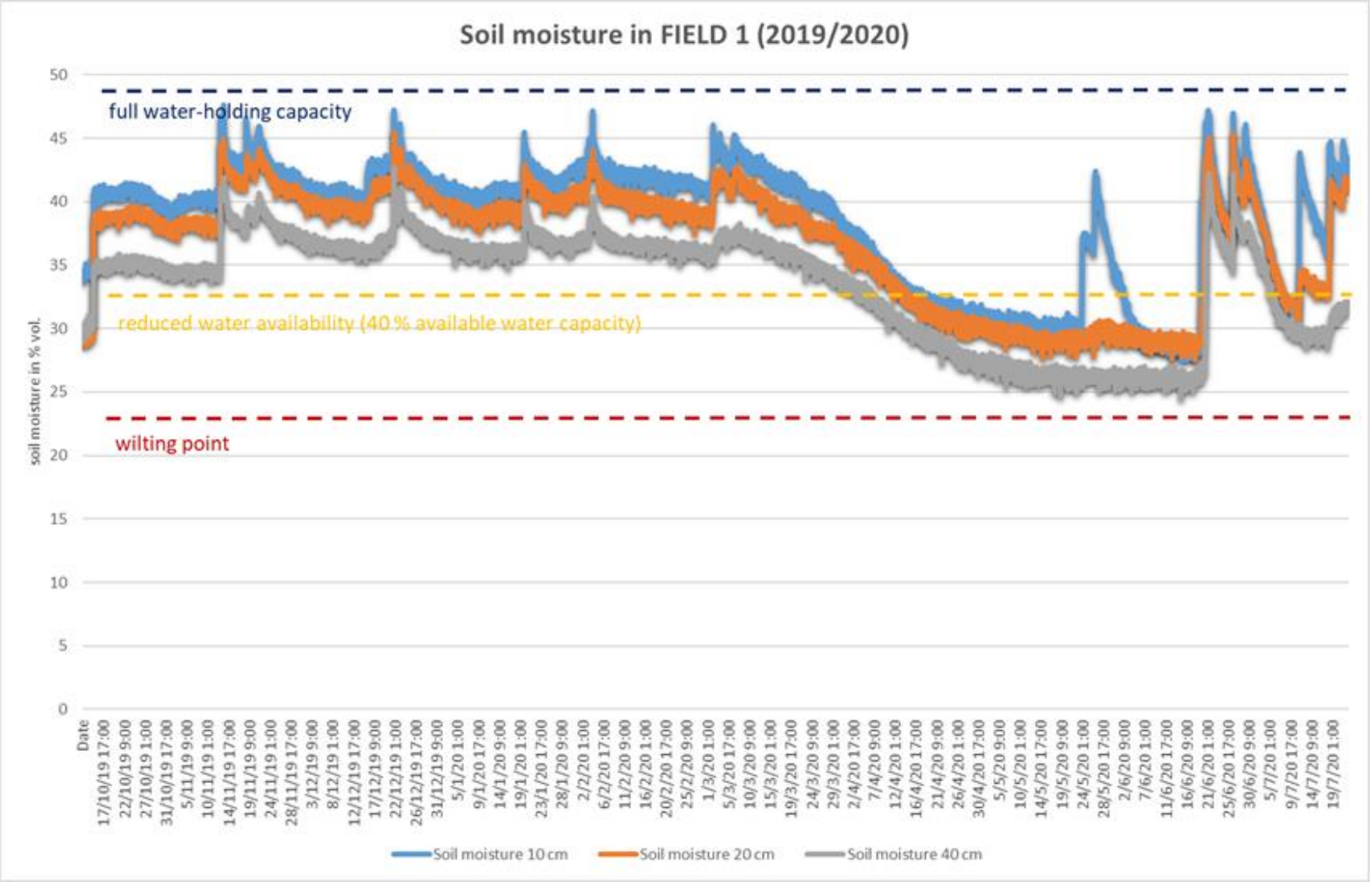

Figure S1. Soil moisture in FIELD 1 during the growing season 2019/2020.

