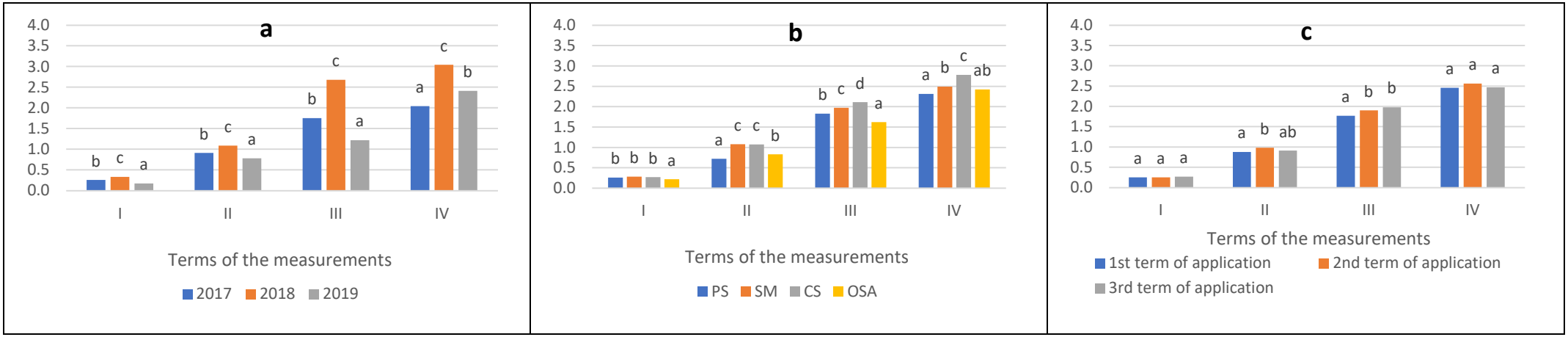

Figure S1. Changes of LAI in years of the experiment (a); depending on silicon form in 2017-2019 (b); depending on term of foliar application in 2017-2019 (c). The same letters indicate lack of significant differences at P=0.05.

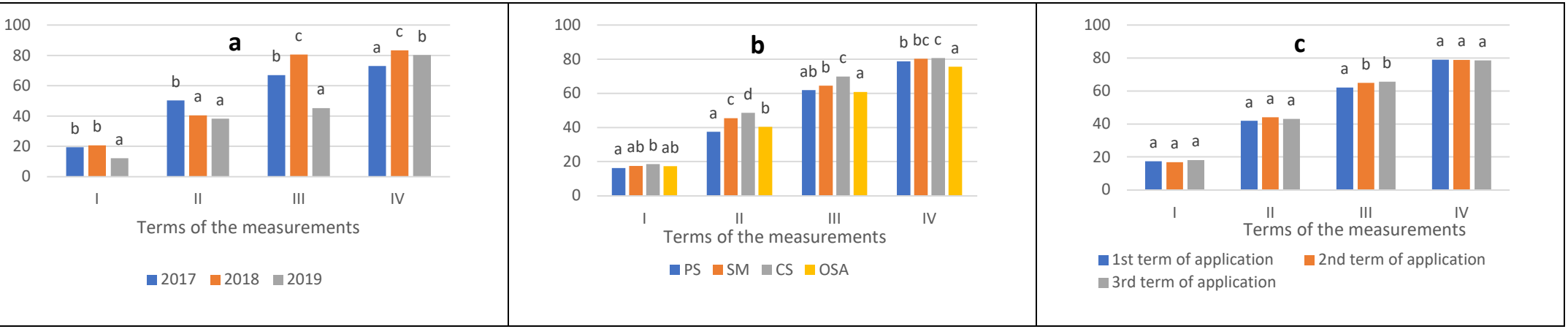

Figure S2. Changes of PAR absorption in years of the experiment (a); depending on silicon form in 2017-2019 (b); depending on term of foliar application in 2017-2019 (c), %. The same letters indicate lack of significant differences at P=0.05.

