Supplementary Materials

Assessment of drought tolerance of *Miscanthus* genotypes to use in bioenergy crop development through dry-down treatment and fixed-soil-moisture-content techniques

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SUPPLEMENTARY DATA
Supplementary Table S1, S2, S3, S4, &S5; Supplementary Figure S1 &S2

Supplemental Table S1. Detailed information of 29 *Miscanthus* genotypes used for the evaluation of low-water-adaptability capacity in *Miscanthus* spp., including entry number, species, origin location, and genetic groups background. Some information is not available for some genotypes

Species	Accession	Genetic clusters†	Type	Country of origin	Cultivar/ Strain name	Place	Latitude	Longitude
M. sacchariflorus	UI11-00033	S Japan 4x Msa	Wild	Japan		Gifu		
M. sacchariflorus	JPN-2011-010	N Japan 4x Msa	Wild	Japan		Hokkaido	42.61618	141.8116
M. sacchariflorus	JPN-2011-004	S Japan 4x Msa	Wild	Japan		Gifu	36.16943	137.3095
M. sacchariflorus	JPN-2011-006	S Japan 4x Msa	Wild	Japan		Gifu	35.3246	136.693
M. sacchariflorus	JPN-2010-005	N Japan 4x Msa	Wild	Japan		Hokkaido	42.61475	141.8167
M. sacchariflorus	UI11-00031	Yangtze diploids (ssp. lutarioriparius) Msa	Wild	China				

M. sacchariflorus	RU2012-169	NEChina/Korea/Russia diploids Msa	Wild	Russia		Primorsky Krai	45.34596	133.5559
M. sacchariflorus	RU2012-183	NEChina/Korea/Russia diploids Msa	Wild	Russia			43.75422	132.0818
M. sacchariflorus	RU2012-056.1WD (4x)	NChina/Korea/Russia tetraploids Msa	Wild	Russia			48.82444	135.948
M. sacchariflorus	JM11-006	S Japan 4x Msa	Wild	Japan		Yamaguchi	34.1986667	131.2806
M. sacchariflorus	UI10-00008	NEChina/Korea/Russia diploids Msa	Cultivar	Unknown	Hortico			
M. sacchariflorus	RU2012-141	NEChina/Korea/Russia diploids Msa	Wild	Russia			47.50762	134.7411

M. sinensis	PMS-164	Yangtze-Qinling Msi	Wild	China		Hebei	37.3400167	114.281
M. sinensis	PMS-007	Yangtze-Qinling Msi	Wild	China		Hubei	30.79765	110.2624
M. sinensis	UI10-00092	C Japan Msi	Cultivar		Strictus			
M. sinensis	PMS-586	Sichuan Msi	Wild	China		Guizhou	27.0010333	108.699
M. sinensis	UI10-00024	S Japan Msi	Cultivar		Arabesque			
M. sinensis var. *condensatus*	UI10-00015	C Japan Msi	Cultivar		Cosmopolitan			
M. sinensis	PMS-014	Sichuan Msi	Wild	China		Hubei	29.6570167	109.1195
M. sinensis	UI10-00097	S Japan Msi	Cultivar		Variegatus			
M. sinensis	UI10-00088	C Japan Msi	Cultivar		Silberturm (Silver Tower)			

M. sinensis	PMS-347	SE China Msi	Wild	China		Guangdong	24.1679833	115.8839
M. sinensis	UI10-00020	S Japan Msi	Cultivar		Adagio			
M. sinensis	PMS-285	Yangtze-Qinling Msi	Wild	China		Anhui	29.64345	118.1584
M. sinensis	UI10-00100	S Japan Msi	Cultivar		Yaku Jima			
M. sinensis	UI10-00053	S Japan Msi	Cultivar		Grosse Fontaine			
M. sinensis	UI10-00080	C Japan Msi	Cultivar		Roland			
M. sinensis	UI10-00048	S Japan Msi	Cultivar		Gracillimus			
M. floridulus	PI417947	SE China Msi	Wild	Papua New Guinea	NG77-022			