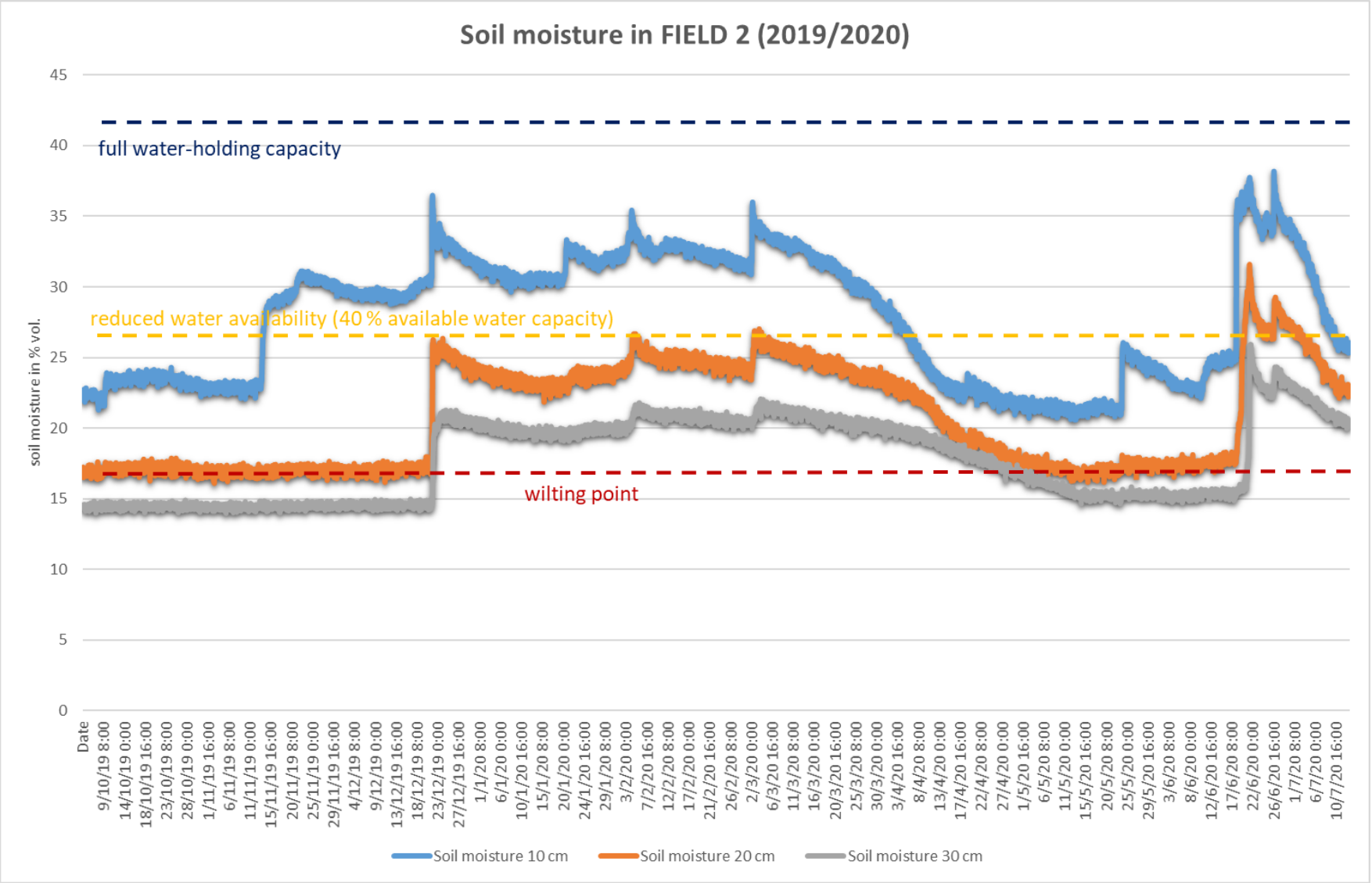

Figure S2.Soil moisture in FIELD 2 during the growing season 2019/2020.

