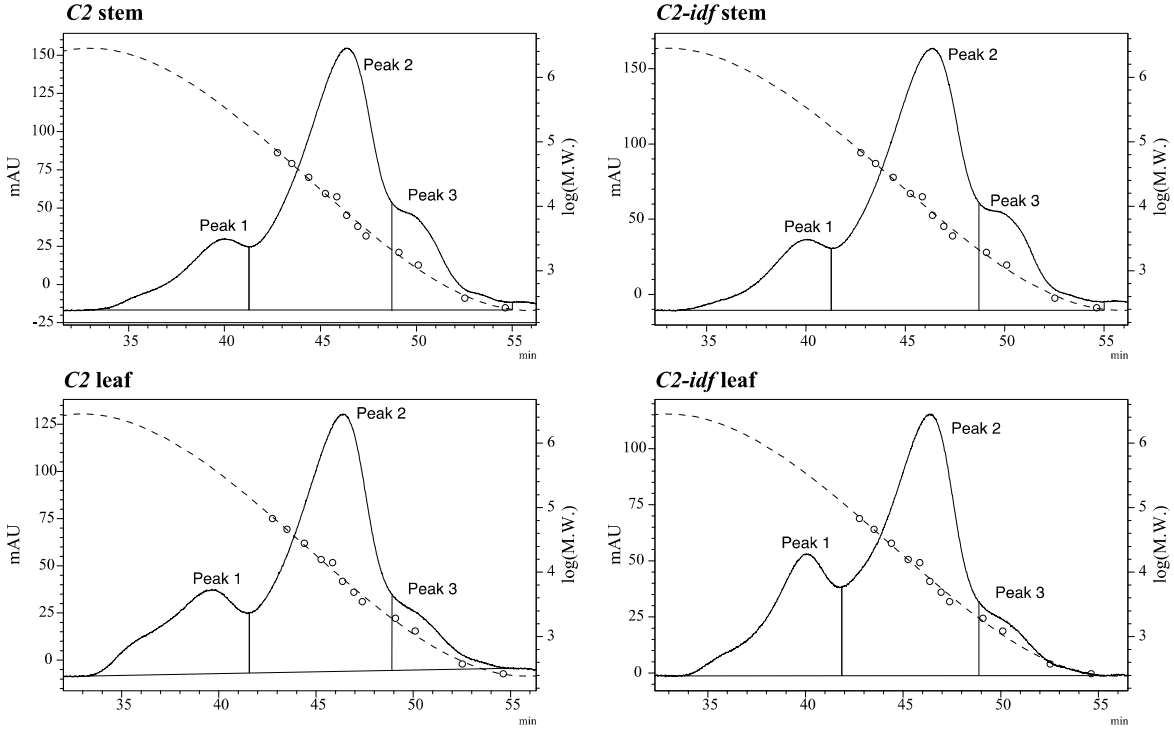
SUPPLEMENTAL FILES

Supplemental File S1. MS/MS spectra of the characterized metabolites

See separate file, Supplemental File S1.pdf

Supplemental Figure S1. GPC chromatographic comparison of lignin from *C2-Idf* mutant and *C2* control stem and leaf. (A) The dashed line shows the standard curve (R^2=0.9962) of polystyrene with 12 data points. The molecular weight distribution curves were each divided into three peaks and the Mn, Mw, and polydispersity index (Mw/Mn) of each peak were analyzed and shown in the table (B). Peak 1 represent an abnormal large molecular weight for lignin samples and was therefore regarded as an unknown contaminant, the peak 2 represented the major lignin polymer and peak 3 originated from lignin oligolignols with molecular weight at around 800-1000. Statistics were performed on peak 2. The Mn, Mw and Mw/Mn values of stem and the Mn value of leaf were not significantly different between the *C2-Idf* mutant and *C2* control (Student t-test, p-value>0.05). The Mw and Mw/Mn values of leaf were significantly different between the *C2-Idf* mutant and *C2* control (8% increase in *C2-Idf* as compared to *C2,* Student t-test, p-value=0.03 for Mw, and 4% increase*,* Student t-test, p-value=0.04 for Mn/Mw). Average ± standard deviation are given for 4 to 6 biological replicates.