†According to Clark *et al*. (2014) and Clark *et al*. (2019)

Supplemental Table S2-1. Least squares means of drought stress index (DSI) values of chlorophyll fluorescence (φPSII) of *Miscanthus* genotypes in a screening experiment at Brigham Young University, Provo, Utah, USA

Species	Accession	Stress level†	DSI of φPSII
M. sinensis	PMS-007	1	102.89 A‡
M. sinensis	UI10-00088	1	84.10 AB
M. sinensis	PMS-285	1	75.91 AB
M. sinensis	PMS-164	2	67.81 AB
M. sacchariflorus	UI11-00031	1	61.13 AB
M. floridulus	PI417947	1	59.20 AB
M. sinensis	PMS-347	1	52.71 AB
M. sinensis	PMS-014	1	52.58 AB
M. floridulus	PI417947	2	51.15 AB
M. sinensis	PMS-007	2	47.43 AB
M. sinensis	PMS-285	2	44.68 AB
M. sinensis	PMS-164	1	42.87 AB
M. sacchariflorus	UI11-00031	2	33.91 AB
M. sinensis	PMS-586	1	32.91 AB
M. sinensis	UI10-00088	2	16.86 AB
M. sinensis	PMS-014	2	0.019 AB

M. sinensis	PMS-586	2	-7.23 AB
M. sinensis	PMS-347	2	-17.19 B

†Stress level 1 represents the slight drought stress treatment and stress level 2 represents the severe drought stress treatment.

‡Least squares means with the same letter are not significantly different ($p < 0.05$).

Supplemental Table S2-2. Least squares means of drought stress index (DSI) values of chlorophyll fluorescence (φPSII) of *Miscanthus* genotypes in a precise-comparison experiment at Hokkaido University, Sapporo, Japan

Species	Accession	Stress level†	DSI of φPSII
M. sinensis	PMS-285	2	163.24 A‡
M. sinensis	UI10-00024	2	114.06 AB
M. sinensis	PMS-164	2	98.95 ABC
M. sinensis	PMS-285	1	94.04 ABC
M. sacchariflorus	JPN-2011-004	2	80.80 ABC
M. sinensis	PMS-347	2	80.06 ABC
M. sinensis	UI10-00024	1	74.97 BC
M. sinensis	PMS-007	1	71.52 BC
M. sinensis	PMS-007	2	68.85 BC
M. sacchariflorus	UI10-00008	1	67.99 BC
M. sinensis	UI10-00020	2	65.80 BC
M. sinensis	PMS-164	1	63.64 BC
M. sinensis	UI10-00020	1	62.51 BC
M. sacchariflorus	UI11-00033	2	61.95 BC
M. sacchariflorus	UI10-00008	2	53.70 BC
M. sacchariflorus	JPN-2011-004	1	53.15 BC
M. sinensis var. condensatus	UI10-00015	2	51.87 BC

M. sinensis	PMS-347	1	47.97 BC
M. sacchariflorus	UI11-00033	1	39.22 C
M. sinensis var. condensatus	UI10-00015	1	37.81 C

†Stress level 1 represents the slight drought stress treatment and stress level 2 represents the severe drought stress treatment.

‡Least squares means with the same letter are not significantly different ($p < 0.05$).

Supplemental Table S3-1. Least squares means of drought stress index (DSI) values of photosynthetic rate (Pn) of *Miscanthus* genotypes in a screening experiment at Brigham Young University, Provo, Utah, USA

