

Table S1. Literature on the state of the art of Silicon capacity to alleviate abiotic stress in tomato.

Stress type	Plant part	Si treatment concentration	Treatment time	Anti-ROS enzymes analysis	Anti-ROS Non-enzymes analysis	Genes analysed	Reference
Salt stress 100 mM NaCl	leaf	2.5 mM soil	27 days	SOD, APx, CAT, G-POD	Chl content, MDA, H ₂ O ₂ content		[104]
Drought polyethylene glycol (PEG, 6000)	Leaf roots	1.5 mM hydroponics	21 days		Sulfate and ammonium Metabolomics	RTqPCR: SJUB1, SIASS, SIASL, SIMS, SIGAD1, SIGAD3, SIP5CR, SIP5CS, SIGR, SIACTIN, SIEF1 α , SICAC, SISAND	[48]
Drought 1.0% PEG	roots	0.6 mM Si pretreatment 1.2 mM Si hydroponics	3, 5, 12 days	SOD, POD, CAT	TEM, O ₂ ⁻ productivity rate, H ₂ O ₂ content, MDA, content of soluble sugar, soluble protein, proline		[105]
Drought 1.0% PEG	leaf	0.6 mM Si pretreatment 1.2 mM Si hydroponics	3,5,8,12 days	proteomic analysis	Gas exchange, SEM, O ₂ ⁻ productivity rate, H ₂ O ₂ content, MDA		[106]
<i>Ralstonia solanacearum</i>	leaf roots	1.4 mM Si(OH) ₄	72 h post inoculation			phosphoglycerate kinase genes (PGK), α -tubulin (TUB) and actin (ACT)	[107]
<i>Ralstonia solanacearum</i>	leaf	1.4 mM Si(OH) ₄	72 h post inoculation			microarray e qRT-PCR: WRKY-IId5, JERF3, TSRF1, ACCO, PR1, FD-I, GLU, CHI-II, POD, PAL, AGP- PGIP, PGK	[108]
Sodic soils NaCl B	shoot root	2.5 mM and 5.0 mM Si soil	4 months	LOX, SOD, CAT, APX	stomatal resistance (SR), MDA, membrane permeability (MP), proline, H ₂ O ₂ content, non-enzymatic total antioxidant activity		[109]
<i>Pythium aphanidermatum</i>	roots	1.4 mM silicic acid	2 days		double-sandwich ELISA		[110]
<i>Fusarium oxysporum</i>	roots crowns stems	100 mg Si/l. in sand	4 weeks after inoculation		Dry weight, Si content, disease assessment		[111]
High pH stress	leaf roots	1 mM Si 100 μ M SA Soil Si, SA, Si+SA	5 weeks	APX, CAT, POD, PPO (polyphenoloxidase)	Chla, Chlb, leaf relative water content (LRWC), lipid peroxidation, •O ₂ ⁻ productivity rate; Si quantification, SA quantification, ABA quantification	RTqPCR: LS1, LHA1, LHA2, ICS, SAMT1, SABP2, SAMT, SABP2, ICS, PAL1, PAL2, CAT, POD, APX, SOD	[112]
Heat stress (43 ± 0.5 °C).	roots shoots leaf	50 mL of 1mM Si as Na ₂ SiO ₃	10 days	total proteins, POD, CAT, PPO, APX	Photosynthetic pigments, relative water content (LRWC), Silicon analysis,	qRT-PCR: CAT, APX POD GR Cu/ZnSOD GST NCED1 ICS PAL PR1b1 PR-P2 HsfA1a HsfA2, SHsfA3, HsfA7,	[113]

					lipid peroxidation, SA quantification, ABA quantification	HsfA1b, DREB2, MAPK1
Salt stress 150 mM NaCl	root shoot leaf	2 mM Si sand	15 days	SOD, CAT	Dry weights of plant tissues, leaf area, pigment concentration, photosynthetic parameters (photosynthetic rate, transpiration rate, stomatal conductance, intercellular CO ₂ concentration); leaf relative water content (RWC), root morphology traits, root hydraulic conductance, root osmotic potential, membrane electrolyte leakage, MDA, H ₂ O ₂ contents, contents of non-protein thiols and ascorbic acid	[114]
Salt stress 25 mM 50 mM	roots	2.5 mM Si hydroponics	5 days	proteomic analysis SOD	silicon content, lipid peroxidation, histochemical localizations of H ₂ O ₂ in roots	RTqPCR: salt stress responses (leDREB-1, leDREB-2, leDREB-3), antioxidants (leAPX, leSOD, leCAT) and Si transport (leLsi-1, leLsi-2 leLsi-3)
Salt stress 25 mM 50 mM	chloroplast	2.5 mM Si (Na ₂ SiO ₃) hydroponics	14 days	proteomic analysis	Lipid peroxidation, H ₂ O ₂ localization, visualization of O ₂ ⁻ , total chlorophyll and carotenoid contents, photosynthetic rate, stomatal conductance and transpiration levels	[116]
Salinity stress 80 mM NaCl	roots leaf	2.5 mM Si hydroponics	30 days		ion analysis Na ⁺ and K ⁺ Cl ⁻ , Si, water uptake, leaf water potential, stomatal conductance to water vapour (gs), net CO ₂ assimilation (ACO ₂), transpiration (E) rates, plant water content, water use efficiency	[117]
Drought 10% (w/v) PEG-6000	root leaves	2.5 mM Si hydroponics	7 days	SOD, CAT	Photosynthetic gas exchange, relative water content, root hydraulic conductance, root osmotic potential, proline, relative electrolyte leakage of roots, MDA, ROS levels, GSH, AsA	qPCR: SIPIP1;3 SIPIP1;5 SIPIP2;6
Cadmium pollution	roots leaves	2 mM Na ₂ SiO ₃ ·9H ₂ O pretreatment	2 weeks	CAT, SOD, APX, GR	Cd and Si concentration, organic acid contents,	[119]

