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## Conversion of GBS polymorphisms into CAPS markers for a fertility restoring gene in carrots

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**B**reeding of carrot hybrids is based on Cytoplasmic Male Sterility (CMS) and CMS lines are reproduced using the so called maintainer lines which should be devoid of fertility restoring alleles. Therefore, the development of DNA markers for such alleles would greatly facilitate production of new hybrids. For this purpose we mapped carrot restorers in the context of DNA polymorphisms detected via Genotyping By Sequencing (GBS). In the present work we selected a few GBS polymorphisms, which were linked to fertility restoration, and subjected them to conversion into Cleaved Amplified Polymorphic Sequences – CAPS markers.

**Methodology and Theoretical Orientation:** The GBS datasets were screened for possible CAPS markers with the VCF2CAPS software developed by Wojciech Wesołowski. The respective PCR primers were designed manually. PCR was followed by restriction with a tetra-cutter and routine electrophoresis in agarose. Genotyping was performed for plants from population 170 which segregated into male-sterile and male-fertile (restored) plants.

**Findings:** Conversion was performed for four GBS polymorphisms from chromosome 9 where the restorer gene from population 170 was mapped. For two GBS polymorphisms the respective CAPS

polymorphisms were not detected. The remaining two GBS polymorphisms translated into polymorphic CAPS markers named pe098/RsaI and pe106/TaqI. Both polymorphic CAPS markers showed co-segregation with the sterility/fertility phenotype. Co-segregation reached the value of 84 and 89 % for pe098/RsaI and pe106/TaqI, respectively. For both markers the male-fertile plants were homozygous and the male-sterile-plants were heterozygous.

**Conclusion and Significance:** The results show that some GBS polymorphisms may be negatively verified with the use of CAPS markers. Likely, it is related to low coverage of DNA sequencing during GBS which results in low quality of the identified polymorphisms. Nevertheless, two GBS polymorphisms were converted into useful CAPS markers which can be used for identification of the restorer from chromosome 9 in segregating populations.

### Biography

Marek Szklarczyk is a faculty member at the Institute of Plant Biology and Biotechnology, Krakow Agricultural University, Poland. His main scientific interests are cytoplasmic male sterility (CMS) and fertility restoration. He studies these traits in carrots, beets, onions and rye.

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