

## Supplementary Tables and Figures

### Tables

**Table S1.** DSC profile settings for determining the dry glass transition temperature of pure and commercial OS samples.

Sample	Steps	Profile Settings			
		Start Temperature (°C)	End Temperature (°C)	Heating Rate (°C/min)	Hold Time (min)
Allulose	Heat	100	120	1	
	Cool	120	-20	50	
	Hold				5
	Heat	-20	50	10	
	Cool	50	-20	50	
	Hold				5
Sucrose	Heat	-20	50	10	
	Heat	175	188	1	
	Cool	188	-10	50	
	Hold	-10	-10		5
	Heat	-10	80	10	
	Cool	80	-10	50	
Melezitose	Hold	-10	-10		5
	Heat	-10	100	10	
	Heat	155	168	1	
	Cool	168	0	50	
	Hold	0			5
	Heat	0	130	10	
Maltotriose	Cool	130	0	50	
	Hold	0	0		5
	Heat	0	130	10	
	Heat	100	160	10	
	Cool	160	50	50	
	Hold	50			5
Raffinose	Heat	50	160	10	
	Heat	100	180	10	
	Hold	180	180		5
	Cool	180	20	50	
	Hold	20	20		5
	Heat	20	140	10	
Raffinose	Cool	140	20	50	
	Hold	20	20		5
	Heat	20	140	10	
	Heat	20	140	10	

Stachyose	Heat	100	180	10	
	Hold	180	180		5
	Cool	180	50	50	
	Hold	50	50		5
	Heat	50	160	10	
	Cool	160	50	50	
	Hold	50	50		5
	Heat	50	160	10	
Kestose	Heat	160	230	10	
	Hold	230	230		5
	Cool	230	50	50	
	Hold	50	50		5
	Heat	50	180	10	
	Cool	180	70	50	
	Hold	50	50		5
	Heat	50	180	10	
XOS	Heat	0	120	10	
	Hold	120	120		3
	Cool	120	0	50	
	Hold	0	0		5
FOS	Heat	0	120	10	
	Heat	30	110	20	
	Hold	110	110		3
	Cool	110	10	50	
	Hold	10	10		5
	Heat	10	90	10	
	Cool	90	10	50	
	Hold	10	10		5
GOS	Heat	10	90	10	
	Heat	80	160	10	
	Hold	160	160		3
	Cool	160	80	50	
LOS	Hold	80	80		5
	Heat	80	180		
	Heat	180	190	1	
	Hold	190	190		5
	Cool	190	-10	50	
	Hold	-10	-10		5
	Heat	-10	130	10	
	Cool	130	-10	50	
IMO	Hold	-10	-10		5
	Heat	-10	130	10	
	Heat	70	130	10	
	Hold	130	130		3

	Cool	130	70	50	
	Hold	70	70		5
	Heat	70	150	10	
P70R	Heat	180	220		
	Hold	220	220		3
	Cool	220	120	50	
	Hold	120	120		5
	Heat	120	220	10	
	Cool	220	120	50	
	Hold	120	120		5
	Heat	120	220	10	
Nutriose	Heat	100	240	10	
	Hold	240	240		1
	Cool	240	160	50	
	Hold	160	160		5
	Heat	160	240	10	

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**Table S2.** The  $T_{gel}$  peak of wheat starch in the presence of pure and commercial OS solutions measured with DSC.