100 µM CdCl ₂	pretreatment and with Cd	15 days treatment	root cell wall isolation and analysis (FTIR), PTS apoplastic transport of Cd, lipid peroxidation, H ₂ O ₂ content, membrane stability index (MSI), GSH, AsA
Low P P 0.44 mM	root leaf	1.5 Mm Si	3 weeks SOD, POD, CAT Biomass, root morphology, Chl, Gas exchange parameters, water use efficiency (WUE), lipid peroxidation, H ₂ O ₂ content, superoxide (O ₂) osmotic potential, soluble sugar, soluble protein proline, free amino acid and organic acid contents, Si content, concentrations of K, Na, Ca, Mg, Fe, Mn, Zn, and Cu Transcriptomics of phospholipids

Table S2. Morphological analysis of the aerial part, roots and fruits of tomato plants cvs Aragon and Gladis.

	AERIAL PART				ROOTS				FRUITS				
	length (cm)		weight (g)		length (cm)		weight (g)		number		weight (g)		
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	
ARAGON	NT	108,0	14,1	229,0	43,8	47,5	0,7	50,5	9,2	18,0	11,3	260,0	175,4
	Low	110,0	7,1	208,0	19,8	51,0	0,0	42,0	4,2	14,5	0,7	275,5	43,1
	High	100,5	19,1	179,5	41,7	45,5	7,8	35,5	2,1	13,5	2,1	309,5	13,4
GLADIS	NT	108,5	2,1	255,5	81,3	44,0	2,8	51,0	36,8	18,0	5,6	271,0	100,4
	Low	112,0	2,8	210,5	0,7	49,0	2,8	57,0	9,9	17,5	4,9	268,5	65,8
	High	107,5	10,6	239,0	15,6	46,5	0,7	53,5	0,7	15,5	6,4	94,0	94,8

Table S3. List of the primer used for gene expression analysis by qRT-PCR.

ID	TARGET GENES	FW	RV	ENCODING PROTEIN	Reference
	COX1	TATCTAGGCATGGTTAT GCC	CTGCTAACGGCATTCCAT CC	cytochrome c oxidase subunit 1	[120]
	GAPDH	ACCACAAATTGCCTTGCT CCCTTG	ATCAACCGTCTTGAGT GGCTGT	Glyceraldehyde de-3-phosphate dehydrogenase	[121]
	CAO	AACCACGAAGAACGCTG AAT	TTGCTCAAAGCAATCAAT CG	Chlorophyllid e a oxygenase, chloroplastic	[122]
	SIHXK3	TAATGATGGTTCAGGCCT TG	CAGGCACTTTGGTTGTG TC	Hexokinases 3	[123]
	CNGC2	TCGCAAGTATGCTGCAA TGTT	GTGAAAAATATGCCAA ACGAGG	Cyclic nucleotide-gated ion channel 2	[124]
Solyc06g036	GGCAGGGAACCTTCAC 100	TAGCCAAAGTGTGAGC TCT	Putative LSI2-like silicon	[125]	
		CCG			

			efflux transporter
ACTIN	ACCCTCCAATCCAGACA	TGACAGGATGAGCAAGG	
CTG	AAA	Actin	

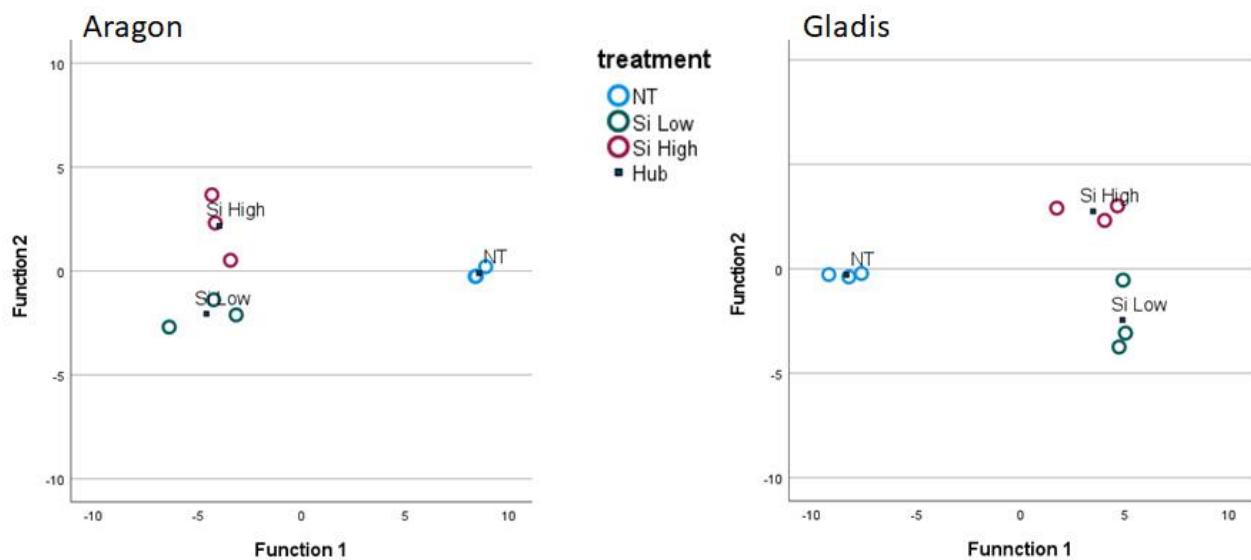


Figure S1. Discriminant Canonical Function analysis of Morphological Analyses. Blue=Control, Green= Low Si, Red= High Si. Blue square= hub of the group.