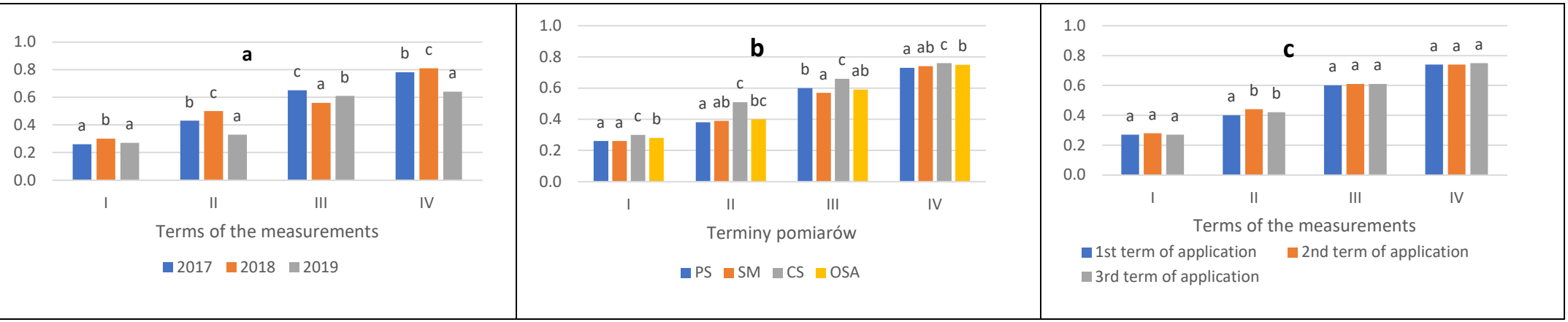

Figure S3. Changes of NDVI value in years of the experiment (a); depending on silicon form in 2017-2019 (b); depending on term of foliar application in 2017-2019 (c). The same letters indicate lack of significant differences at P=0.05.

Table S1. Fertilization treatments in the experiment (2016/2017–2018/2019).

Fertilizer	Rate, kg, dm^3 ha^{-1}	Date
2016/2017		
Polifoska Tytan (N – 60 g kg^{-1}, P – 109 g kg^{-1}, K – 109 g kg^{-1}, S – 20 g kg^{-1}, Fe – 5 g kg^{-1}, Zn – 0.5 g kg^{-1} + Ti)	420	17.10.2016
Sól potasowa (K – 498 g kg^{-1})	300	
Saletrzak 27 Standard with boron (N –270 g kg^{-1}, Ca – 14.3 g kg^{-1}, Mg – 24.1 g kg^{-1}, B – 2 g kg^{-1})	500	29.03.2017
CukroVit Borowy (B – 108 g kg^{-1})	2	29.05.2017
CukroVit Borowy (B – 108 g kg^{-1})	2	12.06.2017
In total (kg ha^{-1}): N – 160; P – 45.8; K – 195; S – 8.4; Ca – 7.2; Mg – 12.1; B –1.4; Fe – 2.1; Zn – 0.2 + Ti		
2017/2018		
Polifoska 6 (N – 60 g kg^{-1}, P – 87.2 g kg^{-1}, K – 249 g kg^{-1}, S – 28 g kg^{-1})	400	16.10.2017
Potassium chloride (K – 498 g kg^{-1})	300	
Salmag with boron (N – 275 g kg^{-1}, Ca – 25 g kg^{-1}, Mg – 24.1 g kg^{-1}, B – 2 g kg^{-1})	550	09.04.2018
Adob Bor (N – 78 g dm^{-3}, B – 150 g dm^{-3})	2	28.05.2018
Adob Bor (N – 78 g dm^{-3}, B – 150 g dm^{-3})	2	11.06.2017
Łącznie (kg ha^{-1}): N – 176; P – 34.9; K – 249; S – 11.2; Ca – 13.8; Mg – 13.3; B – 1.7		
2018/2019		
Polifoska 6 (N – 60 g kg^{-1}, P – 87.2 g kg^{-1}, K – 249 g kg^{-1}, S – 28 g kg^{-1})	400	15.10.2018
Potassium chloride (K – 498 g kg^{-1})	300	
Saletrzak 27 Standard with boron (N –270 g kg^{-1}, Ca – 14.3 g kg^{-1}, Mg – 24.1 g kg^{-1}, B – 2 g kg^{-1})	500	09.03.2019
Boron Forte (N – 30 g kg^{-1}, K – 141 g kg^{-1}, B – 210 g kg^{-1})	1.5	27.05.2019
Boron Forte (N – 30 g kg^{-1}, K – 141 g kg^{-1}, B – 210 g kg^{-1})	1.5	10.06.2019
In total (kg ha^{-1}): N – 159; P – 34.9; K – 249; S – 11.2; Ca – 7.2; Mg – 12.1; B – 1.63		

Table S2. Number of sugar beet plants at harvest depending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), thousand plants ha^{-1}.

