

Supplemental Table S1

Species	Accession name	GRIN #	Origin	Flowering time	Classification
<i>H. argophyllus</i>	ARG1575	468651	Florida	Early	Wild population
<i>H. argophyllus</i>	ARG1805	494571	Texas	Mid	Wild population
<i>H. argophyllus</i>	ARG1820	494580	Texas	Late	Wild population
<i>H. argophyllus</i>	ARG1834	494582	Texas	Late	Wild population
<i>H. annuus</i>	HA412-HO	642777	N/A	Mid	Elite inbred line
<i>H. annuus</i>	RHA373	560141	N/A	Mid	Elite inbred line
<i>H. annuus</i>	Hopi	369359	Arizona	Late	Native American landrace
<i>H. annuus</i>	ANN1238	659440	Nebraska	Mid	Wild population

Supplemental Table S2

Location	Planting density (meters between plants)	ARG1575	ARG1805	ARG1820	ARG1834	ANN1238	HA412-HO	Hopi	RHA373
		GA	0.3	1	1	1	1	0	1
IA	0.3	10	10	10	9	15	10	10	10
IA	0.9	10	8	10	10	5	10	10	10
BC	0.9	9	7	4	5	2	8	7	10
IA	1.5	10	8	10	10	5	10	10	10

Supplemental Table S3

<i>m/z</i>	Compound	Lignin
57,73,85,96,114	C5 sugars	
57,60,73,98,126,144	C6 sugars	
124	guaiacol	G
137	ethylguaiacol, homovanillin, coniferyl alcohol	G
138	methylguaiacol	G
150	vinylguaiacol, coumaryl alcohol	G
152	4-ethylguaiacol, vanillin	G,S
154	syringol	S
164	allyl propenyl guaiacol	G
167	ethylsyringol, syringylacetone, propiosyringone	S
168	4-methyl-2,6-dimethoxyphenol	S
178	2-methoxy-4(prop-2-enal)phenol	G
180	coniferyl alcohol, vinylsyringol, α -D-glucose	G,S
182	syringaldehyde	S
194	4-propenylsyringol, ferulic acid	S
208	sinapylaldehyde	S
210	sinapylalcohol	S

Supplemental Table S4

Trait	IA 0.3m ^z		IA 0.9m		BC 0.9m		IA 1.5m	
	ANN	ARG	ANN	ARG	ANN	ARG	ANN	ARG
C5 sugars	21.11 ± 0.29 ^y	20.94 ± 0.31	19.80 ± 0.36	19.78 ± 0.31	19.75 ± 0.49	20.4 ± 0.43	19.64 ± 0.34	18.91 ± 0.44
C6 sugars	22.07 ± 0.30	21.90 ± 0.31	20.69 ± 0.37	21.08 ± 0.32	20.95 ± 0.50	22.05 ± 0.43	20.48 ± 0.34	20.50 ± 0.44
C6/C5	1.10 ± 0.01	1.10 ± 0.01	1.04 ± 0.00 B ^x	1.07 ± 0.01 A	1.06 ± 0.01	1.08 ± 0.00	1.04 ± 0.00 B	1.09 ± 0.01 A
C6/Total lignin	0.33 ± 0.01	0.32 ± 0.01	0.29 ± 0.01	0.31 ± 0.00	0.29 ± 0.01	0.32 ± 0.00	0.29 ± 0.01	0.30 ± 0.01
Days to flower	81.5 ± 1.0 B	125.1 ± 1.2 A	82.6 ± 1.3 B	124.8 ± 1.7 A	76.5 ± 1.7 B	99.0 ± 13.8 A	83.2 ± 1.2 B	125.7 ± 1.7 A
Height (cm)	104.6 ± 4.1 B	256.4 ± 4.7 A	112.6 ± 5.1 B	234.3 ± 4.6 A	111.1 ± 6.8 B	230.7 ± 6.2 A	103.0 ± 4.7 B	193.9 ± 6.5 A
Stem diameter (mm)	27.1 ± 1.3 B	42.1 ± 1.3 A	30.6 ± 1.6 B	52.4 ± 1.4 A	29.7 ± 2.1 B	49.3 ± 1.9 A	31.4 ± 1.5 B	51.7 ± 1.9 A
Stem biomass (g)	54.3 ± 11.2 B	232.6 ± 11.7 A	73.5 ± 14.1 B	223.6 ± 12.0 A	128.9 ± 35.7	213.5 ± 16.3	55.5 ± 13.5 B	180.3 ± 16.7 A
Biomass (g)	222.7 ± 104.6 B	1409.2 ± 107.3 A	414.7 ± 130.8 B	2140.8 ± 109.3 A	664.5 ± 184.3	1207.4 ± 148.9 B	624.5 ± 123.4 B	2218.4 ± 152.3 A
% main stem	0.20 ± 0.01	0.16 ± 0.01 A	0.15 ± 0.01	0.11 ± 0.01 B	0.17 ± 0.05	0.19 ± 0.01 A	0.14 ± 0.01	0.08 ± 0.01
Stem specific gravity	0.21 ± 0.04	0.27 ± 0.04	0.23 ± 0.05	0.28 ± 0.04	0.21 ± 0.06	0.30 ± 0.05	0.40 ± 0.04	0.29 ± 0.06

^zLocation and planting density (i.e., number of meters between plants within a plot).

^yLSMEAN ± SE.

^xMean separation between species planted at the same location and planting density (ex. ANN IA 0.3m vs. ARG IA 0.3m). Values followed by different letters are significantly different (p -value < 0.05) LSMEANS, PDIFF, Tukey-Kramer.

