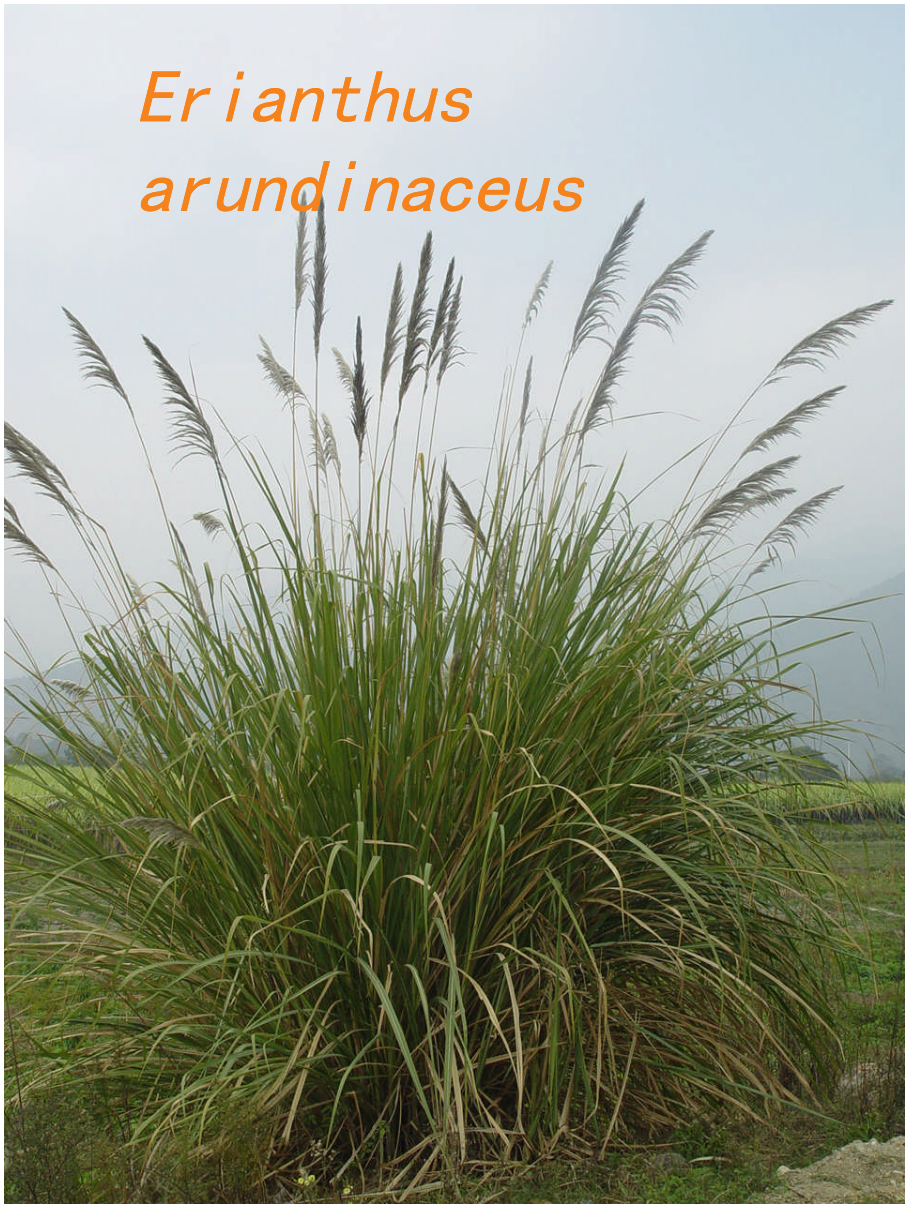
# CHARACTERIZATION OF CHROMOSOME INHERITANCE OF THE NTERGENERIC PROGENY BETWEEN *Saccharum spp.* and *Erianthus arundinaceus*

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# INTRODUCTION




●*Erianthus arundinaceus* is one of the most closely related genera to *Saccharum*

Has many desirable agronomic traits for sugarcane improvement.