Silicon form[1]	Term of application[1]						Mean	
	B1		B2		B3			
			2017					
A1	92.71	abc[2]	98.70	c	99.65	c	97.02	B
A2	84.10	ab	82.83	ab	88.54	abc	85.16	A
A3	98.96	c	83.06	ab	94.10	bc	92.04	AB
A4	93.06	abc	81.54	a	92.19	abc	88.93	A
Mean	92.21	AB	86.53	A	93.62	B	*90.79*	*B*
			2018					
A1	90.25	bcd	89.58	bcd	89.79	bcd	89.88	B
A2	81.60	ab	93.06	d	91.67	cd	88.77	B
A3	77.01	a	94.44	d	75.45	a	82.30	A
A4	75.97	a	81.94	ab	82.36	abc	80.09	A
Mean	81.21	A	89.76	B	84.82	A	*85.26*	*A*
			2019					
A1	81.84	ab	90.97	bc	79.32	a	84.05	a
A2	95.14	c	91.67	bc	88.89	abc	91.90	b
A3	94.44	c	86.11	abc	94.44	c	91.67	b
A4	87.15	abc	84.03	abc	91.32	bc	87.50	ab
Mean	89.64	A	88.19	A	88.49	A	*88.78*	*B*
			2017–2019					
A1	88.27	abc	93.09	c	89.59	abc	90.31	B
A2	86.95	abc	89.18	abc	89.70	abc	88.61	AB
A3	90.14	bc	87.87	abc	88.00	abc	88.67	AB
A4	85.39	ab	82.51	a	88.62	abc	85.51	A
Mean	87.69	A	88.16	A	88.98	A	-	
P-values based on ANOVA	Y		A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05		0.074	0.716	<0.005	<0.05	0.336	<0.05

[1] – see Table 4; [2] the same lowercase letters mean no significant differences between the combinations of silicon forms and foliar application dates, while the same uppercase letters mean no significant differences between the means for the silicon form (this applies to the last column) or between the means for the application dates (row comparisons) or between averages for years (capital letters written in italics). All mean comparisons are at P = 0.05.

Table S3. Root yield of sugar beet plants at harvest depending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), t ha^{-1}.

Silicon form[1]	Term of application[1]						Mean	
	B1		B2		B3			
				2017				
A1	100.31	abcd[2]	102.59	abcd	103.37	abcd	102.09	AB
A2	97.28	ab	97.34	ab	107.77	cd	100.79	A
A3	108.02	cd	95.10	a	99.05	abc	100.72	A
A4	105.64	bcd	106.16	bcd	108.35	d	106.72	B
Mean	102.81	A	100.30	A	104.64	A	*102.58*	*C*
				2018				
A1	64.96	ab	64.58	ab	64.32	ab	64.62	A
A2	60.61	a	67.12	ab	66.70	ab	64.81	A
A3	60.40	a	69.46	b	61.27	a	63.71	A
A4	60.55	a	65.16	ab	63.57	ab	63.10	A
Mean	61.63	A	66.58	B	63.96	AB	*64.06*	*A*
				2019				
A1	89.96	b	77.02	a	72.71	a	79.90	B
A2	77.10	a	68.23	a	75.69	a	73.67	AB
A3	79.64	ab	78.68	ab	70.99	a	76.44	AB
A4	77.45	ab	68.96	a	70.12	a	72.18	A
Mean	81.04	B	73.22	A	72.38	A	*75.55*	*B*
				2017–2019				
A1	85.07	a	81.40	a	80.13	a	82.20	A
A2	78.33	a	77.56	a	83.39	a	79.76	A
A3	82.69	a	81.08	a	77.10	a	80.29	A
A4	81.21	a	80.10	a	80.68	a	80.66	A
Mean	81.83	A	80.03	A	80.33	A	-	
P-value based on ANOVA	Y		A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05		0.485	0.402	0.060	<0.05	0.110	0.403

[1]; [2] see Table 4.

Table S4. Yield of leaves of sugar beet plants at harvest depending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), t ha^{-1}.