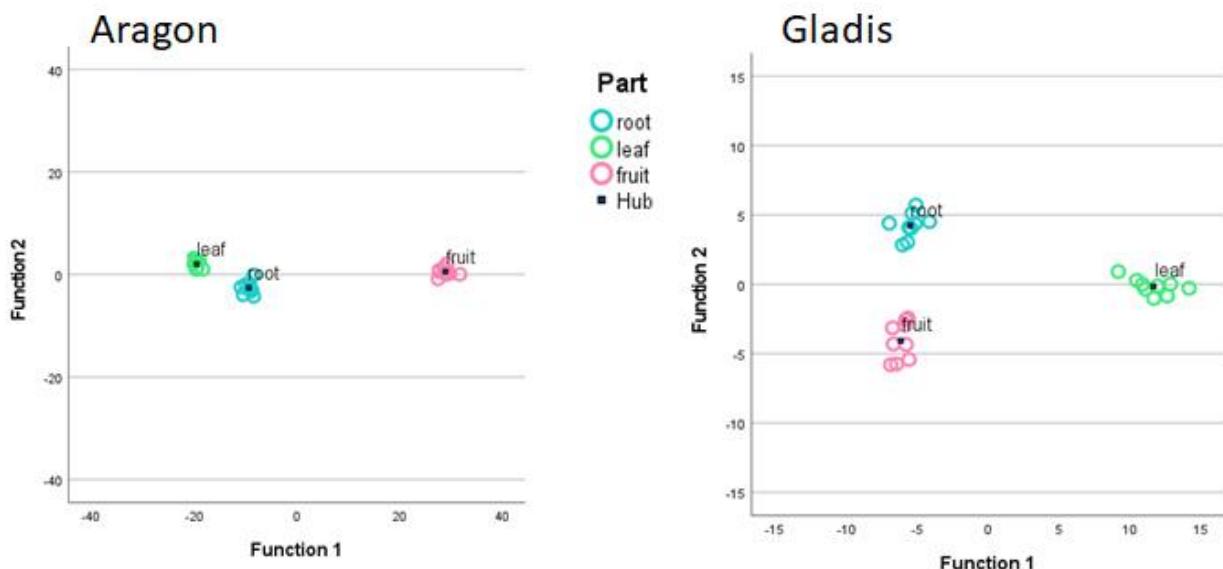


Figure S2. Discriminant Canonical Function Analysis of Elements per parts. Blue=leaf, Green= root, Red= fruit. Blue square= hub of the group.