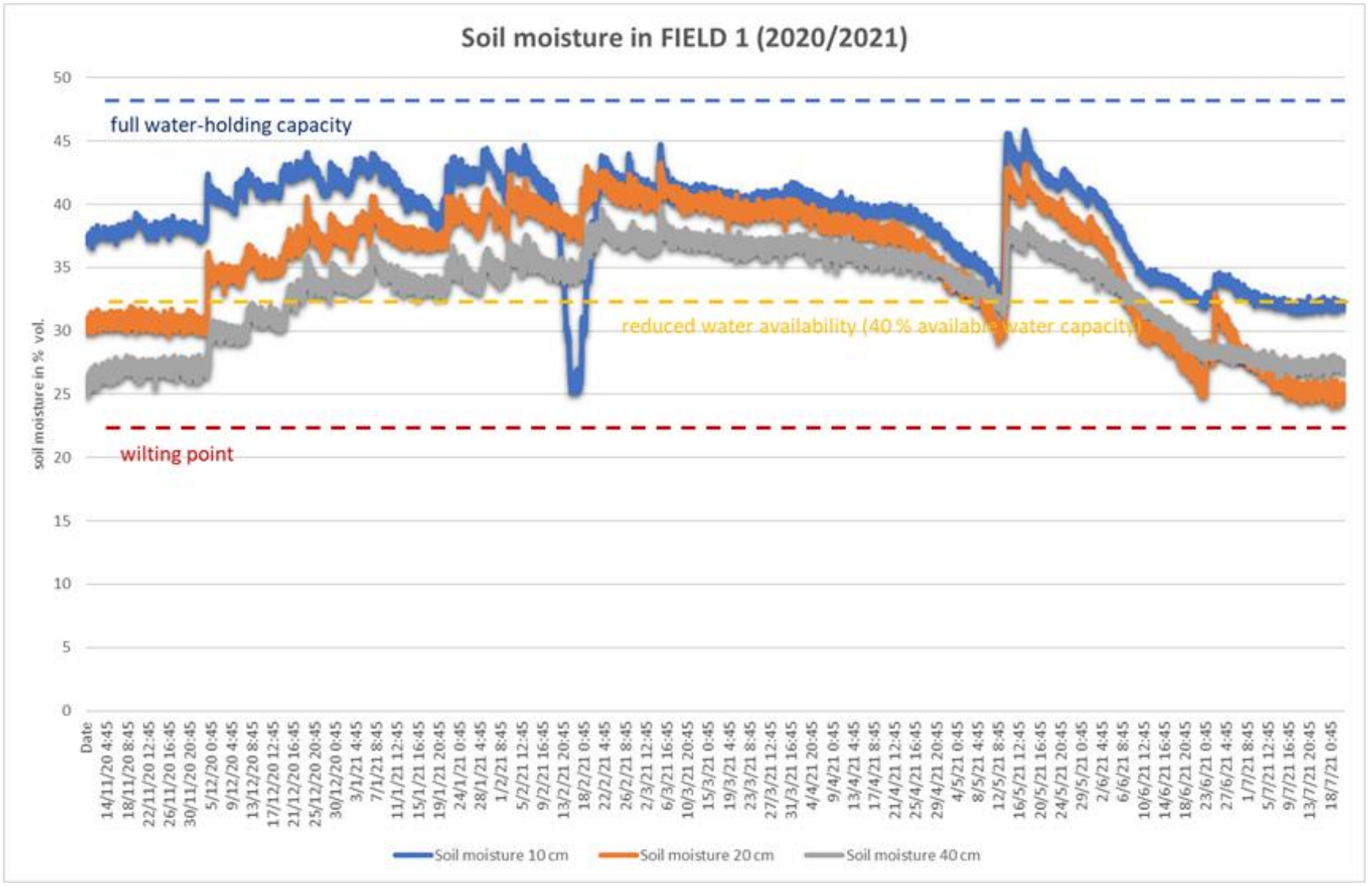

Figure S3. Soil moisture in FIELD 1 during the growing season 2020/2021.

