



Effects of ratoon stunting disease on xylem and leaf structure and endogenous hormone levels in sugarcane stalk

Ming-Hui Chen^{1,2}, Xiao-Na Xie^{1,2}, Li-Tao Yang^{1,2,3*}, Yang-Rui Li^{2,3,4*}

1. Agricultural College, Guangxi University, Nanning 530004, China; 2. State Key Laboratory of Subtropical Bioresources Conservation and Utilization, Nanning 530004, China; 3. Sugarcane Research Center, Chinese Academy of Agricultural Sciences/ Key Laboratory of Sugarcane Biotechnology and Genetic Improvement, Ministry of Agriculture (Guangxi) / Guangxi Key Laboratory of Sugarcane Genetic Improvement/ Sugarcane Research Institute, Guangxi Academy of Agricultural Sciences, Nanning 530007, China; 4. Guangxi Crop Genetic Improvement and Biotechnology, Nanning 530007, China

*Authors for correspondence: litao61@yahoo.com; liyr@gxaas.net

Objective: To determine the effects of RSD on sugarcane growth, endogenous hormone levels and xylem structure in sugarcane

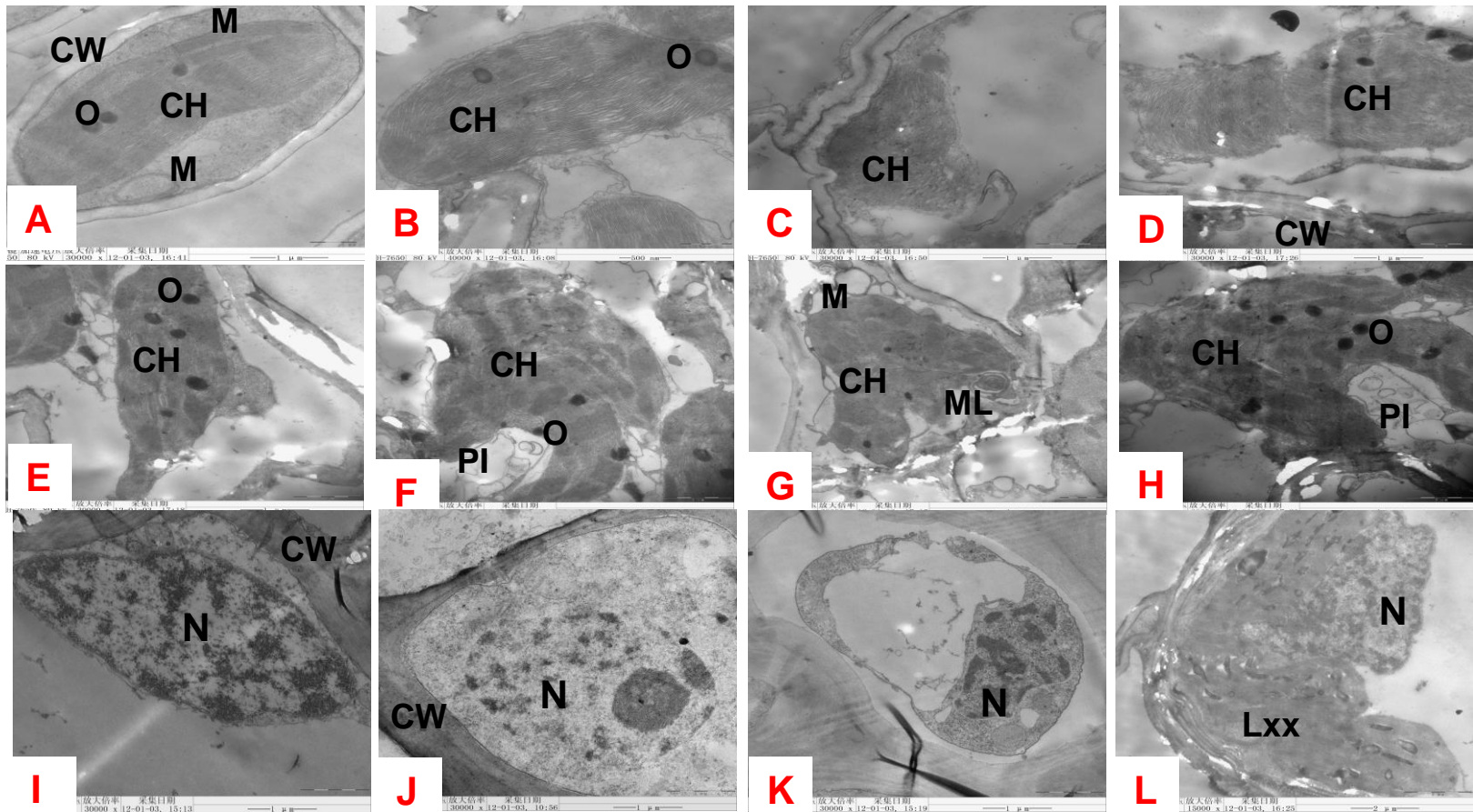
Materials: Sugar cane variety of ROC22 and chewing cane variety of Badila

