



Figure S1. Effects of various cadmium concentrations on the growth of tolerant (A) and susceptible (B) barley accessions. Cd-0: control condition, Cd-250: treatment of seeds with 250 μ M of cadmium, Cd-500: treatment of seeds with 500 μ M of cadmium.

Table S1. Code, origin, and name of 59 barley accessions included in this study.

Accession Code	Origin	Accession Name	Accession Code	Origin	Accession Name
AC1	South of Iraq	Shoaa	AC31	Middle of Iraq	Scio/3
AC2	South of Iraq	Boraak	AC32	Middle of Iraq	Victoria
AC3	South of Iraq	Radical	AC33	Middle of Iraq	Black-Bhoos-B
AC4	South of Iraq	Arivat	AC34	Middle of Iraq	Irani
AC5	South of Iraq	16 HB	AC35	Middle of Iraq	A1
AC6	South of Iraq	Furat 9	AC36	Middle of Iraq	MORA
AC7	South of Iraq	Al-warka	AC37	Middle of Iraq	ABN
AC8	South of Iraq	Numar	AC38	Middle of Iraq	Arabi aswad
AC9	South of Iraq	Al-amal	AC39	Middle of Iraq	Clipper
AC10	South of Iraq	Rafidain-1	AC40	Middle of Iraq	Bhoos-H1
AC11	South of Iraq	Al-khayr	AC41	Middle of Iraq	BN2R
AC12	South of Iraq	BN6	AC42	Middle of Iraq	BA4
AC13	South of Iraq	IBAA-99	AC43	North of Iraq	Qala-1
AC14	North of Iraq	Saydsadiq	AC44	North of Iraq	Black-Kalar
AC15	Middle of Iraq	Bhoos-244	AC45	North of Iraq	White-Kalar
AC16	Middle of Iraq	IBAA-265	AC46	North of Iraq	Black-Akre
AC17	North of Iraq	White-Akre	AC47	North of Iraq	Black-Garmiyan
AC18	North of Iraq	Black-Bhoos Akre	AC48	North of Iraq	Black-Chiman
AC19	North of Iraq	Black-Zaxo	AC49	North of Iraq	Ukranian-Zarayan
AC20	North of Iraq	White-Zaxo	AC50	North of Iraq	White-Zarayan
AC21	South of Iraq	Bhoos-912	AC51	North of Iraq	Abrash
AC22	North of Iraq	White-Halabja	AC52	North of Iraq	Bujayl 1-Shaqlawa
AC23	South of Iraq	Samr	AC53	North of Iraq	Bujayl 2-Shaqlawa
AC24	South of Iraq	GOB	AC54	North of Iraq	Bujayl 3-Shaqlawa
AC25	South of Iraq	Abiad	AC55	South of Iraq	Rehaan
AC26	South of Iraq	CANELA	AC56	South of Iraq	Sameer
AC27	South of Iraq	MSEL	AC57	South of Iraq	Warka-B12
AC28	South of Iraq	Acsad strain	AC58	South of Iraq	Al-Hazzar
AC29	South of Iraq	Acsad-14	AC59	South of Iraq	IBAA-995
AC30	South of Iraq	Gk-Omega			

Table S2. Some descriptive statistics, F, and probability values of growth and biomass collected from 59 accessions of barley under normal and cadmium stress conditions

Cd-0					
	GP	RL	SL	FWS	DWS
Min	50.00	1.59	1.27	146.07	18.067
Max	100.00	15.85	13.19	402.72	41.850
Mean	88.19	9.16	9.83	288.28	29.514
Std	12.27	2.65	1.88	57.83	5.67
F	127.95***	19793.34***	11648.14***	5.42***	4.48***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cd-125					
	GP	RL	SL	FWS	DWS
Min	25.00	3.50	5.17	163.48	19.417
Max	100.00	9.08	11.80	410.33	42.317
Mean	87.18	5.77	7.99	266.11	30.111
Std	13.61	1.21	1.24	55.42	5.36
F	16.39***	15.52***	13.77***	6.44***	4.25***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cd-250					
	GP	RL	SL	FWS	DWS
Min	36.67	2.29	4.41	141.08	17.983
Max	100.00	5.29	9.84	311.23	43.300
Mean	86.61	3.68	6.77	224.18	31.431
Std	13.96	0.74	1.31	45.25	6.20
F	15.06***	5.68***	6.84***	6.20***	5.83***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cd-500					
	GP	RL	SL	FWS	DWS
Min	26.67	0.70	2.66	92.77	17.900
Max	100.00	3.65	7.64	268.02	46.750
Mean	84.80	2.03	5.49	184.86	32.526
Std	17.69	0.72	1.15	40.24	6.39
F	22.38***	7.41***	7.82***	6.19***	5.83***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Min: minimum, Max: maximum, Std: standard deviation, Pr: probability, GP: germination percentage, RL: root length, SL: shoot length, FWS: fresh seedling weight, DWS: Dry seedling weight, Cd-0: control condition, Cd-125: treatment of seeds with 125 μ M of cadmium, Cd-250: treatment of seeds with 250 μ M of cadmium, Cd-500: treatment of seeds with 500 μ M of cadmium.

Table S3. Some descriptive statistics, F, and probability values of physio-chemical collected from 59 accessions of barley under normal and cadmium stress conditions

Cd-0								
	WU	PC	SSC	TPC	AC	LP	GPA	CAT
Min	71.16	294.00	105.10	68.88	552.43	2.081	0.09	12.99
Max	368.17	2907.33	374.34	177.12	994.32	22.290	0.96	127.27
Mean	173.12	1303.15	191.01	107.42	799.91	9.103	0.34	65.67
Std	61.54	661.23	53.03	23.24	86.39	3.577	0.14	24.39
F	4.35***	69.81***	469.63***	392.67***	636.90***	879.64***	64.70***	66.58***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cd-125								
	WU	PC	SSC	TPC	AC	LP	GPA	CAT
Min	86.92	367.59	94.20	91.80	686.89	5.177	0.04	12.99
Max	395.08	3598.36	406.85	234.42	1118.65	25.274	0.43	106.88
Mean	246.21	1371.76	272.74	149.05	930.74	10.995	0.23	61.29
Std	67.90	657.16	72.60	32.55	100.54	3.411	0.10	22.64
F	5.62***	166.74***	216.37***	958.04***	238.67***	2043.50***	40.57***	61.54***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cd-250								
	WU	PC	SSC	TPC	AC	LP	GPA	CAT
Min	87.68	769.64	82.16	102.21	678.11	7.548	0.02	20.78
Max	349.26	5836.56	809.01	323.93	1188.92	27.484	0.82	148.05
Mean	209.03	2442.80	340.21	172.21	930.85	13.253	0.30	71.36
Std	54.40	1249.94	128.27	40.48	127.32	3.227	0.18	32.96
F	5.51***	188.69***	871.32***	921.50***	1755.22***	775.40***	74.99***	74.41***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cd-500								
	WU	PC	SSC	TPC	AC	LP	GPA	CAT
Min	87.53	358.62	90.80	86.10	557.16	3.435	0.05	15.58
Max	236.91	9390.41	1185.86	307.27	1179.46	29.403	0.75	174.03
Mean	164.45	2913.45	379.39	161.05	910.95	12.201	0.32	64.67
Std	37.52	2163.47	213.54	51.92	171.25	4.724	0.21	33.16
F	4.37***	1748.41***	2210.86***	1637.91***	552.33***	975.66***	137.91***	103.42***
Pr	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Min: minimum, Max: maximum, Std: standard deviation, Pr: probability, WU: seed water uptake, PC: proline content, SSC: soluble sugar content, TPC total phenolic content, AC: Antioxidant activity, CAT: catalase activity, GPA: guaiacol peroxidase activity, LP: lipid peroxidation activity, Cd-0: control condition, Cd-125: treatment of seeds with 125 μ M of cadmium, Cd-250: treatment of seeds with 250 μ M of cadmium, Cd-500: treatment of seeds with 500 μ M of cadmium.

Table S4. Comparison means of seedling morphological traits collected from 59 barley accessions under normal conditions.

