1   **Supporting Information**

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3   **Comparison of Structural and Functional Properties of Wheat Starch Under Different**

4   **Soil Drought Conditions**

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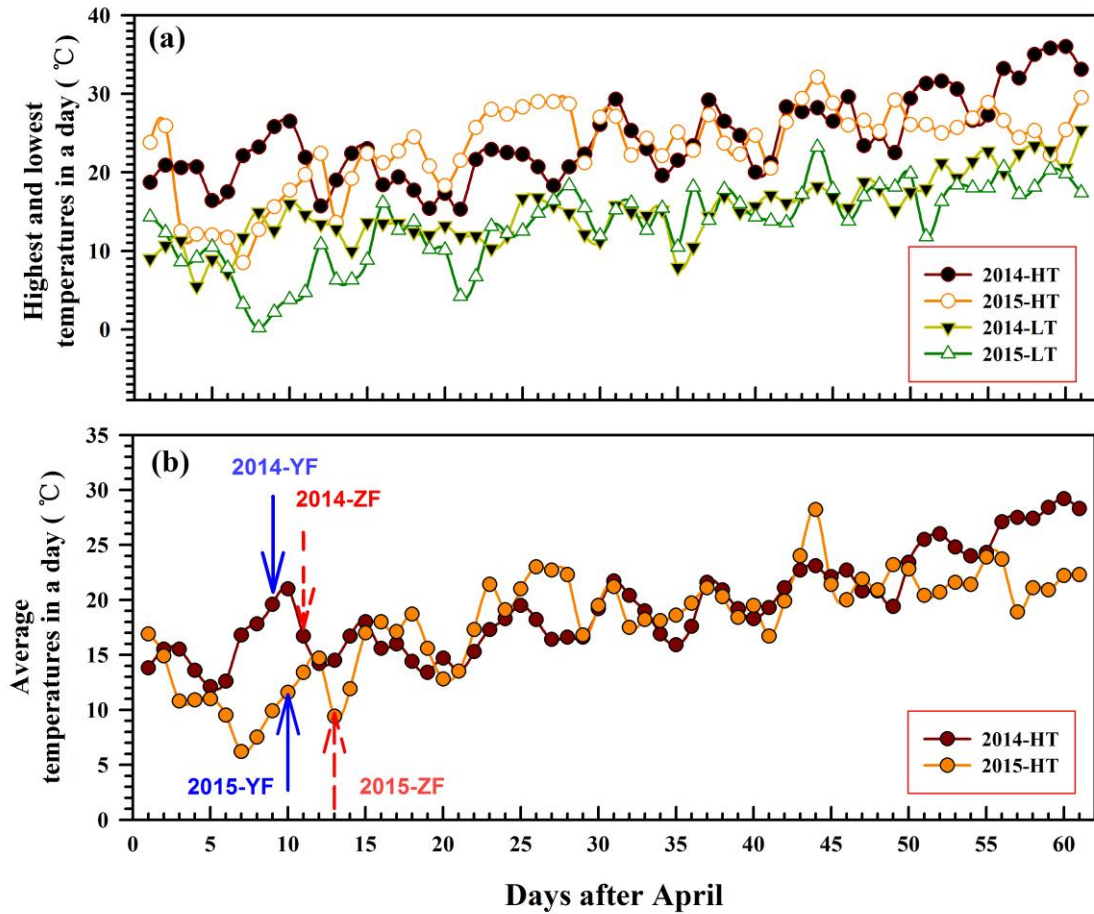
Supplementary Fig. S1. Temperatures during the grain-filling stage (April-May) in 2014