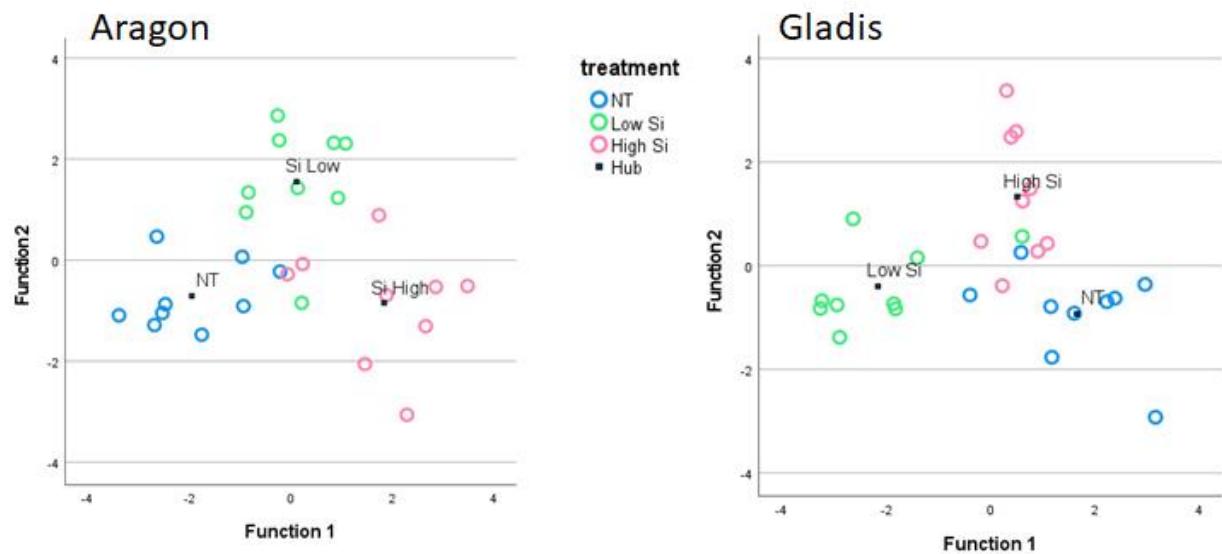
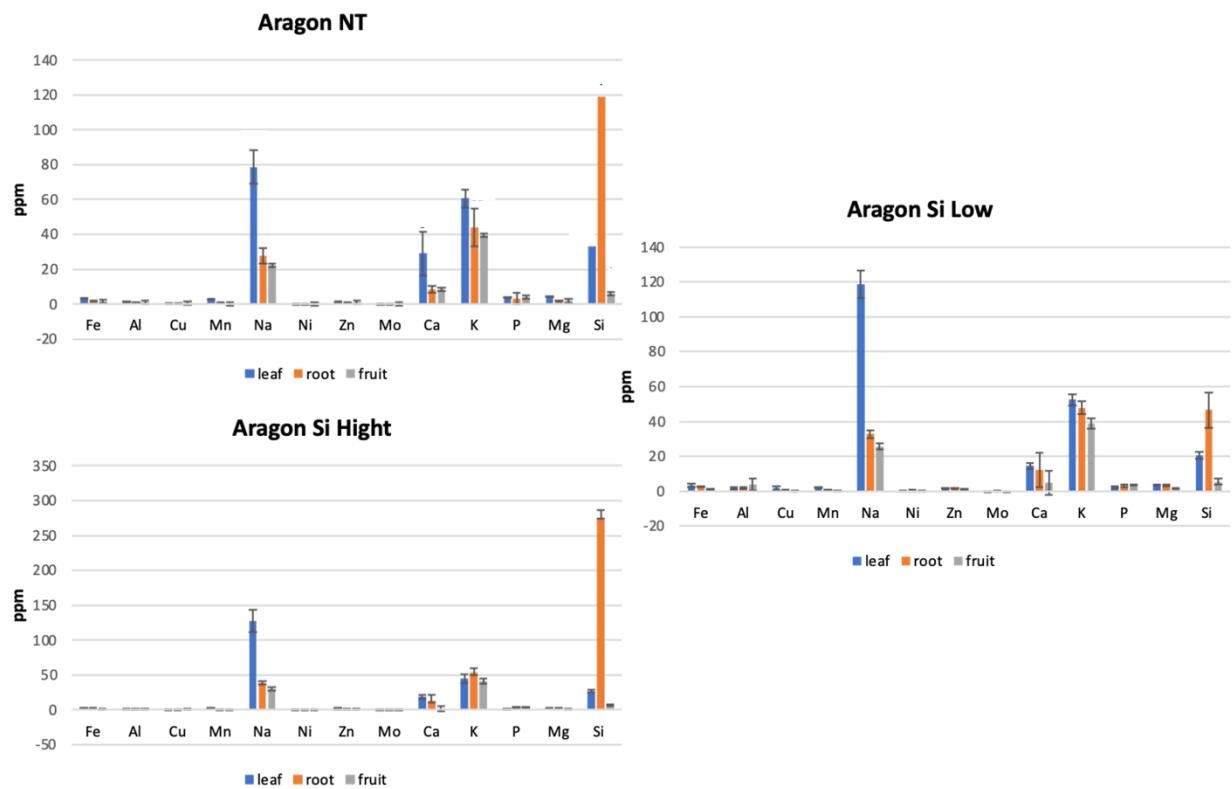


Figure S3. Discriminant Canonical Function analysis of Elements per treatments. Blue=Control, Green= Low Si, Red= High Si. Blue square= hub of the group.



