

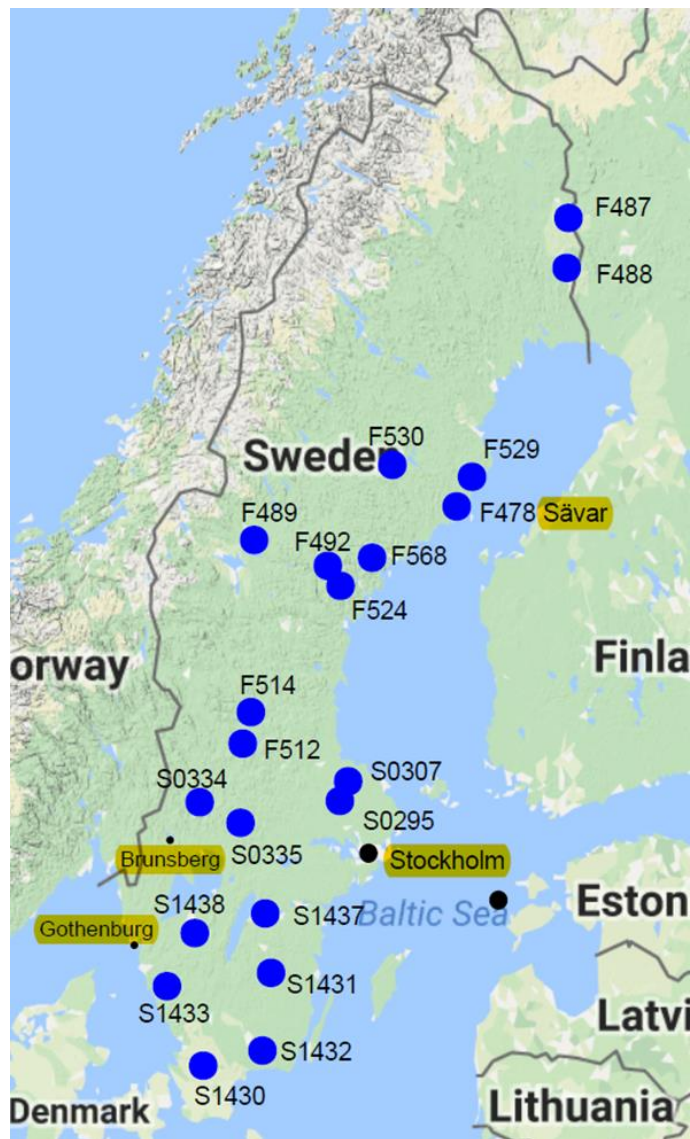
# **Analysis of Phenology (Bud Burst)**

Zhi-qiang Chen

# Phenology (Bud Burst)

- Southern Sweden: 5 archives (done)+28 trials/archives (done)  
*6 full-sib trials (2017-Done)*
- Central Sweden: 6 archives in Brunsberg (done)  
*4 full-sib trials (2017-Done)*
- Northern Sweden: *11 open pollinated progeny trials (2017-Done)*
  - 2 control pollinated progeny trials (done)
  - 2 archives in Sävar (done)
  - 1 clonal trial (S662 Klippen) stems (done)
  - 3 nursery data in Sävar (done)

# Scoring bud burst in 21 trials, 2017



No	Trial	TrialID	Site	LN	LE	Human resource
1	S21S1321437	S1437	Älvan	58.49	15.28	Nils Forsberg
2	S21S1321438	S1438	Malmeslätt	58.20	13.33	Thomas Hjerpe+ Anette Palm
3	S21S1221430	S1430	Hörja	56.22	13.57	Andreas Helmersson
4	S21S1221431	S1431	Ingatorp	57.62	15.43	Nils Forsberg
5	S21S1221432	S1432	Skärvraken	56.45	15.20	Andreas Helmersson
6	S21S1221433	S1433	Staxered	57.42	12.57	Andreas Helmersson
7	S22S0220295	S0295	Åkerlänna	60.07	17.33	Done
8	S22S0520307	S0307	Tierp	60.34	17.56	Mats Berlin
9	S22S1120334	S0334	Edebäck	60.05	13.47	Martin
10	S22S1220335	S0335	Hällefors	59.77	14.59	Martin
11	S23F8720478	F478	Sävar (Holmen)	63.88	20.55	Chen
12	S23F8920487	F487	Kolari	67.17	23.63	Chen
13	S23F8920488	F488	Pyhäjärvi	66.63	23.58	Chen
14	S23F8920489	F489	Häggenås	63.47	14.97	Chen
15	S23F8920492	F492	Helgum	63.15	17.00	Chen
16	S23F9120512	F512	Björka	60.85	14.66	Martin
17	S23F9120514	F514	Labb-Djurberg	61.27	14.88	Martin
18	S23F9220524	F524	Bastusjöberg	62.90	17.35	Chen
19	S23F9220529	F529	Gumboda	64.24	20.97	Chen
20	S23F9220530	F530	Gäddträsk	64.38	18.78	Chen
21	S23F9420568	F568	Kläppen	63.25	18.22	Chen