**such as biomass, vigor, rationing ability, tolerance to drought, and water logging as well as resistance to pests and disease**

# INTRODUCTION

- To investigate the introgression of the *E. arundinaceus* genome into sugarcane and to discover the chromosome inheritance of the intergeneric progeny between *Saccharum* spp. and *E. arundinaceus*
- Intergeneric progeny between *Saccharum* spp. and *E. arundinaceus* were studied using the genomic in situ hybridization (GISH) technique.

# MATERIALS AND METHODS

*Erianthus arundinaceus* clones ：Hainan92-105 Hainan92-77

*S. officinarum* ：Badila

Commercial varieties ：Neijiang57-416，CP84-1198 ROC20 et al

Hybrid of *Erianthus and Saccharum* spp.

5 F1： Badila × *Erianthus arundinaceus* YC96-66、YC96-40 et al

13 BC1： F1 × Commercial varieties YC01-03 YC01-69 YC01-134 YC01-21 YC01-36 YC01-116 et al

9 BC2： Commercial varieties × BC1 or BC1 × Commercial varieties

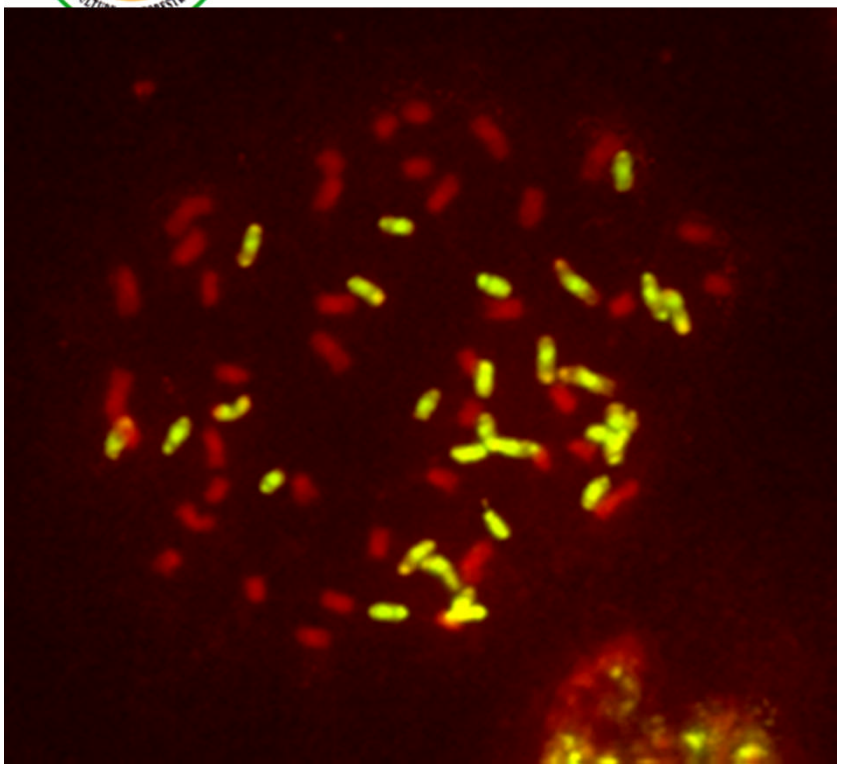
8 BC3： Commercial varieties × BC2 or BC3 × Commercial varieties