^wMean separation (underlined) within a species planted at different locations (ex. ANN IA vs. ANN BC, only for 0.9m planting density). Values followed by different letters are significantly different (p -value < 0.05) LSMEANS, PDIFF, Tukey-Kramer.

Supplemental Table S5

	ANN						ARG					
	0.3 ^z		0.9		1.5		0.3		0.9		1.5	
Lignin	29.10 ± 0.27 ^y		29.56 ± 0.33		29.77 ± 0.31		29.41 ± 0.28		28.36 ± 0.28		27.96 ± 0.39	
S-lignin	18.37 ± 0.23		18.69 ± 0.29		18.55 ± 0.27		19.65 ± 0.25 A ^x		17.93 ± 0.25 B		17.15 ± 0.35 B	
G-lignin	14.39 ± 0.14 B		14.71 ± 0.17 AB		15.07 ± 0.16 A		13.49 ± 0.14 B		14.08 ± 0.15 AB		14.45 ± 0.21 A	
S/G lignin	1.51 ± 0.03		1.49 ± 0.03		1.43 ± 0.03		1.80 ± 0.03 A		1.53 ± 0.03 B		1.36 ± 0.04 C	
C5 sugars	21.11 ± 0.30 A		19.80 ± 0.37 AB		19.64 ± 0.34 B		20.94 ± 0.31 A		19.78 ± 0.32 AB		18.91 ± 0.44 B	
C6 sugars	22.07 ± 0.30 A		20.69 ± 0.38 AB		20.48 ± 0.35 B		21.90 ± 0.32		21.08 ± 0.32		20.50 ± 0.45	
C6/C5	1.05 ± 0.00		1.04 ± 0.00		1.04 ± 0.00		1.05 ± 0.00 B		1.07 ± 0.00 A		1.09 ± 0.01 A	
C6/Total lignin	0.32 ± 0.01 A		0.29 ± 0.01 AB		0.29 ± 0.01 B		0.31 ± 0.01		0.31 ± 0.01		0.30 ± 0.01	
Days to flower	81.5 ± 1.1		82.6 ± 1.3		83.2 ± 1.2		125.1 ± 1.2		124.8 ± 1.2		125.7 ± 1.7	
Height (cm)	104.6 ± 4.1		112.6 ± 5.1		103.0 ± 4.7		256.4 ± 4.7 A		234.3 ± 4.6 B		193.9 ± 6.5 C	
Stem diameter (mm)	27.1 ± 1.3		30.6 ± 1.6		31.4 ± 1.5		42.1 ± 1.3 B		52.4 ± 1.4 A		51.7 ± 1.9 A	
Stem biomass (g)	54.3 ± 11.2		73.5 ± 14.1		55.5 ± 13.5		232.6 ± 11.7		223.6 ± 12.0		180.3 ± 16.7	
Biomass (g)	222.7 ± 104.6		414.7 ± 130.8		624.5 ± 123.4		1409.2 ± 107.3 B		2140.8 ± 109.3 A		2218.4 ± 152.3 A	
% main stem	0.20 ± 0.01 A		0.15 ± 0.01 AB		0.14 ± 0.01 B		0.16 ± 0.0 A		0.11 ± 0.0 B		0.08 ± 0.0 C	
Stem specific gravity	0.2 ± 0.0		0.2 ± 0.1		0.4 ± 0.0		0.3 ± 0.0		0.3 ± 0.0		0.3 ± 0.1	

^zNumber of meters between plants within each plot.

^yLSMEAN ± SE.

^xMean separation of data for each species planted at different planting densities (ex. ANN plants planted at different planting densities or ARG plants planted at different densities). Data followed by different letters are significantly different (p -value < 0.05) LSMEANS, PDIFF, Tukey-Kramer.

Supplemental Table S6

	IA ^y						BC ^w					
	Lignin			S/G Lignin			Lignin			S/G Lignin		
ARG1575	29.37±0.29 ^x	BC ^y	A ^z	1.49±0.04	BC	B	31.10±0.55	A	A	1.79±0.05	A	A
ARG1805	28.91±0.27	CD	AB	1.75±0.04	A	A	27.16±0.62	CD	B	1.69±0.06	AB	A
ARG1820	27.92±0.24	D	B	1.52±0.04	B	B	28.20±0.71	BCD	B	1.79±0.07	AB	A
ARG1834	28.01±0.27	CD	B	1.51±0.04	B	B	26.69±0.65	D	B	1.68±0.07	AB	A
HA412-HO	28.89±0.30	CD	B	1.33±0.03	C	C	29.82±0.59	AB	B	1.34±0.06	CD	C
Hopi	30.51±0.29	AB	A	1.68±0.03	A	A	28.45±0.59	BCD	B	1.53±0.06	BC	B
RHA373	30.74±0.28	A	A	1.50±0.03	B	B	28.88±0.54	BC	B	1.29±0.05	D	C
ANN1238	28.46±0.31	CD	B	1.42±0.03	BC	BC	32.26±0.93	A	A	1.92±0.10	A	A

^yData averaged for 3 planting densities (i.e., 0.3, 0.9, and 1.5 m spaced row plots).

^wData from 0.9 m spaced row plots.

^xLSMEANS ± SE.

^yMean separation across all 8 accessions followed by different letters are significantly different (p -value < 0.05) LSMEANS, PDIFF, Tukey-Kramer.

^zMeans within a species followed by different letters are significantly different (p -value < 0.05) LSMEANS, PDIFF, Tukey-Kramer.