

# 2-3°C Elevated Temperature from Ambient Temperature Regime (30.1/25.8°C)

## During Flowering and Boll Formation Stage Was Beneficial to Cotton Production on Distal Fruiting Positions

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### Introduction

Against global warming, temperature has increased approximately 0.8 since the early 20th century and are likely to rise 1.8-4.0°C by the end of the 21st century. According to statistics, the daily maximum temperature is up to 38-40°C and lasts for 20 days in the middle and lower reaches of the Yangtze River region. The increase temperature will significantly affect cotton production.

### Objectives

- (1) Determine effects of 2-3°C elevated temperature on cotton yield, fiber quality and seed quality in FP1 and FP3.
- (2) Investigate the response of carbohydrates of cotton boll and the subtending leaf to elevated temperature and its relationship to yield and fiber quality.
- (3) Analyze changes in cotton boll source-sink metabolic differences at different FPs.

### Methods

Temperature Control System used in field experiments is shown in the picture. There was no temperature treatment before the appearance of an open white flower in the FP1 on the 7th main-stem fruiting branch. Experimental treatments during boll formation stages are: (a) ambient temperature regime (mean  $T_{day}/T_{night}$  during boll periods of 2 years was 30.1/25.8°C), and (b) elevated temperature regime (ambient temperature plus 2-3°C, mean  $T_{day}/T_{night}$  during boll periods of 2 years was 32.6/28.6°C).

