Supplementary Tables for "**Persistently small tassels have threatened maize yield under a warming climate**" by Zhang et al.

Content

Supplementary Table 1. Distribution of maize inbred line subgroups of different breeding eras

	IDT	NSS	HZS	SS	Mix
CN1960&70s	0	5	3	0	21
CN1980&90s	1	17	21	7	42
CN2000&10s	5	9	9	8	19
Public-US	0	10	2	8	49
Ex-PVP	18	24	0	32	13

Supplementary Table 2. Reference list of 5 publications about spikelet number per tassel (spilkelet/tassel) of modern maize hybrids.

NO.	Reference	Hybirds	Spikelet/tassel$_{mean}$	N
1	Li et al. (2022)	XY335	481.1	4
2	Cui et al. (2015)	ZJ2 ZD958 DH605	923.3	6
3	Yu et al. (2023)	ZD958	536.8	7
4	Sharma et al. (2022)	PG2458	464.7	6
5	Zhao et al. (2021)	DH518 HZ8 ZD958 DH605 JNK728	958.9	8

1. Li, H. et al. Metabolomic and transcriptomic analyses reveal that sucrose synthase regulates maize pollen viability under heat and drought stress. *Ecotoxicology and Environmental Safety.* **246**, 114191 (2022).

2. Cui, H., Camberato, J. J., Jin, L. & Zhang, J. Effects of shading on spike differentiation and grain yield formation of summer maize in the field. *International Journal of Biometeorology.* **59**, 1189-1200 (2015).

3. Yu, N., Ren, B., Zhao, B., Liu, P., & Zhang, J. Nitrogen rate effects reproductive development and grain set of summer maize by influencing fatty acid metabolism. *Plant and Soil*. 1-14 (2023).

4. Sharma, P. et al. Green synthesis of zinc oxide nanoparticles using Eucalyptus lanceolata leaf litter: characterization, antimicrobial and agricultural efficacy in maize. *Physiology and Molecular Biology of Plants.* **28**, 363-381 (2022).

5. Zhao, J., Yu, R. B., Zhao, B., Liu, P. & Zhang, J. W. Relationship Between Growth and Development Characteristics and Yield Formation of Summer Maize Varieties Differing in Maturities (in Chinese). *Scientia Agricultura Sinica.* **54**, 46-57 (2021).

Supplementary Table 3. Reference list of 6 publications about emerged silk number per ear (silk/ear) of modern maize hybrids.

NO.	Reference	Hybirds	$silk/ear_{mean}$	N
1	DeBruin et al. (2018)	P1395HR P1498HR	584.8	11
2	Chen et al. (2022)	/	587.3	54
3	Yan et al. (2018)	JH5 LD9066	613.7	24
4	Zhang et al. (2022)	ZD928 XY335	647.3	8
5	Li et al. (2021)	Baihe Jidan101 Zhongdan2 Yedan13 ZD958 XY335	667.2	6
6	Lin et al. (2020)	DH605 ZD958	711.5	2

1. DeBruin, J. L., Hemphill, B. & Schussler, J.R. Silk development and kernel set in maize as related to nitrogen stress. *Crop Science*. **58**, 2581-2592 (2018).
2. Chen, X. M. et al. Stubby or slender? Ear architecture is related to drought resistance in maize. Frontiers in Plant Science. **13**, 901186 (2022).
3. Yan, P., Chen, Y., Sui, P., Vogel, A. & Zhang, X. Effect of maize plant morphology on the formation of apical kernels at different sowing dates and under different plant densities. *Field Crops Research.* **223**, 83-92 (2018).
4. Zhang, M., et al. Evidence of arrested silk growth in maize at high planting density using phenotypic and transcriptional analyses. *Journal of Integrative Agriculture.* **21**, 3148-3157 (2022).
5. Li, K. Study on silk number and seed set rate of different maize varieties (in Chinese). *Hebei Agriculture*. **12**, 63-64 (2021).
6. Lin, S., et al. Receptivity and Senescence of Maize Silks under High Stand Density (in Chinese). *Acta Agriculurae Boreali-Sinica.* **35**, 89-95 (2020).

Supplementary Table 4. Reference list of 20 publications about maize pollen viability and pollen shed weight under normal and high temperature (>35℃) conditions during flowering stage. PV: pollen viability; PSW: Pollen shed weight.

NO.	Reference	Materials	CK				HT			
			PV	N	PSW	N	PV	N	PSW	N
1	Liu et al. (2022)	Zheng58 QI319 Chang7-2 Xian2 Chang7-2×Qi319 Chang7-2×Xian2 Qi319×Xian2 Xian2×Zheng58 Zheng58×Qi319	87.8	8	1.0	7	25.3	7	0.5	7
2	Wang et al. (2019)	zhuyu309	99.3	1	1.3	1	77.8	2	1.0	2
2	Wang et al. (2019)	zhuyu309	86.8	1	1.8	1	76.8	6	1.1	6
4	Sun et al. (2023)	ZD958 XY335	85.7	4	3.3	4	68.8	4	2.3	4
5	Begcy et al. (2019)	/	82.0	1	23.0	1				
6	Liu et al. (2022)	XY335	92.4	2	1.9	1	76.7	2	1.7	1
7	Shao et al. (2021)	XY335 ZD958					87.1	4		
8	Xia et al. (2021)	NH101 XD20 ZD958 DK653 ZD538 XY335	86.8	12						
9	Shao et al. (2021)	DH605	90.3	1			69.4	1		
10	Zhang. (2019)	XY335 ND372	92.2	2	2.8	2	76.2	2	1.4	2
11	Jia et al. (2020)	DH605 ZD309	87.5	3			49.9	6		
12	Yan et al. (2021)	HN138 ZD985	85.5	4	1.41	4	70.2	4	1.04	4
13	Yu. (2021)	ZD958 XY335					87.1	4	2.4	4
14		Zheng58	88.6	9	1.3	9	22.1	9	0.5	9