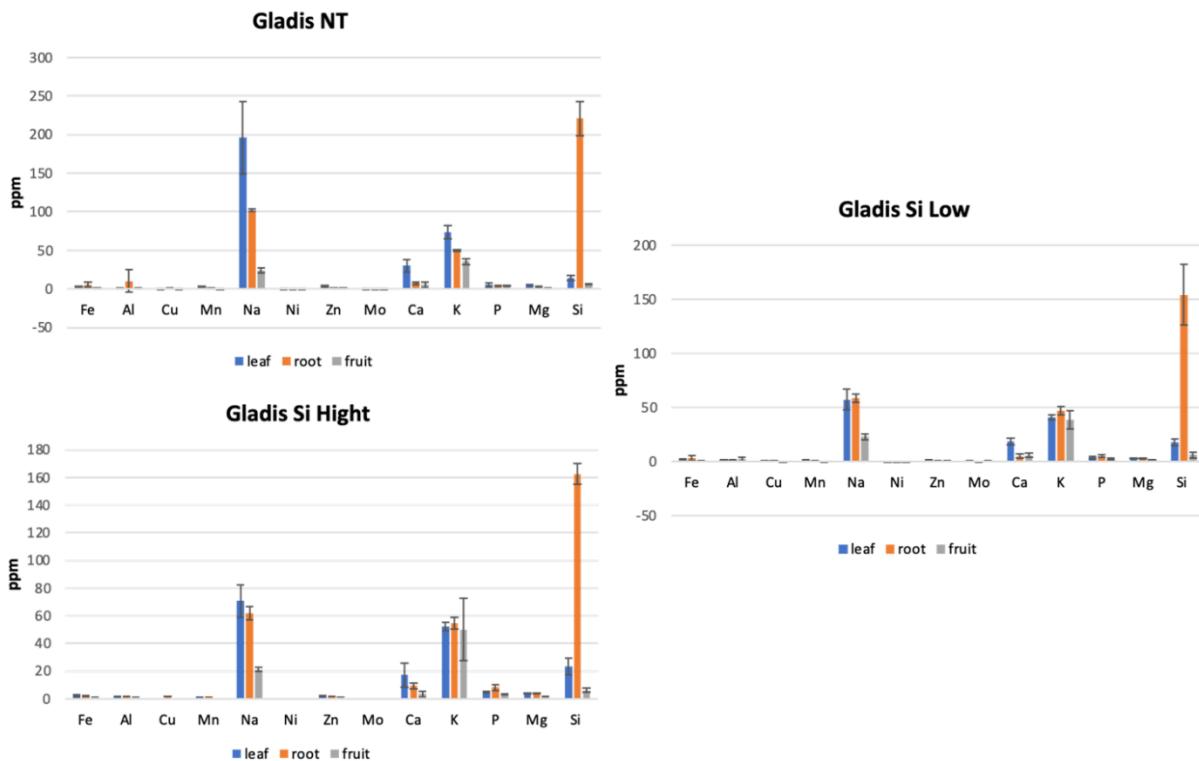
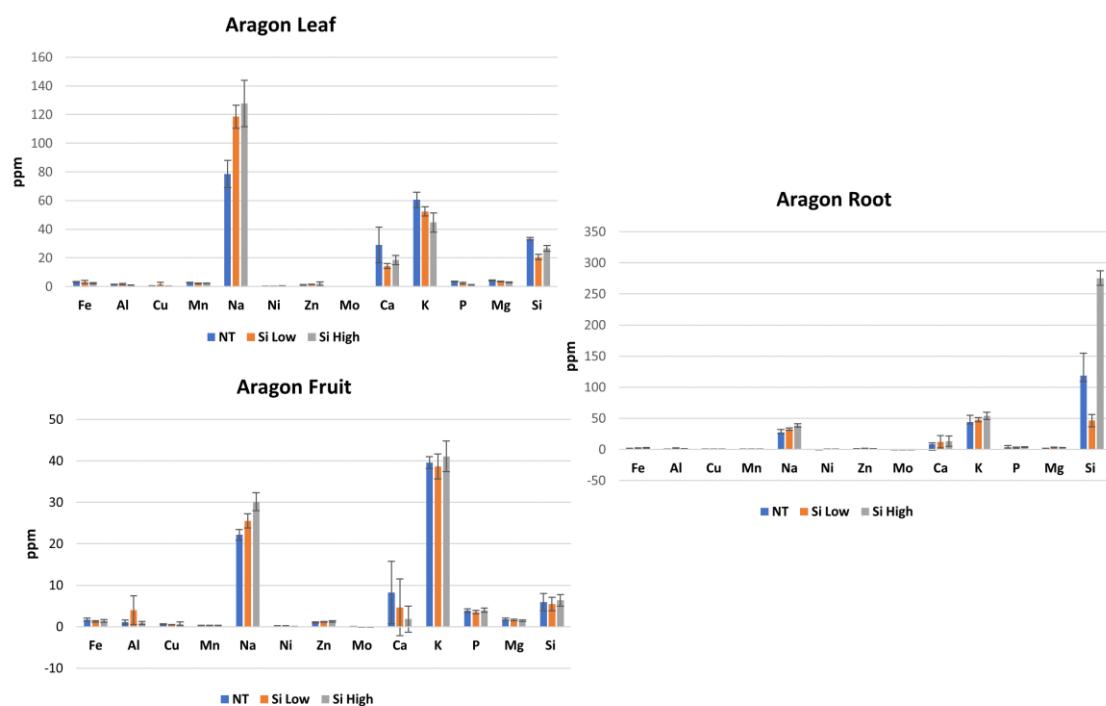


Figure S4. a: Chemical analyses of the elements in the various organs according to treatment for the cultivar Aragon. ANOVA has been performed followed by post hoc Tukey's HSD test with p value $P<0.005$. The P values for Tukey's Multiple Comparisons for each element are in Tables S11. **b:** Chemical analyses of the elements in the various organs according to treatment for the cultivar Gladis ANOVA has been performed followed by post hoc Tukey's HSD test with p value $P<0.005$. The P values for Tukey's Multiple Comparisons for each element are in Tables S12.