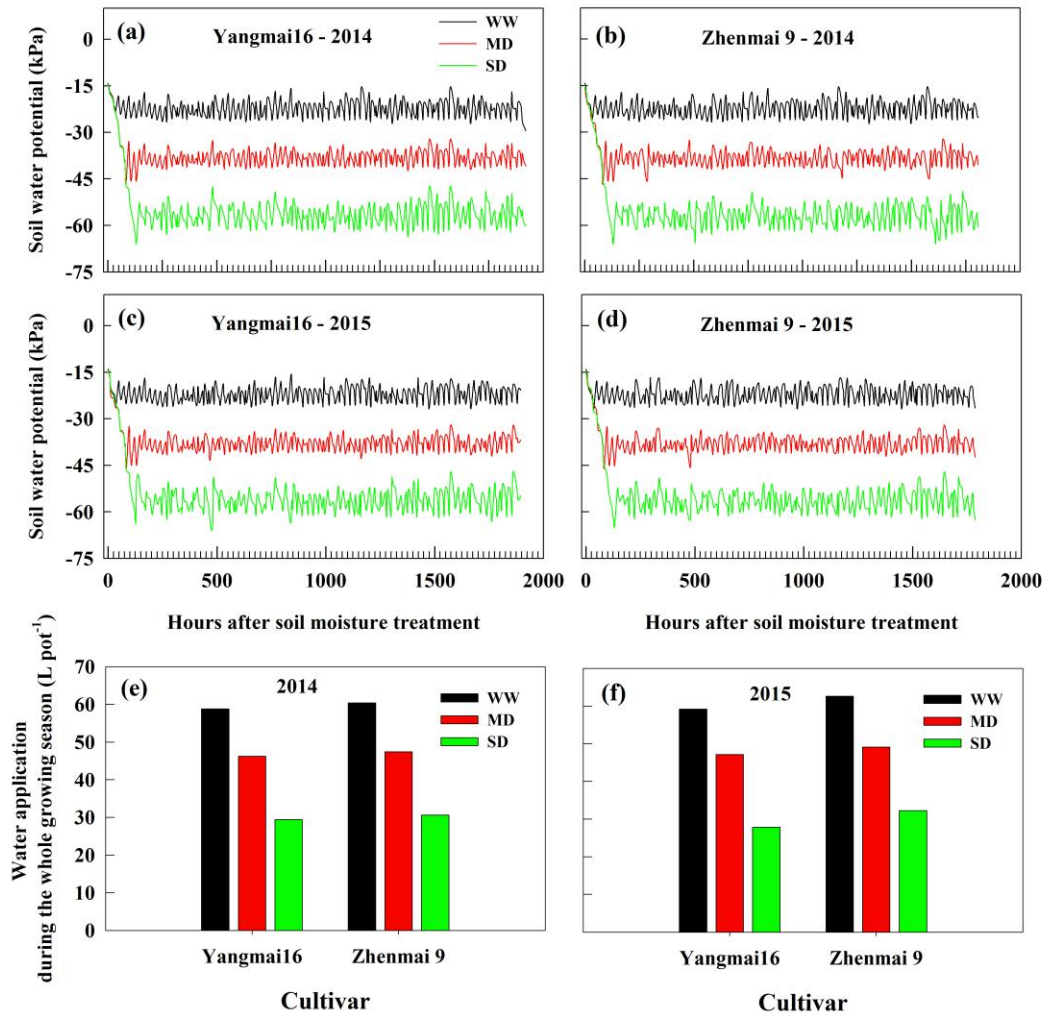**and 2015. HT, LT and AT indicate the highest temperatures, lowest temperatures and**

average temperatures in a day, respectively. Arrows indicate the flowering date of the two

cultivars in two years. YF and ZF indicate the Yangmai 16 flowered and Zhenmai 9 flowered,

respectively.

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Supplementary Fig. S2. Soil water potential (a-d) after soil moisture treatments and water application during whole growing (e, f) of the wheat cultivars Yangmai 16 and Zhenmai 9 under various soil moisture treatments in 2014 and 2015. WW, MD, and SD represent well-watered, moderate soil-drought, and severe soil-drought treatments, respectively. Vertical bars represent ± standard deviations of the mean (n = 3), where they exceed the size of the symbol.

39 **Supplementary Table S1.** Correlation analysis between fine structure and crystallinity, swelling power, thermal properties, and hydrolysis

40 properties of starches.[a]

Correlated with	crystallinity	Swelling power	Thermal properties[d]			Hydrolysis properties[e]		
			ΔH_{gel}	ΔH_{ret}	R (%)	HCL	PPA	AAG
Amylose content[b]	−0.968[**]	−0.898[**]	−0.971[**]	0.901[**]	0.943[**]	−0.973[**]	−0.985[**]	−0.992[**]
Branching degree of amylopectin[b]	0.916[**]	0.850[**]	0.918[**]	−0.920[**]	−0.939[**]	0.949[**]	0.932[**]	0.937[**]
Proportion of DP ≤ 24 in amylopectin[c]	0.939[**]	0.919[**]	0.962[**]	−0.925[**]	−0.956[**]	0.931[**]	0.979[**]	0.984[**]
Proportion of DP ≥ 37 in amylopectin[c]	−0.896[**]	−0.899[**]	−0.961[**]	0.923[**]	0.959[**]	−0.921[**]	−0.959[**]	−0.970[**]
Average chain length of amylopectin[c]	−0.969[**]	−0.898[**]	−0.961[**]	0.893[**]	0.932[**]	−0.976[**]	−0.979[**]	−0.990[**]
Proportion of large granules (d > 10 μm)	−0.576[*]	−0.227	−0.411	0.245	0.338	−0.555	−0.475	−0.458
Proportion of small granules (d < 10 μm)	0.576[*]	0.227	0.411	−0.245	−0.338	0.555	0.475	0.458

41 [a] * and** indicate the significance at p < 0.05 and p < 0.01 level (n=12), respectively.