# 11 northern trials, 2017

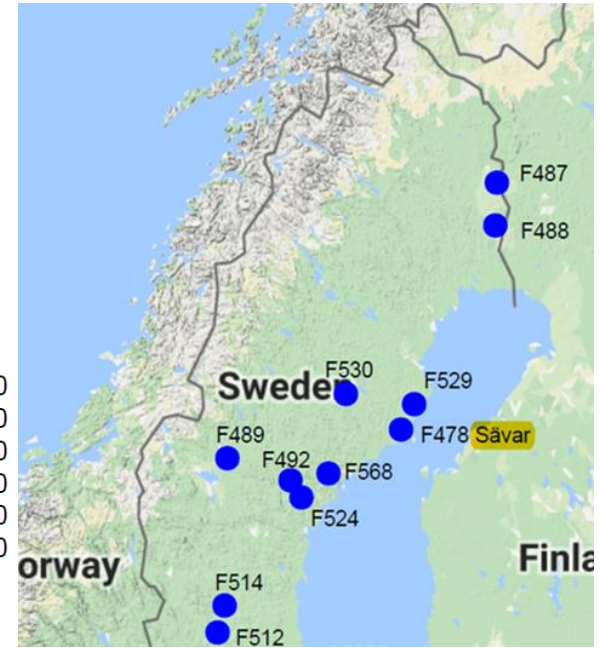
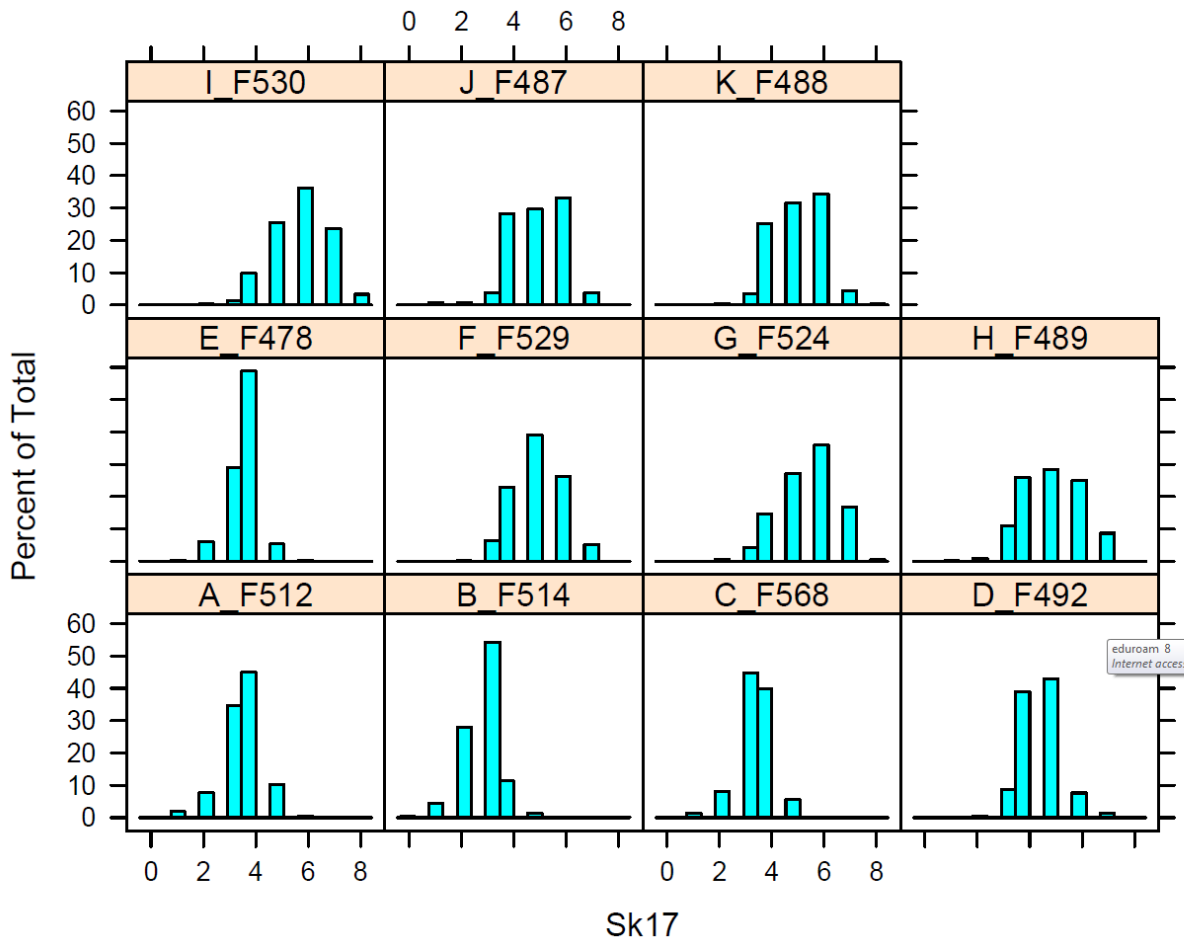


