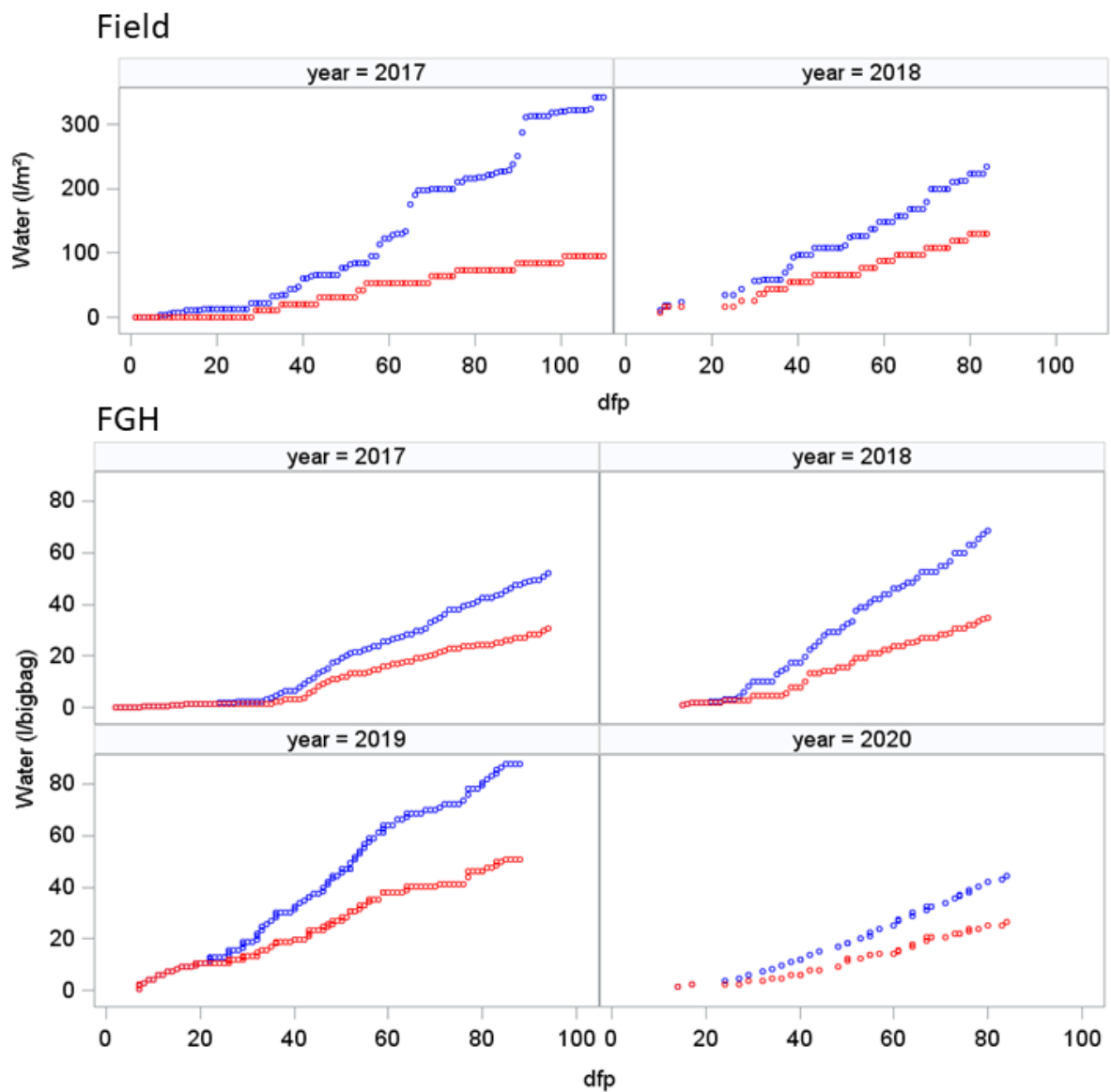
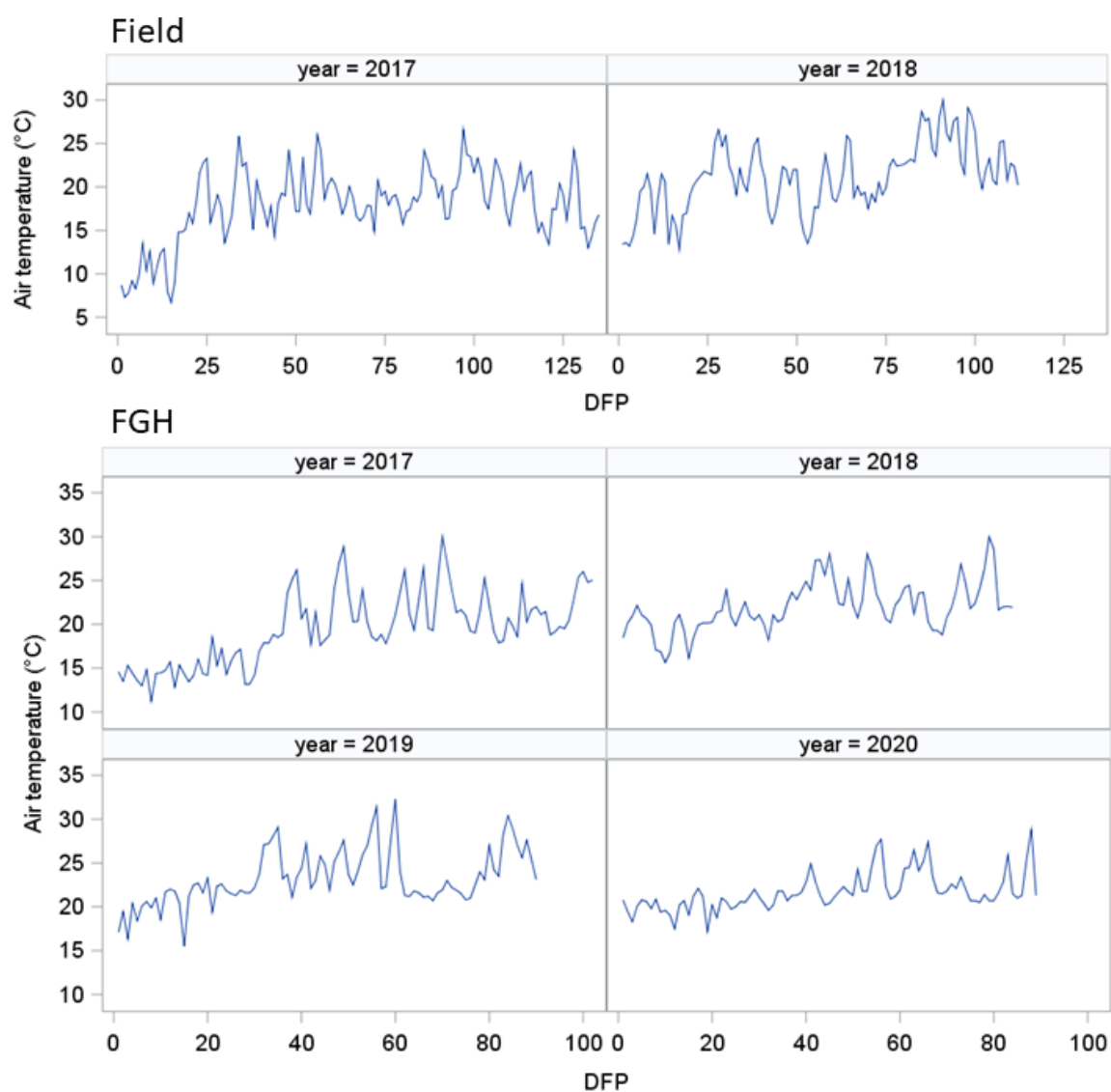