Treatments: (i) Pathogen-free seedcane setts were used as control;

(ii) Thermal treatment: the RSD infected seedcane setts were treated with 52°C for 30 min;

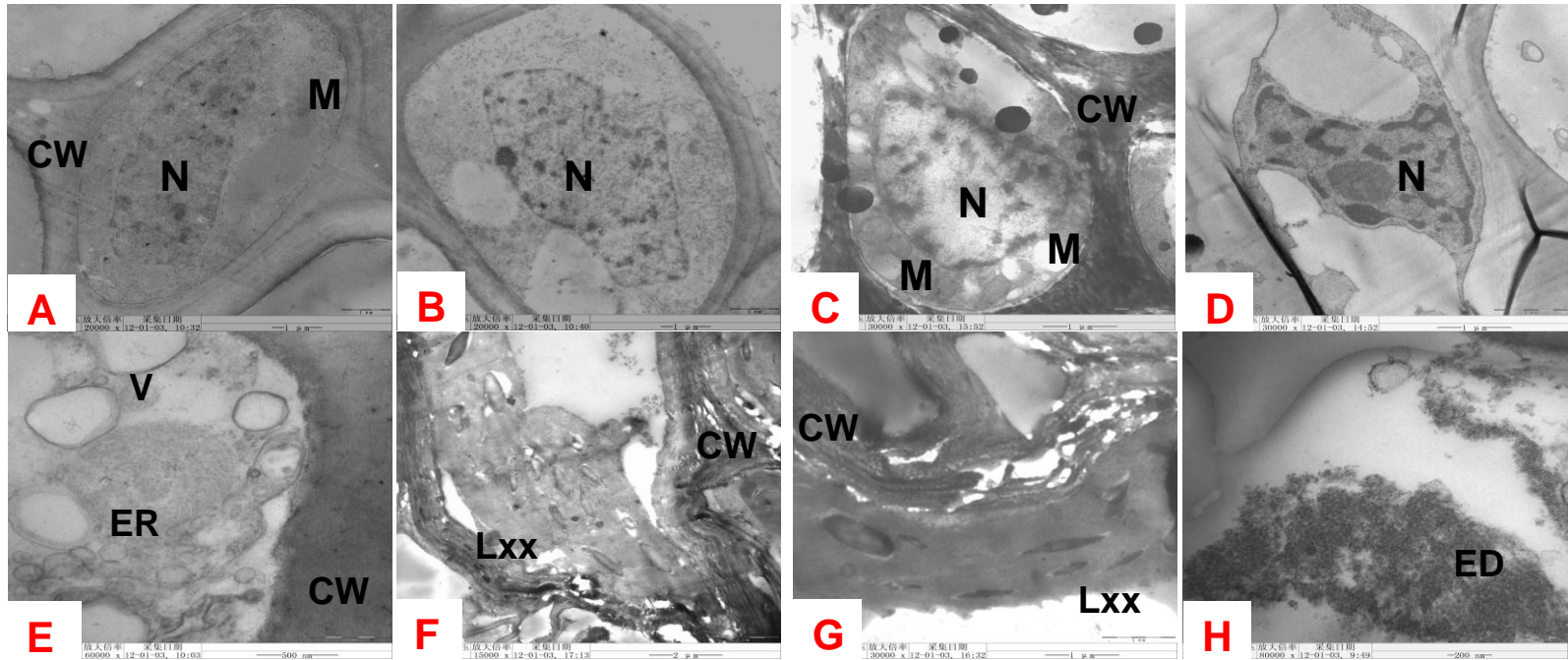
(iii) The seedcane setts from RSD infected plant.

RESULTS & DISCUSSION



A. The chloroplast was more regular in shape of oval in the mesophyll cells of healthy leaves; B, C, D. The chloroplast swelling and partial rupture of the outer membrane; E. The double-layer membrane and stroma lamellae structure were complete in the bundle sheath cells of healthy leaves; F, G, H. Grana and stroma lamellae were loose and severely distorted, and osmiophilic particles of the chloroplast were significantly increased; I. The nucleus structure of the mesophyll cells of healthy leaf; J, K, L. The chromatin of nucleus was in nonuniform distribution and degradation; L. RSD pathogens can be observed living inside and outside the cell wall .

