

Table S1. Comparisons of leaf emergence predictions for different winter wheat cultivars at Bettendorf using five different phyllotherm values. RMSE, MAE and WI refer to root mean square error, mean absolute error, and Willmott's index of agreement, respectively.

Year	Leaf	Phyllotherm (°Cd)	Cultivar	RMSE (%)	MAE (%)	WI	Cultivar	RMSE (%)	MAE (%)	WI
2017	F	100	Kerubino	6	4	0.93	Achat	2	1	0.98
		115		29	23	0.69		40	34	0.46
		130		42	34	0.53		48	40	0.32
		145		51	40	0.42		59	49	0.10
		160		59	48	0.27		65	56	-
	F-1	100		3	1	0.97		5	4	0.93
		115		21	18	0.70		25	21	0.69
		130		28	24	0.62		27	23	0.66
		145		36	31	0.51		39	32	0.53
		160		46	39	0.36		43	35	0.48
	F-2	100		4	3	0.94		5	4	0.93
		115		5	4	0.93		12	10	0.84
		130		7	6	0.90		12	9	0.86
		145		11	9	0.87		16	12	0.82
		160		16	12	0.82		19	15	0.78
2018	F	100	Kerubino	4	3	0.94	Desamo	4	3	0.94
		115		21	18	0.72		31	27	0.54
		130		37	31	0.53		32	27	0.53
		145		49	40	0.36		45	38	0.29
		160		59	49	0.13		52	44	0.14
	F-1	100		1	1	0.98		3	3	0.96
		115		6	5	0.92		15	13	0.81
		130		22	19	0.67		15	12	0.82
		145		40	35	0.38		26	22	0.69
		160		49	42	0.22		32	26	0.62
	F-2	100		4	3	0.95		11	10	0.79
		115		5	4	0.94		3	3	0.95
		130		10	8	0.88		10	8	0.87
		145		14	11	0.84		7	6	0.91
		160		18	14	0.79		9	7	0.89
2019	F	100	Kerubino	2	2	0.97	Desamo	6	5	0.91
		115		24	21	0.66		33	27	0.61
		130		44	38	0.34		21	17	0.75
		145		49	42	0.22		34	28	0.59
		160		62	54	-		39	32	0.53
	F-1	100		2	2	0.97		5	5	0.90
		115		13	12	0.82		21	19	0.64
		130		24	20	0.68		16	15	0.72
		145		28	24	0.63		20	18	0.66
		160		36	30	0.48		24	21	0.59
	F-2	100		3	3	0.95		4	3	0.95
		115		6	5	0.92		10	8	0.88
		130		12	10	0.84		12	10	0.85
		145		12	10	0.84		15	12	0.82
		160		14	11	0.82		17	13	0.81