Accessions	GP (%)	RL (cm)	SL (cm)	FWS (mg)	DWS (mg)
AC1	86.67 de	15.85 a	13.19 a	336.42 a-f	29.43 d-n
AC2	100.00 a	13.06 c	10.87 n	312.03 b-i	35.65 a-g
AC3	91.67 bc	1.59 a-w	1.27 a-s	194.35 n-s	18.93 pq
AC4	100.00 a	6.73 a-p	8.89 ag-ah	272.65 c-o	27.40 f-q
AC5	95.00 b	7.44 a-k	10.68 op	275.32 c-n	18.07 q
AC6	90.00 cd	8.90 a-c	9.33 ab	280.25 c-m	27.52 f-p
AC7	95.00 b	11.44 i	7.55 a-p	184.17 p-s	19.07 pq
AC8	95.00 b	10.70 p	10.21 t	255.17 e-q	26.18 g-q
AC9	100.00 a	8.61 a-e	8.52 a-k	282.83 c-m	28.93 d-n
AC10	95.00 b	10.85 n	9.17 a-d	253.92 f-q	39.80 abc
AC11	90.00 cd	8.40 af	9.30 ab	261.27 d-p	30.73 c-m
AC12	86.67 de	7.95 ai	10.65 pq	285.22 c-m	28.55 d-o
AC13	95.00 b	12.42 e	10.43 r	293.87 c-l	28.72 d-n
AC14	95.00 b	6.18 at	9.03 a-e	317.85 a-i	34.10 a-h
AC15	88.33 cde	9.49 x	10.10 u	315.42 b-i	26.73 f-q
AC16	95.00 b	11.86 f	11.33 k	345.55 a-d	29.03 d-n
AC17	95.00 b	10.28 s	8.91 a-g	292.27 c-l	31.77 b-k
AC18	76.67 hi	11.35 j	11.47 i	246.73 g-q	22.65 k-q
AC19	80.00 gh	9.671 v	9.54 z	175.43 qrs	21.57 m-q
AC20	85.00 ef	9.556 w	8.84 a-h	244.45 h-r	26.42 g-q
AC21	100.00 a	9.27 z	10.04 v	285.47 c-m	27.40 f-q
AC22	75.00 i	11.69 g	10.14 u	302.68 c-k	24.35 i-q
AC23	90.00 cd	10.80 no	12.75 b	329.45 a-i	37.48 a-e
AC24	100.00 a	7.04 a-n	11.40 j	397.85 ab	32.25 b-j
AC25	90.00 cd	10.99 m	11.19 l	348.72 a-d	37.40 a-e
AC26	95.00 b	7.11 a-m	10.62 q	287.35 c-l	26.15 g-q
AC27	100.00 a	6.19 a-t	12.23 e	353.75 abc	31.83 b-k
AC28	95.00 b	12.81 d	11.87 g	315.80 b-i	36.25 a-f
AC29	95.00 b	11.12 l	10.71 o	351.57 abc	41.02 ab
AC30	100.00 a	10.48 q	10.95 m	328.60 a-i	28.82 d-n
AC31	100.00 a	11.18 k	9.81 x	350.83 abc	33.65 a-i
AC32	95.00 b	13.13 b	10.73 o	332.25 a-h	33.10 a-j
AC33	90.00 cd	9.35 y	8.97 a-f	306.48 c-j	28.02 e-p
AC34	85.00 ef	7.89 a-j	12.04 f	343.73 a-d	41.85 a
AC35	81.67 fg	11.19 k	11.64 h	241.98 i-r	29.08 d-n
AC36	100.00 a	7.03 a-n	11.34 k	260.90 d-p	21.00 n-q
AC37	90.00 cd	8.59 a-e	10.88 n	353.12 abc	31.27 c-l
AC38	100.00 a	10.40 r	8.56 a-k	313.82 b-i	35.33 a-g
AC39	95.00 b	10.66 p	8.04 a-m	322.32 a-i	37.97 a-d
AC40	100.00 a	10.21 t	7.76 a-n	293.15 c-l	31.73 b-k
AC41	100.00 a	3.08 a-v	8.68 a-j	349.90 abc	27.07 f-q
AC42	100.00 a	3.05 a-v	8.75 a-i	249.03 f-q	21.88 l-q

AC43	80.00 gh	8.11 a-h	8.43 a-l	310.00 c-j	32.78 a-j
AC44	76.67 hi	11.64 gh	12.65 c	352.33 abc	31.68 b-k
AC45	85.00 ef	8.79 a-d	10.33 s	271.13 c-o	26.87 f-q
AC46	80.00 gh	11.59 h	9.17 a-d	187.48 o-s	24.62 h-q
AC47	70.00 j	6.45 a-s	9.38 aa	146.07 s	29.60 d-n
AC48	70.00 j	8.62 a-e	9.71 y	209.32 l-s	28.92 d-n
AC49	85.00 ef	9.87 u	10.71 o	315.42 b-i	33.65 a-i
AC50	85.00 ef	6.55 a-r	7.66 a-o	295.63 c-l	35.58 a-g
AC51	50.00 k	9.16 aa	12.32 d	269.77 c-o	27.33 f-q
AC52	70.00 j	7.29 a-l	9.83 x	217.02 k-s	26.42 g-q
AC53	50.00 k	6.82 a-o	9.23 abc	223.42 j-s	25.00 h-q
AC54	95.00 b	6.64 a-q	8.69 aj	324.28 a-i	23.80 j-q
AC55	85.00 ef	8.33 a-g	9.91 w	200.63 m-s	37.80 a-d
AC56	95.00 b	11.19 k	10.35 s	333.75 a-g	19.33 opq
AC57	50.00 k	4.13 a-u	5.64 a-r	162.63 rs	24.53 i-q
AC58	80.00 gh	9.08 ab	6.97 a-q	402.72 a	32.58 b-j
AC59	85.00 ef	10.78 o	10.30 s	343.10 a-e	34.67 a-g

GP: germination percentage, RL: root length, SL: shoot length, FWS: fresh seedling weight, DWS: Dry seedling weight. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S5. Comparison means of seedling morphological traits collected from 59 barley accessions under 125 μM cadmium stress conditions.

Accessions	GP (%)	RL (cm)	SL (cm)	FWS (mg)	DWS (mg)
AC1	88.33 a-e	6.75 b-k	9.99 bc	250.00 h-u	30.30 a-h
AC2	96.67 abc	7.42 bc	9.17 c-h	330.48 b-g	34.62 a-h
AC3	93.33 a-d	4.54 u-y	7.19 o-u	184.4 s-w	20.88 opq
AC4	90.00 a-e	5.08 p-w	7.16 p-u	263.63 e-r	26.67 b-h
AC5	86.67 b-f	7.17 b-f	8.05 h-q	272.40 e-p	21.50 n-q
AC6	95.00 a-d	6.49 c-m	7.18 o-u	288.80 d-m	27.62 a-h
AC7	98.33 ab	4.44 v-z	5.58 wx	163.48 w	19.42 q
AC8	96.67 abc	6.26 e-n	9.57 cde	278.92 d-o	30.78 a-h
AC9	95.00 a-d	6.93 b-i	7.89 i-r	163.48 w	19.42 q
AC10	95.00 abc	4.44 v-z	8.64 d-l	317.35 c-j	29.92 a-h
AC11	85.00 c-g	5.33 n-v	8.20 g-p	240.23 j-v	27.17 a-h
AC12	90.00 a-e	3.92 xyz	9.47 c-f	264.03 e-r	24.12 l-q
AC13	96.67 abc	7.39 bc	8.75 d-k	284.25 d-n	33.05 a-h
AC14	88.33 a-e	4.96 q-x	6.60 s-w	255.68 g-t	34.62 a-h
AC15	88.33 a-e	5.77 k-t	8.80 d-i	244.33 i-v	28.32 a-h
AC16	96.67 abc	7.13 b-g	8.40 f-n	236.68 k-w	25.22 b-h
AC17	93.33 a-d	5.63 l-t	6.97 q-u	260.38 f-s	31.72 a-h
AC18	76.67 fgh	6.10 g-p	8.25 g-p	258.72 g-s	27.15 a-h
AC19	75.00 gh	5.96 h-q	6.58 t-w	174.88 uvw	24.35 c-h
AC20	86.67 b-f	4.78 t-y	8.11 h-q	251.42 h-t	29.20 a-h
AC21	95.00 a-d	5.02 q-w	8.68 d-l	251.68h-t	29.62 a-h
AC22	85.00 c-g	4.90 r-y	7.41 m-t	241.25 j-v	34.23 a-h
AC23	96.67 abc	7.33 bcd	10.23 bc	240.65 j-v	33.47 a-h
AC24	96.67 abc	5.11 o-v	11.80 a	323.47 c-h	28.38 a-h
AC25	100.00 a	6.85 b-j	9.62 cd	276.23 e-q	36.63 a-e
AC26	95.00 a-d	4.04 w-z	9.26 c-g	248.67 h-v	23.73 m-q
AC27	96.67 abc	4.48 u-z	10.03 bc	319.82 c-i	33.83 a-h
AC28	96.67 abc	6.14 f-o	8.77 d-j	283.97 d-n	39.55 abc
AC29	98.33 ab	7.08 b-g	8.34 g-o	339.65 b-e	42.32 a
AC30	96.67 abc	6.24 f-n	8.01 i-q	287.68 d-m	30.67 a-h
AC31	93.33 a-d	6.92 b-i	8.02 h-q	363.02 abc	36.95 a-d
AC32	95.00 a-d	4.97 q-x	6.98 q-u	278.23 d-p	31.12 a-h
AC33	83.33 d-g	5.36 n-v	8.04 h-q	306.58 c-k	36.27 a-ef
AC34	90.00 a-e	6.32 d-n	7.73 i-t	308.65 c-k	32.03 a-h
AC35	95.00 a-d	7.30 b-e	7.69 i-t	284.23 d-n	31.47 a-h
AC36	98.33 ab	5.27 n-v	8.11 h-q	261.98 f-r	20.58 pq
AC37	98.33 ab	7.63 b	10.71 b	336.77 b-f	31.42 a-h
AC38	96.67 abc	5.93 i-r	8.74 d-k	335.98 b-f	31.08 a-h
AC39	93.33 a-d	9.08 a	7.53 l-t	352.77 a-d	38.30 a-d