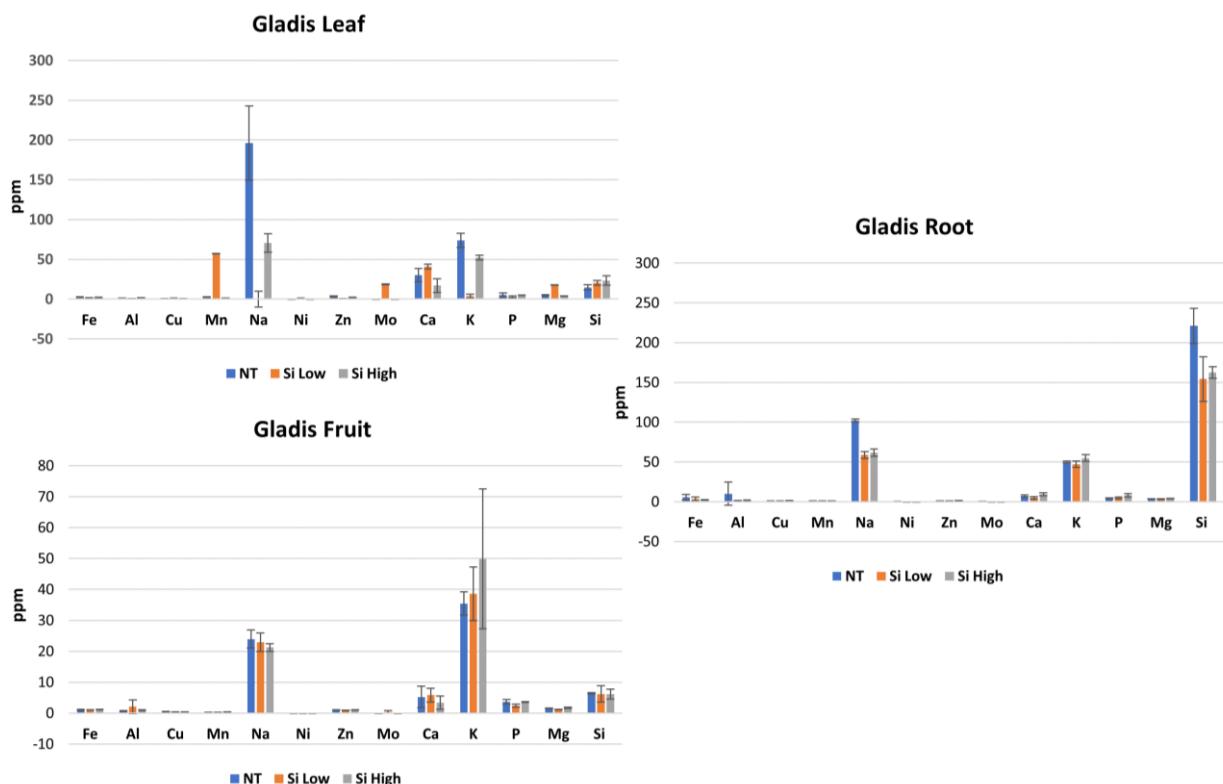


Figure S5. a: Chemical analyses of the elements in the various organs according to plant parts for the cultivar Aragon. ANOVA has been performed followed by post hoc Tukey's HSD test with p value P<0.005. The P values for Tukey's Multiple Comparisons for each element are in Tables S10. **b:** Chemical analyses of the elements in the various organs according to plant parts for the cultivar Gladis. ANOVA has been performed followed by post hoc Tukey's HSD test with p value P<0.005. The P values for Tukey's Multiple Comparisons for each element are in Tables S7.

Table S4. Aragon, Tukey HSD Multiple comparison for treatment. NT= not treated; Si Low= low Si treatment; Si High= High Si treatment.

TP	NT	Si Low	Si High	MDA	NT	Si Low	Si High
	NT	0,910572	0,987746		NT	0,482255	0,599385
SOD	Si Low	0,910572	0,962505		Si Low	0,482255	0,979357
	Si High	0,987746	0,962505		Si High	0,599385	0,979357
GST	NT	Si Low	Si High	POD	NT	Si Low	Si High
	NT	0,950136	0,673846		NT	0,004615	0,022338
PRO	Si Low	0,950136	0,488496	GPX	Si Low	0,004615	0,782454
	Si High	0,673846	0,488496		Si High	0,022338	0,782454
CAT	NT	Si Low	Si High	H2O2	NT	Si Low	Si High
	NT	0,348951	0,500448		NT	0,628526	0,697908
LOX	Si Low	0,348951	0,958601	APX	Si Low	0,628526	0,992961
	Si High	0,500448	0,958601		Si High	0,697908	0,992961
SOD	NT	Si Low	Si High	POD	NT	Si Low	Si High
	NT	0,054497	0,317964		NT	0,004615	0,022338
GST	Si Low	0,054497	0,598575	GPX	Si Low	0,004615	0,782454
	Si High	0,317964	0,598575		Si High	0,022338	0,782454
PRO	NT	Si Low	Si High	H2O2	NT	Si Low	Si High
	NT	0,165002	0,090197		NT	0,165002	0,090197
CAT	Si Low	0,165002	0,944077	APX	Si Low	0,165002	0,944077
	Si High	0,090197	0,944077		Si High	0,165002	0,944077
LOX	NT	Si Low	Si High	APX	NT	Si Low	Si High
	NT	0,581703	0,987861		NT	0,581703	0,987861
SOD	Si Low	0,581703	0,492142		Si Low	0,581703	0,492142
	Si High	0,987861	0,492142		Si High	0,987861	0,492142

	Si High	0,839059	0,996429				
Table S5. Aragon, Tukey HSD Multiple Comparisons Aragon Parts. L= leaf; R= root; F= fruit.							
TP	NT	Si Low	Si High	MDA	NT	Si Low	Si High
	NT	0,997156	0,999676		NT	0,98941	0,999696
	Si Low	0,997156	0,99875		Si Low	0,98941	0,992671
SOD	Si High	0,999676	0,99875		Si High	0,999696	0,992671
	NT	Si Low	Si High	POD	NT	Si Low	Si High
	NT	0,039657	0,360336		NT	0,988077	0,420481
GST	Si Low	0,039657	0,001479		Si Low	0,988077	0,504759
	Si High	0,360336	0,001479	GPX	Si High	0,420481	0,504759
	NT	Si Low	Si High		NT	Si Low	Si High
Pro	NT	0,828361	0,458865		NT	0,831244	0,468864
	Si Low	0,828361	0,808952		Si Low	0,831244	0,199575
	Si High	0,458865	0,808952		Si High	0,468864	0,199575
CAT	NT	Si Low	Si High	H2O2	NT	Si Low	Si High
	NT	0,845464	0,75692		NT	0,653481	0,791069
	Si Low	0,845464	0,4257		Si Low	0,653481	0,970913
LOX	Si High	0,75692	0,4257		Si High	0,791069	0,970913
	NT	Si Low	Si High	APX	NT	Si Low	Si High
	NT	0,419719	0,464662		NT	0,924684	0,987084
CAT	Si Low	0,419719	0,051846		Si Low	0,924684	0,972765
	Si High	0,464662	0,051846		Si High	0,987084	0,972765
	NT	Si Low	Si High				
LOX	NT	0,07603	0,015622				
	Si Low	0,07603	0,748747				
	Si High	0,015622	0,748747				

Table S6. Gladis, Tukey HSD Multiple Comparison for treatment. NT= not treated; Si Low= low Si treatment; Si High= High Si treatment.