- Age **23-30**;
- Planted in 1987-1994;
- Altitude from 10-490 m;
- No. of stems: 3840-11
- Field design: Randomized
- Material: Open-pollinated
- 1193 Parents

# Common parents for Northern 11 trials

Year (planted)		F478	F487	F488	F489	F492	F512	F514	F524	F529	F530	F568
1987	F478	809	165	134	334	233	80	80	244	288	293	241
1989	F487	165	499	372	237	226	235	236	232	354	359	206
1989	F488	134	372	378	235	226	235	235	231	354	358	206
1989	F489	334	237	235	590	398	235	235	412	397	400	350
1989	F492	233	226	226	398	522	347	348	519	222	223	445
1991	F512	80	235	235	235	347	357	357	353	228	229	301
1991	F514	80	236	235	235	348	357	359	355	229	230	301
1992	F524	244	232	231	412	519	353	355	539	228	229	460
1992	F529	288	354	354	397	222	228	229	228	524	521	209
1992	F530	293	359	358	400	223	229	230	229	521	530	211
1994	F568	241	206	206	350	445	301	301	460	209	211	489

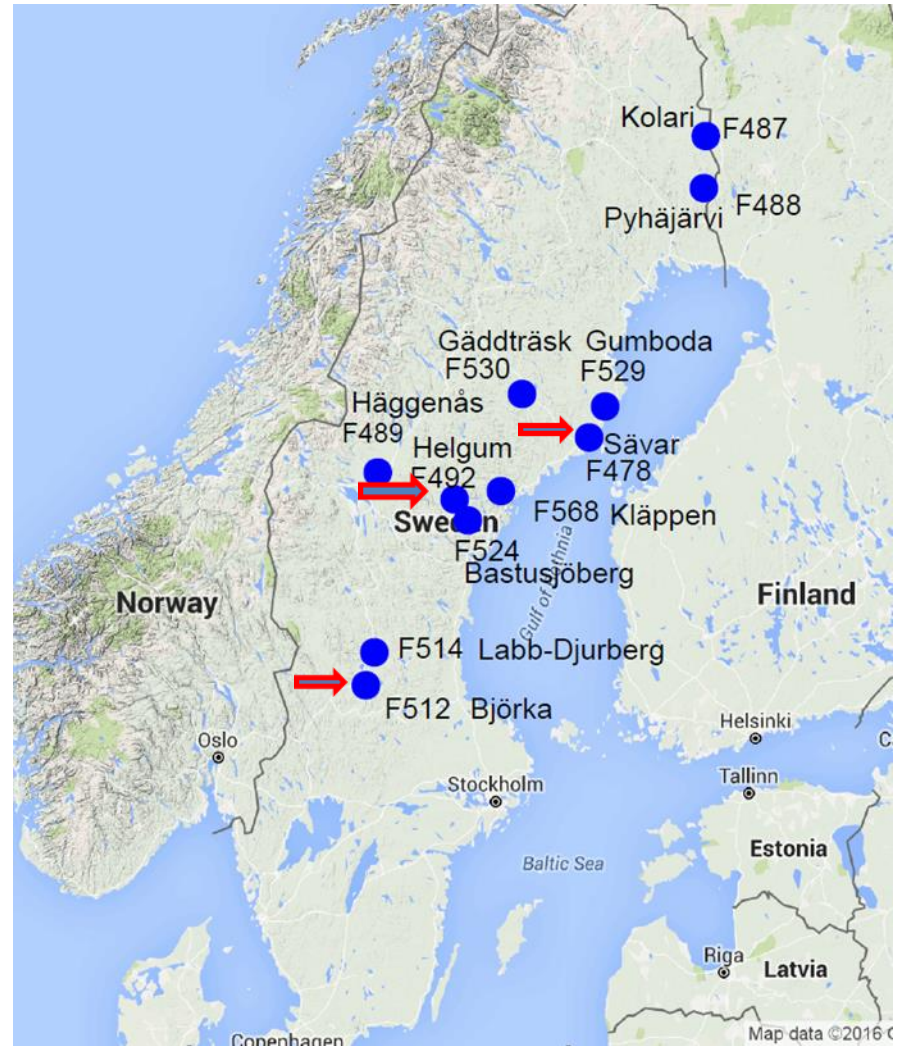
# Distribution of bud burst for each trials