AC40	96.67 abc	7.62 b	7.30 m-t	280.87 d-o	29.12 a-h
AC41	96.67 abc	7.35 bcd	7.93 i-r	319.45 c-i	32.20 a-h
AC42	86.67 b-f	5.85 j-t	6.96 q-u	398.92 ab	33.75 a-h
AC43	96.67 abc	5.28 n-v	5.78 vwx	238.33 s-w	25.67 b-h
AC44	75.00 ghi	5.12 o-v	8.59 d-l	209.97 n-w	24.47 b-h
AC45	90.00 a-e	5.52 m-u	6.84 r-v	296.92 c-l	33.42 a-h
AC46	75.00 ghi	4.88 r-y	7.96 i-r	188.98 r-w	25.88 b-h
AC47	65.00 ijk	3.87 yz	7.25 n-u	205.50 o-w	29.20 a-h
AC48	25.00 l	6.67 b-l	7.61 j-t	173.78 vw	35.23 a-g
AC49	81.67 efg	5.87 j-s	7.93 i-r	284.57 d-n	35.28 a-g
AC50	96.67 abc	4.43 v-z	6.61 s-w	243.33 i-v	33.02 a-h
AC51	63.33 jk	3.96 xyz	7.58 k-t	211.63 m-w	38.27 a-d
AC52	63.33 jk	4.92 q-x	7.58 k-t	201.95 p-w	25.33 b-h
AC53	61.67 jk	4.84 s-y	7.76 i-s	222.75 l-w	29.57 a-h
AC54	56.67 k	4.34 v-z	7.01 q-u	182.13 t-w	21.45 n-q
AC55	76.67 fgh	6.67 b-l	7.70 i-t	247.12 h-v	31.75 a-h
AC56	88.33 a-e	5.74 k-t	6.83 r-v	288.50 d-m	26.87 b-h
AC57	88.33 a-e	3.50 z	5.17 x	200.02 q-w	24.95 b-h
AC58	68.33 hij	4.30 v-z	6.15 u-x	410.33 a	39.75 ab
AC59	80.00 efg	6.99 b-h	8.46 e-m	270.15 e-q	33.73 a-h

GP: germination percentage, RL: root length, SL: shoot length, FWS: fresh seedling weight, DWS: Dry seedling weight. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S6. Comparison means of seedling morphological traits collected from 59 barley accessions under 250 μ M cadmium stress conditions.

Accessions	GP (%)	RL (cm)	SL (cm)	FWS (mg)	DWS (mg)
AC1	80.00 f-j	3.99 c-n	9.00 abc	221.97 c-q	31.35 e-p
AC2	100.00 a	3.29 i-r	4.93 p-s	184.43 h-s	38.53 a-f
AC3	96.66 abc	2.72 pqr	5.69 l-s	141.08 s	19.78 st
AC4	90.00 a-g	3.04 k-r	5.56 n-s	157.27 p-s	25.22 n-t
AC5	95.00 a-d	2.90 n-r	7.58 b-h	186.27 h-s	17.98 t
AC6	95.00 a-d	3.16 j-r	5.06 p-s	179.77 j-s	26.50 l-s
AC7	93.33 a-e	3.48 h-q	4.41 s	150.42 rs	21.47 rst
AC8	90.00 a-g	5.29 a	8.16 b-f	199.18 e-s	21.73 q-t
AC9	100.00 a	3.60 e-q	4.72 qrs	228.30 c-p	31.75 d-o
AC10	95.00 a-d	3.49 g-q	5.45 o-s	272.10 a-d	35.07 a-k
AC11	100.00 a	4.46 a-h	7.14 d-o	252.65 a-h	27.47 j-s
AC12	83.33 d-i	2.80 o-r	7.50 c-j	192.53 g-s	28.77 h-r
AC13	95.00 a-d	4.04 c-l	5.53 n-s	234.18 b-o	32.62 c-n
AC14	95.00 a-d	2.95 l-r	5.66 m-s	224.35 c-q	39.13 a-e
AC15	71.67 ijk	3.64 e-q	8.32 a-e	228.67 c-p	36.13 a-i
AC16	91.67 a-f	4.92 a-d	9.23 ab	300.05 ab	36.78 a-h
AC17	91.67 a-f	3.59 e-q	5.03 p-s	223.60 c-q	34.72 b-l
AC18	80.00 f-j	3.60 e-q	7.44 c-k	173.37 m-s	26.37 l-s
AC19	78.33 g-j	2.65 qr	6.33 g-r	159.08 p-s	25.20 n-t
AC20	85.00 c-h	2.31 r	6.95 d-o	159.52 p-s	26.82 k-s
AC21	100.00 a	2.83 o-r	6.90 e-o	232.80 b-o	33.53 b-n
AC22	70.00 jk	3.30 i-r	4.66 rs	216.57 d-r	31.50 e-p
AC23	86.67 b-g	4.45 a-h	9.84 a	235.65 b-o	36.8 a-h
AC24	96.67 abc	3.76 e-p	8.41 a-e	302.17 ab	35.23 a-j
AC25	90.00 a-g	4.87 a-d	6.30 g-r	261.85 a-g	40.48 abc
AC26	93.33 a-e	3.38 h-q	7.57 b-h	222.55 c-q	27.83 i-s
AC27	95.00 a-d	3.64 e-q	8.16 b-f	310.3 a	36.17 a-i
AC28	100.00 a	3.50 g-q	6.10 h-s	242.03 a-n	36.78 a-h
AC29	100.00 a	3.57 e-q	5.80 i-s	251.30 a-j	39.27 a-e
AC30	98.33 ab	4.45 a-h	7.79 b-h	261.80 a-g	34.20 b-m
AC31	98.33 ab	5.16 ab	6.33 g-r	31.37 a	40.27 abc
AC32	95.00 a-d	4.64 a-e	7.47 c-j	252.00 a-i	31.15 e-p
AC33	88.33 a-g	4.23 a-j	7.54 b-i	269.97 a-e	32.92 c-n
AC34	95.00 a-d	2.29 r	8.49 a-e	288.70 abc	43.30 a
AC35	95.00 a-d	5.01 abc	7.99 b-g	248.93 a-k	34.10 b-m
AC36	100.00 a	3.53 f-q	8.44 a-e	208.53 d-s	23.28 p-t
AC37	96.67 abc	4.60 a-f	8.69 a-d	265.15 a-f	25.32 n-t
AC38	100.00 a	4.34 a-i	6.94 d-o	244.70 a-m	35.23 a-j
AC39	96.67 abc	5.22 a	5.77 j-s	271.92 a-d	41.3 ab

AC40	95.00 a-d	4.57 a-g	6.55 f-p	269.03 a-e	32.45 c-n
AC41	91.67 a-f	3.54 f-q	6.91 e-o	311.23 a	31.27 e-p
AC42	95.00 a-d	3.17 j-r	7.36 c-m	226.77 c-p	23.58 o-t
AC43	83.33 d-i	3.34 i-r	4.61 rs	193.47 f-s	29.95 g-q
AC44	53.33 m	4.13 b-k	7.98 b-g	224.77 c-q	30.37 f-p
AC45	88.33 a-g	2.90 n-r	6.29 g-r	223.05 c-q	34.27 b-m
AC46	70.00 jk	3.42 h-q	7.41 c-l	180.27 i-s	26.27 m-s
AC47	58.33 lm	2.74 pqr	6.23 g-r	154.50 qrs	23.58 o-t
AC48	36.67 n	4.02 c-m	7.28 c-n	166.67 o-s	28.17 i-r
AC49	81.67 e-j	3.69 e-q	6.95 d-o	256.17 a-h	38.78 a-e
AC50	88.33 a-g	3.54 f-q	5.66 m-s	243.95 a-n	40.00 a-d
AC51	73.33 h-k	4.47 a-h	7.44 c-j	175.62 l-s	35.63 a-j
AC52	51.67 m	3.22 j-r	7.07 d-o	186.52 h-s	38.35 a-g
AC53	66.67 kl	3.35 i-r	7.89 b-g	177.83 k-s	26.65 l-s
AC54	85.00 c-h	3.89 d-o	6.41 g-q	157.98 p-s	21.38 rst
AC55	80.00 f-j	3.86 d-o	7.18 d-o	213.15 d-r	34.15 b-m
AC56	90.00 a-g	3.50 g-q	5.70 k-s	245.77 a-l	28.18 i-r
AC57	58.33 lm	2.82 o-r	4.73 qrs	171.98 n-s	20.53 rst
AC58	73.33 h-k	3.21 j-r	5.11 p-s	270.12 a-e	32.33 c-n
AC59	88.33 a-g	2.93 m-r	5.65 m-s	211.87 d-s	36.58 a-h

GP: germination percentage, RL: root length, SL: shoot length, FWS: fresh seedling weight, DWS: Dry seedling weight. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S7. Comparison means of seedling morphological traits collected from 59 barley accessions under 500 μ M cadmium stress conditions.

