RGT Planet. Comparison of control and heat stressed anthers and ovules in barley florets of the variety RGT Planet. Antibodies include BG1 (1,3;1,4- β -glucan, green) and LM19 (low methylesterified pectin, red). Calcofluor White counterstain was used to detect cellulose and mixed-linkage glucan (blue).