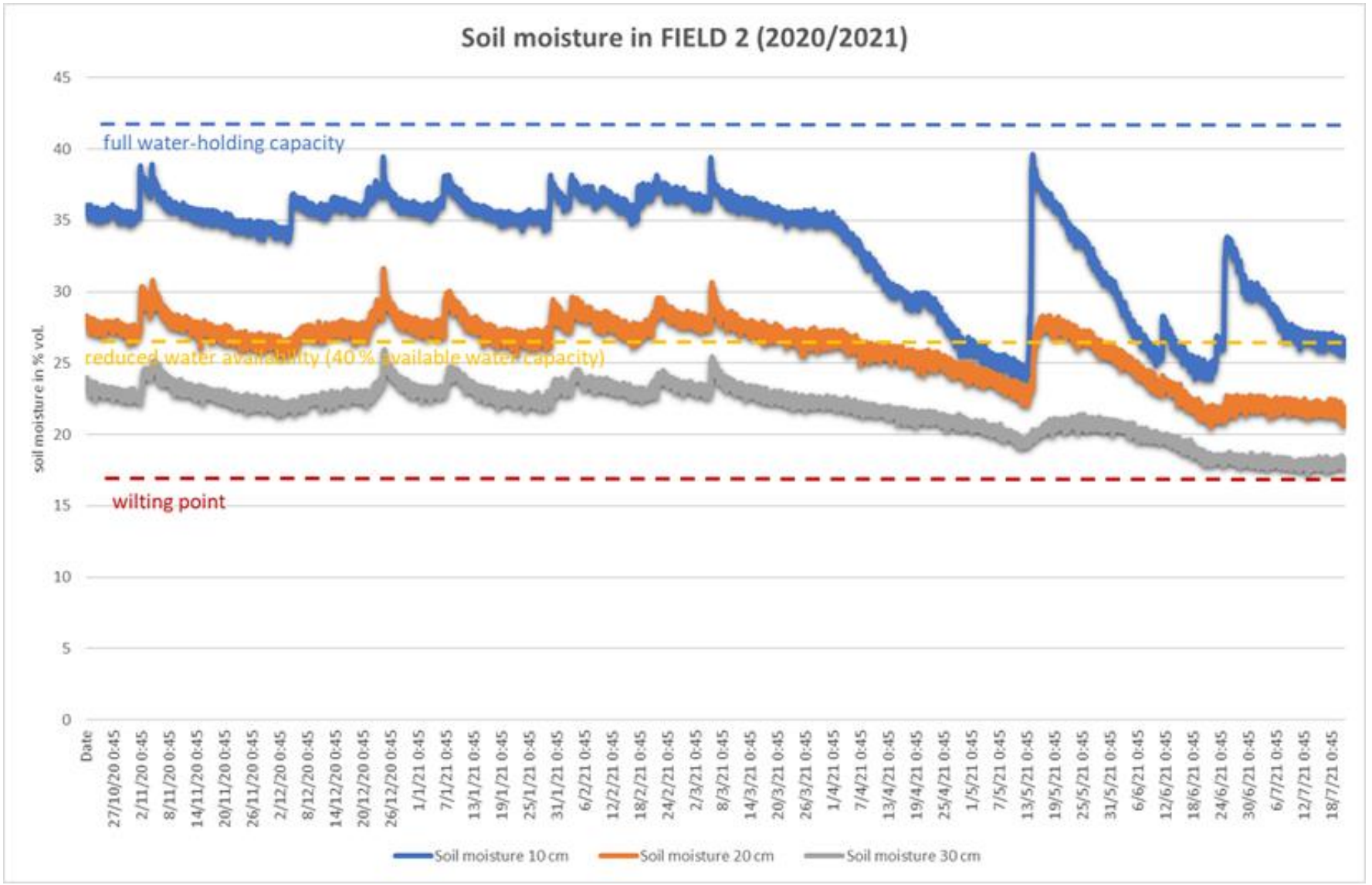

Figure S4. Soil moisture in FIELD 2 during the growing season 2020/2021.

Table S1. Fertilisers dosages and forms.

form	**Fertilisers**	*form*	2020/2021
	FIELD 1		
	2019/2020		
triple superphosphate	90 kg P2O5		
potassium chloride	120 kg K2O		
ammonium nitrate with dolomite	50 Kg N	ammonium nitrate with limestone	50 kg N
ammonium nitrate with urea	60 kg N	ammonium nitrate with urea	60 kg N
ammonium nitrate with limestone	40 kg N		
form	**FIELD 2**	*form*	2020/2021
	2019/2020		
ammonium nitrate with ammonium sulphate	50 kg N + 25 kg S	ammonium nitrate with limestone	30 kg N
ammonium nitrate with urea	40 kg N		

Table S2. Soil texture and the percentage of soil separates.

Location	**Soil Texture**	**Soil Separates**		
		Sand (particles >0.05 mm)	Silt (particles 0.001-0.05 mm)	Clay (particles <0,001 mm)
FIELD 1	silty clay loam	15.70%	53.40%	31.00%
FIELD 2	loam	47.20%	34.80%	18.00%

Table S3. Spearman correlation matrix for the data of **FIELD 1**. Values in bold are different from 0 with a significance level alpha=0.05.