Accessions	GP (%)	RL (cm)	SL (cm)	FWS (mg)	DWS (mg)
AC1	88.33 ab	2.11 e-o	7.22 a-e	219.10 a-f	34.23 d-n
AC2	100.00 a	3.05 a-d	5.49 g-r	206.73 b-h	37.43 b-j
AC3	100.00 a	1.77 i-q	5.84 e-p	92.77 q	17.90 t
AC4	93.33 ab	1.99 g-p	4.18 q-w	128.27 n-q	23.15 rst
AC5	96.67 a	1.98 g-q	7.33 a-d	187.62 d-l	24.87 o-t
AC6	96.67 a	1.97 g-q	5.46 g-r	191.20 c-k	30.20 i-r
AC7	98.33 a	1.55 l-t	3.50 vwx	125.45 n-q	23.72 qrst
AC8	95.00 a	3.45 ab	7.64 a	172.45 f-o	28.48 j-s
AC9	98.33 a	2.50 c-k	4.80 m-v	202.75 b-i	27.17 l-s
AC10	95.00 a	2.37 d-l	4.44 p-v	204.17 b-i	33.35 e-p
AC11	96.67 a	2.81 a-g	6.02 d-o	224.35 a-f	37.23 b-j
AC12	68.33 de	0.76 st	5.15 j-u	151.42 h-p	29.13 j-s
AC13	96.67 a	2.52 c-j	5.33 h-t	187.50 d-l	36.30 c-l
AC14	93.33 ab	1.66 j-s	4.68 o-v	172.03 f-o	34.43 d-n
AC15	71.67 cd	1.71 j-r	6.04 d-o	174.00 e-o	32.17 e-r
AC16	96.67 a	2.66 b-i	6.55 a-k	249.05 ab	35.35 d-n
AC17	91.67 ab	1.70 j-r	4.07 r-w	173.45 e-o	32.30 e-r
AC18	71.67 cd	1.25 o-t	5.60 f-q	137.45 k-q	28.22 j-s
AC19	71.67 cd	1.28 n-t	5.18 i-u	126.35 n-q	24.67 p-t
AC20	86.67 ab	1.70 j-r	5.26 i-t	147.52 i-p	31.48 f-r
AC21	95.00 a	1.51 l-t	5.17 i-u	170.82 f-o	42.83 a-d
AC22	81.67 bc	1.82 i-q	4.80 m-v	176.98 e-n	34.20 d-o
AC23	91.67 ab	2.97 a-e	6.73 a-h	176.32 e-n	41.00 a-e
AC24	95.00 a	1.60 j-t	7.01 a-f	246.08 abc	40.38 a-f
AC25	100.00 a	2.34 d-l	4.72 n-v	197.65 b-j	33.55 e-p
AC26	96.67 a	2.08 e-o	6.35 a-l	158.78 g-p	28.20 j-s
AC27	96.67 a	1.46 l-t	6.81 a-g	187.83 d-k	34.27 d-n
AC28	96.67 a	2.35 d-l	5.67 f-p	213.4 a-g	44.65 abc
AC29	98.33 a	2.77 b-h	5.72 f-p	268.02 a	46.75 a
AC30	98.33 a	2.27 d-m	7.53 ab	207.02 b-h	30.87 g-r
AC31	100.00 a	3.36 abc	5.33 h-t	219.83 a-f	39.80 a-g
AC32	96.67 a	2.91 a-f	6.61 a-i	210.77 b-g	32.52 e-q
AC33	93.33 ab	2.22 d-m	4.97 l-u	196.30 b-j	32.35 e-r
AC34	93.33 ab	1.77 i-q	6.60 a-j	215.27 a-g	45.53 ab
AC35	90.00 ab	2.48 c-k	7.46 abc	212.00 b-g	31.58 f-r
AC36	93.33 ab	1.58 k-t	5.59 f-q	167.48 f-o	24.43 p-t
AC37	98.33 a	2.76 b-h	6.43 a-k	208.57 b-g	30.78 g-r

AC38	98.33 a	2.80 a-g	6.60 a-j	218.50 a-f	38.85 a-i
AC39	98.33 a	3.65 a	5.19 i-u	235.53 a-d	44.58 abc
AC40	95.00 a	3.37 abc	6.38 a-l	238.58 a-d	35.43 d-m
AC41	95.00 a	1.49 l-t	4.82 m-v	210.28 b-g	33.43 e-p
AC42	91.67 ab	1.50 l-t	5.40 g-s	185.22 d-m	30.63 g-r
AC43	86.67 ab	2.18 d-n	4.41 p-v	168.47 f-o	29.35 j-s
AC44	48.33 fg	1.23 o-t	5.19 i-u	169.55 f-o	30.42 h-r
AC45	86.67 ab	1.73 j-q	6.46 a-k	214.80 a-g	32.60 e-q
AC46	53.33 f	1.80 i-q	3.99 s-w	145.77 j-q	26.02 n-t
AC47	56.67 ef	1.06 q-t	3.48 vwx	130.80 m-q	28.27 j-s
AC48	26.67 h	3.06 a-d	6.14 b-n	131.62 l-q	26.87 m-s
AC49	86.67 ab	1.87 h-q	6.10 c-o	199.62 b-j	37.53 b-j
AC50	86.67 ab	2.00 f-p	5.27 i-t	230.28 a-e	39.80 a-g
AC51	65.00 de	0.71 t	4.44 p-v	122.10 n-q	28.38 j-s
AC52	40.00 g	0.70 t	2.66 x	104.63 pq	27.83 k-s
AC53	38.33 g	0.80 rst	2.94 wx	118.05 opq	28.87 j-s
AC54	86.67 ab	1.82 i-q	5.85 e-p	194.55 b-j	20.98 st
AC55	68.33 de	1.13 p-t	6.18 b-m	174.07 e-o	37.22 b-k
AC56	81.67 bc	1.38 m-t	5.10 k-u	202.40 b-j	29.17 j-s
AC57	58.33 ef	1.51 l-t	3.83 u-x	128.40 n-q	21.00 st
AC58	68.33 de	2.74 b-h	3.96 t-x	267.47 a	39.57 a-h
AC59	65.00 de	2.03 f-p	6.43 a-k	209.30 b-g	36.77 b-k

GP: germination percentage, RL: root length, SL: shoot length, FWS: fresh seedling weight, DWS: Dry seedling weight. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S8. Comparison means of seedling physio-chemical parameters collected from 59 barley accessions under control conditions.

