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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

WORKING GROUP ON BIOCHEMICAL AND MOLECULAR TECHNIQUES AND DNA PROFILING IN PARTICULAR

Fifteenth Session

Moscow, Russian Federation, May 24 to 27, 2016

ADVANCES IN THE CONSTRUCTION AND APPLICATION OF DNA FINGERPRINT DATABASE IN MAIZE

Document prepared by experts from China

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The Annex to this document contains a copy of a presentation “Advances in the construction and application of DNA fingerprint database in maize” to be made at its fifteenth session of the Working Group on Biochemical and Molecular Techniques and DNA-Profiling in particular (BMT).

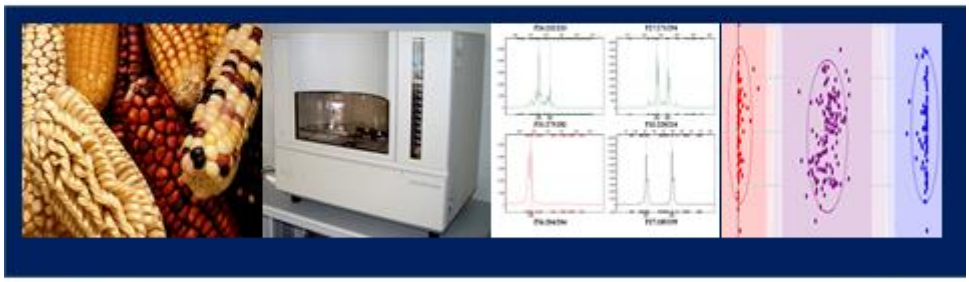
Jiuran Zhao and Zi Shi
The Maize Research Center, Beijing Academy of Agriculture and Forestry Sciences, China

[Annex follows]

ANNEX

ADVANCES IN THE CONSTRUCTION AND APPLICATION OF DNA FINGERPRINT DATABASE IN MAIZE

Advances in the construction and application of DNA fingerprint database in maize



Jiuran Zhao and Zi Shi
The Maize Research Center, Beijing Academy of Agriculture and Forestry Sciences, China