Variables	Spike Length	Total Spikelet Number	Fertile Spikelets	Fertile Flowers	Spike Density	Spike Fertility	Spike Length (2)	Total Spikelet Number (2)	Fertile Spikelets (2)	Grain Number	Spike Density (2)	Spike Fertility (2)	TKW	Yield	HI	Spikes/m2
Spike Length	**1**	**0.548**	**0.397**	0.047	**-0.902**	0.056	**0.553**	**0.381**	**0.266**	0.099	**-0.473**	0.046	0.154	**-0.590**	**-0.507**	**0.369**
Total Spikelet Number	**0.548**	**1**	**0.745**	**0.238**	**-0.176**	**0.179**	**0.242**	0.160	**0.288**	0.105	**-0.209**	**0.286**	0.080	**-0.424**	**-0.347**	**0.355**
Fertile Spikelets	**0.397**	**0.745**	**1**	**0.641**	-0.115	**0.763**	0.117	0.096	**0.229**	0.082	-0.100	**0.249**	-0.033	**-0.319**	**-0.217**	**0.245**
Fertile Flowers	0.047	**0.238**	**0.641**	**1**	0.066	**0.713**	-0.116	-0.080	-0.014	0.123	0.097	0.078	**-0.311**	**-0.230**	-0.165	**0.224**
Spike Density	**-0.902**	**-0.176**	-0.115	0.066	**1**	0.023	**-0.539**	**-0.339**	-0.155	-0.048	**0.474**	0.086	-0.149	**0.454**	**0.412**	**-0.250**
Spike Fertility	0.056	**0.179**	**0.763**	**0.713**	0.023	**1**	-0.074	-0.055	0.078	0.050	0.051	0.155	-0.085	-0.018	0.027	0.023
Spike Length (2)	**0.553**	**0.242**	0.117	-0.116	**-0.539**	-0.074	**1**	**0.577**	**0.474**	0.164	**-0.877**	0.093	**0.325**	**-0.287**	-0.155	0.115
Total Spikelet Number (2)	**0.381**	0.160	0.096	-0.080	**-0.339**	-0.055	**0.577**	**1**	**0.616**	**0.239**	-0.158	-0.022	0.097	**-0.372**	**-0.205**	0.143
Fertile Spikelets (2)	**0.266**	**0.288**	**0.229**	-0.014	-0.155	0.078	**0.474**	**0.616**	**1**	**0.471**	**-0.197**	**0.742**	0.088	-0.120	**-0.244**	**0.215**
Grain Number	0.099	0.105	0.082	0.123	-0.048	0.050	0.164	**0.239**	**0.471**	**1**	-0.019	**0.454**	**-0.365**	-0.158	**-0.480**	**0.494**
Spike Density (2)	**-0.473**	**-0.209**	-0.100	0.097	**0.474**	0.051	**-0.877**	-0.158	**-0.197**	-0.019	**1**	-0.081	**-0.344**	**0.181**	0.076	-0.038
Spike Fertility (2)	0.046	**0.286**	**0.249**	0.078	0.086	0.155	0.093	-0.022	**0.742**	**0.454**	-0.081	**1**	-0.002	0.117	**-0.206**	**0.246**
TKW	0.154	0.080	-0.033	**-0.311**	-0.149	-0.085	**0.325**	0.097	0.088	**-0.365**	**-0.344**	-0.002	**1**	**0.313**	**0.512**	**-0.539**
Yield	**-0.590**	**-0.424**	**-0.319**	**-0.230**	**0.454**	-0.018	**-0.287**	**-0.372**	-0.120	-0.158	**0.181**	0.117	**0.313**	**1**	**0.648**	**-0.541**
HI	**-0.507**	**-0.347**	**-0.217**	-0.165	**0.412**	0.027	-0.155	**-0.205**	**-0.244**	**-0.480**	0.076	**-0.206**	**0.512**	**0.648**	**1**	**-0.847**
Spikes/m2	**0.369**	**0.355**	**0.245**	**0.224**	**-0.250**	0.023	0.115	0.143	**0.215**	**0.494**	-0.038	**0.246**	**-0.539**	**-0.541**	**-0.847**	**1**

Table S4. Spearman correlation matrix for the data of FIELD 2. Values in bold are different from 0 with a significance level alpha=0.05.