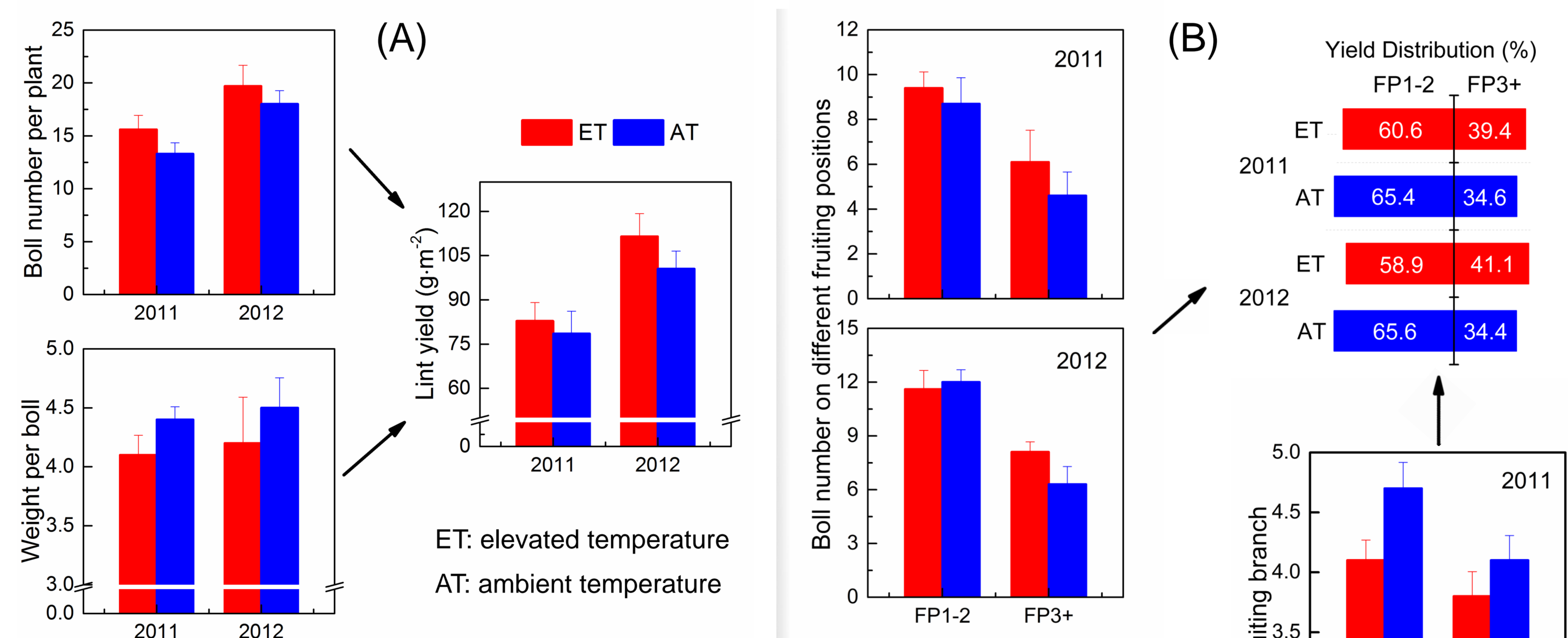
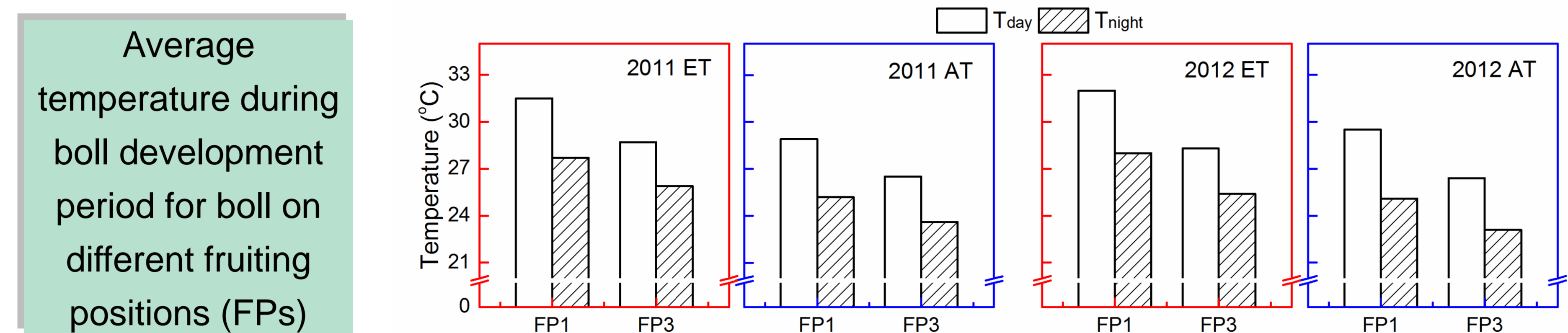
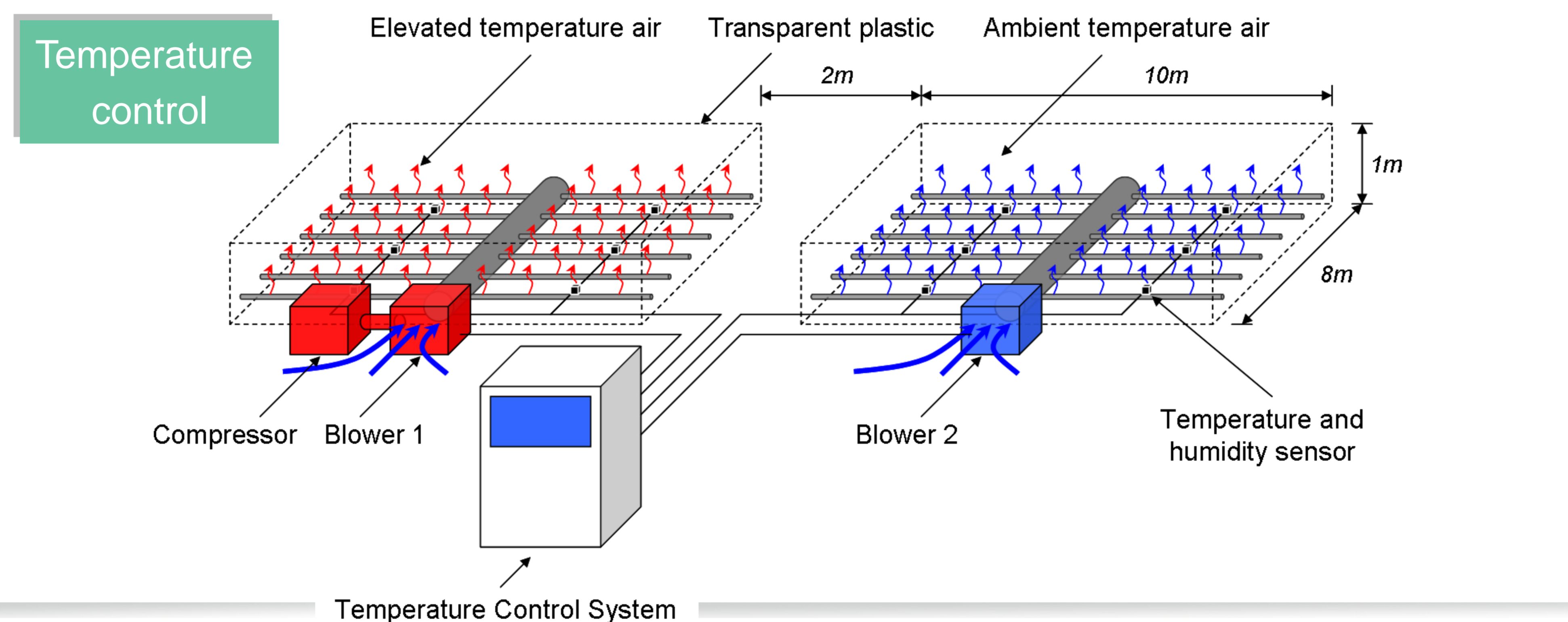
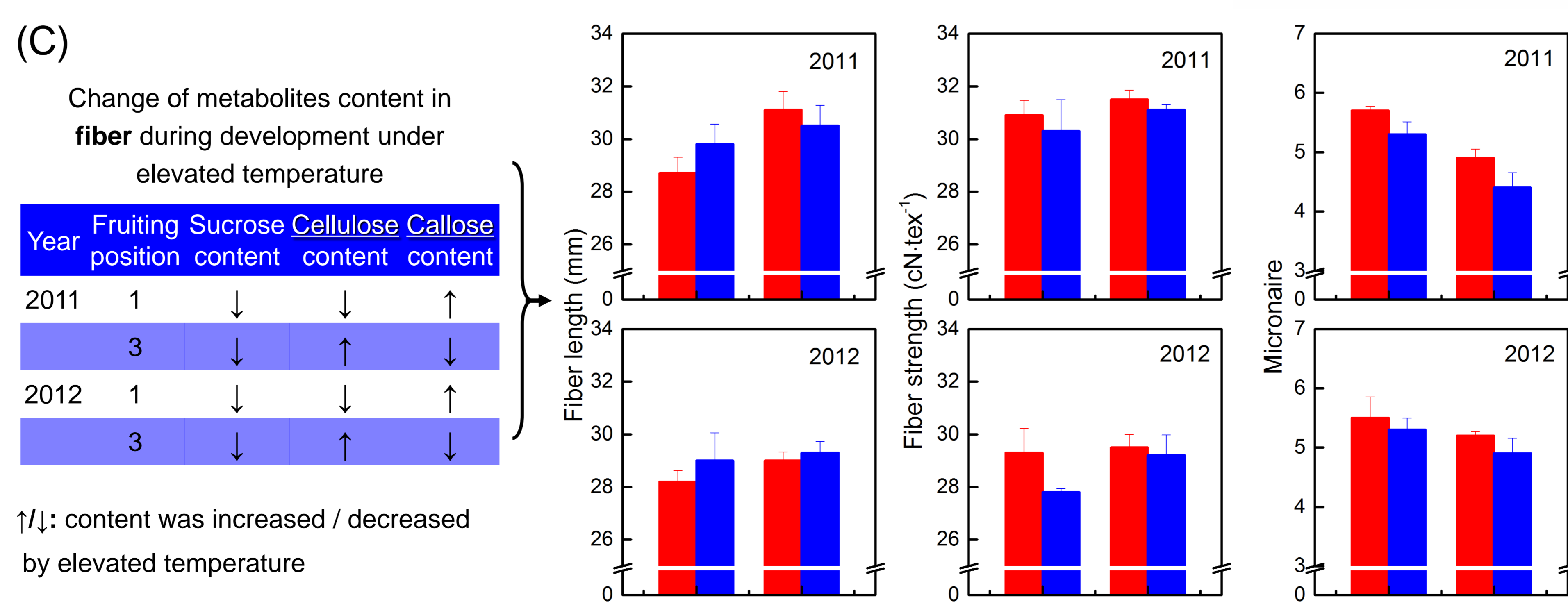


Fig. A. Yield components and yield

Fig. B. Yield distribution

Fig. C. Fiber development and quality



### Results

- (1) Elevated temperature increased boll number by around 20% and cotton yield by around 10%, but decreased boll weight (Fig. A).
- (2) Elevated temperature decreased yield distribution rate and increased boll number on FP1-2, but notably increased yield distribution rate by around 17% and boll number by around 40% on FP3 and FP3+. Whereas boll weight and lint percentage were decreased by elevated temperature due to decreased sucrose content of cotton fiber and the subtending leaf on all FPs (Fig. B).
- (3) For cotton fiber, elevated temperature increased callose content and decreased cellulose content on FP1, but decreased the callose content and increased cellulose content on FP3. In addition, fiber length decreased, fiber strength and micronaire increased by elevated temperature on all FPs (Fig. C).

### Conclusions

2-3°C elevated temperature from ambient temperature regime (30.1/25.8°C) during flowering and boll formation stage can enhance cotton yield by around 17% and improve fiber quality on distal FPs.

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