Pure OS	Peak $T_{gel}$ (°C)				
	0%	15%	30%	45%	60%
<i>Sucrose</i>	64.25±0.25 <sup>E</sup>	69.13±0.24 <sup>Dde</sup>	76.05±0.19 <sup>Cd</sup>	86.57±0.65 <sup>Bc</sup>	102.13±0.28 <sup>Ad</sup>
Allulose	64.25±0.25 <sup>E</sup>	66.10±0.02 <sup>Dg</sup>	69.51±0.08 <sup>Cg</sup>	75.40±0.08 <sup>B</sup>	85.10±0.49 <sup>Ae</sup>
Isomaltulose	64.25±0.25 <sup>E</sup>	69.39±0.15 <sup>Bcd</sup>	77.15±0.08 <sup>Ac</sup>		
Maltose	64.25±0.25 <sup>E</sup>	67.90±0.08 <sup>Cf</sup>	74.44±0.27 <sup>Be</sup>	84.27±0.58 <sup>Ad</sup>	
Maltotriose	64.25±0.25 <sup>E</sup>	68.14±0.14 <sup>Df</sup>	74.37±0.33 <sup>Ce</sup>	83.60±0.48 <sup>Bd</sup>	101.79±0.22 <sup>Ad</sup>
Kestose	64.25±0.25 <sup>E</sup>	70.47±0.15 <sup>Da</sup>	79.75±0.24 <sup>Ca</sup>	94.01±0.75 <sup>Ba</sup>	112.18±0.87 <sup>Aa</sup>
Melezitose	64.25±0.25 <sup>E</sup>	68.88±0.09 <sup>Ce</sup>	72.53±0.07 <sup>Bf</sup>	86.70±0.18 <sup>Ac</sup>	
Lactosucrose	64.25±0.25 <sup>E</sup>	69.96±0.17 <sup>Db</sup>	78.04±0.45 <sup>Cb</sup>	90.58±0.16 <sup>Bb</sup>	108.19±0.39 <sup>Ab</sup>
Raffinose	64.25±0.25 <sup>E</sup>	70.00±0.10 <sup>Bb</sup>	74.38±0.13 <sup>Ae</sup>		
Stachyose	64.25±0.25 <sup>E</sup>	69.71±0.10 <sup>Dbc</sup>	77.77±0.28 <sup>Cb</sup> <sub>c</sub>	89.84±0.36 <sup>Bb</sup>	105.13±0.29 <sup>Ac</sup>

Commercial OS	Peak $T_{gel}$ (°C)				
	0%	15%	30%	45%	60%
<i>Sucrose</i>	64.25±0.25 <sup>E</sup>	69.13±0.24 <sup>Dcd</sup>	76.05±0.19 <sup>Cd</sup> <sub>e</sub>	86.57±0.65 <sup>Bd</sup>	102.13±0.28 <sup>Ae</sup>
FOS	64.25±0.25 <sup>E</sup>	70.86±0.18 <sup>Da</sup>	80.81±0.76 <sup>Ca</sup>	95.13±0.21 <sup>Ba</sup>	114.19±0.25 <sup>Ab</sup>
GOS	64.25±0.25 <sup>E</sup>	69.98±0.11 <sup>Db</sup>	78.84±0.81 <sup>Cb</sup> <sub>c</sub>	91.54±1.08 <sup>Bb</sup>	107.93±0.42 <sup>Ad</sup>
XOS	64.25±0.25 <sup>E</sup>	68.52±0.19 <sup>De</sup>	75.00±0.09 <sup>Ce</sup>	84.86±0.43 <sup>Bd</sup>	99.45±0.21 <sup>Af</sup>
IMO	64.25±0.25 <sup>E</sup>	69.23±0.05 <sup>Dc</sup>	77.51±0.25 <sup>Cc</sup> <sub>d</sub>	89.48±0.21 <sup>Bc</sup>	102.89±0.47 <sup>Ae</sup>
Promitor 70R	64.25±0.25 <sup>E</sup>	68.68±0.10 <sup>Dde</sup>	77.82±0.44 <sup>Cc</sup>	91.12±0.86 <sup>Bbc</sup>	109.85±0.38 <sup>Ac</sup>
Nutriose	64.25±0.25 <sup>E</sup>	68.69±0.25 <sup>Dde</sup>	80.36±0.79 <sup>Ca</sup> <sub>b</sub>	95.61±0.25 <sup>Ba</sup>	116.55±1.08 <sup>Aa</sup>

Uppercase letters indicate statistical differences between solution concentration for a given sample, and lowercase letters indicate statistical differences between samples within a concentration.

**Table S3.** The  $\Delta H$  of wheat starch gelatinization in the presence of pure and commercial OS solutions measured with DSC.