TP	NT	Si Low	Si High	MDA	NT	Si Low	Si High
	NT	0,910572	0,987746		NT	0,482255	0,599385
	Si Low	0,910572	0,962505		Si Low	0,482255	0,979357
SOD	Si High	0,987746	0,962505		Si High	0,599385	0,979357
	NT	Si Low	Si High	POD	NT	Si Low	Si High
	NT	0,950136	0,673846		NT	0,004615	0,022338
GST	Si Low	0,950136	0,488496		Si Low	0,004615	0,782454
	Si High	0,673846	0,488496		Si High	0,022338	0,782454
	NT	Si Low	Si High	GPX	NT	Si Low	Si High
PRO	NT	0,348951	0,500448		NT	0,628526	0,697908
	Si Low	0,348951	0,958601		Si Low	0,628526	0,992961
	Si High	0,500448	0,958601		Si High	0,697908	0,992961
PRO	NT	Si Low	Si High	H2O2	NT	Si Low	Si High
	NT	0,054497	0,317964		NT	0,165002	0,090197
	Si Low	0,054497	0,598575		Si Low	0,165002	0,944077
CAT	Si High	0,317964	0,598575		Si High	0,090197	0,944077
	NT	Si Low	Si High	APX	NT	Si Low	Si High
	NT	0,90723	0,136602		NT	0,581703	0,987861
CAT	Si Low	0,90723	0,278558		Si Low	0,581703	0,492142
	Si High	0,136602	0,278558		Si High	0,987861	0,492142
	NT	Si Low	Si High				
LOX	NT	0,878635	0,839059				

Si Low	0,878635	0,996429
Si High	0,839059	0,996429

Table S7. Gladis, Tukey HSD Multiple Comparison for plants parts. L= leaf; R= root; F= fruit.

TP	L	R	F	MDA	L	R	F
	L	5,13E-09	0,721169		L	1,99E-05	0,001662
	R	5,13E-09	5,13E-09		R	1,99E-05	7,92E-09
SOD	F	0,721169	5,13E-09	POD	F	0,001662	7,92E-09
	L	0,003263	0,945274		L	0,077018	0,951545
	R	0,003263	0,001479		R	0,077018	0,137172
GST	F	0,945274	0,001479	GPX	F	0,951545	0,137172
	L	9,12E-06	0,746472		L	5,26E-09	0,00761
	R	9,12E-06	1,57E-06		R	5,26E-09	1,05E-07
PRO	F	0,746472	1,57E-06	H2O2	F	0,00761	1,05E-07
	L	0,99904	0,011343		L	3,12E-05	0,00519
	R	0,99904	0,012507		R	3,12E-05	0,122759
CAT	F	0,011343	0,012507	APX	F	0,00519	0,122759
	L	0,000158	0,279916		L	7,14E-08	0,666382
	R	0,000158	3,31E-06		R	7,14E-08	1,56E-08
LOX	F	0,279916	3,31E-06		F	0,666382	1,56E-08
	L	0,998458	0,212721	APX	L	0,998458	0,212721
	R	0,998458	0,194595		R	0,212721	0,194595
	F	0,212721	0,194595		F	0,194595	0,212721

Table S8. Aragon, Tukey HSD Multiple Comparison per treatments. NT= not treated; Si Low= low Si treatment; Si High= High Si treatment.

Fe	NT	Si Low	Si High	Al	NT	Si Low	Si High
	NT	0,975506	0,871241		NT	0,072962	0,994346
	Si Low	0,975506	0,757783		Si Low	0,072962	0,059301
Cu	Si High	0,757783	0,757783	Mn	NT	Si Low	Si High
	NT	0,357949	0,98475		NT	0,826653	0,907161
	Si Low	0,357949	0,279957		Si Low	0,826653	0,984414
Na	Si High	0,98475	0,279957	Ni	Si High	0,907161	0,984414
	NT	0,685842	0,478433		NT	0,59931	0,876226
	Si Low	0,685842	0,937775		Si Low	0,59931	0,879511
Zn	Si High	0,478433	0,937775	Mo	Si High	0,876226	0,879511
	NT	0,199143	0,089437		NT	0,966574	0,751348
	Si Low	0,199143	0,900714		Si Low	0,966574	0,600343
Ca	Si High	0,089437	0,900714	K	Si High	0,751348	0,600343
	NT	0,600116	0,696357		NT	0,904739	0,930817
	Si Low	0,600116	0,986548		Si Low	0,904739	0,997609
P	NT	Si Low	Si High	Mg	Si High	0,930817	0,997609

	NT	0,492274	0,525767		NT	0,987975	0,955043
	Si Low	0,492274	0,998243		Si Low	0,987975	0,90038
	Si High	0,525767	0,998243		Si High	0,955043	0,90038
	NT	Si Low	Si High				
Si	NT	0,742194	0,410401				
	Si Low	0,742194	0,124872				
	Si High	0,410401	0,124872				

Table S9. Aragon, Tukey SHD Multiple Comparison per parts of the Plant. L= leaf; R= root; F= fruit.