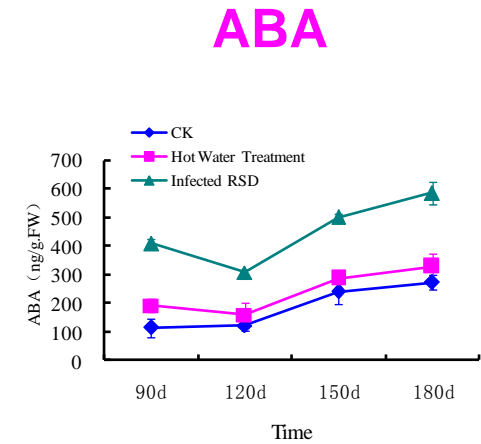
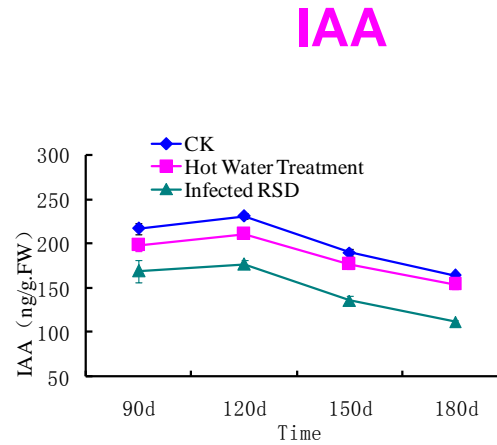
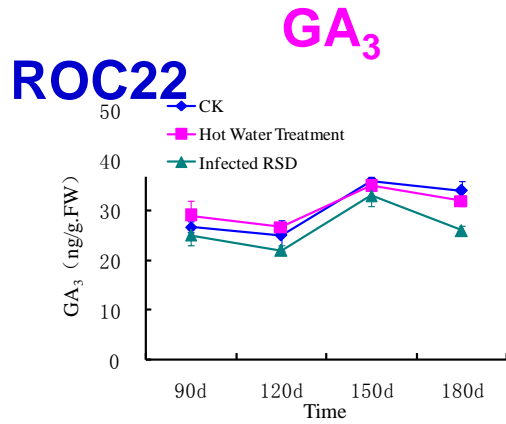
CH. chloroplasts; CW. cell wall; M. mitochondrion; O. osmiophilic; PI. plasmalemma; ML. myelin-like; N. nucleus ; Lxx. RSD pathogen



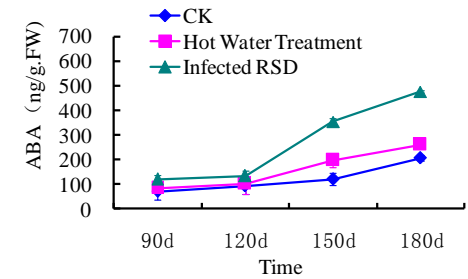
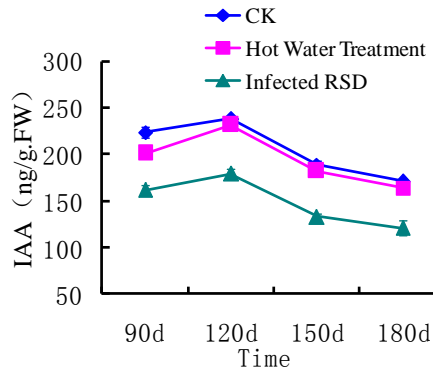
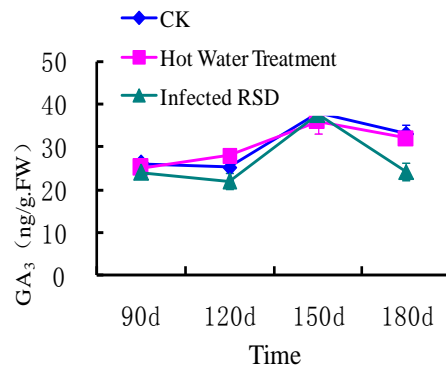
A. The cell structure of xylem vessels in healthy sugarcane stalks; **B, C, D.** The injured structure of nucleus and mitochondrion in sugarcane stalks infected with RSD; **E.** Endoplasmic reticulum swelling and a large number of vesicles produced in sugarcane stalks infected by RSD; **F, G.** RSD pathogens were found inside and outside the cell wall; **H.** A large number of electron-dense material was produced.

ER. Endoplasmic reticulum; **R.** Ribosome; **V.** Vesicles;
ED. Electron-dense material

GA₃, IAA and ABA in sugarcane stalks with different treatment



Badila



CONCLUSION

Sugarcane RSD infection suppressed the growth of leaf and stalk, and made plant height significantly declined. The structure/ ultrastructure degradation happened in mesophyll cell, chloroplast, mitochondria, nucleus, vessel cell, etc. The contents of endogenous hormone were changed, and IAA and GA₃ were decreased while ABA was increased. There was no significant difference in plant height and hormone levels between the healthy and hot water treatments, indicating that the seedcane with thermal treatment is efficient to control sugarcane RSD.