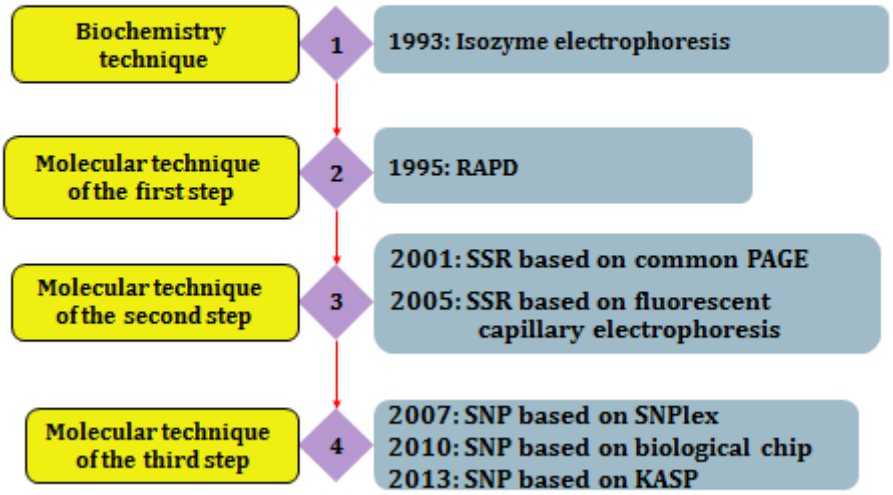
Outline

1 Overview of maize variety identification

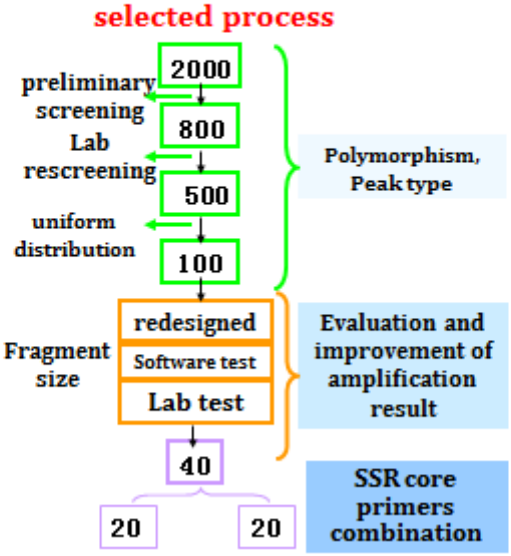
2 SSR-DNA fingerprint technology

3 SNP-DNA fingerprint technology

1. Four stages of maize variety identification



2. SSR-DNA fingerprint technology
2.1 Selection of core SSR primers in maize



2.2 Maize DNA fingerprint identification standard

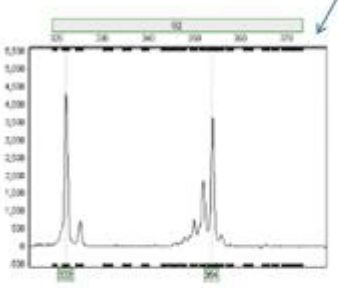
Agricultural industry standard in China

2.3 SSR-DNA fingerprint database containing ＞26,000 maize varieties

- Base database : 500
  - Main inbred lines: 200
  - Main hybrids: 100
  - VCU new varieties: 100
  - PVP varieties: 100

- Expansion database: ＞ 26, 000
  - VCU varieties: ＞18,000
  - PVP varieties: ＞ 2,000
  - Registered varieties: ＞ 5,000
  - Inbred lines: ＞ 1,700
  - Core landraces: 124

Standard DNA fingerprint for hybrid Zhengdan958



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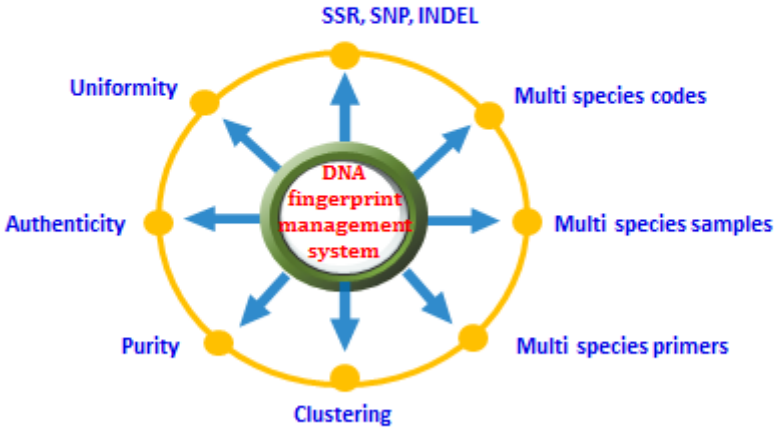
2.4 The development of robust SSR-DNA database management system

- Maize DNA Fingerprint Database Management System
  - User Management
  - Sample Management
  - Locus Management
  - DNA Fingerprint Management
  - DNA Fingerprint Analysis

DNA fingerprint management system



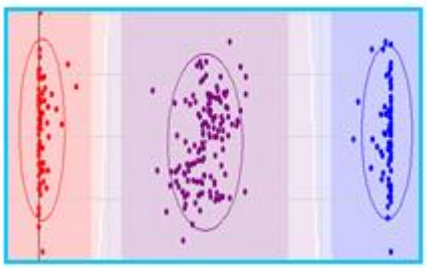
SSR analyzer imbedded in the DNA fingerprint database management system

2.5 More than 50,000 samples have been tested

Source	Numbers
VCU	>18,000
Registered varieties	>5,000
PVP	>2,000
Screening similar varieties in DUS	2,564
Authenticity in seed market (by government)	>12,000
National germplasms samples	1527
Identifying service for company and institute	>13,000
Juridical identification	>1000