A



B

C2 stem	Mn	Mw	Mw/Mn
Peak 1	421200 ± 37000	720000 ± 66500	1.71 ± 0.03
Peak 2	8500 ± 300	25000 ± 1400	2.95 ± 0.06
Peak 3	810 ± 50	1100 ± 30	1.34 ± 0.04

C2-idf stem	Mn	Mw	Mw/Mn
Peak 1	477100 ± 55300	812300 ± 112500	1.70 ± 0.08
Peak 2	8300 ± 300	24200 ± 1400	2.92 ± 0.06
Peak 3	900 ± 80	1100 ± 50	1.29 ± 0.06

C2 leaf	Mn	Mw	Mw/Mn
Peak 1	507100 ± 23700	891700 ± 42200	1.76 ± 0.05
Peak 2	8000 ± 300	21100 ± 1000	2.62 ± 0.05
Peak 3	800 ± 20	1100 ± 10	1.33 ± 0.02

C2-idf leaf	Mn	Mw	Mw/Mn
Peak 1	405300 ± 76700	710200 ± 144600	1.75 ± 0.05
Peak 2	8400 ± 300	22900 ± 1100	2.71 ± 0.07
Peak 3	800 ± 80	1000 ± 60	1.38 ± 0.06

Supplemental Table S1. Growth parameters of *C2-Idf* mutant and *C2* control plants. Plant height and dry biomass measurements were performed on senesced greenhouse-grown plants. DW: dry weight; SEM: standard error of the mean with n=12; n.s.: not significantly different; underlined values: significantly different compared to the control; *:0.05≥p>0.01, **: p<0.01.

Growth parameter	*C2* (mean ± SEM)	*C2-Idf* (mean ± SEM)	% difference	t-test
Plant height with tassel (cm)	296.33 ± 17.78	292.01 ± 19.01	-1.4	n.s.
Leaf DW (g)	36.11 ± 6.71	45.13 ± 6.20	25	*
Stem DW (g)	90.79 ± 31.45	121.80 ± 28.08	34.16	**
Total DW (g) (leaves + stems)	126.90 ± 37.76	166.94 ± 33.94	31.55	**

Supplemental Table S2. Targeted search for oligolignols isolated from stem and leaf of *C2-Idf* and *C2* control plants. b.d.: below detection limit; SD: standard deviation, p-values are calculated via Student t-tests statistics. Nomenclature of the oligolignols is explained in Morreel et al., (2004; 2010a; 2010b), the prime (') signifies an aldehyde moiety.

nr	Name	$[M-H^+]^-$	RT (min)	*C2* internode (Mean ± SD)	*C2-Idf* internode (Mean ± SD)	p-value	Ratio *C2-Idf*/C2	*C2* leaf (Mean ± SD)	*C2-Idf* leaf (Mean ± SD)	p-value	Ratio *C2-Idf*/C2
1	**G(8-O-4)S(8-5)G 1**	583.2180	14.81	29243 ± 7109	39767 ± 20579	0.267	1.36	2539 ± 934	2162 ± 896	0.442	0.85
2	**G(8-O-4)S(8-5)G 2**	583.2180	15.61	13912 ± 3862	14941 ± 9379	0.903	1.07	1411 ± 648	887 ± 640	0.125	0.63
3	**G(8-O-4)S(8-8)G**	583.2194	17.04	2494 ± 653	4590 ± 3247	0.110	1.84	b.d.	b.d.	-	-
4	**G(8–O–4)S(8–5)G'**	581.2034	16.93	2172 ± 4397	1062 ± 826	0.611	0.49	2011 ± 546	1889 ± 1202	0.372	0.94
5	**S(8-O-4)S(8-8)S**	643.2390	16.54	713 ± 398	984 ± 727	0.465	1.38	3233 ± 2903	2791 ± 742	0.645	0.86
6	**G(8–O–4)G(8–O–4)S(8–8)S**	809.3000	18.09	2153 ± 1182	4997 ± 3693	0.083	2.32	1110 ± 327	1415 ± 646	0.439	1.27