Species	Accession	Stress level†	DSI of Pn
M. sinensis	PMS-164	2	124.48 A‡
M. sinensis	UI10-00088	1	99.62 A
M. sinensis	PMS-007	1	94.39 A
M. floridulus	PI417947	1	89.04 A
M. sinensis	PMS-285	1	86.75 A
M. floridulus	PI417947	2	82.02 A
M. sinensis	PMS-285	2	71.93 A
M. sinensis	PMS-007	2	66.02 A
M. sacchariflorus	UI11-00031	1	63.54 A
M. sinensis	PMS-014	1	56.38 A
M. sinensis	PMS-164	1	42.95 A
M. sinensis	PMS-586	1	39.28 A
M. sinensis	PMS-347	1	36.13 A
M. sacchariflorus	UI11-00031	2	35.86 A
M. sinensis	UI10-00088	2	21.59 A
M. sinensis	PMS-586	2	3.16 A
M. sinensis	PMS-014	2	-0.86 A

M. sinensis	PMS-347	2	-5.47 A

†Stress level 1 represents the slight drought stress treatment and stress level 2 represents the severe drought stress treatment.

‡Least squares means with the same letter are not significantly different ($p < 0.05$).

Supplemental Table S3-2. Least squares means of drought stress index (DSI) values of photosynthetic rate (Pn) of *Miscanthus* genotypes in a precise-comparison experiment at Hokkaido University, Sapporo, Japan

Species	Accession	Stress level†	DSI of Pn
M. sinensis	PMS-007	1	77.31 A‡
M. sacchariflorus	UI11-00033	2	76.05 A
M. sinensis var. condensatus	UI10-00015	1	75.19 A
M. sinensis var. *condensatus*	UI10-00015	2	66.66 AB
M. sacchariflorus	JPN-2011-004	2	63.66 ABC
M. sinensis	UI10-00024	1	62.08 ABC
M. sacchariflorus	JPN-2011-004	1	61.20 ABC
M. sinensis	PMS-285	1	58.94 ABC
M. sinensis	PMS-007	2	56.27 ABC
M. sacchariflorus	UI11-00033	1	55.11 ABC
M. sinensis	PMS-285	2	54.60 ABC
M. sinensis	PMS-347	1	52.45 ABCD
M. sinensis	UI10-00020	1	51.97 ABCD
M. sinensis	PMS-164	1	37.64ABCD
M. sinensis	PMS-347	2	35.96 BCD
M. sinensis	PMS-164	2	34.95 CD
M. sacchariflorus	UI10-00008	2	15.46 D

M. sacchariflorus	UI10-00008	1	8.71 D

† Stress level 1 represents the slight drought stress treatment and stress level 2 represents the severe drought stress treatment.

‡Least squares means with the same letter are not significantly different ($p < 0.05$).

Supplemental Table S4-1. Least squares means of drought stress index (DSI) values of stomatal conductance (gs) of *Miscanthus* genotypes in a screening experiment at Brigham Young University, Provo, Utah, USA

Species	Accession	Stress level†	DSI of gs
M. sinensis	PMS-164	2	223.67 A‡
M. floridulus	PI417947	1	205.71 A
M. sinensis	PMS-164	1	195.37 A
M. sinensis	UI10-00088	1	188.70 A
M. sinensis	PMS-007	1	181.12 A
M. sinensis	PMS-285	1	177.53 A
M. sinensis	PMS-007	2	117.85 A
M. floridulus	PI417947	2	109.87 A
M. sinensis	PMS-586	1	104.44 A
M. sinensis	PMS-285	2	96.88 A
M. sinensis	PMS-347	1	88.73 A
M. sacchariflorus	UI11-00031	1	79.86 A
M. sinensis	UI10-00088	2	53.99 A
M. sinensis	PMS-014	1	53.59 A
M. sacchariflorus	UI11-00031	2	31.96 A
M. sinensis	PMS-586	2	8.55 A
M. sinensis	PMS-014	2	-4.02 A

M. sinensis	PMS-347	2	-28.86 A

† Stress level 1 represents the slight drought stress treatment and stress level 2 represents the severe drought stress treatment.

‡Least squares means with the same letter are not significantly different ($p < 0.05$).