Accessions	WU (%)	PC ($\mu\text{g g}^{-1}$)	SSC ($\mu\text{g g}^{-1}$)	TPC ($\mu\text{g g}^{-1}$)	AA ($\mu\text{g g}^{-1}$)	GPA ($\text{units min}^{-1} \text{g}^{-1}$)	CAT ($\text{units min}^{-1} \text{g}^{-1}$)	LP (nmol g^{-1})
AC1	163.73 e-p	1254.26 k-o	249.96 e	86.67 ab	734.86 x	0.48 cd	33.77 uv	5.47 v
AC2	163.75 e-p	1410.41 i-l	125.58 v	99.40 st	834.86 jkl	0.44 c-g	51.95 qr	6.97 t
AC3	189.29 c-o	572.21 vwx	115.08 w	135.54 ef	552.43 ae	0.18 wx	54.55 pqr	10.13 jk
AC4	227.71 c-m	1259.64 k-o	207.57 ij	94.72 vwx	885.54 f	0.60 b	59.74 opq	12.37 fg
AC5	203.52 c-n	294.00 y	151.19 r	76.93 ad	599.73 ad	0.27 p-t	51.95 qr	10.63 i
AC6	160.24 e-p	608.10 u-x	203.46 jk	115.51 jk	849.73 hi	0.22 t-w	12.99 x	13.50 d
AC7	138.59 i-p	1704.77 gh	332.06 c	90.22 zaa	960.54 b	0.40 e-j	54.55 pqr	10.44 ij
AC8	166.98 e-p	775.03 s-v	158.09 q	124.68 h	803.78 o	0.19 vwx	70.13 lmn	2.87 z
AC9	140.01 i-p	1340.41 i-n	213.81 i	96.59 tuv	856.49 h	0.48 cd	64.94 no	9.52 m
AC10	201.77 c-n	1338.62 i-n	214.57 i	103.71 pqr	768.65 rs	0.45 c-f	64.94 no	7.95 r
AC11	149.12 g-p	2061.95 ef	235.86 fg	90.79 y-aa	892.97 f	0.59 b	85.71 g-j	8.85 no
AC12	180.89 d-o	728.36 t-w	199.03 kl	102.58 qrs	738.24 wx	0.49 c	28.57 vw	8.19 qr
AC13	163.44 e-p	859.38 p-u	169.92 op	106.70 nop	868.65 g	0.22 t-w	62.34 nop	8.26 pqr
AC14	112.81 nop	1076.56 n-r	253.56 e	105.39 opq	789.59 pq	0.33 l-p	64.94 no	9.65 lm
AC15	96.32 op	2139.13 def	229.90 gh	119.06 i	844.32 ij	0.30 n-r	85.71 g-j	9.16 n
AC16	143.98 h-p	534.51 v-y	137.92 st	109.33 lmn	825.41 lmn	0.15 x	93.51 d-g	10.56 i
AC17	194.78 c-o	495.03 wxy	195.53 l	95.47 vw	738.92 wx	0.44 c-g	41.56 stu	12.06 g
AC18	118.48 nop	941.95 p-t	181.54 m	99.40 st	850.41 hi	0.40 f-k	67.53 mno	6.97 t
AC19	122.77 nop	1017.33 o-s	374.34 a	99.21 stu	845.00 ij	0.25 r-u	90.91 e-h	7.16 t
AC20	250.19 b-g	1347.59 i-m	342.35 b	85.92 ab	937.57 c	0.32 m-q	127.27 a	12.10 g
AC21	250.47 b-g	1121.44 m-p	197.39 kl	99.59 st	820.00 mn	0.43 d-h	49.35 rs	8.13 qr
AC22	141.93 i-p	751.69 s-w	226.30 h	108.01 mno	905.14 de	0.28 o-s	70.13 lmn	8.61 op
AC23	110.09 nop	640.41 u-x	213.64 i	128.99 g	749.73 uv	0.09 y	90.91 e-h	15.26 b
AC24	191.96 c-o	642.21 u-x	135.35 tu	94.34 v-y	761.89 st	0.33 m-p	64.07 no	12.65 ef
AC25	128.70 l-p	1004.77 o-s	214.84 i	100.15 rst	888.92 f	0.49 c	54.55 pqr	13.81 d
AC26	281.49 a-d	1119.64 m-p	194.92 l	97.72 tuv	752.43 tuv	0.27 q-t	49.35 rs	11.24 h
AC27	239.01 b-j	320.92 y	131.85 tuv	68.88 af	784.86 q	0.48 cd	51.95 qr	8.60 op
AC28	154.60 f-p	846.82 q-u	209.42 ij	89.10 aaab	764.59 rs	0.18 wx	49.35 rs	8.52 opq
AC29	133.05 k-p	617.08 u-x	171.15 op	115.32 jk	722.03 y	0.18 wx	23.38 w	12.56 ef
AC30	240.45 b-i	1505.54 h-k	169.20 op	102.40 qrs	796.35 op	0.09 y	59.74 opq	7.53 s
AC31	156.62 f-p	696.05 t-x	170.95 op	133.86 ef	711.89 z	0.20 u-x	38.96 tu	11.50 h
AC32	193.66 c-o	1482.21 h-l	132.57 tuv	95.66 uvw	724.73 y	0.48 cd	33.77 uv	8.44 pq
AC33	131.49 k-p	2907.33 a	174.65 mno	95.28 vw	748.38 vw	0.36 i-n	46.75 rst	14.58 c
AC34	135.47 j-p	1904.60 fg	174.96 mno	117.75 ij	785.54 q	0.37 h-m	28.57 vw	12.77 e
AC35	260.71 b-e	841.44 r-u	105.41 x	95.28 vw	830.14 klm	0.28 o-s	51.95 qr	9.94 kl
AC36	330.21 ab	2424.51 c	191.11 l	90.60 yzaa	838.24 jk	0.48 cd	80.52 ijk	10.68 i
AC37	368.17 a	1600.67 hi	165.29 pq	150.52 c	759.19 stu	0.35 j-n	77.92 jkl	10.31 ij

AC38	166.11 e-p	2528.62 bc	193.27 l	112.32 kl	767.30 rs	0.46 cde	54.55 pqr	14.71 c
AC39	233.11 b-l	1424.77 i-l	271.56 d	132.55 f	821.35 mn	0.22 t-w	46.75 rst	5.26 v
AC40	153.47 f-p	2338.36 cd	198.00 kl	151.27 c	826.08 lmn	0.41 e-i	98.70 cde	7.16 t
AC41	286.49 abc	2103.23 def	160.04 q	140.22 d	855.81 h	0.28 o-s	96.10 c-f	14.37 c
AC42	182.48 d-o	1498.36 h-l	228.56 h	136.67 e	815.95 n	0.39 g-l	103.90 c	22.29 a
AC43	174.99 e-p	866.56 p-u	226.91 h	92.66 w-aa	748.38 vw	0.22 t-w	54.55 pqr	7.13 t
AC44	166.55 e-p	1317.08 j-n	179.49 mn	92.28 w-aa	774.73 r	0.36 i-m	59.74 opq	7.34 st
AC45	255.81 b-f	1541.44 hij	195.02 l	111.39 lm	634.86 ac	0.27 p-t	51.95 qr	2.08 aa
AC46	155.92 f-p	1238.10 l-o	163.44 pq	156.52 b	682.16 aa	0.30 n-r	83.12 h-k	7.90 r
AC47	113.50 nop	1514.51 h-k	173.31 no	126.74 gh	895.68 ef	0.25 rstu	54.55 pqr	5.89 u
AC48	126.45 m-p	679.90 t-x	194.51 l	125.99 gh	784.86 q	0.32 m-q	49.35 rs	3.84 x
AC49	111.39 nop	934.77 p-t	161.58 q	91.16 x-aa	805.81 o	0.43 d-h	49.35 rs	5.15 v
AC50	233.49 b-k	766.05 s-v	240.91 f	127.68 gh	908.51 d	0.96 a	124.68 a	8.16 qr
AC51	101.64 nop	1001.18 o-s	182.26 m	73.37 ae	867.30 g	0.19 u-x	85.71 g-j	7.90 r
AC52	71.16 p	1238.10 l-o	180.82 mn	93.97 v-z	626.76 ac	0.23 s-w	114.29 b	8.83 no
AC53	99.82 nop	2401.18 c	105.10 x	81.61 ac	670.68 ab	0.24 r-v	83.12 h-k	3.35 y
AC54	246.90 b-h	2672.21 b	143.89 s	86.67 ab	797.70 op	0.40 f-k	101.30 cd	4.40 w
AC55	107.04 nop	460.92 xy	178.97 mn	106.52 nop	798.38 op	0.35 j-n	88.31 f-i	4.42 w
AC56	136.02 j-p	2332.97 cd	112.51 w	71.12 ae-af	835.54 jkl	0.28 o-s	83.12 h-k	9.92 kl
AC57	131.94 k-p	2280.67 cde	128.77 uv	177.12 a	955.14 b	0.36 i-m	49.35 rs	5.37 v
AC58	122.75 nop	2453.23 bc	210.35 ij	155.21 b	994.32 a	0.40 f-k	77.92 jkl	8.15 qr
AC59	100.88 nop	1107.08 m-q	169.71 op	73.37 ae	805.81 o	0.34 k-o	75.32 klm	5.52 v

WU: seed water uptake, PC: proline content, SSC: soluble sugar content, TPC total phenolic content, AC: Antioxidant activity, CAT: catalase activity, GPA: guaiacol peroxidase activity, LP: lipid peroxidation activity. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S9. Comparison means of seedling physio-chemical parameters collected from 59 barley accessions under 125 μM cadmium stress conditions.