# METHODS

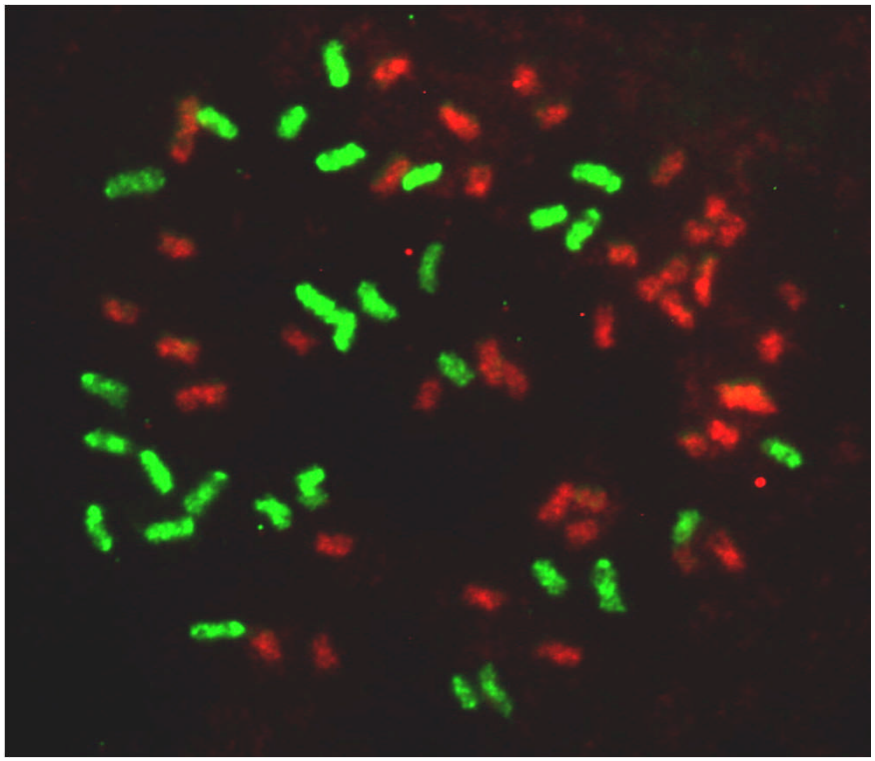
- Chromosome preparation and the GISH experiment were carried out according to the method described by D'hont et al.

- Chromosome number counting: Fifteen cells were taken for counting the chromosome number under the microscope by amplifying 1000 times, and photos of the best distracting cell were taken.

# Results



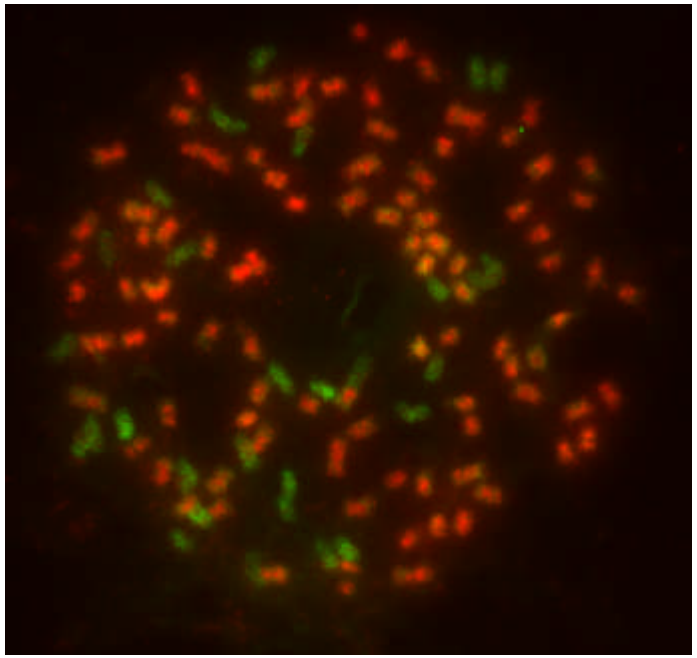
YC96-40(F1)



