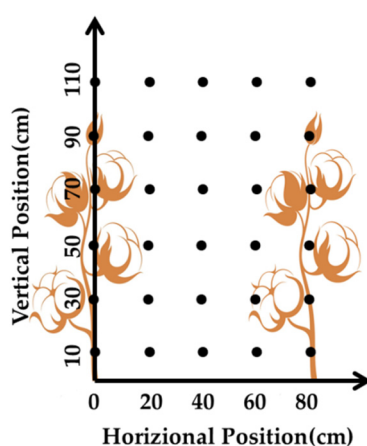# Effect of Spatial-Temporal Light Competition on Cotton Yield and Yield Distribution

Supplemental Table S1. English abbreviation table.

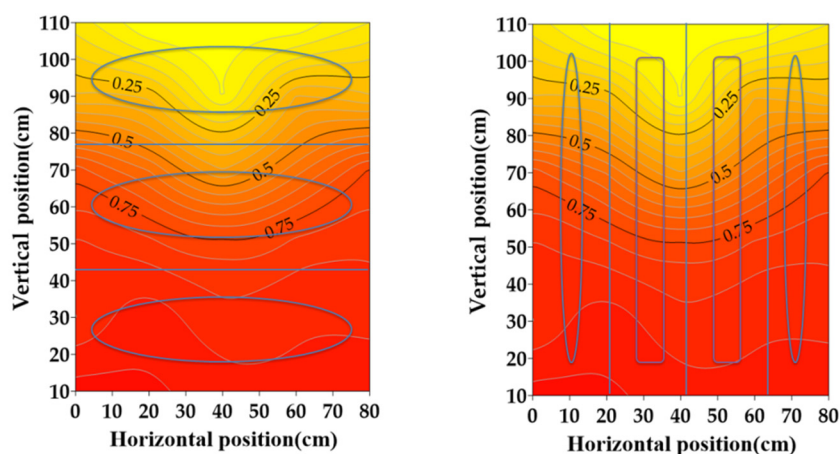| English Abbreviation	English Full Name
PAR	Photosynthetically active radiation
iPAR	PAR interception
DAE	Days after emergence
LAI	Leaf area index

Supplemental Figure S1. Measurement point between the two lines of cotton.

$$tPAR = \text{transmitted PAR intensity/incident PAR intensity} \qquad (1)$$

$$rPAR = \text{reflected PAR intensity/incident PAR intensity} \qquad (2)$$

iPAR = (incident PAR total intensity - transmitted PAR intensity - reflected PAR intensity)/incident PAR intensity

$$= 1\text{-tPAR-rPAR} \qquad (3)$$

Supplemental Figure S2. The spatial distribution of the interception of PAR in the different section.

$$t_0 = \frac{\ln b}{k} \quad (t_0 = t) \tag{4}$$
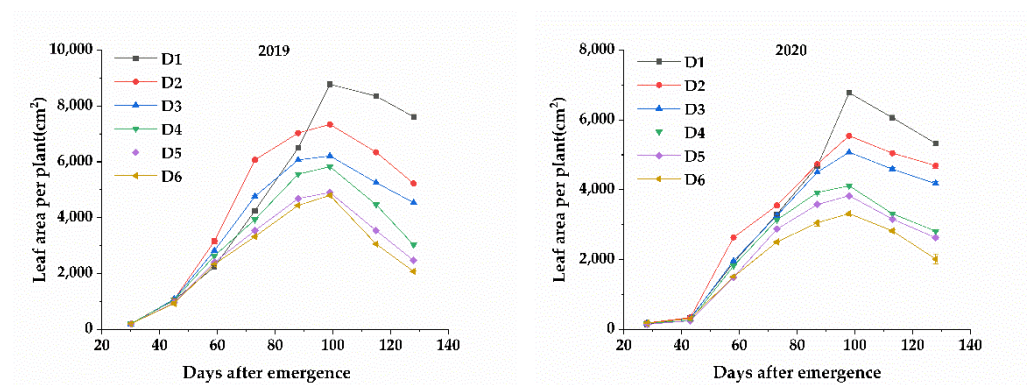
$$t_1 = \frac{\ln b - \ln(2 + \sqrt{3})}{k} \tag{5}$$