Pure OS	$\Delta H$ (J/g)				
	0%	15%	30%	45%	60%
<i>Sucrose</i>	3.04±0.25 <sup>A</sup>	3.59±0.12 <sup>Aa</sup>	2.96±0.67 <sup>Ab</sup>	3.54±0.16 <sup>Aa</sup>	3.56±0.79 <sup>Aa</sup>
Allulose	3.04±0.25 <sup>A</sup>	2.83±0.04 <sup>Aab</sup>	2.76±0.14 <sup>Ab</sup>	2.65±0.06 <sup>Aa</sup>	3.07±0.33 <sup>Aa</sup>
Isomaltulose	3.04±0.25 <sup>A</sup>	3.16±0.31 <sup>Aab</sup>	3.56±0.54 <sup>Aab</sup>		
Maltose	3.04±0.25 <sup>A</sup>	3.26±0.42 <sup>Aab</sup>	3.31±0.38 <sup>Aab</sup>	3.46±0.18 <sup>Aa</sup>	
Maltotriose	3.04±0.25 <sup>A</sup>	2.58±0.38 <sup>Ab</sup>	3.26±0.76 <sup>Aab</sup>	3.49±0.57 <sup>Aa</sup>	4.33±1.21 <sup>Aa</sup>
Kestose	3.04±0.25 <sup>B</sup>	3.07±0.03 <sup>ABab</sup>	4.38±0.11 <sup>Aa</sup>	3.87±1.02 <sup>ABa</sup>	3.11±0.52 <sup>ABa</sup>
Melezitose	3.04±0.25 <sup>A</sup>	2.91±0.37 <sup>Aab</sup>	3.48±0.35 <sup>Aab</sup>	3.57±0.50 <sup>Aa</sup>	
Lactosucrose	3.04±0.25 <sup>A</sup>	3.36±0.56 <sup>Aab</sup>	3.70±0.64 <sup>Aab</sup>	3.56±0.99 <sup>Aa</sup>	3.22±0.73 <sup>Aa</sup>
Raffinose	3.04±0.25 <sup>A</sup>	2.98±0.10 <sup>Aab</sup>	2.35±0.12 <sup>Ab</sup>		
Stachyose	3.04±0.25 <sup>A</sup>	2.96±0.13 <sup>Aab</sup>	2.77±0.32 <sup>Ab</sup>	3.04±0.50 <sup>Aa</sup>	3.12±0.55 <sup>Aa</sup>
Commercial OS	$\Delta H$ (J/g)				
	0%	15%	30%	45%	60%*
<i>Sucrose</i>	3.04±0.25 <sup>A</sup>	3.59±0.12 <sup>Aa</sup>	2.96±0.67 <sup>Aa</sup>	3.54±0.16 <sup>Aa</sup>	3.56±0.79 <sup>Aa</sup>
FOS	3.04±0.25 <sup>A</sup>	3.00±0.56 <sup>Aab</sup>	2.69±0.75 <sup>Aa</sup>	3.53±0.14 <sup>Aa</sup>	3.14±0.05 <sup>Aa</sup>
GOS	3.04±0.25 <sup>A</sup>	3.15±0.66 <sup>Aa</sup>	3.78±0.61 <sup>Aa</sup>	3.80±0.63 <sup>Aa</sup>	3.87±0.37 <sup>Aa</sup>
XOS	3.04±0.25 <sup>A</sup>	3.09±0.34 <sup>Aab</sup>	3.44±0.17 <sup>Aa</sup>	3.12±0.45 <sup>Aa</sup>	2.88±0.50 <sup>Aa</sup>
IMO	3.04±0.25 <sup>AB</sup>	3.27±0.26 <sup>Ba</sup>	3.54±0.18 <sup>ABa</sup>	4.43±0.49 <sup>Aa</sup>	3.51±0.45 <sup>Aa</sup>
Promitor 70R	3.04±0.25 <sup>A</sup>	2.80±0.27 <sup>Aab</sup>	3.57±0.72 <sup>Aa</sup>	3.18±0.99 <sup>Aa</sup>	2.38±0.96 <sup>Aa</sup>
Nutriose	3.04±0.25 <sup>AB</sup>	2.04±0.30 <sup>Bb</sup>	3.36±0.70 <sup>ABa</sup>	3.49±0.55 <sup>Aa</sup>	

Uppercase letters indicate statistical differences between solution concentration for a given sample, and lowercase letters indicate statistical differences between samples within a concentration.