Variables	Spike Length	Total Spikelet Number	Fertile Spikelets	Fertile Flowers	Spike Density	Spike Fertility	Spike Length (2)	Total Spikelet Number (2)	Fertile Spikelets (2)	Grain Number	Spike Density (2)	Spike Fertility (2)	TKW	Yield	HI	Spikes/m2
Spike Length	**1**	**0.575**	**0.582**	**0.471**	**-0.865**	**0.286**	**0.654**	**0.376**	**0.208**	**0.276**	**-0.588**	-0.020	**0.435**	**-0.212**	**-0.339**	0.153
Total Spikelet Number	**0.575**	**1**	**0.636**	**0.244**	-0.128	0.012	**0.344**	**0.261**	0.053	0.139	**-0.254**	-0.102	0.037	-0.096	**-0.290**	**0.205**
Fertile Spikelets	**0.582**	**0.636**	**1**	**0.763**	**-0.331**	**0.743**	**0.264**	**0.220**	0.099	0.124	**-0.183**	-0.009	0.065	-0.021	**-0.167**	-0.091
Fertile Flowers	**0.471**	**0.244**	**0.763**	**1**	**-0.445**	**0.813**	0.079	0.054	-0.047	0.017	-0.070	-0.084	0.122	-0.041	0.016	-0.077
Spike Density	**-0.865**	-0.128	**-0.331**	**-0.445**	**1**	**-0.332**	**-0.580**	**-0.285**	**-0.207**	**-0.203**	**0.560**	-0.029	**-0.543**	**0.240**	**0.193**	-0.058
Spike Fertility	**0.286**	0.012	**0.743**	**0.813**	**-0.332**	**1**	0.029	0.089	0.098	0.000	0.027	0.073	0.054	0.010	0.039	**-0.314**
Spike Length (2)	**0.654**	**0.344**	**0.264**	0.079	**-0.580**	0.029	**1**	**0.550**	**0.506**	**0.557**	**-0.883**	**0.219**	**0.483**	**-0.299**	**-0.243**	**0.276**
Total Spikelet Number (2)	**0.376**	**0.261**	**0.220**	0.054	**-0.285**	0.089	**0.550**	**1**	**0.552**	**0.290**	-0.152	0.022	**0.170**	**-0.170**	-0.164	-0.013
Fertile Spikelets (2)	**0.208**	0.053	0.099	-0.047	**-0.207**	0.098	**0.506**	**0.552**	**1**	**0.546**	**-0.297**	**0.809**	**0.198**	-0.038	-0.154	-0.061
Grain Number	**0.276**	0.139	0.124	0.017	**-0.203**	0.000	**0.557**	**0.290**	**0.546**	**1**	**-0.515**	**0.451**	0.158	**0.186**	**-0.378**	**0.327**
Spike Density (2)	**-0.588**	**-0.254**	**-0.183**	-0.070	**0.560**	0.027	**-0.883**	-0.152	**-0.297**	**-0.515**	**1**	**-0.243**	**-0.512**	**0.271**	**0.217**	**-0.325**
Spike Fertility (2)	-0.020	-0.102	-0.009	-0.084	-0.029	0.073	**0.219**	0.022	**0.809**	**0.451**	**-0.243**	**1**	0.089	0.093	-0.057	-0.091
TKW	**0.435**	0.037	0.065	0.122	**-0.543**	0.054	**0.483**	**0.170**	**0.198**	0.158	**-0.512**	0.089	**1**	**-0.400**	0.053	**0.337**
Yield	**-0.212**	-0.096	-0.021	-0.041	**0.240**	0.010	**-0.299**	**-0.170**	-0.038	**0.186**	**0.271**	0.093	**-0.400**	**1**	**-0.232**	-0.151
HI	**-0.339**	**-0.290**	**-0.167**	0.016	**0.193**	0.039	**-0.243**	-0.164	-0.154	**-0.378**	**0.217**	-0.057	0.053	**-0.232**	**1**	-0.144
Spikes/m2	0.153	**0.205**	-0.091	-0.077	-0.058	**-0.314**	**0.276**	-0.013	-0.061	**0.327**	**-0.325**	-0.091	**0.337**	-0.151	-0.144	**1**