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Internet access

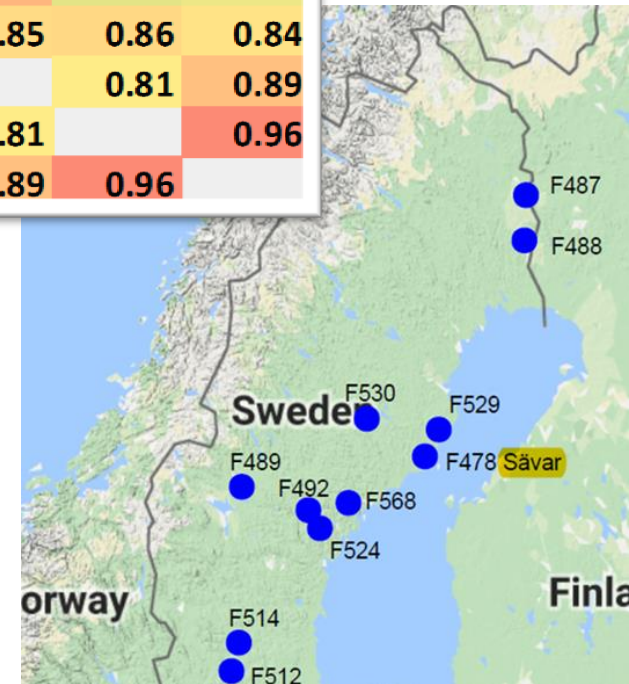
# Heritabilities of 11 trials

	Hertiability	SE
<b>F512</b>	<b>0.07</b>	<b>0.05</b>
F514	0.67	0.09
F568	0.55	0.09
<b>F492</b>	<b>0.02</b>	<b>0.09</b>
<b>F478</b>	<b>0.07</b>	<b>0.05</b>
F529	0.53	0.07
F524	0.56	0.07
F489	0.61	0.06
F530	0.57	0.06
F487	0.80	0.08
F488	0.58	0.07