Supplemental Table S4-2. Least squares means of drought stress index (DSI) values of stomatal conductance (gs) of *Miscanthus* genotypes in a precise-comparison experiment at Hokkaido University, Sapporo, Japan

Species	Accession	Stress level†	DSI of gs
M. sinensis	PMS-164	1	824.29 A‡
M. sinensis	PMS-007	2	148.33 B
M. sinensis var. condensatus	UI10-00015	2	105.52 B
M. sinensis	UI10-00024	2	97.24 B
M. sacchariflorus	UI11-00033	1	70.15 BC
M. sinensis	PMS-285	2	43.53 BC
M. sinensis var. condensatus	UI10-00015	1	27.49 BC
M. sinensis	PMS-007	1	27.32 BC
M. sinensis	PMS-164	2	26.25 BC
M. sinensis	PMS-285	1	24.51 BC
M. sinensis	UI10-00024	1	24.14 BC
M. sinensis	PMS-347	1	15.97 BC
M. sacchariflorus	JPN-2011-004	1	9.21 BC
M. sinensis	UI10-00020	1	7.47 BC
M. sacchariflorus	UI10-00008	1	5.49 BC
M. sacchariflorus	JPN-2011-004	2	-16.64 BC
M. sinensis	PMS-347	2	-43.31 BC

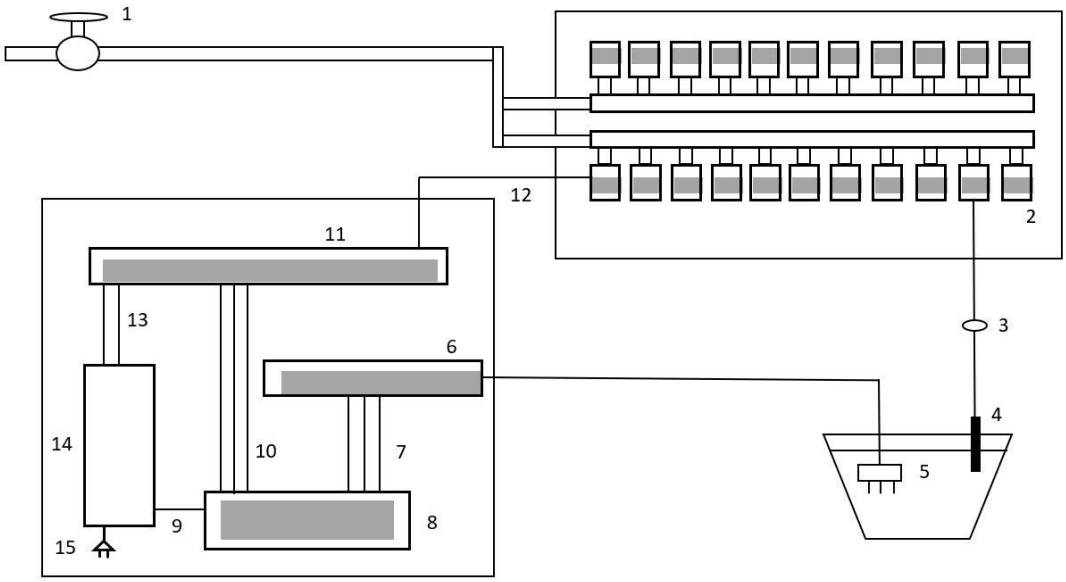
M. sacchariflorus	UI10-00008	2	-49.48 BC
M. sinensis	UI10-00020	2	-60.07 BC
M. sacchariflorus	UI11-00033	2	-118.04 C

†Stress level 1 represents the slight drought stress treatment and stress level 2 represents the severe drought stress treatment.