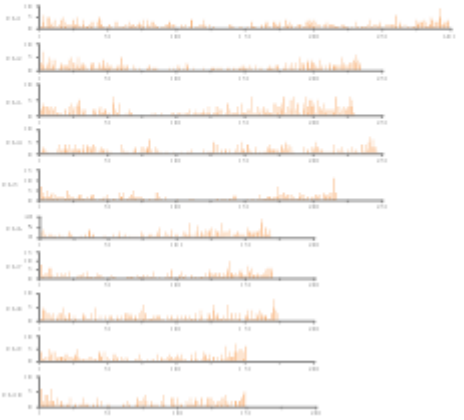
3. SNP-DNA fingerprint technology

- Since 2007, the SNP fingerprint technology has been developed
- Three types of high density SNP chips with various applications
- High throughput KASP platform



3.1 High density and compatibility MaizeSNP3072 chip

- 3072 SNPs selected from MaizeSNP50k (56,110 loci)
- application: >4000 samples, including inbred lines, hybrids and populations



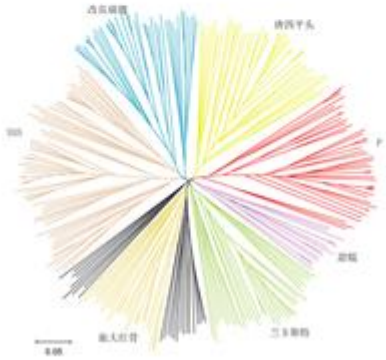
maizeSNP3072 chip

3.2 High density and multifunction MaizeSNP200k chip

- The most high throughput SNP chip in China, manufactured by Affymatrix
- Samples from a diverse genetic background, including 700+ inbred lines from China and USA
- 60, 000,000 SNPs from re-sequencing and Hapmap2 data
- Containing 621 mapped genes with 2-5 loci on each gene
- Containing high quality SNPs from maizeSNP50K and 3072 SNPs from ISF
- Application: 3000+ samples including hybrids, maize germplasms, population samples and breeding materials

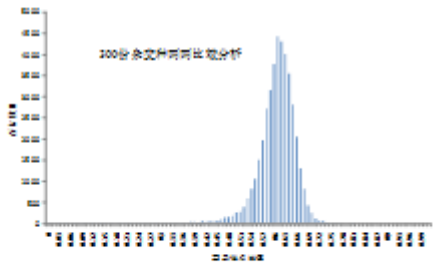
3.3 Special SNP array MaizeSNP384 chip

- Based on 200K and 3072 Chip, using 1,000+ sample to evaluate
- 384 SNP loci, manufactured by Illumina
- maize variety identification and fingerprint database construction

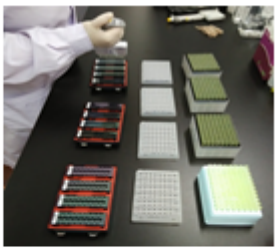


3.4 Applications of MaizeSNP384

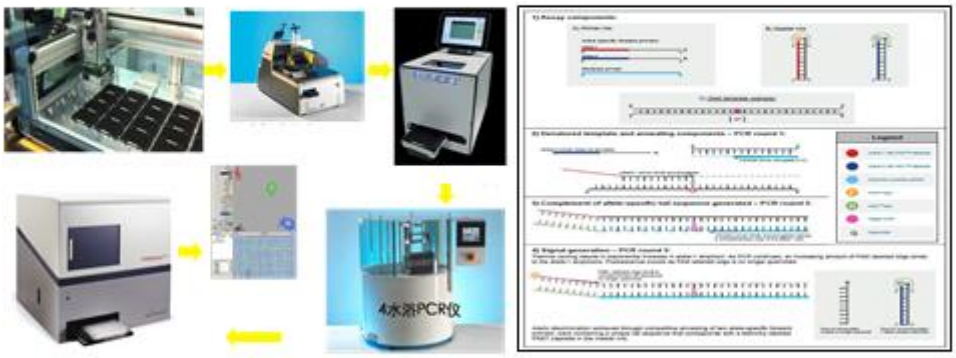
Construction of maize varieties DNA fingerprinting database for 5000+ varieties



Hybrids identification



3.5 High throughput identification technology system



Kompetitive Allele Specific PCR (KASP) platform

3.6 Future direction

- Use 200 loci to verify most of the samples
- Utilize high density SNP chip (200K) to evaluate similar samples
- Optimize current chip to produce SNP chip product at 10K level

Thanks for your attention!

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