Supplemental Table S3. Relative quantification of lignin units and linkages based on volume integrals from the HSQC spectra of stem and leaf of *C2-Idf* mutant and *C2* control plants. The lignin units were expressed as a percentage of the sum of G (guaiacyl), S′ (benzylic-oxidized S units, or syringaldehyde- or sinapaldehyde-derived), and S (syringyl) units. The linkage types were expressed as percentage of the sum of interunit linkage types **A**-**C** (including **C'**). Units relatively quantified (as volume integrals only) include: cinnamaldehyde end-groups **X2**; benzaldehyde end-groups **X**3, phenylcoumaran (β–5) units **B**, β-aryl ether (β–O–4) units **A**; resinol (β–β) units **C**; and β–β′ tetrahydrofuran units **C′**. n= 6 biological replicates. Bold or underlined values indicate significantly increased or decreased values, respectively, as compared to those of the control plants,. *p*CA: *p*-coumarate, H: *p*-hydroxyphenyl unit, FA: ferulate, T: tricin unit. SD: standard deviation, inf: infinite, n.d.: not detected, -: not applicable, n.s.: not significant, *:0.05<p≤0.01, **: 0.01<p≤0.001, ***: p<0.001.

feature	*C2* stem (mean ± SD)	*C2-Idf* stem (mean ± SD)	% difference	t-test	*C2* leaf (mean ± SD)	*C2-Idf* leaf (mean ± SD)	% difference	t-test
*p*CA%	98.2 ± 3.7	91.2 ± 4.8	-9.1	n.s	56.5 ± 2.7	52.8 ± 2.3	-6.5	*
H%	1.0 ± 0.1	0.6 ± 0.2	-43.3	*	10.1 ± 1.8	8.5 ± 1.0	-16.4	n.s.
FA%	1.8 ± 0.9	1.6 ± 0.8	-9.5	n.s.	2.4 ± 1.1	2.2 ± 0.2	-9.3	n.s.
G%	25.6 ± 2.3	**30.4 ± 0.5**	**18.7**	**	55.6 ± 1.4	55.3 ± 1.7	-0.6	n.s
S′%	0.8 ± 0.3	0.8 ± 0.2	4.0	n.s.	n.d.	n.d.	-	-
S%	73.6 ± 2.2	68.8 ± 0.6	-6.6	**	44.4 ± 1.4	44.7 ± 1.7	0.7	n.s
T%	1.9 ± 0.3	n.d.	inf down	***	27.6 ± 1.4	n.d.	inf down	***
Total (G+S+S′)	100	100			100	100		
S/G	3.0 ± 0.5	2.3 ± 0.1	-20.7	**	0.8 ± 0.1	0.8 ± 0.1	1.3	n.s.
X2 (cinnamaldehyde end-group)%	0.9 ± 0.4	1.0 ± 0.3	13.5	n.s.	n.d.	**0.4 ± 0.3**	**inf up**	**
X3 (benzaldehyde end-group)%	- ± -	0.1 ± 0.1	66.6	n.s.	n.d.	n.d.	-	-
B (β–5)%	0.6 ± 0.3	0.9 ± 0.6	57.9	n.s.	2.0 ± 0.5	**4.2 ± 0.9**	**109.6**	***
A (β–O-4)%	94.4 ± 0.9	92.6 ± 1.2	-2.0	*	97.7 ± 0.7	93.9 ± 1.5	-3.9	***
C (β–β, resinol)%	0.3 ± 0.3	0.6 ± 0.6	67.6	n.s.	0.3 ± 0.3	**1.2 ± 0.5**	**310.3**	**
C′ (β–β, tetrahydrofuran)%	4.7 ± 0.7	**6.0 ± 0.6**	**27.9**	*	n.d.	**0.7 ± 0.5**	**inf up**	***
Total (A+B+C+C′)	100	100			100	100		

Supplemental Table S4. Saccharification efficiency of senesced stem and leaf biomass from *C2-Idf* mutant and *C2* control plants. The numbers listed in this table are visualized in the graphs of Figure 4.

See separate file, Supplemental Table S4.xlsx