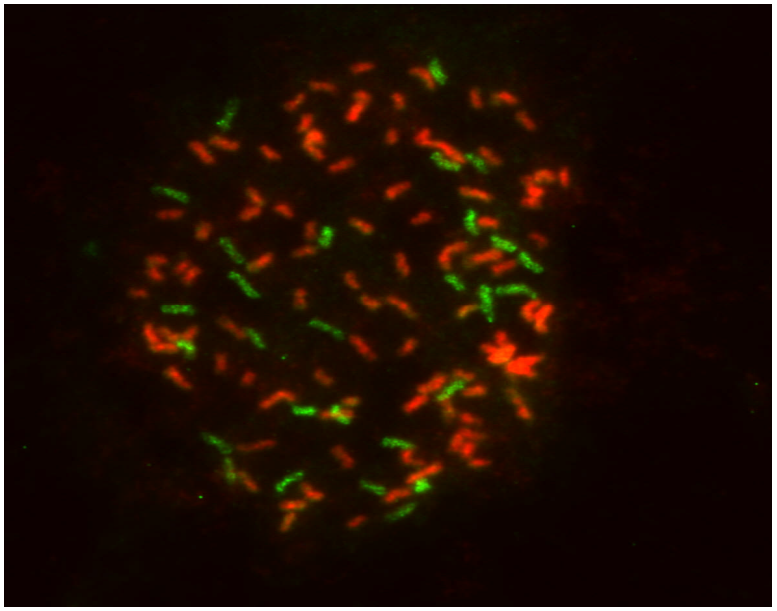
YC96-66(F1)

•Five F1 showed a total of 68 to 69 chromosomes, of which 40 were derived from *Saccharum officinarum* (2n = 80, RED) and 28 to 29 were derived from *E. arundinaceus* (2n = 60, GREEN or YELLOW). All F1 clones were product of a n + n transmission.

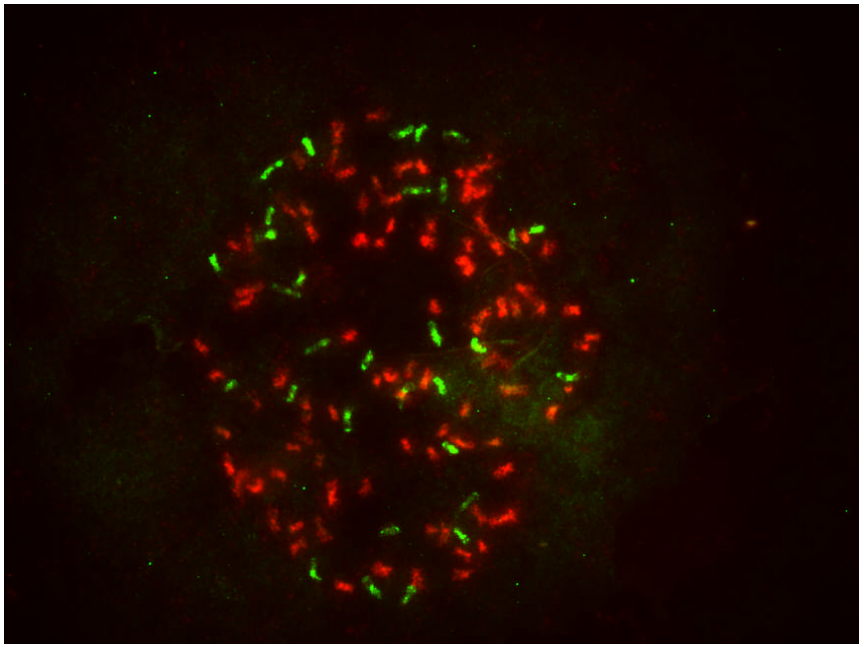
- In the 13 BC1 progeny, the total numbers of chromosomes were 120 to 134, of which 22 to 36 were derived from *E.arundinaceus*.
- 9 BC1 clones were product of 2n + n transmission