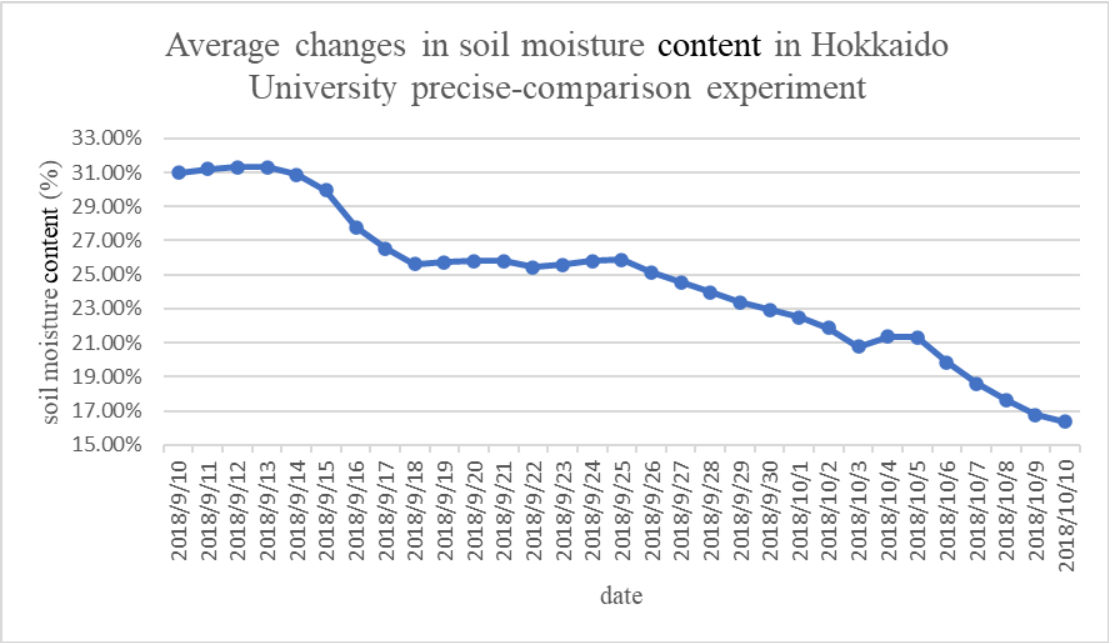
‡Least squares means with the same letter are not significantly different ($p < 0.05$).

Supplemental Table S5. Photosynthetic rate (Pn) of each *Miscanthus* genotype under each soil water content level in a precise-comparison experiment at Hokkaido University, Sapporo, Japan

		Pn (μmol $CO_2 \bullet m^{-2} \bullet s^{-1}$) in each soil water content level			
Species	Accession	30%	25%	20%	15%
M. sinensis	PMS-007	13.608	9.684	7.475	0.258
M. sinensis	PMS-285	15.008	7.761	7.457	-0.158
M. sacchariflorus	UI10-00008	13.844	1.160	2.281	0.308
M. sinensis	UI10-00020	24.656	12.798	11.650	2.947
M. sinensis	PMS-164	13.528	4.497	4.513	-1.812
M. sinensis	UI10-00024	17.117	10.304	9.341	1.526
M. sinensis	PMS-347	11.377	5.666	4.212	0.352
M. sinensis var. condensatus	UI10-00015	9.672	7.493	5.768	-0.054
M. sacchariflorus	JPN-2011-004	12.280	7.737	8.077	0.684
M. sacchariflorus	UI11-00033	13.692	7.433	10.404	0.681



Supplemental Figure S1 Simplified diagram showing various parts of the irrigation system, including the (1) water resource; (2) solenoid valve; (3) woodpecker emitter; (4) drip emitter; (5) soil moisture sensor; (6) thermocouple multiplexer; (7) connecting wires between CR6 datalogger and multiplexer; (8) CR6 datalogger; (9) power supply to CR6 datalogger; (10) connecting wires between CR6 datalogger and SDM 16 AC/DC relay controller; (11) SDM-CD16AC 16-Channel AC/DC relay controller; (12) power supply to solenoid valve; (13) power supply to SDM 16 AC/DC relay controller; (14) PS150 battery; and (15) main power supply. Only one pot is shown in detail (in the system, 30 pots can be independently irrigated).



Supplemental Figure S2 Average changes in soil moisture content controlled by the automated irrigation system in a precise-comparison experiment at Hokkaido University, Sapporo, Japan.