42 [b] Molecular weight distribution of isoamylase-debranched starch is determined by gel-permeation chromatography.

43 [c] Chain length distribution of amylopectin is determined by high-performance anion-exchange chromatography.

44 [d] H$_{gel}$, gelatinization enthalpy; ΔH_{ret}, retrogradation enthalpy; %R, retrogradation percentage.

45 [e] Starch is hydrolyzed using hydrochloric acid (HCl), porcine pancreatic a-amylase (PPA) or Aspergillus niger amyloglucosidase (AAG).

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47 **Supplementary Table S2.** Correlation analysis between molecular structure and *in vitro* digestion of starches.[a]

Correlated with	Native starch			Gelatinized starch			Retrograded starch		
	RDS (%)	SDS (%)	RS (%)	RDS (%)	SDS (%)	RS (%)	RDS (%)	SDS (%)	RS (%)
Apparent amylose content	−0.886[**]	−0.920[**]	0.942[**]	−0.946[**]	0.819[**]	0.952[**]	−0.872[**]	0.776[**]	0.868[**]
Amylopectin short branch-chain content[b]	0.904[**]	0.941[**]	−0.963[**]	0.954[**]	−0.836[**]	−0.958[**]	0.900[**]	−0.793[**]	−0.898[**]
Amylopectin long branch-chain content[b]	−0.780[**]	−0.805[**]	0.828[**]	−0.750[**]	0.685[*]	0.752[**]	−0.727[**]	0.584[*]	0.752[**]
Amylose content[b]	−0.902[**]	−0.941[**]	0.962[**]	−0.969[**]	0.846[**]	0.974[**]	−0.910[**]	0.815[**]	0.902[**]
Branching degree of amylopectin[b]	0.879[**]	0.910[**]	−0.933[**]	0.890[**]	−0.795[**]	−0.893[**]	0.850[**]	−0.735[**]	−0.856[**]
Proportion of DP 6-12 in amylopectin[c]	0.869[**]	0.897[**]	−0.920[**]	0.951[**]	−0.785[**]	−0.962[**]	0.882[**]	−0.704[**]	−0.951[**]
Proportion of DP 13-24 in amylopectin[c]	0.813[**]	0.836[**]	−0.860[**]	0.891[**]	−0.738[**]	-0.903[**]	0.807[**]	−0.713[**]	−0.807[**]
Proportion of DP 25-36 in amylopectin[c]	−0.761[**]	−0.877[**]	0.862[**]	−0.887[**]	0.814[**]	0.885[**]	−0.839[**]	0.825[**]	0.796[**]
Proportion of DP ≥ 37 in amylopectin[c]	−0.855[**]	−0.836[**]	0.878[**]	−0.905[**]	0.715[**]	0.923[**]	−0.816[**]	0.651[*]	0.850[**]
Average chain length of amylopectin[c]	−0.906[**]	−0.926[**]	0.955[**]	−0.968[**]	0.823[**]	0.977[**]	−0.904[**]	0.808[**]	0.898[**]
Relative crystallinity	0.848[**]	0.910[**]	−0.920[**]	0.925[**]	−0.814[**]	−0.929[**]	0.873[**]	−0.850[**]	−0.832[**]
Proportion of large granules (d > 10 μm)	−0.622[*]	−0.692[*]	0.689[*]	−0.552	0.696[*]	0.519	−0.260	0.773[**]	0.634[*]
Proportion of small granules (d < 10 μm)	0.622[*]	0.692[*]	−0.689[*]	0.552	−0.696[*]	−0.519	0.260	−0.773[**]	−0.634[*]

48 [a] * and** indicate the significance at p < 0.05 and p < 0.01 level (n=12), respectively.

49 [b] Molecular weight distribution of isoamylase-debranched starch is determined by gel-permeation chromatography.

50 [c] Chain length distribution of amylopectin is determined by high-performance anion-exchange chromatography.