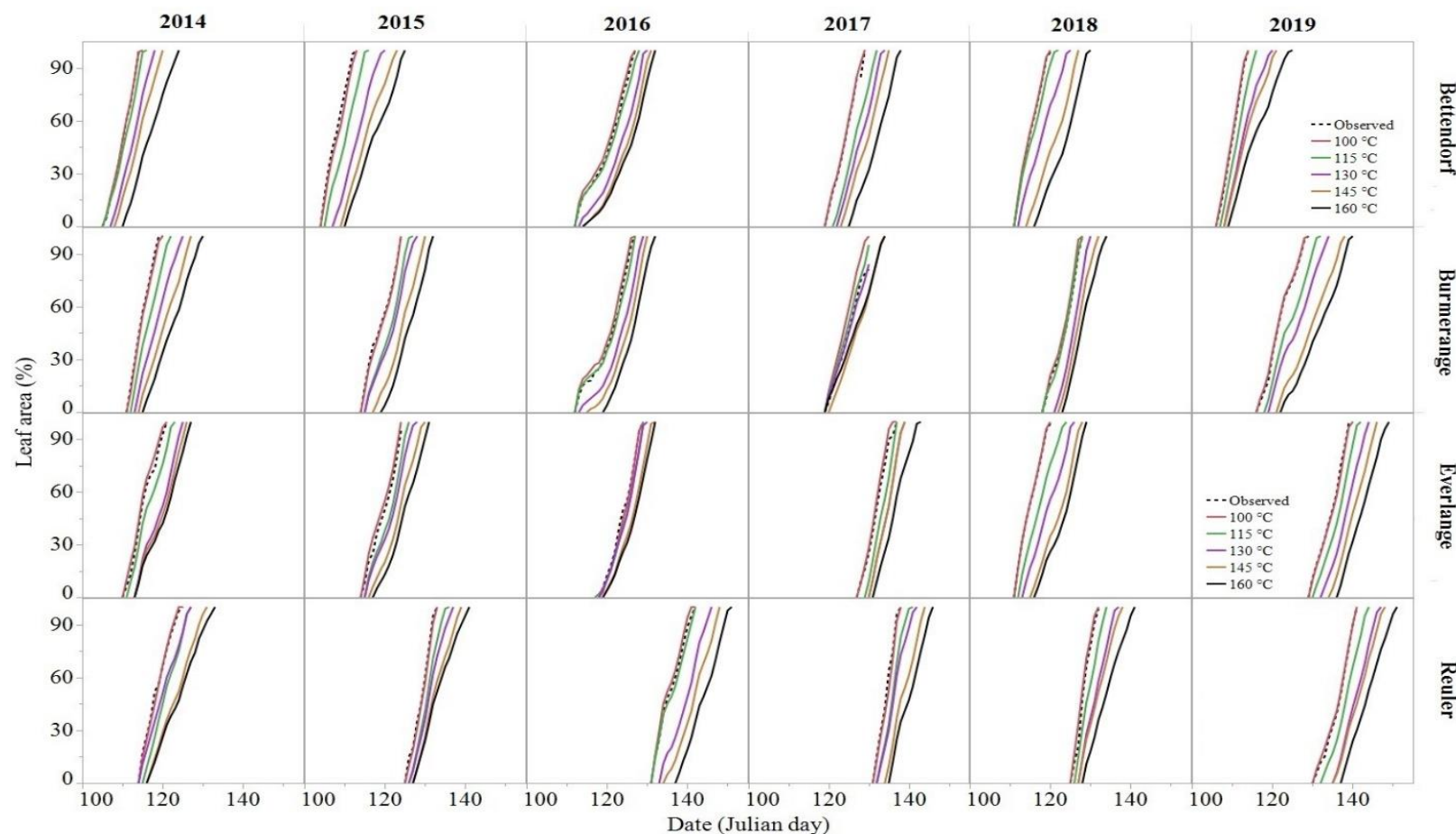


Figure S1. Observed (dashed lines) and predicted (solid lines) percentage emergence of the leaf below the flag leaf (F-1) in winter wheat during the 2017 to 2019 growing seasons at the different study sites in Luxembourg. The percentage of leaf area emerged for each of the three leaf layers was estimated by comparison to the total area of the preceding fully emerged leaf (assumed as 100%), and by checking the ligule of the emerging leaf (a fully visible leaf ligule corresponds to a fully emerged leaf). The percentage emerged areas were estimated for each of the 40 replicate plants at each assessment. Observations were carried out weekly between March and July each year by trained personnel. All data originated from plots which received no foliar fungicide throughout the cropping season. In all years only values for the cultivar Kerubino were used. Note: the curve for observed values and that for predicted values using the 100 °Cd phyllotherm are superposed in some graphs.