Silicon form[1]	Term of application[1]						Mean	
	B1		B2		B3			
				2017				
A1	59.95	bc[2]	59.81	bc	58.77	bc	59.51	A
A2	49.74	a	59.08	bc	59.05	bc	55.95	A
A3	65.25	c	49.84	a	54.24	ab	56.44	A
A4	62.12	bc	55.31	ab	60.52	bc	59.32	A
Mean	59.26	A	56.01	A	58.14	A	*57.81*	*B*
				2018				
A1	35.54	ab	34.98	ab	36.35	ab	35.62	A
A2	37.14	ab	35.33	ab	32.50	a	34.99	A
A3	34.44	ab	45.52	c	39.08	b	39.68	B
A4	32.23	a	46.44	c	40.34	bc	39.67	B
Mean	34.83	A	40.57	B	37.07	A	*37.49*	*A*
				2019				
A1	33.77	a	34.69	a	34.37	a	34.28	A
A2	42.47	bcd	35.36	ab	35.90	ab	37.91	AB
A3	46.07	d	45.05	cd	34.13	a	41.75	B
A4	36.63	ab	38.24	abc	34.57	a	36.48	A
Mean	39.73	B	38.34	AB	34.74	A	*37.60*	*A*
				2017–2019				
A1	43.08	a	43.16	a	43.16	a	43.14	A
A2	43.11	a	43.26	a	42.48	a	42.95	A
A3	48.58	a	46.81	a	42.48	a	45.96	B
A4	43.66	a	46.66	a	45.14	a	45.16	AB
Mean	44.61	A	44.97	A	43.32	A	-	
P-values based on ANOVA	Y		A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05		<0.05	0.270	<0.05	<0.05	0.241	<0.05

[1]; [2] see Table 4.

Table S5. Content of sugar in sugar beet roots depending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), %.

Silicon form[1]	Term of application[1]						Mean	
	B1		B2		B3			
				2017				
A1	17.72	cd[2]	17.52	bc	17.38	ab	17.54	AB
A2	17.18	a	17.64	bcd	17.69	cd	17.50	A
A3	17.42	ab	17.81	d	17.51	bc	17.58	AB
A4	17.49	bc	17.72	cd	17.84	d	17.68	B
Mean	17.45	A	17.67	B	17.60	B	*17.58*	*B*
				2018				
A1	16.28	cdef	16.05	abc	16.14	bcd	16.16	B
A2	15.78	ab	16.18	bcde	15.70	a	15.88	A
A3	16.59	efg	16.83	g	16.50	defg	16.64	C
A4	16.61	fg	16.75	g	16.79	g	16.71	C
Mean	16.31	A	16.45	A	16.28	A	*16.35*	*A*
				2019				
A1	18.30	a	18.71	abc	18.66	abc	18.55	A
A2	18.75	abc	18.66	abc	18.61	abc	18.67	A
A3	18.45	ab	18.91	bcd	18.52	ab	18.63	A
A4	19.06	cd	18.82	bcd	19.25	d	19.04	B
Mean	18.64	A	18.77	A	18.76	A	*18.72*	*C*
				2017–2019				
A1	17.43	a	17.43	a	17.39	a	17.42	A
A2	17.24	a	17.49	a	17.33	a	17.35	A
A3	17.49	a	17.85	a	17.51	a	17.61	B
A4	17.72	a	17.76	a	17.96	a	17.81	C
Mean	17.47	A	17.63	B	17.55	AB	-	
P-values based on ANOVA	Y		A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05		<0.05	<0.05	<0.05	0.650	<0.05	0.059

[1]; [2] see Table 4.

Table S6. The content of α-amino nitrogen in sugar beet roots depending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), mmol kg^{-1}.