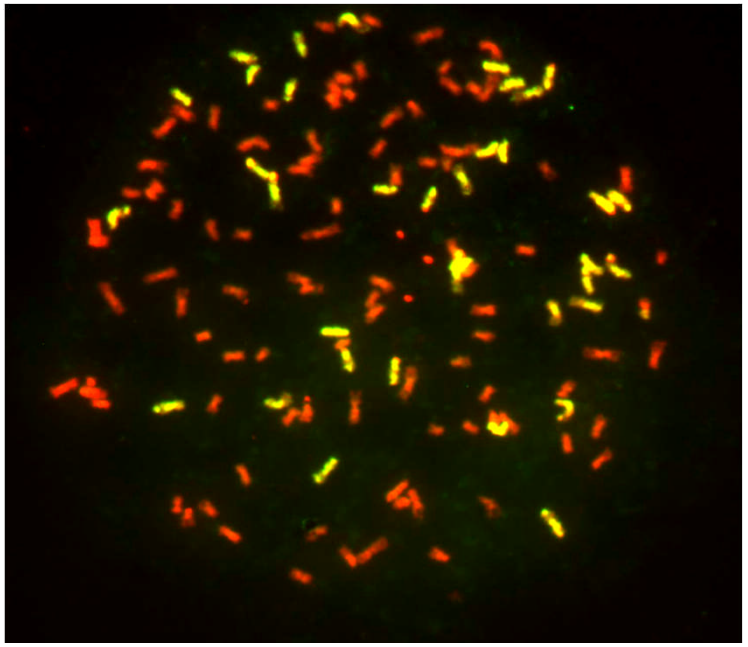
BC1 YCE01-134
（2n = 123 = 94S + 29 E ）



BC1 YCE 01-116
（2n = 124 = 96 S + 28 E ）



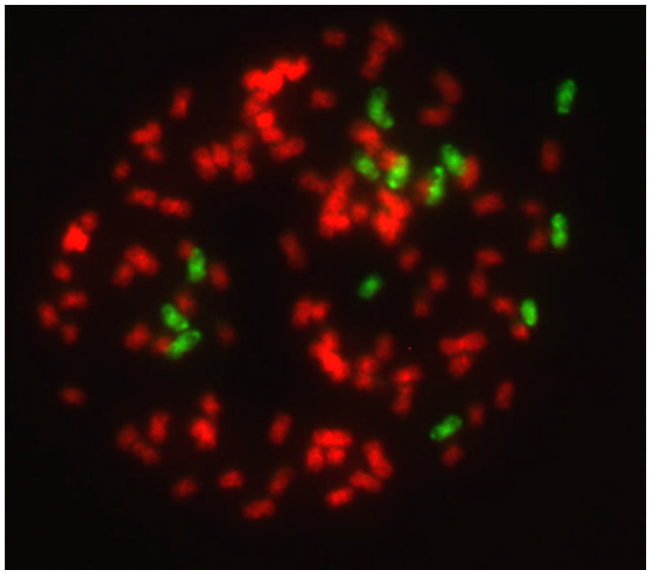
BC1 YCE01-69
（2n = 120 = 89 S + 31 E）



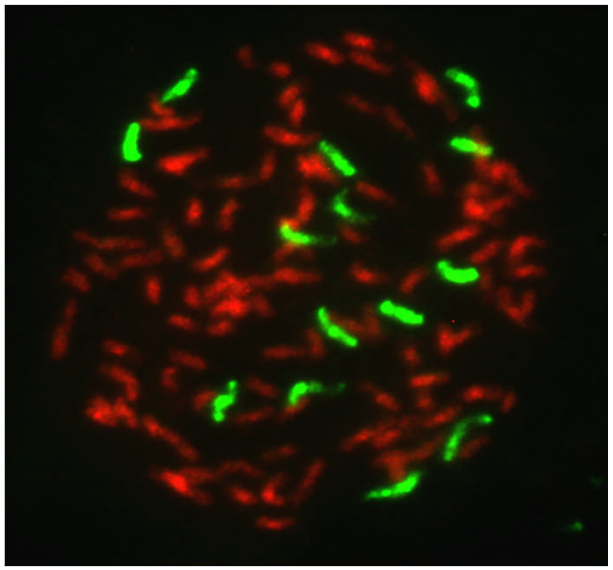
BC1 YCE01-36
（2n = 132 = 96 S + 35 E +1 R）

- Four of the 13 FI resulted from more than 2n + n transmission.

- Most of the BC2, BC3 and BC4 resulted from n + n chromosome transmission, the number of *E. arundinaceus* chromosomes was halved along with backcross generations.