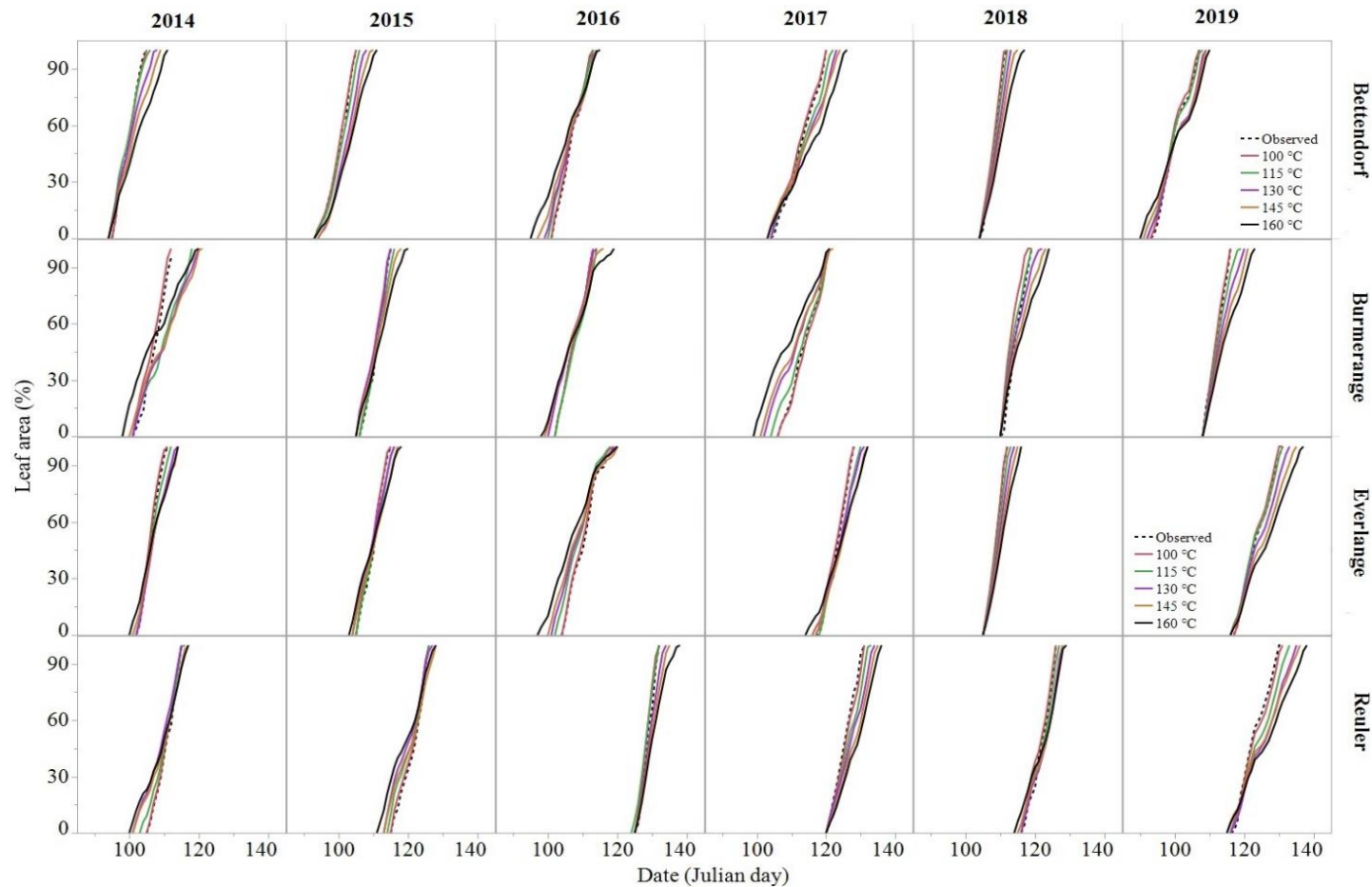


Figure S2. Observed (dashed lines) and predicted (solid lines) percentage emergence of the leaf below the flag leaf (F-2) in winter wheat during the 2017 to 2019 growing seasons at the different study sites in Luxembourg. The percentage of leaf area emerged for each of the three leaf layers was estimated by comparison to the total area of the preceding fully emerged leaf (assumed as 100%), and by checking the ligule of the emerging leaf (a fully visible leaf ligule corresponds to a fully emerged leaf). The percentage emerged areas were estimated for each of the 40 replicate plants at each assessment. Observations were carried out weekly between March and July each year by trained personnel. All data originated from plots which received no foliar fungicide throughout the cropping season. In all years only values for the cultivar Kerubino were used. Note: the curve for observed values and that for predicted values using the 100 °Cd phyllotherm are superposed in some graphs.