\*The  $\Delta H$  of 60% Nutriose-wheat starch slurry was not obtained due to overlapping of the  $\Delta H$  from water vaporization.

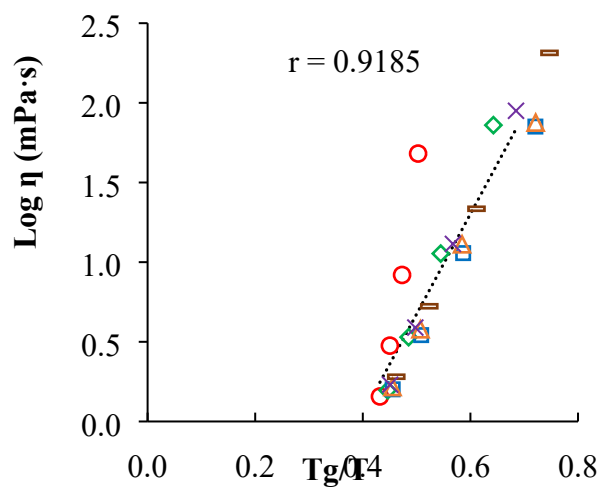
**Table S4.** The solvent effective volume fraction ( $\phi_{w,eff}$ ) of pure and commercial OS solutions examined in this study.

Sweetener	Conc. (%w/w)	Molar Concentration	$\phi_{w,eff}$
Sucrose	15	0.4643	0.7507
	30	1.0050	0.6608
	45	1.5728	0.5731
	60	2.2509	0.4681
FOS	15	0.1856	0.7416
	30	0.3931	0.6471
	45	0.6165	0.5491
	60	0.8845	0.4317
GOS	15	0.2497	0.7522
	30	0.5316	0.6678
	45	0.8502	0.5749
	60	1.1851	0.4817
IMO	15	0.4401	0.7586
	30	0.9373	0.6823
	45	1.4581	0.6073
	60	2.1017	0.5124
Promitor 70R	15	0.0658	0.7391
	30	0.1371	0.6494
	45	0.2155	0.5519
	60	0.3098	0.4348
XOS	15	0.3598	0.7498
	30	0.7567	0.6659
	45	1.2108	0.5707
	60	1.7276	0.4652
Water	0	0.0000	0.7561
Allulose	15	0.8822	0.7608
	30	1.9094	0.6824
	45	2.9883	0.6067
	60	4.2767	0.5155
Maltose	15	0.4654	0.7501
	30	0.9895	0.6648
Isomaltulose	15	0.4646	0.7517
	30	0.9927	0.6665
Kestose	15	0.3151	0.7430
	30	0.6727	0.6483
	45	1.0729	0.5457

	60	1.5332	0.4305
Raffinose	15	0.3148	0.7485
	30	0.6692	0.6609
Lactosucrose	15	0.3170	0.7504
	30	0.6720	0.6668
	45	1.0735	0.5743
	60	1.5146	0.4760
Maltotriose	15	0.3198	0.7491
	30	0.6721	0.6678
	45	1.0711	0.5768
	60	1.4775	0.4886
Melezitose	15	0.3160	0.7494
	30	0.6546	0.6704
	45	1.0420	0.5789
Stachyose	15	0.2393	0.7429
	30	0.5092	0.6499
	45	0.8136	0.5478
	60	1.1327	0.4452

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## Supplementary Figures



**Figure S1.** The solution viscosity ( $\eta$ ) of sucrose (red circles) and OS solutions [FOS (green diamonds), GOS (blue squares), IMO (orange triangle), P70R (brown dash), and XOS (purple 'X's)] compared to  $T_g/T$ ; where  $T_g$  was the calculated  $T_g$  of the OS in solution based on the Couchman-Karasz model from van der Sman and Mauer (2019)<sup>39</sup>, and  $T$  was the onset  $T_{\text{gel}}$  measured in Table 5.