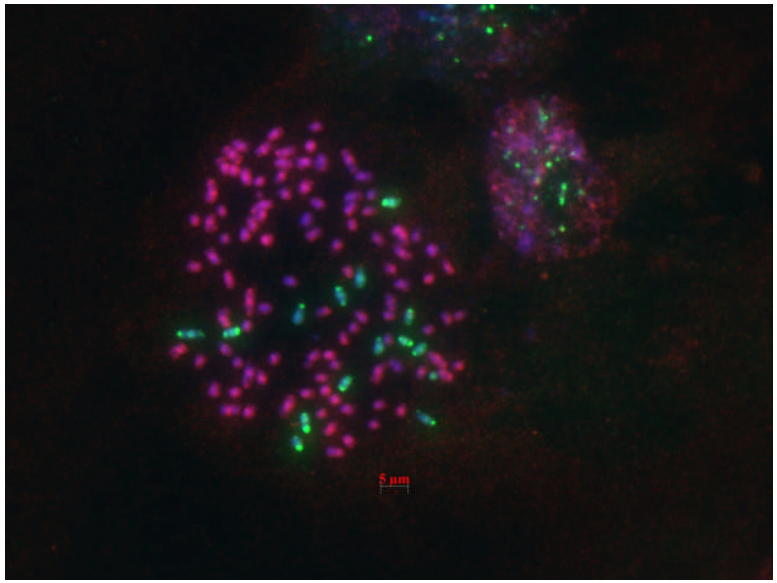


BC2 YCE 05-179
（2n = 110 = 96 S + 14 E ）



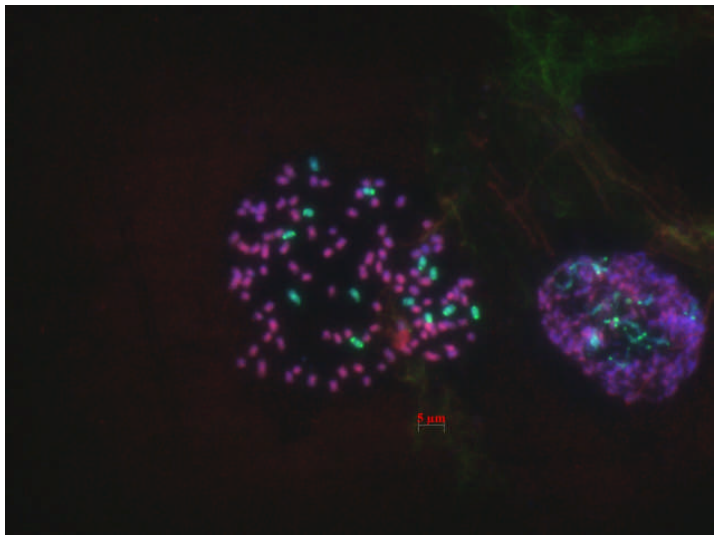
BC2 YCE03-06
（2n = 120= 106 S + 14 E ）

- However, a special phenomenon of chromosome inheritance existed in BC3 progeny YCE05-164. The *E.arundinaceus* chromosome number in YCE05-164 was more than YCE03-16 as the male parent. May be BC3 progeny YCE05-164 resulted from more than 2 n + n chromosome transmission.



