Progress of Sugarcane Disease Research in China

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Sugarcane Diseases

- Sugarcane is an important economic crop in southern of China, more than 9 million hectare sugarcane was planted per year.



Harvest sugarcane

Sugarcane Diseases

- It is reported there are more than 30 diseases occurred in China.
- More important diseases and research progress as below:

1 Sugarcane Smut (*Sporisorium scitaminea*; Synonym: *Ustilago scitaminea*)



Sugarcane Smut



Sugarcance Smut Research

- The whole genome sequence and transcriptome of the fungal pathogen *Sporisorium scitaminea* were determined recently with a combination of high throughput sequencing coupled with Sanger's method in Guangxi University.

Sugarcance Smut Research

- The analysis on pathogenic related genes are conducting now. The research results will be helpful to understand *Sporisorium scitaminea* pathogenesis.

Sugarcance Smut Research

- In Fujian province, response of sugarcane to infection by the smut fungus was investigated and it was revealed that 36 genes were up-regulated and 20 proteins involved in several metabolism pathways were differentially expressed. (Que Youxiong et al, 2008)

Sugarcance Smut Research

- In Hainan province, the research results shown that transgenic sugarcane expressing chitinase and β-1,3-glucanase was shown to be resistant to the smut fungus (Gu Lihong et al, 2008).

2 Sugarcane Viral Diseases



Sugarcane Viral Diseases



Sugarcance Viral Diseases Research

- Five viruses have been reported in China, including
- *Sugarcane mosaic virus* (SCMV), ***Potyvirus***
- *Sorghum mosaic virus* (SrMV), ***Potyvirus***
- *Sugarcane yelllow leaf virus* (SCYLV), ***Luteoviridae, Polerovirus***
- *Sugarcane streak mosaic virus* (SCSMV), Unassigned genus in the family ***Potyviridae***
- *Sugarcane bacilliform virus* (SCBV) ***Badnavirus***

Sugarcance Viral Diseases Research

- SCMV and SrMV were two common viruses occurred in China.
- SCYLV is now sporadic in many sugarcane planting regions in southern China.
- SCBV was only found in Guangdong and Yunnan provinces in individual field .
- SCSMV is detected only from a sugarcane variety imported from India.

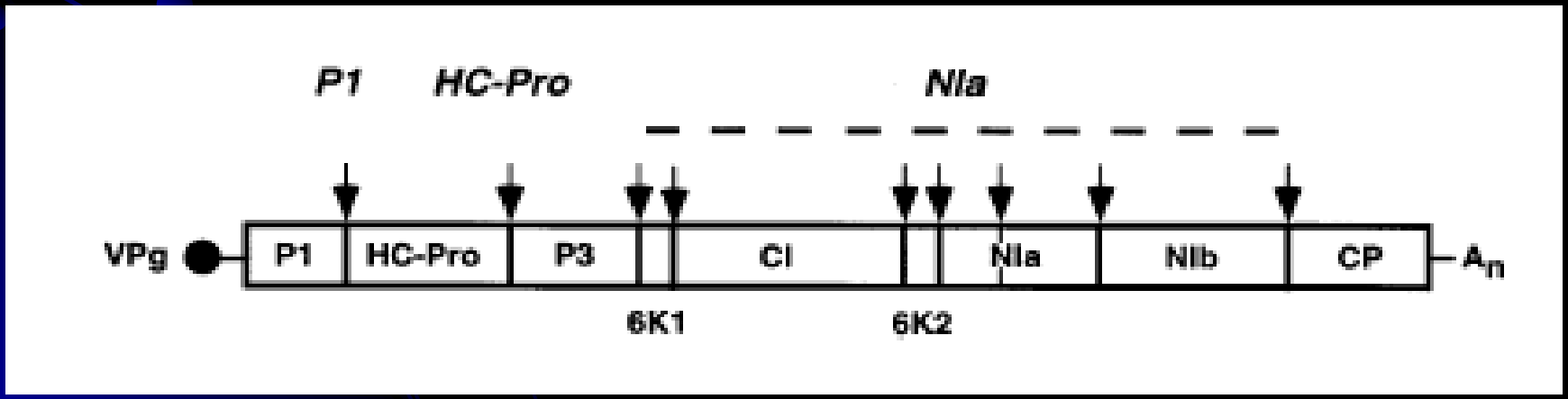
Sugarcance Viral Diseases Research

- Zhou Guo Hui et al (2006) first confirmed that sugarcane woolly aphid (*Ceratovacuna lanigera*) is another transmission vector of SCYLV.