Silicon form[1]	Term of application[1]									
	B1		B2		B3		Mean			
				2017						
A1	36.30	ef[2]	27.55	bc	23.60	ab	29.15	B		
A2	37.10	f	28.45	c	34.35	ef	33.30	C		
A3	24.05	ab	29.85	cd	32.75	de	28.88	B		
A4	22.10	a	29.00	cd	23.85	ab	24.98	A		
Mean	29.89	A	28.71	A	28.64	A	*29.08*	*B*		
				2018						
A1	27.55	a	27.85	ab	26.90	a	27.43	A		
A2	30.95	cd	31.90	cd	27.85	ab	30.23	B		
A3	33.85	d	27.50	a	30.65	bc	30.67	B		
A4	27.20	a	30.55	bc	31.45	cd	29.73	B		
Mean	29.89	A	29.45	A	29.21	A	*29.52*	*B*		
				2019						
A1	17.05	bcdef	15.50	abc	13.50	a	15.35	A		
A2	17.55	cdef	19.10	f	16.65	bcd	17.77	B		
A3	16.80	bcde	15.20	ab	17.75	def	16.58	B		
A4	18.80	ef	21.50	g	22.20	g	20.83	C		
Mean	17.55	A	17.83	A	17.53	A	*17.63*	*A*		
				2017–2019						
A1	26.97	bc	23.63	abc	21.33	a	23.98	A		
A2	28.53	c	26.48	abc	26.28	abc	27.10	C		
A3	24.90	abc	24.18	abc	27.05	bc	25.38	B		
A4	22.70	ab	27.02	bc	25.83	abc	25.18	B		
Mean	25.78	A	25.33	A	25.13	A	-			
P-values based on ANOVA	Y		A	B	Y x A	Y x B	A x B	Y x A x B		
	<0.05		<0.05	0.346	<0.05	0.740	<0.05	<0.05		

[1]; [2] see Table 4.

Table S7. Potassium content in sugar beet roots depending on the form of silicon (A) and the date of foliar application (B) (2017–2019), mmol kg^{-1}.

Silicon form[1]	Term of application[1]			Mean
	B1	B2	B3	
		2017		
A1	30.80 abc[2]	31.55 abc	28.75 a	30.37 A
A2	39.35 f	34.95 de	38.75 f	37.68 C
A3	33.15 cd	37.30 ef	32.20 bcd	34.22 B
A4	28.85 ab	29.40 ab	28.70 a	28.98 A
Mean	33.04 A	33.30 A	32.10 A	*32.81 B*
		2018		
A1	36.65 a	35.50 a	34.55 a	35.57 A
A2	41.55 cd	40.80 cd	43.20 d	41.85 C
A3	39.85 c	36.85 ab	34.60 a	37.10 B
A4	36.60 a	35.35 a	39.20 bc	37.05 B
Mean	38.66 B	37.13 A	37.89 AB	*37.89 C*
		2019		
A1	29.40 bc	26.80 a	29.55 bcd	28.58 A
A2	30.95 e	30.95 e	28.40 b	30.10 B
A3	33.70 fg	33.00 f	32.65 f	33.12 D
A4	30.45 cde	34.85 g	30.90 de	32.07 C
Mean	31.13 B	31.40 B	30.38 A	*30.97 A*
		2017–2019		
A1	32.28 ab	31.28 a	30.95 a	31.51 A
A2	37.28 d	35.57 bcd	36.78 d	36.54 D
A3	35.57 bcd	35.72 cd	33.15 abc	34.81 C
A4	31.97 a	33.20 abc	32.93 abc	32.70 B
Mean	34.28 B	33.94 AB	33.45 A	-

P-values based on ANOVA	Y	A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05	<0.05	0.077	<0.05	0.108	<0.05	<0.05

[1]; [2] see Table 5.

Table S8. Sodium content in sugar beet roots depending on the form of silicon (A) and the date of foliar application (B) (in 2017–2019), mmol kg^{-1}.

Silicon form[1]	Term of application[1]						Mean	
	I		II		III			
				2017				
A1	3.55	b[2]	3.75	b	3.75	b	3.68	B
A2	5.60	c	5.95	c	5.25	c	5.60	C
A3	3.80	b	3.30	b	5.50	c	4.20	D
A4	2.30	a	1.95	a	3.25	b	2.50	A
Mean	3.81	A	3.74	A	4.44	B	*4.00*	*C*
				2018				
A1	4.50	f	4.30	ef	3.95	def	4.25	B
A2	4.25	ef	3.90	def	3.65	cde	3.93	B
A3	3.10	abc	2.50	a	3.45	bcd	3.02	A
A4	2.80	ab	3.95	def	2.60	a	3.12	A
Mean	3.66	A	3.66	A	3.41	A	*3.58*	*B*
				2019				
A1	2.15	de	1.60	ab	2.10	de	1.95	B
A2	1.80	abcd	1.55	a	1.65	abc	1.67	A
A3	3.30	g	2.00	cde	2.15	de	2.48	C
A4	2.35	e	2.80	f	1.95	bcd	2.37	C
Mean	2.40	B	1.99	A	1.96	A	*2.12*	*A*
				2017–2019				
A1	3.40	abcd	3.22	abcd	3.27	abcd	3.29	B
A2	3.88	d	3.80	cd	3.52	bcd	3.73	C
A3	3.40	abcd	2.60	ab	3.70	cd	3.23	B
A4	2.48	a	2.90	abc	2.60	ab	2.66	A
Mean	3.29	A	3.13	A	3.27	A	-	

P-value based on ANOVA	Y	A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05	<0.05	0.159	<0.05	<0.05	<0.05	<0.05

[1]; [2] see Table 4.