Accessions	WU (%)	PC ($\mu\text{g g}^{-1}$)	SSC ($\mu\text{g g}^{-1}$)	TPC ($\mu\text{g g}^{-1}$)	AA ($\mu\text{g g}^{-1}$)	GPA ($\text{units min}^{-1} \text{g}^{-1}$)	CAT ($\text{units min}^{-1} \text{g}^{-1}$)	LP (nmol g^{-1})
AC1	337.86 a-g	1241.69 l-p	361.48 d	128.24 st	814.59 w	0.32 c-f	88.31 cde	5.76 a-e
AC2	209.28 k-s	1424.77 ijk	216.11 nop	143.60 m	846.35 uv	0.27 g-j	77.92 fgh	7.85 abc
AC3	381.93 abc	1238.10 l-p	216.73 nop	138.91 no	686.89 aa	0.12 t-w	70.13 h-k	7.73 abc
AC4	395.08 a	1223.74 m-p	222.59 n	184.79 f	888.24 rs	0.18 o-s	33.77 uvw	9.47 st
AC5	318.81 a-j	949.13 rst	256.23 jk	148.28 l	737.57 yz	0.08 vwx	41.56 stu	9.05 vw
AC6	322.43 a-i	882.72 st	378.15 bc	148.84 l	951.08 lmn	0.12 t-w	41.56 stu	10.32 r
AC7	257.63 e-o	2126.56 ef	330.00 ef	135.17 pq	1098.38 b	0.24 h-m	62.34 k-n	10.97 nop
AC8	277.13 d-m	1114.26 pq	244.30 kl	136.29 opq	1006.49 gh	0.23 i-o	62.34 k-n	5.18 ag
AC9	246.81 f-p	1078.36 pqr	322.90 f	130.49 rs	980.14 ijk	0.32 c-f	49.35 p-s	10.13 r
AC10	298.61 b-k	1153.74 opq	339.57 e	207.45 c	910.54 pq	0.23 h-n	96.10 bc	8.97 vwx
AC11	238.99 g-p	2013.49 fg	358.40 d	225.06 b	967.97 jkl	0.25 h-l	64.94 j-m	9.02 vw
AC12	298.80 b-k	498.62 xyz	317.65 f	148.28 l	1022.03 fg	0.36 bcd	93.51 cd	10.92 opq
AC13	249.79 e-p	1557.59 hi	321.36 f	142.10 m	998.38 hi	0.25 h-l	46.75 q-t	10.29 r
AC14	247.12 f-p	1220.15 m-p	376.60 bc	124.87 u	861.89 tu	0.07 wx	83.12 efg	11.47 l
AC15	175.97 m-t	2079.90 f	341.73 e	126.18 tu	948.38 lmn	0.18 o-s	93.51 cd	10.76 pq
AC16	264.76 e-o	1207.59 m-p	192.14 q	170.75 h	846.35 uv	0.12 t-w	49.35 p-s	10.76 pq
AC17	225.75 i-q	584.77 wxy	342.96 e	175.43 g	1069.32 c	0.27 f-i	31.17 vwx	12.44 j
AC18	249.99 e-p	703.74 uvw	229.20 mn	136.33 opq	1073.38 c	0.27 g-j	12.99 y	9.56 s
AC19	234.70 h-p	1541.44 hi	342.90 e	96.48 ab	941.62 mno	0.17 p-t	23.38 x	9.29 tu
AC20	259.74 e-o	432.21 yz	406.85 a	137.98 nop	1048.38 de	0.06 x	25.97 wx	18.58 b
AC21	253.31 e-p	2394.00 d	367.65 cd	133.48 qr	1053.11 cd	0.21 k-p	33.77 uvw	11.18 mn
AC22	222.01 i-q	796.56 tuv	388.02 b	142.28 m	961.22 klm	0.18 o-s	28.57 wx	10.16 r
AC23	256.88 e-o	897.08 st	271.56 hi	147.53 l	882.84 rs	0.20 l-q	49.35 p-s	15.61 e
AC24	347.00 a-f	916.82 st	245.74 kl	167.75 h	870.68 st	0.33 bcd	72.73 hij	14.94 g
AC25	232.98 h-p	841.44 tu	254.38 jkl	155.02 jk	930.81 no	0.32 c-f	75.32 ghi	14.74 g
AC26	386.48 ab	1026.31 qrs	284.01 gh	140.79 mn	961.89 klm	0.22 j-p	75.32 ghi	13.79 i
AC27	368.74 a-d	1015.54 qrs	197.59 q	108.76 xy	901.76 qr	0.33 b-e	106.49 a	11.19 mn
AC28	260.35 e-o	586.56 wxy	213.64 nop	111.01 x	940.95 mno	0.15 q-u	93.51 cd	10.19 r
AC29	227.69 i-q	595.54 wx	202.22 pq	129.18 st	892.97 qr	0.32 c-f	57.14 m-p	14.53 h
AC30	295.83 b-k	1598.87 h	254.07 jkl	157.27 j	967.97 jkl	0.23 i-o	62.34 k-n	11.35 lm
AC31	255.92 e-o	1121.44 pq	267.04 ij	197.53 d	988.92 hi	0.27 g-j	38.96 tuv	10.73 q
AC32	247.03 f-p	1374.51 j-m	198.21 q	115.51 w	770.68 x	0.27 g-j	64.94 j-m	8.77 xyz
AC33	206.82 k-s	2727.85 b	275.37 hi	168.76 h	1025.41 fg	0.24 h-m	54.55 n-q	16.55 d
AC34	225.27 i-q	1507.33 hij	240.19 klm	120.37 v	924.05 op	0.19 n-r	46.75 q-t	16.98 c
AC35	295.10 b-k	3598.36 a	152.22 rs	182.73 f	1053.78 cd	0.26 h-k	54.55 n-q	11.13 mno
AC36	286.70 c-l	2386.82 d	280.62 ghi	206.33 c	1041.62 def	0.36 bcd	57.14 m-p	12.50 j

AC37	271.35 d-n	1304.51 k-o	218.58 no	155.58 jk	945.68 mn	0.37 bc	59.74 l-o	12.42 j
AC38	204.95 k-s	2659.64 bc	290.80 g	188.91 e	901.08 qr	0.28 e-h	54.55 n-q	15.34 f
AC39	188.97 l-s	1406.82 ijk	403.46 a	208.20 c	1118.65 a	0.21 k-p	75.32 ghi	8.47 aaab
AC40	259.90 e-o	2289.90 d	292.14 g	154.64 jk	910.54 pq	0.42 a	85.71 def	8.77 xyz
AC41	290.53 b-l	2114.00 ef	239.26 lm	190.79 e	924.05 op	0.23 h-n	51.95 o-r	13.79 i
AC42	348.39 a-e	1559.38 hi	344.51 e	154.27 jk	1040.95 def	0.38 b	106.49 a	25.27 a
AC43	241.22 g-p	1342.21 j-n	344.20 e	183.30 f	832.84 v	0.27 g-j	57.14 m-p	8.77 xyz
AC44	166.04 o-t	1430.92 ijk	215.80 nop	104.64 zaa	786.22 x	0.34 bcd	67.73 i-l	9.52 st
AC45	333.29 a-h	2562.72 c	376.30 bc	185.17 f	910.54 pq	0.37 bc	96.10 bc	14.76 g
AC46	197.80 k-s	1487.08 hij	204.57 opq	163.93 i	719.32 z	0.31 d-g	103.59 ab	8.71 yz
AC47	154.72 p-t	1239.90 l-p	294.19 g	130.67 rs	954.23 lm	0.10 uvw	48.61 p-s	10.11 r
AC48	132.17 q-t	909.13 st	291.30 g	131.05 rs	890.95 qrs	0.19 m-r	52.34 o-r	8.27 ab
AC49	218.12 j-r	367.59 z	196.98 q	106.40 yz	871.35 st	0.36 bcd	44.16 rst	6.40 a-d
AC50	189.00 l-s	658.36 vw	381.54 bc	129.74 s	986.22 hij	0.33 b-e	54.55 n-q	9.50 st
AC51	117.58 st	1019.64 qrs	245.93 kl	124.61 u	1028.78 ef	0.07 wx	60.13 l-o	8.90 wxy
AC52	86.92 t	1172.46 n-q	254.94 jkl	116.07 w	743.65 y	0.17 p-t	49.61 p-s	12.40 j
AC53	121.52 rst	1397.26 i-l	155.74 r	102.06 aa	722.70 z	0.43 a	75.02 ghi	7.85 ac
AC54	170.87 n-t	1358.36 j-m	94.20 t	110.52 x	852.43 tuv	0.08 vwx	40.82 stu	8.60 zaa
AC55	219.07 j-r	373.49 z	216.48 nop	135.73 opq	884.86 rs	0.15 q-u	106.88 a	5.42 af
AC56	212.69 k-s	1227.33 m-p	141.11 s	91.80 ac	1072.03 c	0.15 r-u	64.94 j-m	11.88 k
AC57	165.09 o-t	1905.54 g	202.59 opq	234.42 a	990.27 hi	0.13 s-v	44.94 q-t	8.98 vwx
AC58	198.53 k-s	2257.59 de	252.41 jkl	168.24 h	991.85 hi	0.04 x	33.77 uvw	12.52 j
AC59	178.67 m-t	1232.72 l-p	224.38 n	153.37 k	967.97 jkl	0.28 e-h	62.34 k-n	9.19 uv

WU: seed water uptake, PC: proline content, SSC: soluble sugar content, TPC total phenolic content, AC: Antioxidant activity, CAT: catalase activity, GPA: guaiacol peroxidase activity, LP: lipid peroxidation activity. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S10. Comparison means of seedling physio-chemical parameters collected from 59 barley accessions under 250 μ M cadmium stress conditions.