Table S5. Mean values of the observed traits for all varieties.

V	Y	S	SL	TSN	FS	FF	SD	SF	SL2	TSN2	FS2	GN	SD2	SF2	TKW	Yie	HI	S/m²
Balitus	19/20	F1	98.7 ±4.8	20.3 ±0.5	17.1 ±0.9	46.4 ±4.2	0.2± 0.0	84.2 ±3.2	92.0 ±7.0	20.0 ±1.1	18.0 ±1.3	53.2 ±8.4	0.2± 0.0	90.0 ±3.5	43.3 ±2.4	11.9 ±0.6	0.4± 0.1	815.0±51.7
		F2	94.4 ±5.5	19.6 ±0.8	18.0 ±1.0	61.8 ±5.9	0.2± 0.0	91.8 ±2.6	92.8 ±11.9	18.8 ±1.0	16.3 ±1.6	46.6 ±9.8	0.2± 0.0	86.6 ±4.7	42.1 ±0.6	5.51 ±0.2	0.4± 0.1	540± 19.5
	20/21	F1	92.3 ±3.8	20.0 ±0.7	18.0 ±1.0	53.4 ±5.4	0.2± 0.0	90.0 ±4.0	83.1 ±4.6	19.1 ±1.0	16.3 ±1.2	41.3 ±4.0	0.2± 0.0	85.3 ±3.4	43.3 ±0.2	11.2 ±0.4	0.6± 0.9	640± 50.1
		F2	83.9 ±6.7	18.1 ±1.0	16.2 ±0.9	46.5 ±8.2	0.2± 0.0	89.6 ±3.9	75.8 ±3.5	18.9 ±0.7	15.9 ±0.9	37.9 ±6.1	0.2± 0.0	84.2 ±5.7	40.6 ±1.6	6.1± 0.4	0.4± 0.0	415.0±16.2
Bohemia	19/20	F1	130.0±9.5	21.2 ±0.6	18.5 ±1.3	51.1 ±9.3	0.2± 0.0	87.2 ±4.7	114.0±5.7	20.2 ±1.0	17.7 ±1.1	52.2 ±2.5	0.2± 0.0	87.9 ±7.6	45.3 ±1.9	10.8 ±0.4	0.4± 0.1	890.0±1.0
		F2	117.0±8.6	19.5 ±0.8	16.6 ±1.4	47.4 ±8.8	0.2± 0.0	85.2 ±7.8	108.0±13.9	19.4 ±1.0	16.9 ±1.4	50.8 ±6.3	0.2± 0.0	87.3 ±8.9	45.1 ±1.0	4.85 ±0.2	0.4± 0.1	618± 32.9
	20/21	F1	114.0±5.7	20.2 ±1.0	17.9 ±1.0	50.3 ±4.8	0.2± 0.0	88.6 ±3.1	104.0±5.5	20.7 ±0.5	17.9 ±0.6	43.7 ±2.3	0.2± 0.0	86.5 ±2.9	46.8 ±0.4	10.7 ±0.4	0.5± 0.0	593± 40.7
		F2	115.0±2.3	19.9 ±1.1	17.5 ±1.2	53.1 ±4.3	0.2± 0.0	88.0 ±3.5	98.5 ±5.2	19.1 ±0.3	15.8 ±0.8	40.0 ±5.0	0.2± 0.0	82.7 ±4.2	45.0 ±0.9	5.8± 0.4	0.5± 0.0	439.0±23.4
IS Conditor	19/20	F1	96.4 ±8.4	19.6 ±0.5	17.6 ±1.0	57.7 ±7.3	0.2± 0.0	89.8 ±3.5	87.4 ±4.8	20.5 ±0.7	17.0 ±1.0	55.0 ±5.2	0.2± 0.0	82.9 ±4.1	37.8 ±2.6	9.87 ±1.0	0.4± 0.0	897.0±82.3
		F2	91.8 ±6.2	20.7 ±0.7	16.7 ±1.5	44.8 ±5.9	0.2± 0.0	80.6 ±5.1	83.6 ±3.6	18.5 ±0.7	15.2 ±0.6	49.8 ±6.0	0.2± 0.0	82.2 ±3.4	39.9 ±0.6	6.16 ±0.2	0.4± 0.1	620.0±24.3
	20/21	F1	87.4 ±4.8	20.3 ±0.7	17.5 ±1.1	54.9 ±5.2	0.2± 0.0	86.2 ±4.6	81.2 ±5.0	19.5 ±0.7	16.3 ±1.1	48.5 ±5.8	0.2± 0.0	83.5 ±3.5	41.8 ±0.9	11.3 ±0.4	0.5± 0.0	642.0±59.2
		F2	81.8 ±4.3	18.8 ±1.2	15.9 ±1.1	50.1 ±6.0	0.2± 0.0	84.7 ±4.2	73.1 ±4.7	18.5 ±1.3	15.0 ±0.9	39.4 ±4.2	0.2± 0.0	81.2 ±4.5	41.4 ±1.1	6.1± 0.3	0.5± 0.0	560.0±22.0
RGT	19/20	F1	89.3 ±6.6	19.2 ±0.6	17.6 ±1.1	58.1 ±7.0	0.2± 0.0	91.7 ±5.0	92.3 ±3.8	20.0 ±0.7	17.9 ±0.7	52.0 ±5.5	0.2± 0.0	89.5 ±3.6	38.7 ±2.4	11.4 ±0.7	0.4± 0.0	805.0±73.6
		F2	81.4 ±6.1	18.1 ±0.9	15.3 ±1.0	43.2 ±4.8	0.2± 0.0	84.5 ±2.4	84.0 ±6.5	18.2 ±0.9	16.6 ±1.1	46.8 ±8.4	0.2± 0.0	91.3 ±5.8	44.9 ±0.5	6.1± 0.4	0.4± 0.1	618.0±20.1