	Sheng. (2020)	QI319 Chang7-2 Xian2 Chang7-2×Qi319 Chang7-2×Xian2 Qi319×Xian2 Xian2×Zheng58 Zheng58×Qi319								
15	Liu. (2021)	ZD958 DMY1	88.2	6			72.6	2		
16	Hou. (2020)	XY335 ZD958	97.9	6	1.2	6	87.8	6	0.7	6
17	Ren. (2020)	XY335 ZD958	99.7	2	1.2	2	74.3	6	0.5	6
18	Zhao. (2012)	ZY309 XD20	91.1	2			71.9	2		
19	Liu et al. (2022)	Chang7-2 XY335 Changqi ZD958 Qi319	95.8	5	1.0	5	57.7	5	0.4	5
20	Wang. (2021)	zhuyu309	74.8	5	0.9	6	87.1	1	1.9	2

1. Liu, M., et al. Dissecting heat tolerance and yield stability in maize from greenhouse and field experiments. *Journal of Agronomy and Crop Science.* **208**, 348-361 (2022).

2. Wang, Y., et al. Flowering dynamics, pollen, and pistil contribution to grain yield in response to high temperature during maize flowering. *Environmental and Experimental Botany.* **158**, 80-88 (2019).

3. Wang, Y. et al. High temperature sensitivity of kernel formation in different short periods around silking in maize. *Environmental and Experimental Botany.* **183**, 104343 (2021).

4. Sun, J. et al. Maize (Zea mays L.) responses to heat stress: Mechanisms that disrupt the development and hormone balance of tassels and pollen. *Journal of Agronomy and Crop Science*, (2023).

5. Begcy, K., Nosenko, T., Zhou, L. Z., Fragner, L., Weckwerth, W. & Dresselhaus, T. Male sterility in maize after transient heat stress during the tetrad stage of pollen development. *Plant Physiology* **181**, 683-700 (2019).

6. Li, H., et al. Metabolomic and transcriptomic analyses reveal that sucrose

synthase regulates maize pollen viability under heat and drought stress. *Ecotoxicology and Environmental Safety.* **246**, 114191 (2022).

7. Shao, R. X. et al. The effect of elevating temperature on the growth and development of reproductive organs and yield of summer maize. *Journal of Integrative Agriculture* **20**, 1783-1795 (2021).

8. Xia, Z. et al. Response of different maize hybrids to high temperature and drought stresses at flowering stage (in chinese). *Journal of Henan Agricultural Sciences* **46**, 32-37 (2017).

9. Shao, J. Y. et al. Combined effects of high temperature and drought on yield and stem microstructure of summer maize (in chinese). *Scientia Agricultura Sinica.* **54**, 3623-3631 (2021).

10. Zhang, S. Effects of high temperature stress on reproductive organ development and yield of summer maize (in chinese). Hebei Agricultural University (2019).

11. Jia, L., Huang, S. H., Liu, X. T., Yang, Y. M. & Sun, Y. M. Effect of high temperature during flowering on pollen viability and yield of different summer maize varieties (in Chinese). *Jiangsu agricultural sciences.* **48**, 92-95 (2020).

12. Yan, Z. et al. Maize tassel development, physiological traits and yield under heat and drought stress during flowering stage (in Chinese). *Scientia Agricultura Sinica.* **54**, 3592-3608 (2021).

13. Yu, K. Responses of reproductive organs development in maize (Zea mays L.)to high temperature stress (in Chinese). Henan Agricultural University (2016).

14. Sheng, D. Response of different maize germplasm materials to high temperature during flowering stage. China Agricultural University(2020).

15. Liu, X. Effect physiological mechanism of drought and heat stresses around flowering on maize kernel numbers and kernel weigh China Agricultural University (2021).

16. Hou, X. Effects of different temperature treatments during flowering on fertilization and flowering characteristics of maize. China Agricultural University(2020)

17. Ren, H. Response mechanism of tassel and ear development in summer maize to high temperature stress. Shandong Agricultural University(2020)

18. Zhao, L. Genotypic responses and physiological mechanisms of Maize (Zea mays L.) to high temperature stress during flowering. Henan Agricultural University(2012)

19. Liu, X. Response of maize glume opening to high temperature and physiological mechanisms. China Agricultural University(2022)

20. Wang, Y. The responses of seed set to heat stress at different episodes or with different intensity during flowering in maize. Dessertation, China Agricultural University (2021)