Accessions	WU (%)	PC (μ g g ⁻¹)	SSC (μ g g ⁻¹)	TPC (μ g g ⁻¹)	AA (μ g g ⁻¹)	GPA (units min ⁻¹ g ⁻¹)	CAT (units min ⁻¹ g ⁻¹)	LP (nmol g ⁻¹)
AC1	290.23 abc	1674.26 o-t	314.88 r	102.77 ad	986.89 mn	0.19 u-x	38.96 qrs	10.42 yz
AC2	200.90 e-p	3081.44 hi	374.75 lm	191.16 ij	1071.35 fg	0.53 de	64.94 lmn	9.48 aa
AC3	349.26 abc	4497.59 d	275.99 wx	235.36 cd	1188.91 a	0.40 h-k	72.73 kl	7.94 a-d
AC4	236.08 b-m	1726.31 o-t	674.75 b	170.56 q	959.86 p	0.48 d-g	80.52 jk	13.55 m
AC5	283.78 abc	2273.74 lm	506.23 f	203.15 fg	990.94 m	0.34 lmn	67.53 lm	14.42 ijk
AC6	313.33 abc	769.64 aa	555.00 d	236.29 c	1183.51 a	0.23 r-v	59.74 l-o	11.42 vw
AC7	214.27 c-o	2300.67 lm	407.47 k	152.77 tu	684.86 a-f	0.23 r-v	25.97 tu	13.58 m
AC8	260.50 abc	2158.87 mn	254.38 z-ac	225.81 e	1057.16 i 812.57 z- aa	0.25 p-u	93.51 ghi	11.10 wx
AC9	215.69 c-o	1613.23 p-u	354.07 nop	134.23 y	912.57 u	0.32 m-p	57.14 m-p	15.60 g
AC10	214.28 c-o	2428.10 klm	304.69 rst	159.33 s	1096.35 e	0.12 x-ab	51.95 nop	12.56 opq
AC11	200.67 e-p	2336.56 lm	309.94 rs	172.62 pq	1061.22 hi	0.15 w-aa	64.94 lmn	12.45 pqr
AC12	245.43 abc	1123.23 xyz	498.83 f	158.76 s	809.86 aa	0.30 m-q	111.69 ef	10.12 z
AC13	176.91 i-r	1069.38 yz	450.37 h	201.82 g	916.62 tu	0.27 o-s	67.53 lm	11.68 tuv
AC14	290.08 abc	1422.97 t-w	443.58 hi	144.53 w	1008.51 l	0.20 s-w	59.74 l-o	14.74 hi
AC15	87.68 s	2569.90 jkl	405.62 k	206.70 f	881.49 v	0.24 q-v	72.73 kl	9.06 ab-ac
AC16	234.60 b-m	1476.82 s-w	246.36 ab-ac	149.21 uv	962.57 p	0.32 m-p	33.77 rst	10.97 x
AC17	184.90 g-r	1762.21 o-s	809.012 a	194.53 hi	923.38 rst	0.63 c	64.94 lmn	14.00 l
AC18	254.43 abc	1365.54 u-x	193.58 af	150.52 uv	1045.00 j	0.31 m-p	31.17 stu	13.10 n
AC19	243.97 abc	3031.18 i	365.80 mn	103.71 ac-ad	1078.11 f	0.11 y-ac	64.94 lmn	10.53 y
AC20	222.75 c-n	1764.00 o-s	469.81 g	129.55 z	927.43 rs 1067.97 gh	0.21 s-w	90.91 hij	18.90 b
AC21	236.07 b-m	2453.23 klm	253.77 z-ac	175.24 op	911.89 u	0.18 v-y	44.16 pqr	11.50 uv
AC22	188.15 f-q	4307.33 de	380.62 l	180.11 mn	1020.68 k	0.19 u-x	20.78 u	10.32 yz
AC23	223.11 c-n	4461.69 d	298.72 s-v	183.67 lm	962.57 p	0.21 s-w	49.35 opq	16.89 e
AC24	263.16 abc	2652.46 jk	292.04 tuv	245.09 b	919.32 stu	0.44 f-i	132.47 cd	17.53 d
AC25	210.24 c-p	4415.03 d	359.32 no	323.93 a	826.08 y	0.47 e-h	145.45 ab	15.46 g
AC26	254.72 abc	1694.00 o-t	423.82 j	169.25 q	948.38 q	0.42 f-k	103.90 fg	15.66 g
AC27	278.21 abc	2476.56 kl	232.16 ad	177.68 no	917.97 stu	0.36 k-n	148.05 a	14.99 h
AC28	249.18 abc	3332.72 gh	400.37 k	195.28 hi	1027.43 k	0.25 p-u	85.71 ij	11.88 st
AC29	211.70 c-o	2394.00 klm	524.14 e	172.81 pq	844.73 x	0.48 def	62.34 l-o	14.53 ij
AC30	269.49 abc	1972.21 no	289.57 uv	163.26 r	766.62 a-d	0.26 p-t	62.34 l-o	12.68 opq
AC31	173.49 i-r	1004.77 y-aa	265.19 xyz	186.85 kl	868.65 w	0.33 mno	93.51 ghi	11.80 tu
AC32	202.53 d-p	5436.31 b	241.73 ac-ad	171.50 pq	828.11 y	0.44 f-j	54.55 m-p	9.27 aaab
AC33	184.08 g-r	4097.33 ef	432.16 ij	191.35 ij	878.78 v	0.40 i-l	103.90 fg	18.10 c
AC34	207.86 d-p	1559.38 q-v	394.50 k	139.10 x	917.97 stu	0.43 f-k	101.30 fgh	17.11 e
AC35	260.48 abc	958.10 zaa	430.31 j	197.34 h	1027.43 k	0.42 g-k	124.68 cd	11.63 tuv
AC36	254.22 abc	2763.74 j	344.51 pq	194.53 hi		0.62 c	106.49 f	13.08 n

AC37	231.85 c-n	3199.90 hi	261.28 y-aa	190.04 jk	1126.08 d	0.54 d	129.87 cd	12.85 no
AC38	165.33 k-r	5339.38 b	310.04 rs	178.05 no	1137.57 c	0.82 a	127.27 cd	14.48 ij
AC39	161.98 l-s	1471.43 s-w	605.93 c	227.30 e	1024.05 k	0.52 de	111.69 ef	8.84 ac
AC40	177.60 i-r	4910.41 c	302.63 r-u	163.45 r	878.78 v	0.48 def	62.34 l-o	12.32 qr
AC41	279.83 abc	3524.77 g	206.85 ae	180.67 mn	1165.95 b	0.37 j-m	122.08 de	16.21 f
AC42	229.20 c-n	1805.28 o-r	339.88 q	154.64 t	820.68 yz	0.73 b	135.06 bc	27.48 a
AC43	200.45 e-p	1615.03 p-u	296.36 s-v	146.97 vw	797.03 ab	0.06 ab-ad	36.36 rst	14.50 ij
AC44	179.96 h-r	1912.97 nop	256.54 y-ab	126.20 z	766.62 a-d	0.02 ad	28.57 stu	15.58 g
AC45	230.27 c-n	1358.36 u-x	183.09 af	128.61 z	678.11 a-f	0.10 z-ac	49.35 opq	15.58 g
AC46	129.64 p-s	1541.44 q-w	242.35 ac-ad	169.81 q	797.70 ab	0.08 aa-ad	36.36 rst	9.37 aaab
AC47	135.18 o-s	1512.72 r-w	343.58 pq	127.87 z	710.54 a-e	0.15 w-aa	54.55 m-p	17.08 e
AC48	116.24 qrs	1842.98 opq	347.28 opq	140.79 x	875.40 vw	0.16 w-z	54.55 m-p	12.68 opq
AC49	183.23 g-r	1268.62 v-y	190.80 af	119.06 aa	929.46 r	0.31 m-p	38.96 qrs	12.15 rs
AC50	151.25 n-s	2675.79 jk	242.03 acad	185.54 l	924.05 rst	0.30 n-r	49.35 opq	14.25 jkl
AC51	167.00 j-r	1424.77 t-w	259.63 y-ab	152.77 tu	1061.89 hi	0.07 ab-ad	64.94 lmn	12.48 pqr
AC52	115.33 qrs	2315.03 lm	254.69 y-ac	155.77 st	807.84 aa	0.19 t-w	44.16 pqr	14.13 kl
AC53	186.78 g-q	1238.10 w-z	287.10 vw	102.21 ad	794.32 ab	0.20 s-w	44.16 pqr	8.81 ac
AC54	167.25 j-r	1764.00 o-s	82.16 ah	110.82 ab	873.38 vw	0.06 ab-ad	44.16 pqr	13.62 m
AC55	192.55 f-q	5836.56 a	248.21 aa-ac	186.67 kl	686.22 af	0.07 ab-ad	49.35 opq	7.55 ae
AC56	105.61 rs	1794.51 o-r	128.46 ag	106.90 ac	780.81 ac	0.09 aa-ad	57.14 m-p	14.60 ij
AC57	159.52 m-s	3907.08 f	259.94 y-ab	232.18 d	981.49 n	0.05 ac-ad	38.96 qrs	11.40 vw
AC58	113.47 qrs	1516.30 r-w	376.91 lm	179.18 no	963.24 p	0.18 v-y	54.55 m-p	15.07 h
AC59	166.97 j-r	3925.02 f	268.58 xy	204.46 fg	1018.65 k	0.20 s-w	62.34 l-o	12.79 nop

WU: seed water uptake, PC: proline content, SSC: soluble sugar content, TPC total phenolic content, AC: Antioxidant activity, CAT: catalase activity, GPA: guaiacol peroxidase activity, LP: lipid peroxidation activity. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).

Table S11. Comparison means of seedling physio-chemical parameters collected from 59 barley accessions under 500 μ M cadmium stress conditions.