	L	R	F		L	R	F
Fe	L	0,005457	1,01E-05	Al	L	0,696784	0,648009
	R	0,005457	0,047151		R	0,696784	0,996503
	F	1,01E-05	0,047151		F	0,648009	0,996503
	L	R	F	Mn	L	R	F
Cu	L	0,690187	0,399548		L	7,75E-05	5,13E-09
	R	0,690187	0,876568		R	7,75E-05	5,13E-09
	F	0,399548	0,876568		F	5,13E-09	5,13E-09
	L	R	F	Ni	L	R	F
Na	L	0,581967	5,19E-09		L	0,094141	0,026472
	R	0,581967	5,54E-09		R	0,094141	0,818949
	F	5,19E-09	5,54E-09		F	0,026472	0,818949
	L	R	F	Mo	L	R	F
Zn	L	0,960787	0,141613		L	0,015497	0,028065
	R	0,960787	0,225889		R	0,015497	0,962826
	F	0,141613	0,225889		F	0,028065	0,962826
	L	R	F	K	L	R	F
Ca	L	0,22904	0,001167		L	0,028093	0,001521
	R	0,22904	0,060907		R	0,028093	0,45099
	F	0,001167	0,060907		F	0,001521	0,45099
	L	R	F	Mg	L	R	F
P	L	0,587627	0,005133		L	0,000217	1E-07
	R	0,587627	0,049809		R	0,000217	0,009729
	F	0,005133	0,049809		F	1E-07	0,009729
	L	R	F				
Si	L	0,000116	0,739361				
	R	0,000116	0,000758				
	F	0,739361	0,000758				

Table S10. Gladis, Tukey HSD Multiple Comparison per treatments. NT= not treated; Si Low= low Si treatment; Si High= High Si treatment.

	NT	Si Low	Si High		NT	Si Low	Si High
Fe	NT	0,576927	0,446876	Al	NT	0,558452	0,500458
	Si Low	0,576927	0,973764		Si Low	0,558452	0,994862
	Si High	0,446876	0,973764		Si High	0,500458	0,994862
	NT	Si Low	Si High	Mn	NT	Si Low	Si High
Cu	NT	0,913224	0,696143		NT	0,244087	0,477855
	Si Low	0,913224	0,451021		Si Low	0,244087	0,883724
	Si High	0,696143	0,451021		Si High	0,477855	0,883724
	NT	Si Low	Si High	Ni	NT	Si Low	Si High
Na	NT	0,034238	0,053902		NT	0,13959	0,053526
	Si Low	0,034238	0,975488		Si Low	0,13959	0,877828
	Si High	0,053902	0,975488		Si High	0,053526	0,877828

	NT	Si Low	Si High		NT	Si Low	Si High
Zn	NT	0,136061	0,687561	Mo	NT	0,269413	0,937359
	Si Low	0,136061	0,487907		Si Low	0,269413	0,151376
	Si High	0,687561	0,487907		Si High	0,937359	0,151376
Ca	NT	Si Low	Si High	K	NT	Si Low	Si High
	NT	0,593613	0,581334		NT	0,188265	0,990438
	Si Low	0,593613	0,999779		Si Low	0,188265	0,234672
P	NT	Si Low	Si High	Mg	NT	Si Low	Si High
	NT	0,685173	0,386772		NT	0,301316	0,994821
	Si Low	0,685173	0,095787		Si Low	0,301316	0,347218
Si	NT	Si Low	Si High		Si High	0,994821	0,347218
	NT	0,859037	0,910719				
	Si Low	0,859037	0,992855				
	Si High	0,910719	0,992855				

Table S11. Gladis, Tukey HSD Multiple Comparisons per parts of the plant. L= leaf; R= root; F= fruit.

	L	R	F		L	R	F
Fe	L	0,002762	0,221906	Al	L	0,411761	0,998672
	R	0,002762	0,125195		R	0,411761	0,438811
	F	0,221906	0,125195		F	0,998672	0,438811
Cu	L	6,65E-08	0,191698	Mn	L	0,04423	6,84E-07
	R	6,65E-08	3,84E-06		R	0,04423	0,000356
	F	0,191698	3,84E-06		F	6,84E-07	0,000356
Na	L	0,044097	0,0008	Ni	L	0,229901	0,055071
	R	0,044097	0,230158		R	0,229901	0,729248
	F	0,0008	0,230158		F	0,055071	0,729248
Zn	L	0,835571	0,000304	Mo	L	0,954583	0,911811
	R	0,835571	0,001284		R	0,954583	0,765345
	F	0,000304	0,001284		F	0,911811	0,765345
Ca	L	0,565244	1,7E-06	K	L	0,252514	0,050739
	R	0,565244	2,07E-05		R	0,252514	0,670294
	F	1,7E-06	2,07E-05		F	0,050739	0,670294
P	L	0,009261	0,269459	Mg	L	1,47E-06	6,16E-08
	R	0,009261	0,241966		R	1,47E-06	0,340045
	F	0,269459	0,241966		F	6,16E-08	0,340045
Si	L	5,13E-09	0,447138				
	R	5,13E-09	5,13E-09				
	F	0,447138	5,13E-09				

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