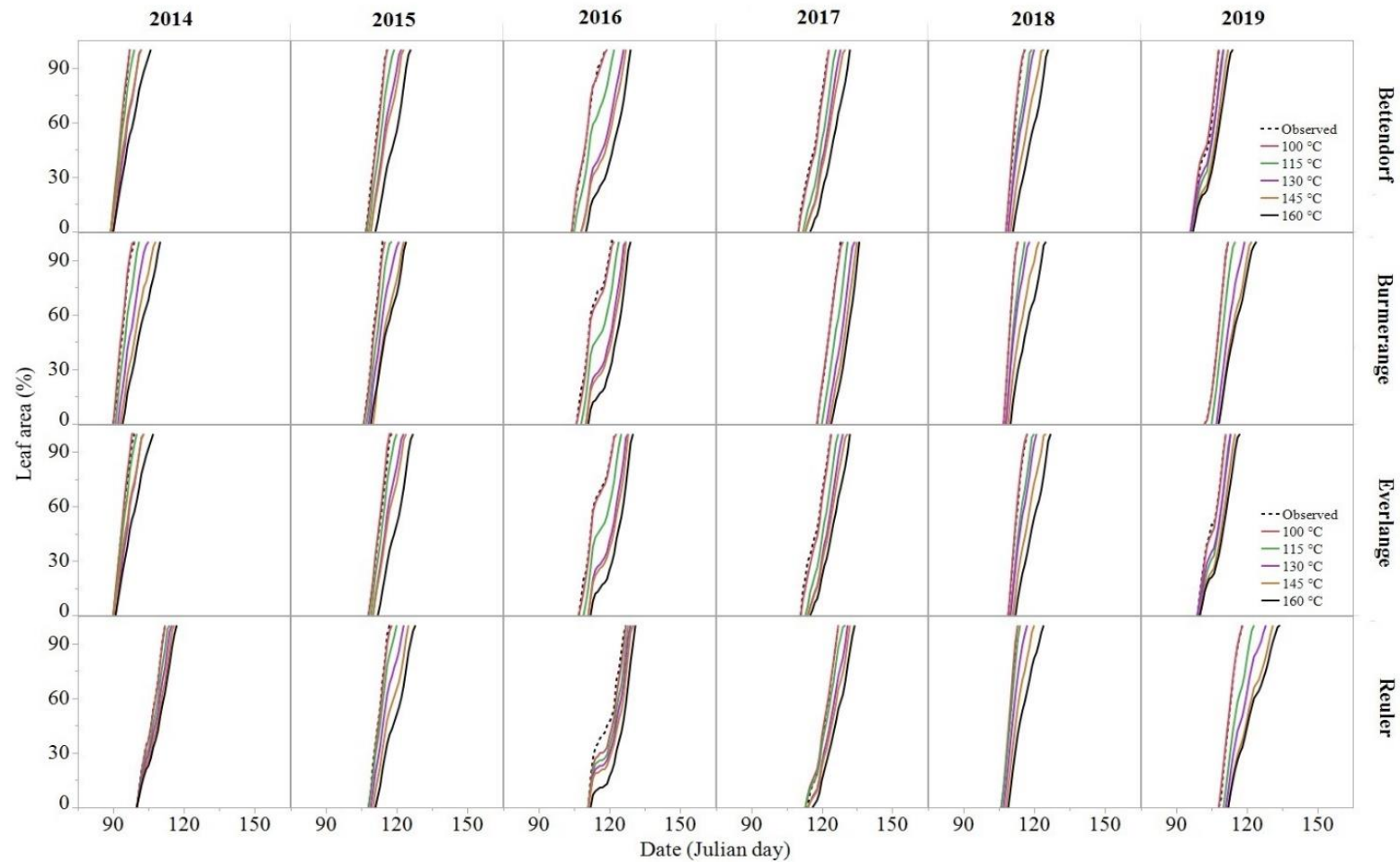


Figure S3. Observed (dashed lines) and predicted (solid lines) percentage emergence of the leaf below the flag leaf (F-1) in winter barley during the 2017 to 2019 growing seasons at the different study sites in Luxembourg. The percentage of leaf area emerged for each of the three leaf layers was estimated by comparison to the total area of the preceding fully emerged leaf (assumed as 100%), and by checking the ligule of the emerging leaf (a fully visible leaf ligule corresponds to a fully emerged leaf). The percentage emerged areas were estimated for each of the 40 replicate plants at each assessment. Observations were carried out weekly between March and July each year by trained personnel. All data originated from plots which received no foliar fungicide throughout the cropping season. Note: the curve for observed values and that for predicted values using the 100 °Cd phyllotherm are superposed in some graphs.

