



Introduction

- Uniformity and stability of maize hybrids depend upon high and stable inbred lines performance. Distinctness, uniformity and stability (DUS) testing is one of the important criteria to test inbred lines and it is essential to comprehend different modes of the traits expression. It is conducted according to national guidelines prepared on the basis of UPOV (Union Internationale pour la Protection des Obtentions Végétales) guidelines. Ultra Thin Isoelectric Focusing (UTLIEF) analysis is a standard reference method for testing the genetic purity of lines and hybrids. Simple Sequence Repeats (SSR) markers are considered as the most reliable tool for genotypes' fingerprinting, assessing variation within parental lines and genetic purity testing.

Results and discussion

Table 1 Segregation in VG traits according to particular UPOV descriptors scale level (given in brackets) for three (L1 – L3) maize inbred lines evaluated.

VG trait	L1	L2	L3
Quantitative traits (QN)			
ACSh	1:0 - (1)	5:1 - (3,5)	5:1 - (1,3)
ACBG	1:0 - (1)	1:5 - (1,3)	1:0 - (1)
ACGB	2:1 - (3,5)	1:3 - (7,9)	1:3 - (3,5)
ACA	1:5 - (1,3)	5:1 - (1,3)	1:3 - (5,7)
ACS	1:5 - (1,3)	1:3 - (3,5)	3:1 - (3,5)
ACBR	1:11 - (1,3)	1:3 - (7,9)	5:1 - (5,7)
ACGC	1:5 - (3,5)	1:0 - (5)	11:1 - (5,7)
ABS	5:7 - (3,5)	1:3 - (1,3)	1:11 - (3,5)
Pseudo-qualitative traits (PQ)			
CTG	1:3 - (4,5)	11:1 - (5,6)	1:3 - (3,4)
CDG	1:3 - (3,4)	3:1 - (3,4)	7:5 - (5,6)
Qualitative traits (QL)			
GT	1:0 - (1)	2:1 - (1,2)	1:5 - (3,4)

Conclusions

- Based on results obtained by analysing seed storage proteins (albumines and zeins) profiles, maize inbreds displayed absolute genetic purity
- Determined genetic purity of MRIZP inbreds was confirmed by eight informative SSR markers recommended by ISTA protocol
- Certain discrepancies in estimation of genetic purity obtained by morphological and molecular markers could be the result of neutral nature of SSR markers, as markers uninfluenced by environmental or growth conditions.



Table 2. Significance for observed morphological traits according to ANOVA for inbred lines

Inbred	PH	PHN	NLAE	LL	LW	EH	LALB	LAHB
Factor A (year)								
L1	***	***	ns	***	***	***	**	*
L2	***	***	**	***	***	***	ns	ns
L3	***	***	**	***	***	***	***	ns
Interaction Factor B (plant density)								
L1	ns	ns	ns	ns	ns	ns	ns	ns
L2	ns	ns	ns	ns	ns	ns	ns	ns
L3	ns	ns	ns	ns	ns	ns	ns	ns
Factor C (sowing date)								
L1	ns	ns	ns	ns	ns	ns	**	**
L2	ns	ns	ns	ns	ns	ns	ns	ns
L3	ns	ns	ns	ns	ns	ns	ns	ns
Interaction A x B								
L1	ns	**	*	*	ns	ns	**	*
L2	ns	ns	ns	ns	ns	ns	ns	ns
L3	ns	ns	ns	ns	ns	ns	ns	ns
Interaction A x C								
L1	ns	ns	ns	ns	ns	ns	*	*
L2	ns	ns	ns	ns	ns	ns	***	ns
L3	ns	ns	ns	ns	**	ns	**	***

P – plant height; PHN – plant height to upper most node; NLAE – number of leaves above upper most ear; LL – leaf length; LW – leaf width; EH – ear height; LALB – lowest lateral; LAHB – length of main axis above the highest lateral branch; *, **, *** – significant at $p \leq 0.05$, 0.01 and 0.001 probability level, respectively; ns – non-significant.