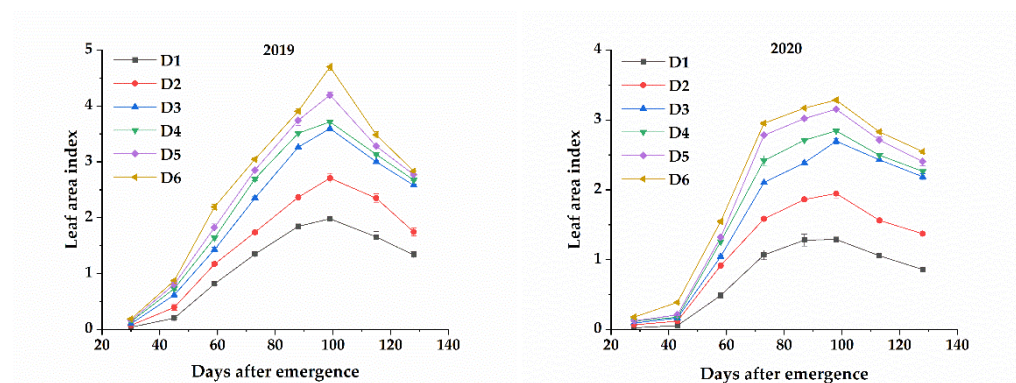$$t_2 = \frac{\ln b + \ln(2 + \sqrt{3})}{k} \tag{6}$$

$$V_M = \frac{Ak}{4} \tag{7}$$

$$\Delta t = t_2 - t_1 \tag{8}$$

$$V_A = \frac{Y_2 - Y_1}{\Delta t} \tag{9}$$

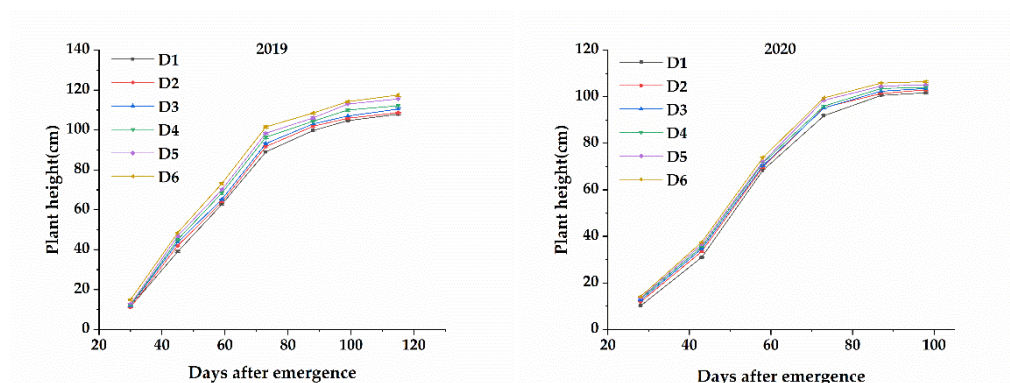In the formula, V_M is the maximum rate of biomass accumulation, t (d) is the maximum period of rapid biomass accumulation, Y_1 and Y_2 are the biomass at t_1 and t_2, respectively, and Δt is the total period of average biomass accumulation.

Supplemental Figure S3. Leaf area per cotton plant growing at different planting densities in 2019 and 2020.

Supplemental Figure S4. Leaf area index of cotton plants growing at different planting densities in 2019 and 2020.

Supplemental Figure S5. Cotton plant height at different planting densities in 2019 and 2020.