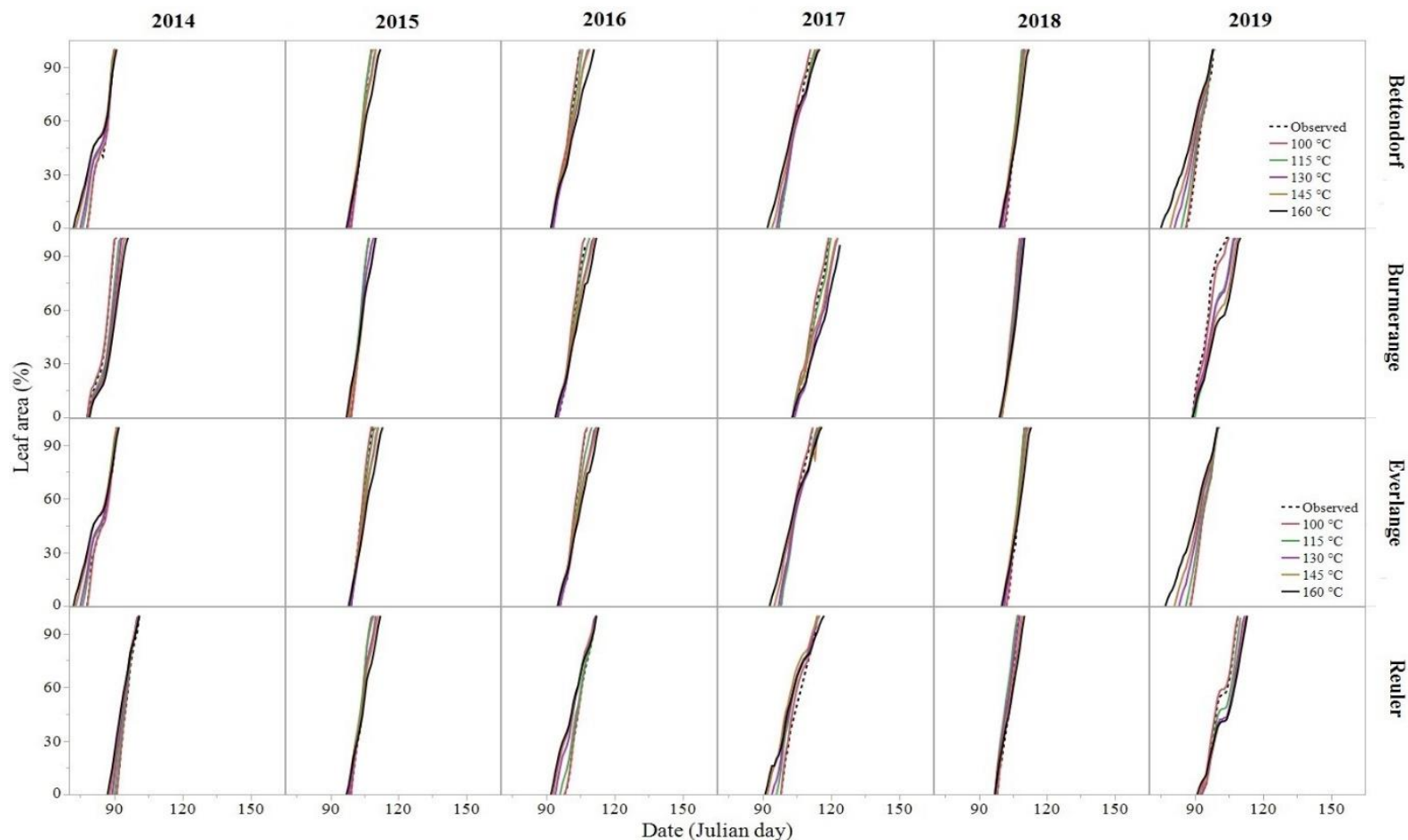


Figure S4. Observed (dashed lines) and predicted (solid lines) percentage emergence of the leaf below the flag leaf (F-2) in winter barley during the 2017 to 2019 growing seasons at the different study sites in Luxembourg. The percentage of leaf area emerged for each of the three leaf layers was estimated by comparison to the total area of the preceding fully emerged leaf (assumed as 100%), and by checking the ligule of the emerging leaf (a fully visible leaf ligule corresponds to a fully emerged leaf). The percentage emerged areas were estimated for each of the 40 replicate plants at each assessment. Observations were carried out weekly between March and July each year by trained personnel. All data originated from plots which received no foliar fungicide throughout the cropping season. Note: the curve for observed values and that for predicted values using the 100 °Cd phyllotherm appear superposed in some graphs.