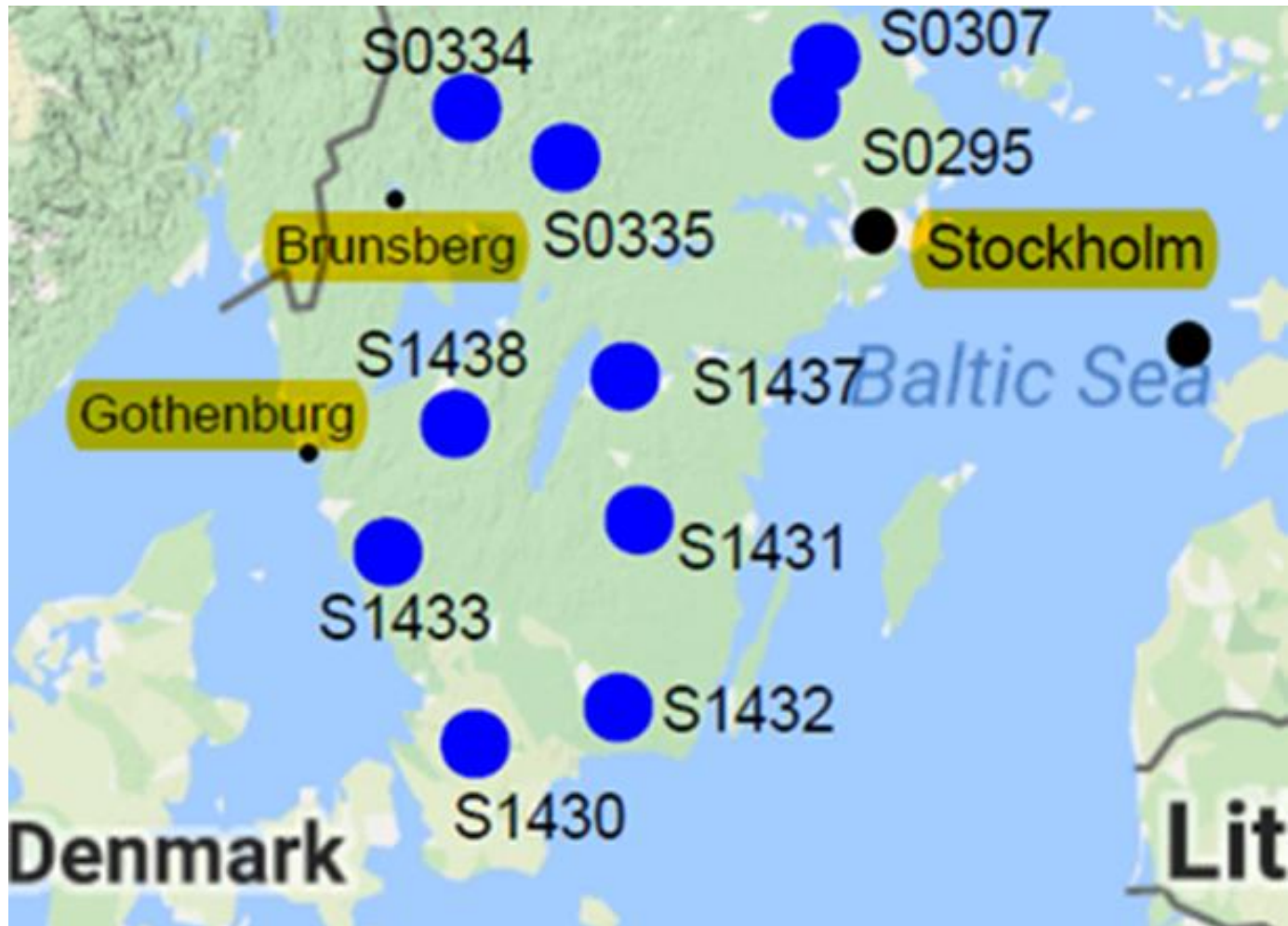
# Genetic correlations between trials

	F512	F514	F568	F492	F478	F529	F524	F489	F530	F487	F488
F512		0.88	0.54	0.76	0.03	0.53	0.79	0.59	0.89	0.48	0.63
F514	0.88		0.87	0.95	0.25	0.77	0.98	0.83	0.89	0.55	0.65
F568	0.54	0.87		0.94	0.56	0.90	0.94	0.94	0.73	0.64	0.63
F492	0.76	0.95	0.94		0.54	0.93	0.99	0.96	0.92	0.76	0.80
F478	0.03	0.25	0.56	0.54		0.81	0.44	0.74	0.47	0.88	0.75
F529	0.53	0.77	0.90	0.93	0.81		0.88	0.99	0.83	0.90	0.87
F524	0.79	0.98	0.94	0.99	0.44	0.88		0.92	0.90	0.68	0.73
F489	0.59	0.83	0.94	0.96	0.74	0.99	0.92		0.85	0.86	0.84
F530	0.89	0.89	0.73	0.92	0.47	0.83	0.90	0.85		0.81	0.89
F487	0.48	0.55	0.64	0.76	0.88	0.90	0.68	0.86	0.81		0.96
F488	0.63	0.65	0.63	0.80	0.75	0.87	0.73	0.84	0.89	0.96	