V	Y	S	SL	TSN	FS	FF	SD	SF	SL2	TSN2	FS2	GN	SD2	SF2	TKW	Yie	HI	S/m²
	20/21	F1	76.9 ±3.4	18.4 ±0.7	16.5 ±0.8	49.1 ±5.0	0.2± 0.0	89.7 ±3.1	72.5 ±3.6	18.1 ±1.0	16.5 ±1.1	48.4 ±4.4	0.2± 0.0	91.1 ±3.0	42.1 ±0.6	12.2 ±0.3	0.5± 0.0	767± 70.2
		F2	74.8 ±3.8	17.3 ±0.5	15.2 ±0.6	45.1 ±5.8	0.2± 0.0	87.8 ±1.9	69.1 ±4.6	17.1 ±0.9	14.3 ±0.9	37.1 ±4.9	0.2± 0.0	83.6 ±3.5	43.4 ±1.2	5.8± 0.3	0.5± 0.0	496. 0±16 .2
Tobak	19/20	F1	107± 5.1	20.8 ±0.4	18.3 ±0.7	51.7 ±4.9	0.2± 0.0	88.0 ±2.5	82.5 ±7.8	19.6 ±1.0	17.6 ±1.0	57.6 ±5.7	0.2± 0.0	89.8 ±2.2	37.0 ±1.8	10.5 ±0.4	0.3± 0.1	882. 0±53 .8
		F2	97.4 ±4.6	18.8 ±0.6	16.8 ±0.9	51.8 ±7.0	0.2± 0.0	89.5 ±5.9	84.0 ±5.5	18.8 ±0.4	16.3 ±0.5	53.7 ±6.9	0.2± 0.0	86.7 ±2.7	44.7 ±0.8	6.6± 0.3	0.4± 0.2	528. 0±21 .2
	20/21	F1	91.9 ±7.0	20.0 ±1.1	18.3 ±1.6	52.6 ±8.2	0.2± 0.0	91.4 ±4.3	88.3 ±5.0	19.7 ±0.5	17.5 ±0.7	48.2 ±4.0	0.2± 0.0	88.8 ±3.2	40.3 ±1.7	11.7 ±0.3	0.6± 0.0	790. 0±52 .7
		F2	87.3 ±8.7	18.4 ±0.7	15.9 ±1.2	42.7 ±8.2	0.2± 0.0	86.3 ±3.9	85.0 ±8.1	18.7 ±0.9	16.7 ±1.1	45.1 ±7.5	0.2± 0.0	89.3 ±2.5	40.8 ±0.4	6.1± 0.4	0.5± 0.0	489. 0±19 .7
Tonnage	19/20	F1	97.7 ±4.8	20.3 ±1.1	17.8 ±1.5	58.7 ±7.3	0.2± 0.0	87.6 ±4.4	76.9 ±3.4	18.4 ±0.7	16.4 ±0.8	49.0 ±5.0	0.2± 0.0	89.1 ±3.6	36.2 ±0.5	10.3 ±0.3	0.3± 0.0	925. 0±12 5.5
		F2	86.8 ±7.7	18.3 ±1.0	16.9 ±1.2	60.0 ±10. 2	0.2± 0.0	92.4 ±5.1	77.1 ±5.4	17.6 ±0.7	15.1 ±0.6	45.3 ±5.6	0.2± 0.0	85.9 ±5.0	43.9 ±1.4	6.4± 0.4	0.4± 0.1	545. 0±21 .8
	20/21	F1	83.0 ±7.6	19.5 ±1.0	17.8 ±1.1	57.7 ±5.7	0.2± 0.0	91.2 ±2.6	75.1 ±6.0	19.2 ±1.0	17.0 ±1.0	52.2 ±6.0	0.3± 0.0	88.6 ±3.1	40.8 ±1.8	12.0 ±0.1	0.5± 0.0	757. 0±10 2.8
		F2	82.6 ±6.1	18.6 ±0.5	16.6 ±0.8	53.2 ±7.0	0.2± 0.0	89.2 ±2.7	73.1 ±3.3	17.9 ±1.0	15.8 ±1.1	45.0 ±6.3	0.2± 0.0	88.2 ±3.2	36.9 ±0.7	6.3± 0.5	0.4± 0.0	404. 0±16 .2
Tybalt	19/20	F1	107. 0±2. 1	22.7 ±0.8	20.6 ±1.1	59.9 ±3.0	0.2± 0.0	90.7 ±2.6	93.1 ±12. 8	20.9 ±0.7	19.3 ±1.1	56.1 ±7.0	0.2± 0.0	92.3 ±4.1	40.7 ±0.8	9.77 ±0.8	0.3± 0.0	1187 .0±5 0.9
		F2	92.8 ±7.1	19.5 ±1.3	18.3 ±1.2	58.5 ±6.9	0.2± 0.0	93.9 ±3.2	82.8 ±3.6	19.1 ±0.7	16.9 ±0.7	46.5 ±4.2	0.2± 0.0	88.5 ±3.8	44.7 ±0.8	6.1± 0.2	0.5± 0.1	504. 0±10 .4
	20/21	F1	93.5 ±12. 7	20.9 ±0.7	19.2 ±1.0	56.0 ±7.0	0.2± 0.0	91.9 ±4.0	80.5 ±5.6	18.9 ±1.0	17.9 ±0.9	47.0 ±3.3	0.2± 0.0	94.8 ±2.3	43.2 ±1.2	11.6 ±0.6	0.5± 0.0	805± 34.6
		F2	83.0 ±3.0	19.3 ±0.5	17.3 ±0.7	47.3 ±4.2	0.2± 0.0	89.7 ±3.4	78.0 ±4.3	18.8 ±1.0	16.5 ±1.1	42.2 ±4.8	0.2± 0.0	87.7 ±2.7	41.1 ±0.3	6.2± 0.6	0.4± 0.0	462. 0±4. 0

Abbreaviations: V=Variety, Y=Year, S=Site, SL=Spike Length, TSN=Total Spikelets Number, FS=Fertile Spikelets, FF=Fertile Flowers, SD=Spike Density, SF=Spike Fertility, SL2=Spike Length 2, TSN2= Total Spikelet Number 2, FS2= Fertile Spikelets, GN= Grain Number, SD2= Spike Density 2, SF2=Spike Fertility 2, TKW=Thousand Kernel Weight, Yie=Yield, HI=Harvest Index, s/m²=spikes/m², the red marked values were not statistically significant p=>0.05