Supplemental Table S2. Characteristic value of biomass accumulation in cotton growing season in 2019 and 2020.
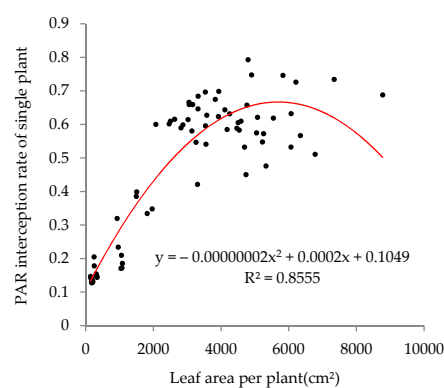
Treatment	A(kg·ha⁻¹)	t_1(DAE)	t_2(DAE)	Δt(d)	At DAE
Year 2019					
D1	8051.792	65.9	106.6	40.7	86.3
D2	9106.212	61.4	93.9	32.5	77.7
D3	10866.005	61.7	100.1	38.5	80.9
D4	11330.813	60.6	99.2	38.5	79.9
D5	11951.848	59.2	95.7	36.5	77.5
D6	13469.528	59.4	98.7	39.3	79.0
Average		61.4	99.0	37.7	80.2
Year 2020					
D1	5500.282	65.2	96.6	31.4	80.9
D2	7451.035	61.5	93.1	31.7	77.3
D3	8723.458	61.0	95.3	34.3	78.1
D4	9635.201	61.1	93.4	32.3	77.2
D5	10052.363	59.7	91.9	32.2	75.8
D6	11629.892	60.5	94.8	34.3	77.7
Average		61.5	94.2	32.7	77.8

Note: A represents the theoretical maximum of aboveground biomass accumulation; t_1 represents the starting point and t_2 represents the ending point of the fast accumulation period; Δt represents the duration of t_1 to t_2; DAE represents days after emergence.
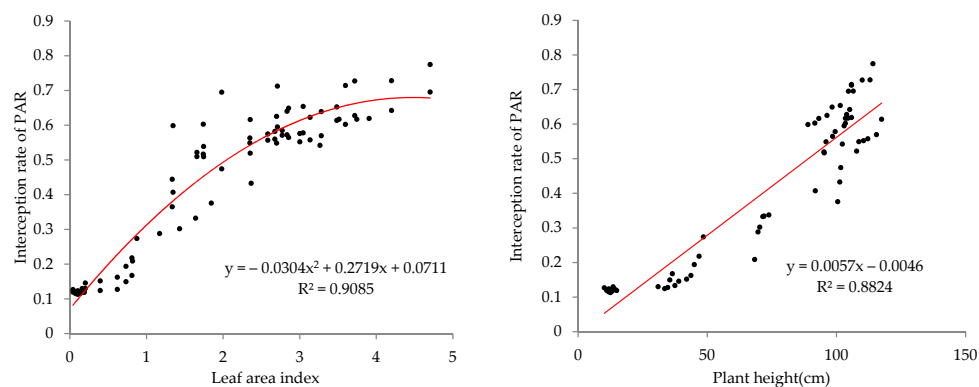
Supplemental Table S3. Fitting equation of dry matter accumulation process in different density population from 2019 to 2020.

Treament	Regression Equation	R^2
Year 2019		
D1	$Y=8051.792/(1+265.178e^{-0.469t})$	0.997
D2	$Y=9106.212/(1+542.416e^{-0.081t})$	0.999
D3	$Y=10866.005/(1+254.255e^{-0.068t})$	0.999
D4	$Y=11330.813/(1+235.204e^{-0.068t})$	0.999
D5	$Y=11951.848/(1+267.615e^{-0.072t})$	0.999
D6	$Y=13469.528/(1+200.971e^{-0.067t})$	0.998
Year 2020		

D1	$Y = 5500.282/(1+880.114e^{-0.084t})$	0.999
D2	$Y = 7451.035/(1+621.515e^{-0.083t})$	0.999
D3	$Y = 8723.459/(1+405.124e^{-0.077t})$	0.998
D4	$Y = 9635.201/(1+546.677e^{-0.082t})$	0.999
D5	$Y = 10052.363/(1+495.999e^{-0.082t})$	0.999
D6	$Y = 11629.892/(1+389.186e^{-0.077t})$	0.999

Supplemental Figure S6. Relationships and fitted models between iPAR per plant and leaf area per plant in 2019 and 2020.

Supplemental Figure S7. Relationships and fitted models between the population iPAR and LAI, plant height in 2019 and 2020.