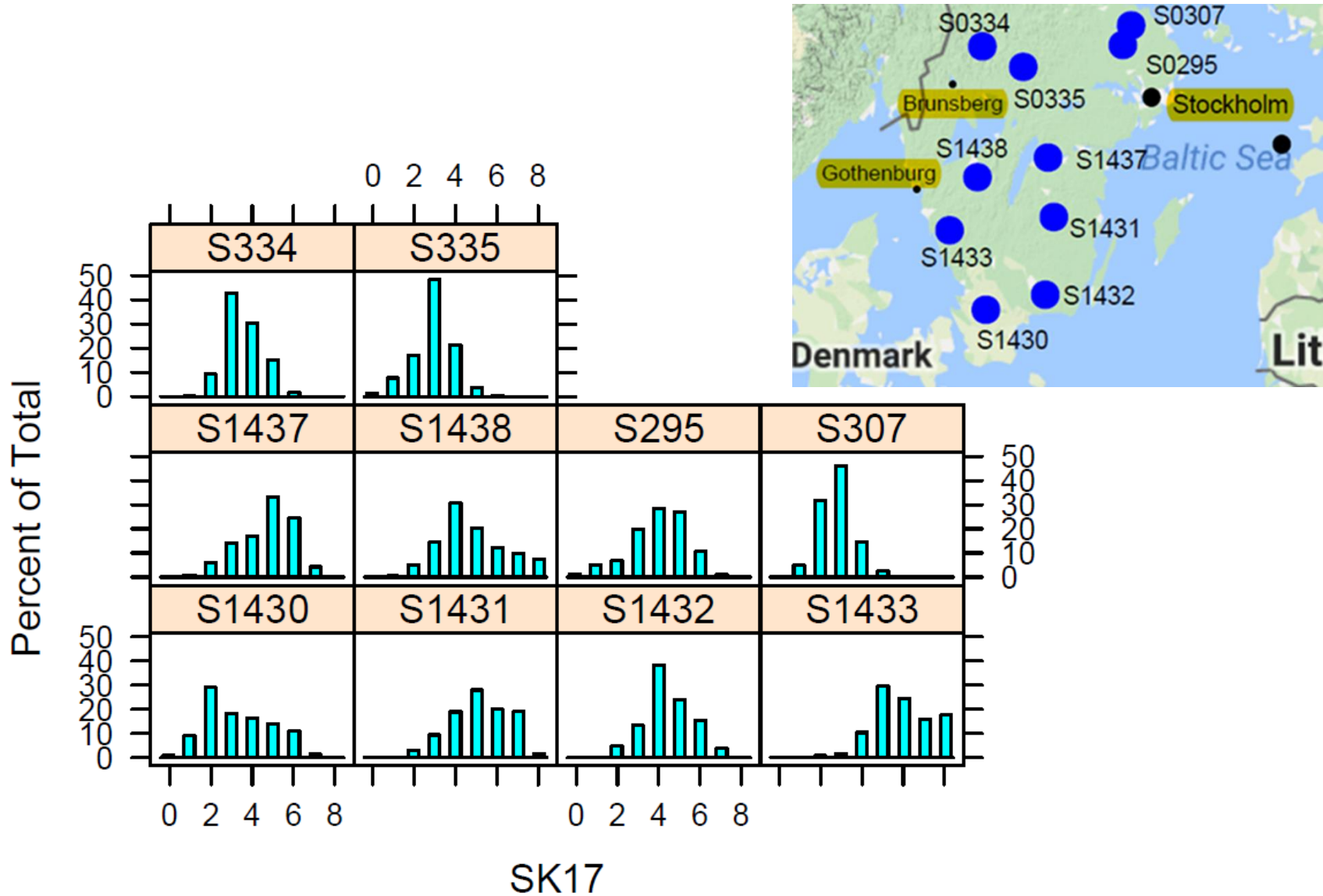




# The distribution of southern 10 trials



# Distribution of bud burst for each trial



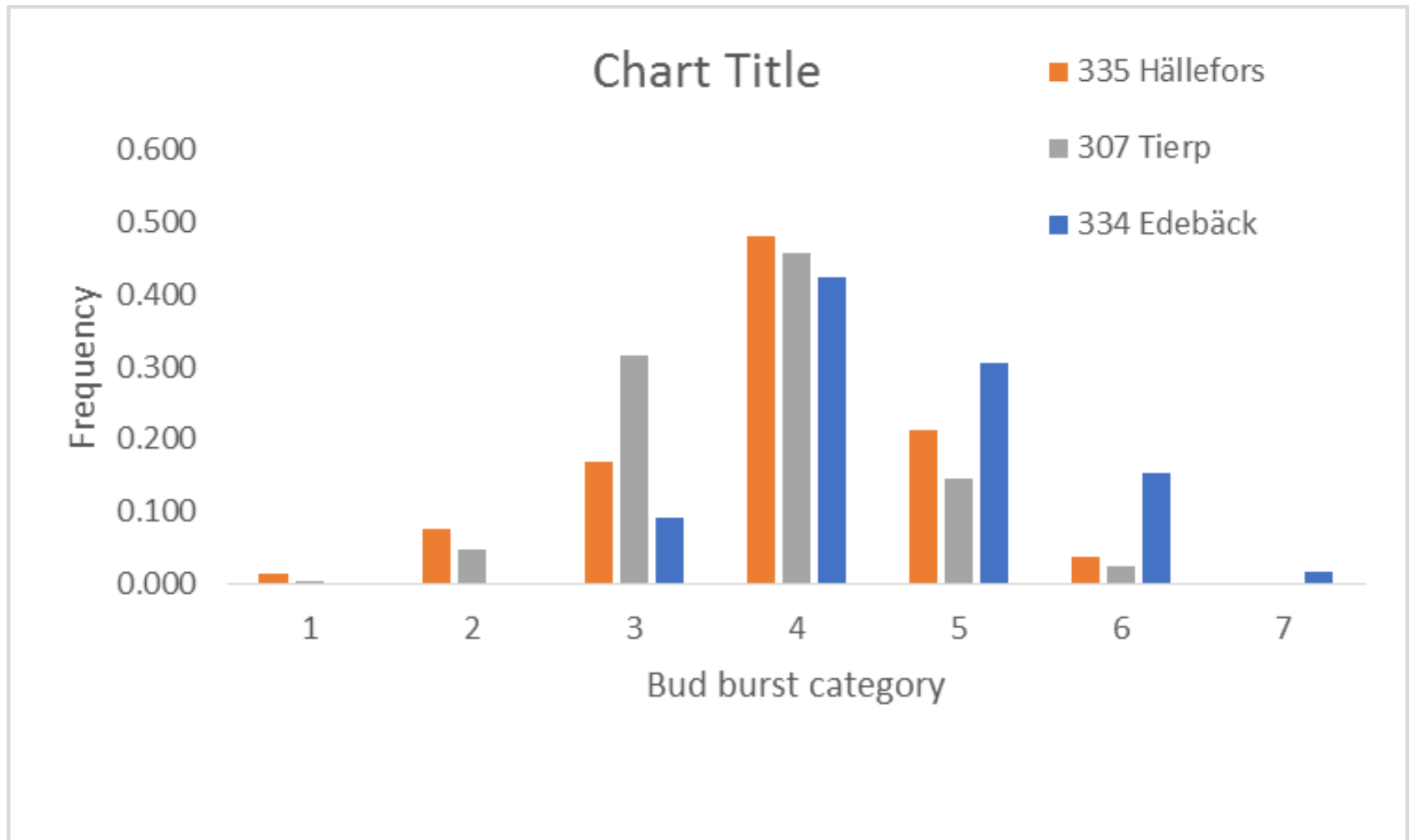
# Common parents between all pairs of 10 southern trials