Table S9. Biological yield of sugardepending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), t ha^{-1}.

Form of silicon[1]	Term of application[1] B1		B2		B3		Mean	
				2017				
A1	17.78	abcd[2]	17.98	abcd	17.96	abcd	17.91	A
A2	16.72	a	17.17	abc	19.06	d	17.65	A
A3	18.81	cd	16.93	ab	17.34	abc	17.70	A
A4	18.47	bcd	18.81	cd	19.33	d	18.87	B
Mean	17.94	A	17.72	A	18.42	A	*18.03*	*C*
				2018				
A1	10.57	a	10.37	ab	10.39	a	10.45	A
A2	9.57	cd	10.86	cd	10.47	ab	10.30	A
A3	10.02	d	11.69	a	10.11	bc	10.61	A
A4	10.06	a	10.92	bc	10.67	cd	10.55	A
Mean	10.05	A	10.96	B	10.41	AB	*10.47*	*A*
				2019				
A1	16.47	c	15.56	bc	13.54	ab	15.19	B
A2	14.45	abc	12.75	a	14.09	ab	13.76	A
A3	14.68	abc	14.89	abc	13.14	a	14.24	AB
A4	14.76	abc	12.97	a	13.50	ab	13.74	A
Mean	15.09	B	14.04	A	13.57	A	*14.23*	*B*
				2017–2019				
A1	14.94	a	14.64	a	13.96	a	14.51	B
A2	13.58	a	13.59	a	14.54	a	13.90	A
A3	14.50	a	14.51	a	13.53	a	14.18	AB
A4	14.43	a	14.23	a	14.50	a	14.39	AB
Mean	14.36	A	14.24	A	14.13	A	-	
P-values based on ANOVA	Y		A	B	Y x A	Y x B	A x B	Y x A x B
	<0.05		0.190	0.670	<0.05	<0.05	0.058	0.314

[1]; [2] see Table 4.

Table S10. Pure sugar yield depending on the form of silicon (A) and the term of foliar application (B) (in 2017–2019), t ha^{-1}.

Silicon form[1]	Term of application[1]						Mean	
	B1		B2		B3			
				2017				
A1	15.41	abcde[2]	15.75	abcdef	15.86	bcdef	15.67	A
A2	14.28	a	14.97	abc	16.44	cdef	15.23	A
A3	16.54	ef	14.76	ab	15.05	abcd	15.45	A
A4	16.37	cdef	16.52	def	17.12	f	16.67	B
Mean	15.65	A	15.50	A	16.12	A	*15.76*	*C*
				2018				
A1	9.12	abc	8.94	ab	8.98	ab	9.01	A
A2	8.13	a	9.26	bc	8.92	ab	8.77	A
A3	8.57	ab	10.16	c	8.72	ab	9.15	A
A4	8.72	ab	9.43	bc	9.19	abc	9.11	A
Mean	8.63	A	9.44	B	8.95	AB	*9.01*	*A*
				2019				
A1	14.79	c	14.07	bc	12.24	ab	13.70	B
A2	12.99	abc	11.43	a	12.69	ab	12.37	A
A3	13.15	abc	13.42	abc	11.78	a	12.78	AB
A4	13.27	abc	11.56	a	12.09	ab	12.31	A
Mean	13.55	B	12.62	A	12.20	A	*12.79*	*B*
				2017–2019				
A1	13.11	a	12.92	a	12.36	a	12.79	B
A2	11.80	a	11.89	a	12.69	a	12.12	A
A3	12.75	a	12.78	a	11.85	a	12.46	AB
A4	12.79	a	12.50	a	12.80	a	12.70	B
Mean	12.61	A	12.52	A	12.42	A	-	
P-value based on ANOVA		Y	A	B	Y x A	Y x B	A x B	Y x A x B
		<0.05	0.061	0.715	<0.05	<0.05	0.058	0.196

[1]; [2] see Table 4.