BC3 YCE 05-164

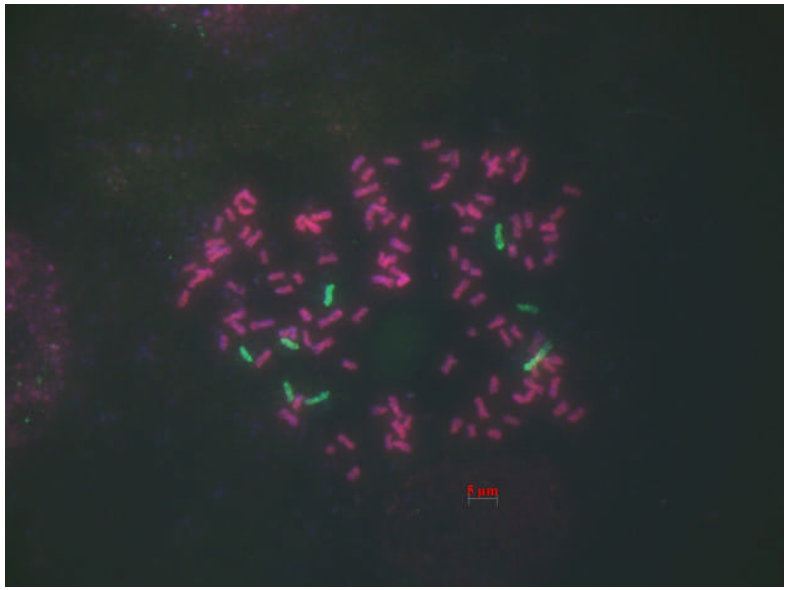
2n = 115 = 100S + 15E



BC2 YCE 03-16

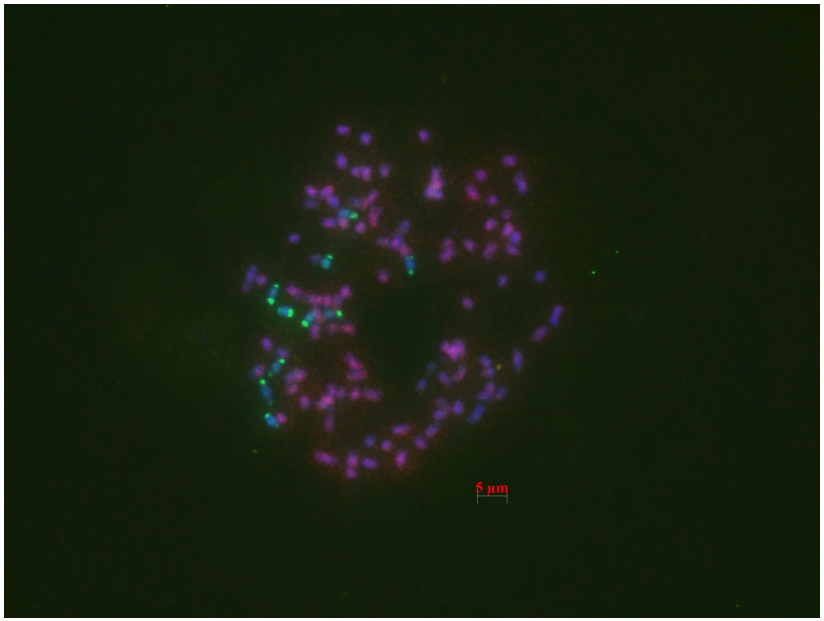
2n = 2n = 113 =100S + 13E

- And BC3 YCE05-150 have 8 *E.arundinaceus* chromosome ,and it's female parent only 10 *E.arundinaceus* chromosome , May be BC3 progeny YCE05-150 resulted from 2 n + n chromosome transmission.