Materials and methods

- Three Maize Research Institute inbred lines (L1-L3) from breeder seed category were evaluated regarding their uniformity, stability and genetic purity
- Inbreds were subjected to DUS evaluation according to the UPOV markers in three-year field experiment set up according to Complete Randomised Block Design (RCBD), in two densities (i.e. D-30cm and D-40cm) and two sowing dates (in ten-day interval), in two replications
- Eleven visually scored (VG) and eight measured (MS) morphological traits were evaluated
- After manual harvesting and drying to 14% of water content, grain yield (GY) was calculated per plant basis
- Yield components – ear length (EL), ear diameter (ED), cob diameter (CD), kernel length (KL), width (KW) and thickness (KT), number of kernels per row (NKR) and number of rows per ear (NRE), were recorded on ten randomly chosen ears per replication
- Three-way analyses of variance (ANOVA) was used for agro-morphological data analyzing
- UTLIEF method regarding determination of electrophoretic patterns for storage proteins (albumines and zeins) was applied
- Eight informative SSR markers for genetic purity testing were used.

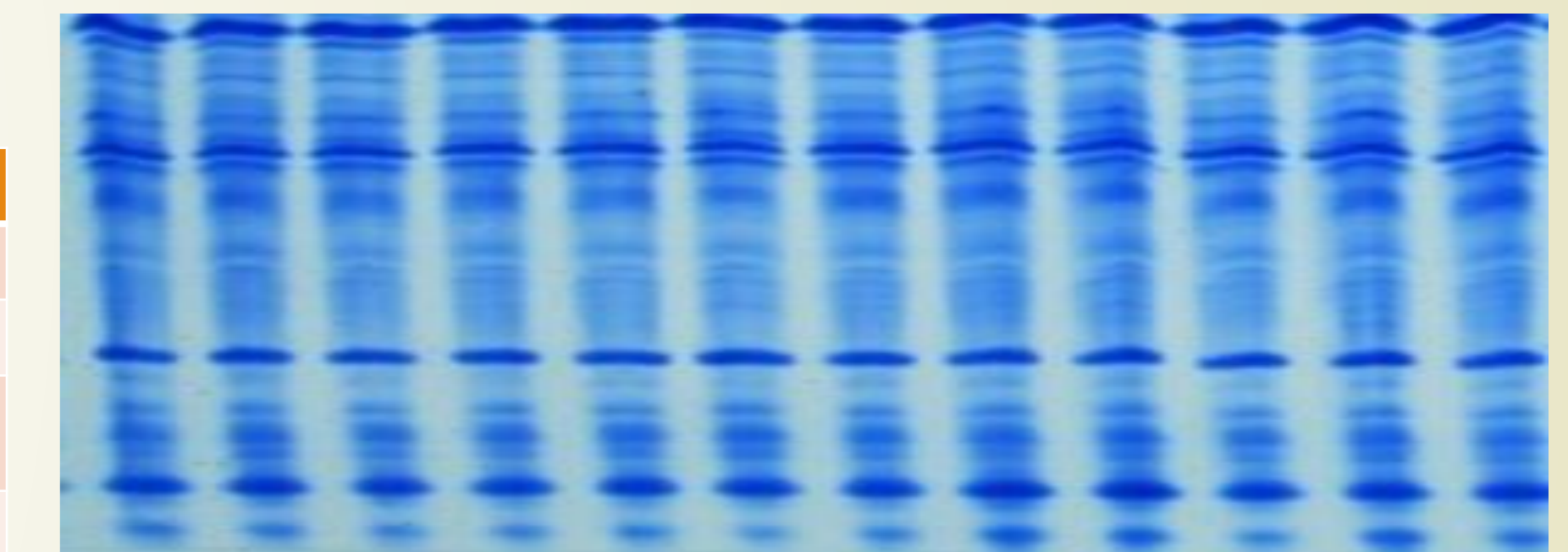


Figure 1. Electropherogram of storage proteins (100% homozygous maize inbred)



Figure 2. Electropherogram of SSR analysis (umc1133) of eight marker used. M - 20 bp DNA ladder; B - seed bulk sample; P1-P10 - single seed samples. (100% homozygous maize inbred)