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Application of molecular markers (SSRs) in foreground selection for maize quality traits

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Molecular markers offer several advantages over the conventional phenotypic markers. When molecular markers are tightly linked to genes of interest, they can be used to select indirectly for the desirable allele, what is the simplest form of marker assisted selection (MAS). Markers can be used to either control the target gene (foreground selection) or to accelerate the reconstruction of the recurrent parent genotype (background selection). Application of co-dominant markers such as simple sequence repeats (SSR) enable effective selection of recessive alleles of desired traits without the need for selfing or test crossing in each generation of selection, thus saving time and accelerating breeding progress. The greatest progress in MAS has been achieved with the qualitative traits that are regulated by the action of a single or several genes and are clearly phenotypically defined. One successful example of MAS for maize quality improvement is the utilization of *opaque 2*-specific SSR markers phi057 and umc1066 for development of quality protein maize (QPM) lines with enhanced nutritional quality. Another example is the use of *lpa2*-2-specific SSR marker umc2230 for obtaining the agronomically superior lines with low phytic acid content. Similarly, significant enhancement of kernel β-carotene in elite maize genotypes is being accomplished with the use of crtRB1-specific SSR marker for foreground selection. At the Maize Research Institute, one commercial inbred line was converted to its QPM counterpart, adapted to temperate regions. Having the increased tryptophan content, hard kernel endosperm, improved grain yield and good combining abilities, this new line is being used for developing QPM hybrids adapted to temperate regions aimed for feed. Another ongoing breeding project includes development of lines with low phytic acid content, as well as β-carotene enriched lines. In future, these lines will be used to obtain high-yielding hybrids with improved nutritional benefit.

Biography

Marija Kostadinovic has completed her PhD in Genetics at University of Belgrade, Serbia. At present, she is working as a Research Associate in the Laboratory of Molecular Genetics and Physiology at the Maize Research Institute Zemun Polje, where she is engaged in the project improving the quality of maize and soybean by conventional and molecular breeding funded by the Ministry of Education, Science and Technological Development of Republic of Serbia. Her research focus is on the marker assisted selection for improvement of the maize protein quality. Also, she is included in genetic characterization of maize lines, hybrids and populations, as well as in biochemical testing of the grain quality.

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