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Comparative evaluation of maize inbred lines (zea mays l.) according to dus testing using morphological, physiological and molecular markers

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ABSTRACT

A major challenge facing those involved in the testing of new plant varieties for Distinctness, Uniformity and Stability (DUS) is the need to compare them against all those of 'common knowledge'. A set of maize inbred lines was used to compare how morphological, physiological characterization and RAPD molecular marker described variety relationships. All the inbred lines were confirmed as morphologically and physiologically distinct. At morphological level the maximum genetic distance (10.8) and least genetic distance (1.6) were found. For physiological characters distance varied from 0.35 to 1.92 and results from dendrogram, which was made on the basis of dissimilarity matrix, were grouped into five major clusters. From RAPD, random primers provide polymorphic amplification products; the distance varying 0.42 to 0.65 and dendrogram showed that these lines formed close clusters due to the less variation in these lines at molecular level. In the present study, the molecular markers also exposed useful genetic diversity and the visual displays appeared to disperse the lines somewhat more evenly over the plot than the morphological and physiological methods.

KEYWORDS

DUS; Inbred Lines; Maize; Markers; Genetic Distance; Diversity

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References

[1] (2008) FAOSTAT, Food and Agricultural Organization, Rome.

[2] Anderson, E. and Brown, W.L. (1952) Origin of corn belt maize and its genetic significance, In: Heterosis - A Record of Researches Directed toward Explaining and Utilizing the Vigor of Hybrids, Gowen, J.W., Ed., Iowa State College Press, Ames, 124-148.

[3] Troyer, A.F. (2001) Temperate corn. In: Hallauer, A., Ed., Specially Corns, CRC Press, Boca Raton.

[4] Henry, A. and Damerval, C. (1997) High rates of ploymorphism and recombination at the Opaque-2 locus in cultivated maize. Molecular and General Genetics, 256, 147-157.

[5] Ching, A., Caldwell, K.S., Jung, M., Dolan, M. and Smith, O.S. (2002) SNP frequency, haplotype structure and linkage disequilibrium in elite maize inbred lines. BMC Genet, 3(19), 1-14.

[6] Bretting, P.K. and Widrlechner, M.P. (1995) Genetic markers and plant genetic resource management. Plant Breeding Reviews, 13, 11-86.

[7] Hamrick, J.L. and Godt, M.J.W. (1989) Allozyme diversity in plant species. In: Brown, A.H.D., Clegg, M.T., Kahler, A.L. and Weir, B.S., Eds., Plant Population Genetics, Breeding, and Genetic Resources, Sinouer Association, Sunderland, 43-63.

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[8] UPOV (1979) Revised general introduction to the guidelines for the conduct of tests for distinctness, homogeneity and stability of new varieties of plants. UPOV TG/1/2, 11.

[9] UPOV (1980) Guidelines for the conduct of tests for distinctness, homogeneity and stability – maize (Zea mays L.). UPOV TG/2/4, 14.

[10] UPOV (1991) UPOV Publication No. 221(E) of 1992 on international convention for the protection of new varieties of plants of December 23, 1978; and on March 19, 1991. 31.

[11] UPOV (1994a) Guidelines for the conduct of tests for distinctness, homogeneity and stability-maize (Zea mays L.). UPOV TG/2/6, 63.

[12] Sujay, R. and Singh, N.N. (2001) Guidelines for conduct of test for distinctness, uniformity and stability in maize (Zea mays L.). Directorate of maize Research, New Delhi.

[13] (2001) The applied biotechnology center ' s manual of laboratory protocols. CIMMYT, Mexico.

[14] Jaccard, P. (1908) Nouvelles researches sur la distribution florale. Bulletin de la Société vaudoise des sciences naturelles, 44, 223-270.

[15] Rohlf, F.J. (1992) NTSYS-pc Numerical taxonomy and multivariate analysis system. Exeter Software, New York.

[16] Warburton, M.L., Xianchun, X., Crossa, J., Franco, J., Melchinger, A.E., Frisch, M., Bohn, B. and Hoistington, D. (2002) Genetic characterization of CIMMYT inbred maize lines and open pollinated populations using large scale fingerprinting methods. Crop Science, 42, 1832- 1840.

[17] Mishra, J.P. (1999) Biotechnology and Intellectual Property Rights. Yojana, May, 15-20.

[18] Hallauer, A.R., Russel, W.A. and Lamkey, K.R. (1988) Corn breeding. In: Sprague, G.F. and Dudley, J.W., Eds., Corn and Corn Improvement, 3rd Edition, Agronomy Monograph, 18, ASA, CSSA and SSSA, Madison, 463- 564.

[19] Yuan, L., Zhang, S., Warburton, M., Li, X., Fu, J. and Li, M. (2002) Assessment of genetic similarities among maize inbred lines using SSR markers. In: Proceedings of the Eighth Asian Regional Maize Workshop, Bangkok, 50-58.

[20] Melchinger, A.E. (1999) Genetic diversity and heterosis. In: Coors, J.G. and Pandey, S., Eds., Proceedings of the International Symposium on Genetics and Exploitation of Heterosis in Crops, CIMMYT, Mexico, 17-22 August 1997, 3-48.

[21] Ben-Har, A., Charcoset, A., Bourgoin, M. and Guiard, J. (1995) Relationships between genetic markers and morphological traits in a maize inbred lines collection. Euphytica, 84, 145-154.

[22] Burstin, J. and Charcosset, A. (1997) Relationship between phenotypic and markers distance: Theoretical and experimental investigations. Heredity, 78, 477-483.

[23] Senior, M.L., Murphy, J.P., Goodman, M.M. and Stuber, C.W. (1998) Utility of SSRs for determining genetic similarities and relationship in maize using and Aqarose gel system. Crop Science, 38, 1088-1098.

[24] Smith, J.S.C., Chin, E.C.L., Shu, H., Smith, O.S., Wall, S. J., Senior, M.L., Mitchell, S.E. Kresobitch, S. and Ziegle, J. (1997) An evaluation of the utility of SSR loci as molecular markers in maize (Zea mays L): Comparisons with data from RFLPs and Pedigree. Theoretical and Applied Genetics, 95, 163-173.

[25] Messmer, M.M., Melchinger, A.E. and Boppenmaier, E. (1992) Relationship among European maize inbreds: I. Genetic diversity among flint and dent lines revealed by RFLPs. Crop Science, 32, 1301-1309.

[26] Messmer, M.M., Melchinger, A.E., Boppenmaier, J., Brunklaus-Jung, E. and Herrmann, R.G. (1992) Relationship among early European maize inbreds: I. Genetic diversity among flint and dent lines revealed by RFLPs. Crop Science, 32, 1301-1309.

[27] Dubreuil, P., Dufour, P., Drejci, E., Causse, M.M., de Vienne, D. Gallais, A. and Char Cosset, A. (1996) Organization of RFLP diversity among inbred lines of maize representing the most significant heterotic groups. Crop Science, 36, 790-799.