	S1430	S1431	S1432	S1433	S1437	S1438	S295	S307	S334	S335
S1430	68	68	68	68	68	68	0	0	0	68
S1431	68	90	68	68	68	68	11	22	22	90
S1432	68	68	68	68	68	68	0	0	0	68
S1433	68	68	68	68	68	68	0	0	0	68
S1437	68	68	68	68	68	68	0	0	0	68
S1438	68	68	68	68	68	70	0	0	0	68
S295	0	11	0	0	0	0	21	11	11	11
S307	0	22	0	0	0	0	11	22	22	22
S334	0	22	0	0	0	0	11	22	22	22
S335	68	90	68	68	68	68	11	22	22	90

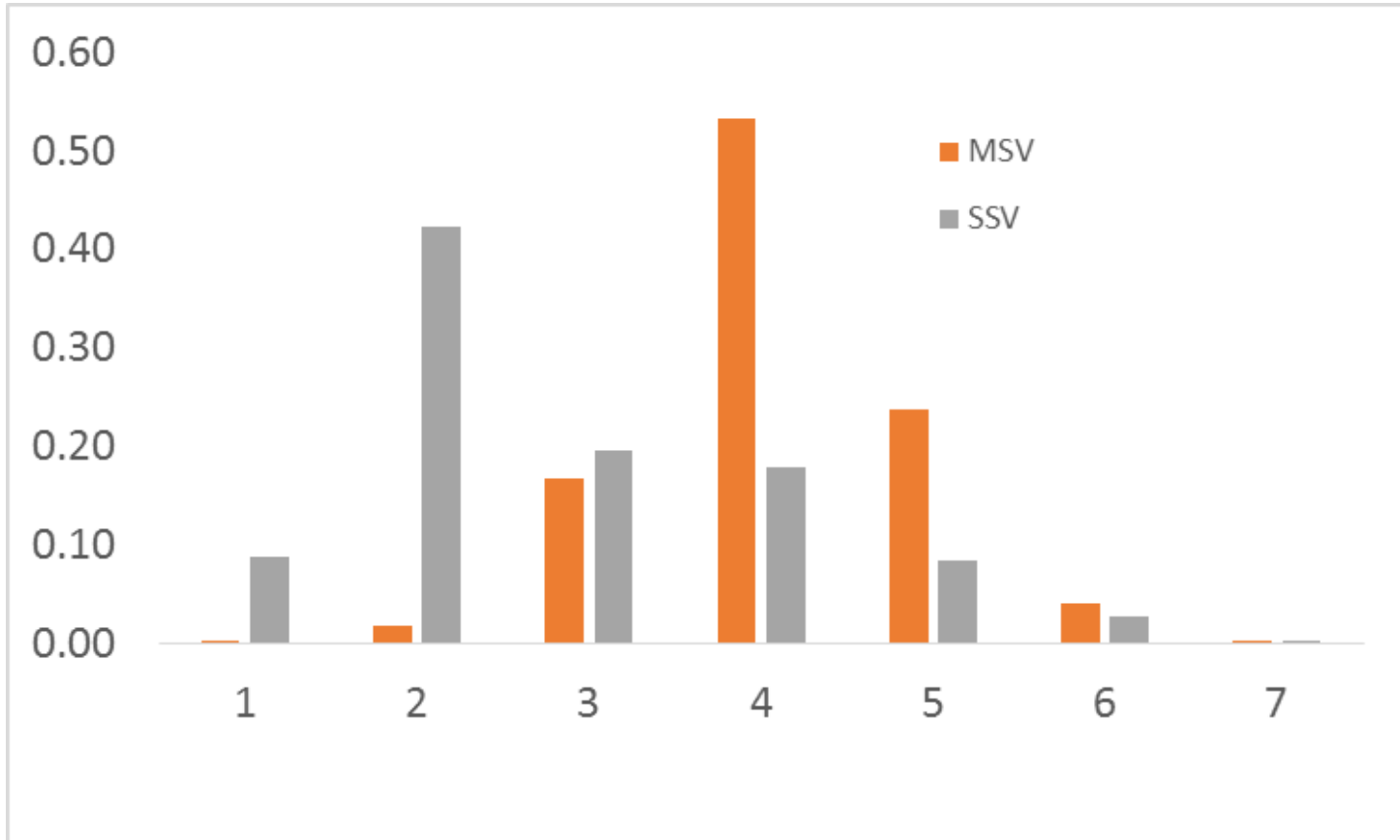
# Heritability and repeatability of bud Burst