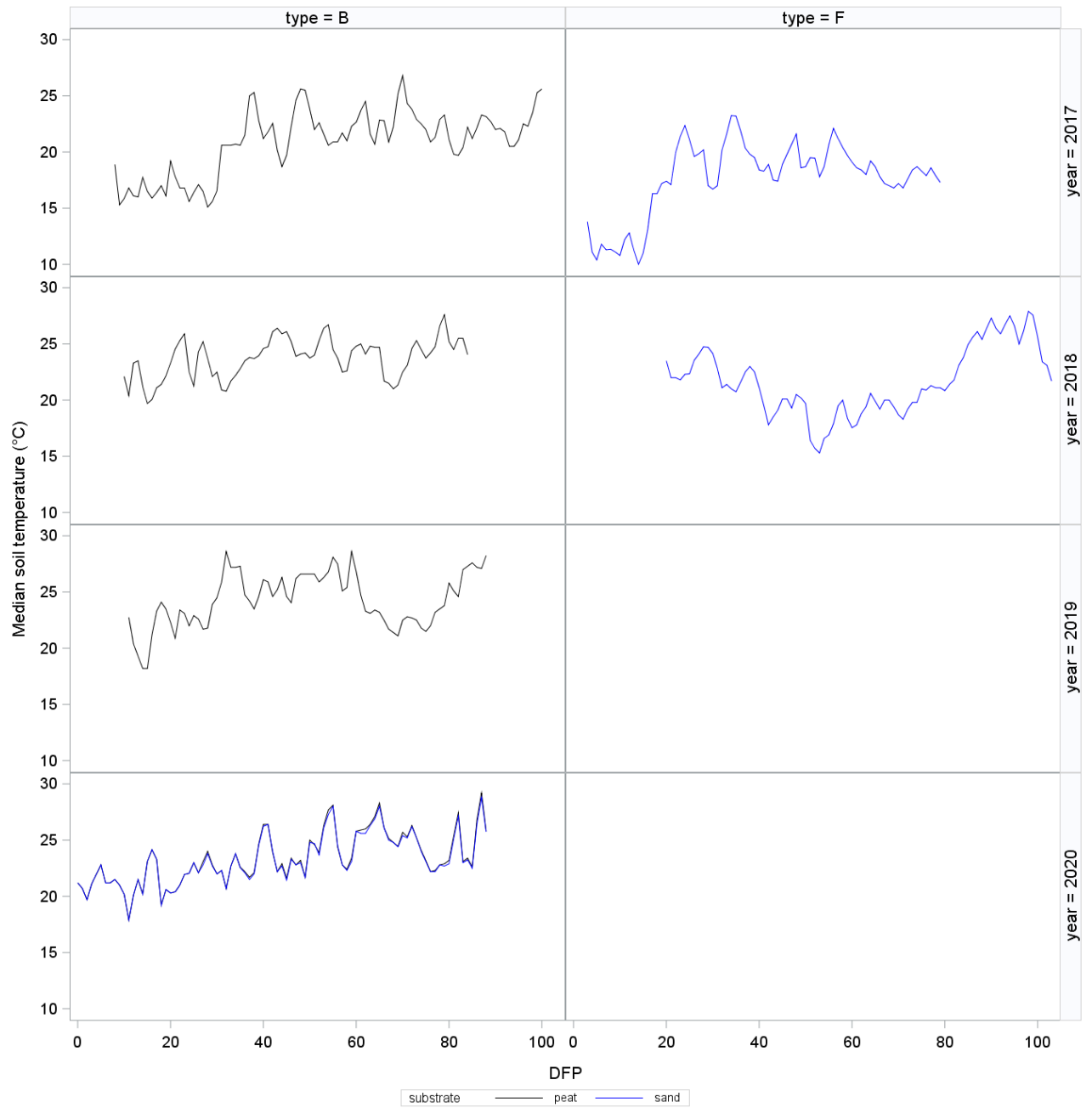
**Supplemental Figure S1.** Potato genotypes in test populations 1 to 3. Population 1: 34 potato cultivars (details see Sprenger, Rudack *et al.* 2015 [14]). Population 2: Cultivars A (id =2870), R (2880), E (2858) and D(382), offsprings of the crossing A  $\times$  R (29 lines) and E  $\times$  A (31 lines) (details see Haas *et al.* 2020 [21]). Population 3: potato cultivars A, D, E and R and cultivars 2674, 2879, 2876, 2866, 2871, 2859 and 2854 plus crossing lines AR23 (899486), AR56 (899519), AR59 (899522), AR202 (899665), AR285 (899748), EA62 (899822), EA71 (899831), EA74 (899834), EA162 (899922), EA264 (900024).