Sugarcance Viral Diseases Research

- Transgenic sugarcane with introduced SCMV-CP was developed and shown to be resistant to SCMV infection (Ruan Miaohong，2007).



Sugarcance Viral Diseases Research

- Eradication of viruses by heat treatment to generate virus-free plants have been in application (Zhou Guohui et al, 2005).

- Other measures such as water and fertilizer management were found to be effective in delaying or abating the symptom development of yellow leaf disease (Wang Qinnan et al, 2009).

3 Sugarcane Ratoon Stunting Disease Research

- Sugarcane ratoon stunting disease by *Leifsonia xyli* subsp. *xyli* (Lxx) is now an increasingly important disease in China



图9—14 甘蔗宿根矮化病为害茎部症状

Sugarcane Ratoon Stunting Disease Research

- PCR and Real-time PCR protocol were developed and widely used for detection of Lxx in sugarcane seed stem (ZHAO Tingting et al, 2011; Dan Ming et al, 2011).
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- Polyclonal Antibody technology was used to detect the bacterium in sugarcane tissues (Yang Litao et al)

Sugarcane Ratoon Stunting Disease Research

- Bacterium-free sugarcane plants have been obtained by stem-tip tissue culture (Dan Ming et al, 2011).

4 Sugarcane Nematodes Research

- Wei Ji Li et al (2008) summarized that there were 8 genuses of nematodes in China, including
- *Tylenchorhynchus*, *Helicotylenchus*,
- *Meloidogyne*, *Xiphinema*,
- *Pratylenchus*, *Radopholus*,
- *Rotylenchus*, *Trichodorus*.

Sugarcane Nematodes Research

- Chen Ping Hua et al (2004) used nematodes-resiatance gene *Hs1*$^{pro-1}$ transgened sugarcane and transgenic sugarcane plants received nematodes-resiatance.

5 Sugarcane Pokkah Boeng (*Fusarium moniliforme*)



Sugarcane Pokkah Boeng Research

- Hong Weixiong et al (2011) researched on *Fusarium moniliforme* molecular biology
- Including preparation fugus's protoplast and transformation technologies,
- testing and verifying some MAPK pathway related genes's function.

6 Other Sugarcane Diseases

- There are few recent reports on the other sugarcane diseases, but these diseases also occurred commonly in the field, as below:

Sugarcane Pineapple Disease (*Ceratocystis paradoxa*)





Sugarcane Tiger Spot (Sheath blight)
（*Rhizoctonia solani*）



Sugarcane Tiger Spot



Sugarcane Red Rot (*Colletotrichum falcatum*)



Sugarcane Red Rot



Sugarcane Brown Stripe (*Bipolaris stenospila*)





Sugarcane Brown Stripe



Sugarcane Purple Spot (*Dimeriella sacchari* ?)





Sugarcane Purple Spot



Sugarcane Ring Spot (*Phyllosticta saccharicola*)



Sugarcane Ring Spot



Sugarcane “Yellow Leaf”



Sugarcane “Yellow Leaf”



Green leaf vein, Iron deficiency symptom different from White Leaf Disease caused by *Phytoplasma*

Summary

- There are so many diseases problems in sugarcane production, but research on sugarcane diseases is limited.
- Suggestion more research funding was put into sugarcane diseases theoretical basis and comprehensive control research.
- Devoloping a healthy sugarcane production.



Farmers are planting sugarcane in my hometown, hope them will have a smile face at the end of the year with bumper harvest of sugarcane


Due to my limited reading, I believe there are more researches developing on sugarcane diseases in China, just as so many experts speaking in this workshop!
Thank you !