BC3 YCE 05-150

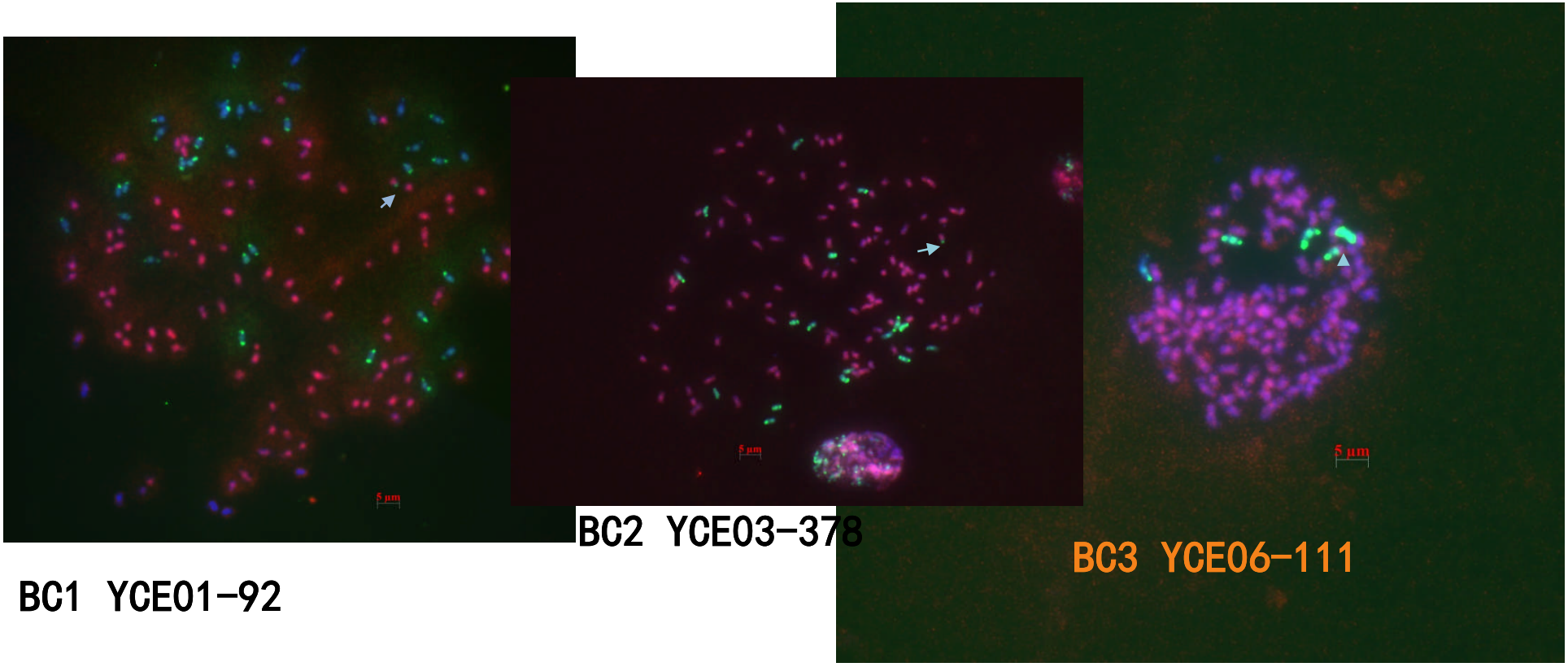
2n =116= 108S + 8 E



BC2 YCE 03-218

2n =107= 97S + 10E

- Chromosome translocation occurred in 8 of 37 progeny of *Saccharum* spp. and *E. arundinaceus*. Among them, there were 2 translocation lines in BC1, 2 translocation lines in BC2, and 4 translocation lines in BC3. According to the pedigree, the translocated chromosomes could be transmitted to their progeny. For instance, YCE01-92 was the male parent of YCE03-378 and YCE03-168 was the female parent of YCE06-111.



# Discussion

- The number of *E*. *arundinaceus* chromosomes in the other four of 13 BC1 progeny were above 29 more than that in their F1 female parents. This is the first report on cytogenetic evidence for unexpected inheritance pattern of *E*. *arundinaceus* in sugarcane. We addressed the question which mechanism is the occurrence of more than 2n gametes formation in the BC1 progeny.
- The first possibility (Model I) ： NHC + SDR

（NHC + SDR: nondisjunction of homologous chromosomes in first meiotic division and second division restitution ）

- The second possibility (Model II) ：FDR + NSC

（ FDR + NSC: first division restitution and nondisjunction of a chromosome with sister chromatids in second meiosis division. We do not show the case of recombination in the meiotic division. ）

( Jiayun Wu, Yongji Huang, Yanquan Lin **,Zuhu DENG** etal . PLOS one, October 2014 | Volume 9 | Issue 10 | e110390)





- BC4 YCE07-65 with high yield ,strong resistance ,good ratooning ability, Brix20.5%, using as parent。
- Cultivar with *Erianthus arundinaceus* genomic would be breed!

# Acknowledgments

## Other contributions

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THANK YOU FOR
YOUR ATTENTION!