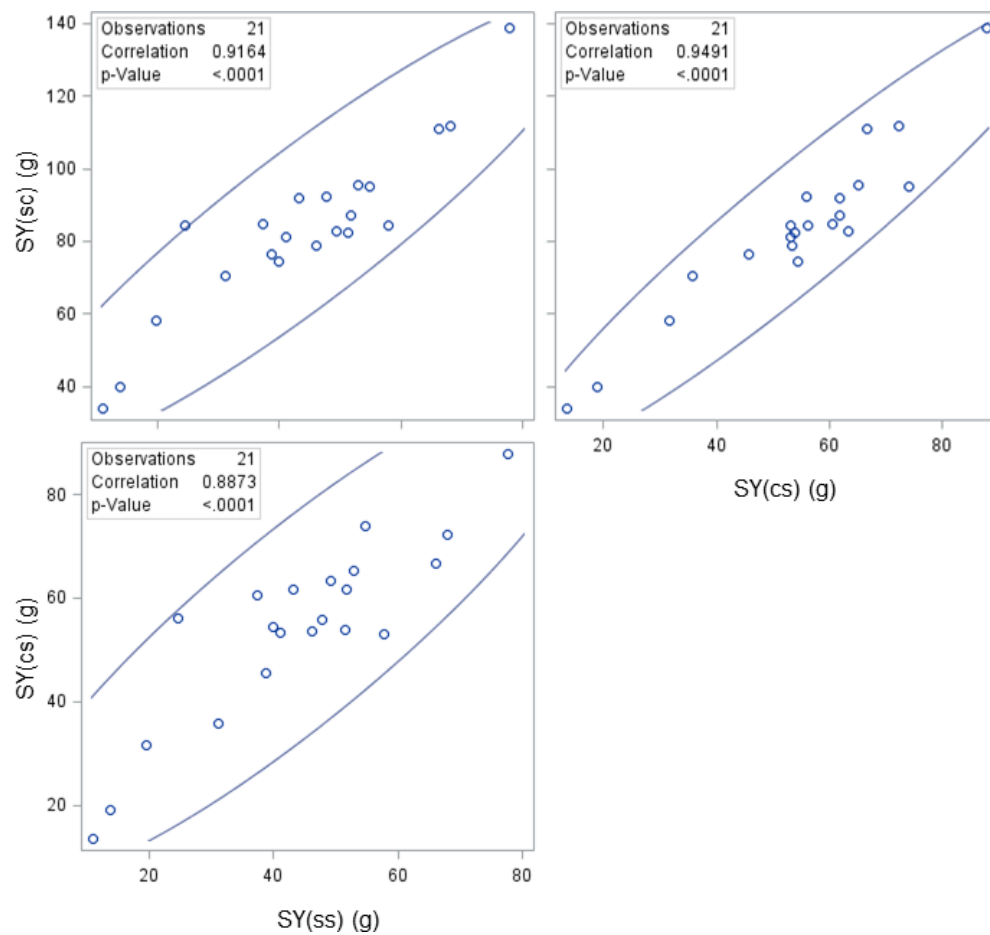
**Figure S2.** Cumulative water supply in experiments performed on population 3. Control (blue), long-term stress (red). Water supply to control treatment in the field is the sum of irrigation and precipitation. dfp = days from planting.