Accessions	WU (%)	PC ($\mu\text{g g}^{-1}$)	SSC ($\mu\text{g g}^{-1}$)	TPC ($\mu\text{g g}^{-1}$)	AA ($\mu\text{g g}^{-1}$)	GPA ($\text{units min}^{-1} \text{g}^{-1}$)	CAT ($\text{units min}^{-1} \text{g}^{-1}$)	LP (nmol g^{-1})
AC1	234.00 ab	1485.79 xyz	359.63 qr	116.44 y	811.22 rs	0.67 bc	44.16 p-s	4.40 a-d
AC2	157.43 e-o	2927.08 o	494.51 i	157.64 o	1064.59 def	0.60 de	59.74 k-n	11.72 opq
AC3	204.89 a-g	3168.84 n	487.72 ij	211.01 g	713.24 wx	0.53 fg	83.12 gh	10.89 tuv
AC4	203.88 a-h	2907.33 o	555.62 g	164.01 n	1079.46 d	0.20 o-s	80.52 hi	17.31 e
AC5	225.45 abc	2083.49 t	382.16 op	169.06 m	915.27 q	0.49 gh	36.36 rst	11.33 q-t
AC6	236.91 a	2928.87 o	516.42 h	170.94 lm	826.76 r	0.39 i	64.94 j-m	10.85 uv
AC7	140.84 h-r	1738.87 vw	360.56 qr	103.15 ac	582.16 ab	0.06 ab-ac	51.95 n-q	4.48 a-d
AC8	224.75 abc	1943.49 tu	336.07 tu	103.90 ab-ac	945.68 p	0.35 ij	49.35 n-q	7.26 ab
AC9	177.25 a-m	1591.69 wx	350.16 rs	127.30 vwxx	795.68 st	0.35 ij	59.74 k-n	12.77 lm
AC10	159.29 e-o	2727.85 pq	322.901 uv	155.20 op	1045.68 fgh	0.70 abc	64.94 j-m	11.10 r-u
AC11	229.78 abc	2815.80 op	471.98 k	182.73 ij	1080.81 d	0.27 l-o	70.13 jk	14.84 h
AC12	170.63 c-m	1015.54 abc	372.59 pq	230.67 d	1178.78 a	0.71 ab	174.03 a	18.02 d
AC13	166.83 c-n	1948.87 tu	478.35 jk	132.55 tu	1068.65 de	0.29 klm	57.14 l-o	14.21 j
AC14	190.41 a-j	2666.82 pq	617.96 e	197.53 h	1133.51 b	0.22 o-r	64.94 j-m	16.40 f
AC15	116.93 l-r	2108.62 t	492.04 i	142.66 rs	947.03 p	0.24 m-p	51.95 n-q	13.33 k
AC16	210.13 a-e	3896.31 j	369.51 pq	213.46 fg	1015.27 j-m	0.215 o-s	15.58 v	17.23 e
AC17	175.70 a-m	1873.49 uv	557.16 g	180.49 jk	818.65 r	0.59 e	64.94 j-m	15.18 gh
AC18	207.38 a-f	448.36 ad-ae	142.96 ad-ae	86.10 a-f	659.19 yz	0.19 p-u	49.35 n-q	5.95 ac
AC19	114.88 m-r	3404.51 m	388.33 no	93.60 a-e	990.95 no	0.23 m-p	54.55 m-p	11.45 qrs
AC20	151.69 e-q	3614.51 l	554.38 g	140.97 s	788.92 t	0.12 v-ab	33.77 st	11.97 nop
AC21	167.52 c-n	3776.05 jk	335.25 tu	232.73 cd	932.84 pq	0.34 ijk	18.18 v	11.42 qrs
AC22	192.96 a-j	2291.69 s	239.26 y	144.91 qr	699.05 x	0.14 t-z	20.78 uv	12.16 no
AC23	199.38 a-i	2650.67 q	316.11 v	124.49 x	982.16 no	0.20 p-t	64.94 j-m	17.531 e
AC24	184.81 a-k	3524.77 lm	501.30 i	296.59 b	1013.92 klm	0.46 h	72.73 ij	11.66 pq
AC25	172.92 b-m	2009.90 tu	400.06 n	307.27 a	1064.59 def	0.65 cd	174.03 a	14.34 ij
AC26	176.42 a-m	1227.33 ab	198.52 aa	174.49 l	921.35 q	0.31 jkl	93.51 ef	19.90 b
AC27	201.01 a-h	4287.59 i	299.75 w	163.45 n	1001.08 lmn	0.40 i	111.69 cd	14.24 j
AC28	179.37 a-l	2715.29 pq	339.57 st	232.17 cd	1014.59 j-m	0.31 jkl	46.75 o-r	14.15 j
AC29	175.09 a-m	3654.00 kl	585.25 f	220.00 e	1026.08 h-k	0.58 ef	33.77 st	12.35 mn
AC30	190.19 a-j	2017.08 tu	424.14 m	236.10 c	917.30 q	0.40 i	116.88 c	13.26 k
AC31	189.62 a-j	1509.13 xy	288.95 w	126.74 wx	1018.65 i-l	0.28 lmn	54.55 m-p	19.06 c
AC32	143.07 g-r	934.77 abc	167.96 abc	117.57 y	753.78 u	0.15 t-y	33.77 st	10.52 vw
AC33	143.29 g-r	7563.23 d	1185.86 a	199.78 h	986.89 no	0.60 de	90.91 efg	15.34 g
AC34	149.97 e-r	4732.72 h	456.85 l	158.76 o	1024.06 h-l	0.32 jkl	41.56 qrs	11.07 stu
AC35	223.97 a-d	1589.90 wx	332.16 tu	155.40 op	992.97 mno	0.15 s-x	67.53 jkl	15.47 g
AC36	198.12 a-i	8466.05 c	992.65 b	215.69 f	1037.57 g-j	0.71 ab	142.86 b	14.84 h
AC37	161.15 d-o	5491.95 g	353.77 r	233.86 cd	1179.46 a	0.67 bc	135.06 b	13.16 kl

AC38	153.74 e-p	9236.05 b	544.20 g	210.45 g	1174.73 a	0.75 a	85.71 fgh	16.47 f
AC39	132.90 j-r	6712.46 f	800.37 d	234.04 cd	1054.46 efg	0.56 ef	96.10 e	9.87 x
AC40	152.04 e-q	9390.41 a	387.71 no	182.92 ij	974.05 o	0.45 h	70.13 jk	14.76 hi
AC41	181.16 a-k	6999.64 e	456.85 l	152.40 p	1039.59 ghi	0.49 gh	106.49 d	17.56 e
AC42	141.30 g-r	6744.77 f	864.26 c	219.44 e	930.81 pq	0.70 abc	80.52 hi	29.40 a
AC43	148.32 e-qr	1020.92 ac	215.19 z	115.88 yz	787.57 t	0.10 w-ac	44.16 p-s	10.097 wx
AC44	98.31 o-r	514.77 ad	182.78 ab	103.15 ac	647.03 z	0.12 v-ab	46.75 o-r	4.51 a-d
AC45	136.94 i-r	1265.02 aaab	154.69 ac-ad	119.64 y	623.38 aa	0.21 o-s	57.14 l-o	10.79 uv
AC46	93.12 pqr	1416.39 y-aa	134.01 ae	99.21 ad	673.38 y	0.07 aa-ac	46.75 o-r	14.85 h
AC47	140.52 h-r	999.38 ac	186.48 aaab	112.51 zaa	715.95 wx	0.089 y-ac	44.16 p-s	9.42 y
AC48	105.09 n-r	358.61 ae	111.79 af	135.54 t	557.16 ac	0.10 w-ac	59.74 k-n	3.55 a-e
AC49	173.10 b-m	1326.05 z-ab	120.43 af	118.69 y	661.89 yz	0.17 q-v	28.57 tu	8.66 z
AC50	130.74 j-r	3657.59 kl	162.41 ac	178.61 k	1076.08 de	0.16 r-w	46.75 o-r	11.55 pqr
AC51	160.66 e-o	1392.46 y-aa	362.10 qr	129.36 uvw	1176.08 a	0.13 u-aa	57.14 l-o	13.93 j
AC52	87.53 r	1670.66 w	369.81 pq	106.14 ab-ac	759.19 u	0.05 ac	44.16 p-s	4.82 a-d
AC53	90.11 qr	940.15 ac	295.12 w	86.67af	731.48 vw	0.097 x-ac	51.95 n-q	11.69 pq
AC54	122.50 k-r	1449.89 xyz	90.80 ag	95.28 ae	765.27 u	0.097 x-ac	44.16 p-s	3.43 a-e
AC55	159.69 e-o	2499.90 r	138.64 ae	130.86 uv	650.40 z	0.08 z-ac	44.16 p-s	10.98 s-v
AC56	114.25 m-r	1708.36 w	107.78 af	107.64 ab	794.32 st	0.07 aa-ac	64.94 j-m	7.77 aa
AC57	147.47 e-r	3815.53 j	262.42 x	185.54 i	1104.46 c	0.23 n-q	41.56 qrs	6.24 ac
AC58	144.28 f-r	1961.43 tu	195.74 aaab	147.34 q	1071.35 de	0.14 t-z	59.74 k-n	14.89 h
AC59	141.14 g-r	1074.76 ac	211.79 z	111.39 aa	749.73 uv	0.14 t-z	44.16 p-s	3.44 a-e

WU: seed water uptake, PC: proline content, SSC: soluble sugar content, TPC total phenolic content, AC: Antioxidant activity, CAT: catalase activity, GPA: guaiacol peroxidase activity, LP: lipid peroxidation activity. The numbers (AC1-AC59) represent the barley genotypes. According to Duncan's multiple-range test, different letters indicate that there is a significant difference between the mean values ($p \leq 0.01$).