

1 **Supplementary data**

2 **Table S1.** Climatic information in an upland field during two-year experimental duration.

	Sowing time	Leaf length (cm)	ADT ----- (°C)	DTR ----- (°C)	ACT ----- (hr)	ALP (hr)	ADP ----- (mol m ⁻²)	ACP ----- (mol m ⁻²)	RH (%)	Rainfall (mm)
2019	Mar	10	8.0	15.0	165.1	8.9	88	1854	57.7	21.6
		15	8.8	14.4	242.2	8.3	84	2352	60.4	41.1
		18	9.2	15.1	329.1	8.8	89	3193	57.2	41.5
	Apr	10	11.9	14.1	286.4	9.4	103	2360	59.4	67.5
		15	13.1	13.4	380.0	8.7	97	2720	63.0	98.3
		18	13.9	13.4	486.0	8.8	98	3328	63.3	144.2
	May	10	17.5	11.3	244.4	7.4	97	1263	73.1	32.2
		15	18.4	12.1	404.9	8.1	103	2154	70.5	33.4
		18	19.0	12.1	474.6	8.2	103	2476	71.1	33.4
	Jun	10	23.0	10.7	298.5	7.0	98	1181	81.4	107.2
		15	23.0	10.3	391.2	6.7	94	1504	82.2	137.0
		18	23.2	10.1	463.0	6.6	92	1750	82.5	229.6
	Jul	10	22.6	6.6	317.0	3.6	66	860	89.6	280.0
		15	22.8	6.2	388.1	3.3	61	980	84.2	427.2
		18	22.7	6.0	476.5	3.2	58	1167	83.9	483.1
	Aug	10	27.0	8.8	432.6	7.1	86	1284	81.6	127.2
		15	25.4	8.4	609.1	6.2	75	1727	82.8	217.4
		18	23.9	8.7	810.9	5.9	71	2359	82.6	226.8
	Sep	10	18.4	11.9	294.4	7.6	80	1203	73.2	0.2
		15	16.1	12.8	578.5	7.7	73	2562	69.7	28.6
		18	14.7	13.2	677.6	7.6	70	3129	70.1	30.9
	Oct	10	9.7	15.6	214.0	7.8	58	1210	69.8	2.3
		15	8.8	13.9	328.3	7.0	52	2020	67.0	25.6
		18	5.0	13.4	328.3	7.0	49	3599	63.8	34.8

3 **Abbreviation** – ADT, average daily temperature; DTR, daily temperature range; ACT, accumulated temperature;

4 ALP, average light period; ADP, average daily photons; ACP, accumulated photons; RH, relative humidity.

5 **Table S1.** (Continued)

Sowing time		Leaf length	ADT	DTR	ACT	ALP	ADP	ACP	RH	Rainfall
		(cm)	----- (°C)	-----	(hr)	----- (mol m ⁻²)	-----	(%)	(mm)	
2020	Mar	10	8.0	14.7	158.4	8.8	88	1840	57.1	21.6
		15	8.7	14.3	245.1	8.4	84	2441	59.9	41.1
		18	9.0	14.8	297.6	8.6	87	2957	57.7	41.5
	May	10	17.5	11.3	244.4	7.4	97	1263	73.1	32.2
		15	18.4	12.1	404.9	8.1	103	2154	70.5	33.4
		18	19.0	12.1	474.6	8.2	103	2476	71.1	33.4
	Sep	10	20.0	9.0	340.5	5.5	61	968	82.9	172.3
		15	19.0	10.1	454.8	6.6	65	1505	78.7	172.3
		18	18.2	10.4	563.4	6.5	63	1890	79.3	182.1
	Oct	10	7.2	13.6	208.9	6.7	50	1596	68.3	48.2
		15	6.6	14.0	221.5	6.9	49	1924	67.7	48.2
		18	6.4	13.9	241.3	6.9	48	2132	67.5	48.2

6 **Abbreviation** – ADT, average daily temperature; DTR, daily temperature range; ACT, accumulated temperature;
7 ALP, average light period; ADP, average daily photons; ACP, accumulated photons; RH, relative humidity.

10 **Table S2.** Correlation matrix of FW, leaf length, GI, GP, and climatic factors.

	Leaf length	GI	GP	ADT	DTR	ACT	ALP	ADP	ACP	RH	Rainfall
FW	0.992**	0.002	0.563**	−0.004	−0.028	0.593**	−0.045	−0.092	0.625**	−0.021	0.196
Leaf length	1	0.030	0.529**	0.001	−0.036	0.581**	−0.056	−0.084	0.608**	−0.030	0.215
GI		1	−0.735**	0.802**	−0.718**	0.190	−0.473**	0.382*	−0.560**	0.685**	0.563**
GP			1	−0.617**	0.450**	0.131	0.195	−0.455**	0.763**	−0.453**	−0.278
ADT				1	−0.861**	0.584**	−0.524**	0.263	−0.496**	0.861**	0.605**
DTR					1	−0.465**	0.852**	0.125	0.582**	−0.916**	−0.849**
ACT						1	−0.245	0.019	0.242	0.462**	0.389*
ALP							1	−0.558**	0.595**	−0.816**	−0.834**
ADP								1	0.170	−0.197	−0.256
ACP									1	−0.660**	−0.406*
RH										1	0.695**

11 **Abbreviation** – FW, fresh weight; GI, growth index; GP, growth period; ADT, average daily temperature; DTR, daily temperature range; ACT,
12 accumulated temperature; ALP, average light period; ADP, average daily photons; ACP, accumulated photons; RH, relative humidity.
13 *, ** Correlation is significant at the 0.05 and 0.01 level, respectively.

Table S3. Loading values of the plant parameters of saponarin, FW, leaf length, GI, GP, and climatic factors.

Parameter	PC 1	PC 2
Saponarin	0.553	−0.697
FW	−0.048	0.962
Leaf length	−0.061	0.951
GI	−0.809	−0.165
GP	0.545	0.690
ADT	−0.894	−0.052
DTR	0.973	−0.021
ACT	−0.461	0.647
ALP	0.824	−0.061
ADP	0.072	−0.205
ACP	0.633	0.690
RH	−0.942	−0.041
Rainfall	−0.838	0.188

Abbreviation – FW, fresh weight; GI, growth index; GP, growth period; ADT, average daily temperature; DTR, daily temperature range; ACT, accumulated temperature; ALP, average light period; ADP, average daily photons; ACP, accumulated photons; RH, relative humidity.