**Figure S3.** Air temperature in experiments on population 3. Daily median of air temperature plotted against days from planting (DFP) during experiments in the field and the FGH. Notice different axis for field and FGH.



**Figure S4.** Soil temperature in experiments on population 3. Soil temperature measured 15 – 20 cm below surface by 16 to 24 sensors per substrate in bigbag (type = B) or field (type = F) experiments. DFP = days from planting. Soil temperatures on sand and peat in type = B, year = 202 are so similar that the line for sand obscures the line for peat.



**Figure S5.** Scatter plot of mean starch yield (SY) in 21 cultivars of population 3 under early stress (sc), late stress (cs) and long-term stress (ss) in bigbag experiments on peat. Notice different scaling of axis for SY(sc) compared to SY(cs) and SY(ss). Ellipse = .95 prediction range.

**Table S1.** ANOVA on the effect of planting material on tuber size distribution. Treatment: control = optimal irrigation, stress = drought; size = tuber size L (> 65 mm), M (35 – 65 mm) and S (< 35); genotype: potato genotypes A, D, E and R; Plant = planting material (*in vitro* cutting, tuber). DF = degrees of freedom, F = F-value, Prob = probability.

Treatment	Size	_SOURCE_	DF	F	Prob
Control	L	ERROR	115	.	.
Control	L	Genotype	3	16.9873	0
Control	L	Plant	1	0.0926	0.76145
Control	L	Genotype*Plant	3	1.2435	0.29729
Control	M	ERROR	115	.	.
Control	M	Genotype	3	8.756	0.00003
Control	M	Plant	1	0.5468	0.46115
Control	M	Genotype*Plant	3	4.7494	0.00369
Control	S	ERROR	115	.	.
Control	S	Genotype	3	9.4169	0.00001
Control	S	Plant	1	3.4308	0.06656
Control	S	Genotype*Plant	3	2.2368	0.08771
Stress	L	ERROR	108	.	.
Stress	L	Genotype	3	3.4133	0.02009
Stress	L	Plant	1	9.283	0.00291
Stress	L	Genotype*Plant	3	3.4133	0.02009
Stress	M	ERROR	108	.	.
Stress	M	Genotype	3	4.9969	0.00277
Stress	M	Plant	1	13.0841	0.00045
Stress	M	Genotype*Plant	3	3.4696	0.01871
Stress	S	ERROR	108	.	.
Stress	S	Genotype	3	16.2189	0
Stress	S	Plant	1	13.1047	0.00045
Stress	S	Genotype*Plant	3	0.7949	0.4993