Trial	Heritability	Repeatability
S1430	0.79	1.02
S1431	0.71	0.94
S1432	0.82	1.09
S1433	0.77	0.99
S1437	0.68	0.88
S1438	0.82	1.21
S295	0.58	1.04
S307	0.29	0.67
S334	0.36	0.72
S335	1.15	1.35

# Distributions of bud burst in three southern trials



# Distributions of two populations in trial S335



# Heritability and repeatability of bud Burst

Trial	Heritability	Repeatability
S1430	0.79	1.02
S1431	0.71	0.94
S1432	0.82	1.09
S1433	0.77	0.99
S1437	0.68	0.88
S1438	0.82	1.21
S295	0.58	1.04
S307	0.29	0.67
S334	0.36	0.72
S335	1.15	1.35
S335_Central	0.34	0.69
S335_South	0.59	0.75
S335_Population	0.72	1.04

# Trial S335 Accessor effect?

SK17	ANM	access	ID	VIT12	SK17	ANM	access	ID	VIT12	SK17	ANM	access
1	.	a	90337	3	.	.	.	90337	3	1	.	c
2	.	a	91025	3	.	.	.	91025	3	2	.	c
2	.	a	91049	3	.	.	.	91049	3	3	.	c
3	.	a	90200	3	.	.	.	90200	3	3	.	c
3	.	a	90025	3	.	.	.	90025	3	3	.	c
3	.	a	91169	3	.	.	.	91169	3	3	.	c
3	.	a	90644	3	.	.	.	90644	3	3	.	c
3	.	a	90350	3	.	.	.	90350	3	3	.	c
3	.	a	90687	3	.	.	.	90687	3	3	.	c
4	.	a	90053	3	.	.	.	90053	3	4	.	c

ID	VIT12	SK17	ANM	access	ID	VIT12	SK17	ANM	access
97001	3	2	.	b	97001	3	1	.	c
97001	3	1	.	b	97001	3	2	.	c
97001	3	1	.	b	97001	3	3	.	c



# Genetic correlations between trials

	S334	S335	S307	S295	S1437	S1431	S1430	S1432	S1433	S1438
S334		0.97	0.95	-0.32	0.74	0.94	0.91	0.93	0.89	0.78
S335	0.97		0.93	-0.33	0.73	0.92	0.89	0.92	0.87	0.78
S307	0.95	0.93		-0.52	0.83	0.98	0.90	0.94	0.91	0.81
S295	-0.32	-0.33	-0.52		-0.86	-0.61	-0.63	-0.62	-0.69	-0.75
S1437	0.74	0.73	0.83	-0.86		0.91	0.94	0.93	0.96	0.97
S1431	0.94	0.92	0.98	-0.61	0.91		0.97	0.99	0.98	0.91
S1430	0.91	0.89	0.90	-0.63	0.94	0.97		0.99	1.00	0.97
S1432	0.93	0.92	0.94	-0.62	0.93	0.99	0.99		0.99	0.95
S1433	0.89	0.87	0.91	-0.69	0.96	0.98	1.00	0.99		0.98
S1438	0.78	0.78	0.81	-0.75	0.97	0.91	0.97	0.95	0.98	



**If you can correctly guess which stage of this tree, we will not fail for the measurement in F478**









# Acknowledgements

Northern Sweden	Chen	8
	AF	7
	John	7
	Xinyu	3
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	Harry	1
	Wei	1
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	Sari	1