

Characterization of an Improved Ogu-NWSUAF CMS in *Brassica Napus* L.

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ABSTRACT

Cytoplasmic male sterility (CMS) is one of the most important approaches to utilize the heterosis in *Brassica napus* L. Discovery and characterization of novel male sterile cytoplasm is always the base for rapeseed heterosis breeding. Up to now, a variety of rapeseed CMS have been found, among which, Ogu CMS shows very stable and complete sterility. However, no restorer is available in rapeseed, and it shows chlorosis under low temperature and low nectar production. Therefore, it is very necessary to improve the Ogu CMS to overcome these shortcomings and to breed new Ogu CMS restorers. We have transferred Ogu CMS from Chinese cabbage and developed an improved Ogu-NWSUAF CMS. In this investigation, the Ogu-NWSUAF CMS was compared with the Ogu CMS from genetic, cytological and molecular levels to reveal its inheritance, cytological and molecular characterization. Restoring and maintaining relationship of the Ogu-NWSUAF CMS and the Ogu CMS was tested by 130 rapeseed accessions, which include 119 *Brassica napus*, 9 *B. rapa*, one *B. juncea* and one *B. carinata* accession. Anther abortion of both of them was observed by the paraffin section method. Molecular characterization of both of them was revealed by site-specific PCR method. Field observation revealed that the Ogu-NWSUAF CMS line has restored etiolation of the Ogu CMS, has normal nectary, and its stamen still aborted thoroughly. The restoring and maintaining relationship of the Ogu-NWSUAF CMS line and the Ogu CMS was not the same, two restorers for the Ogu-NWSUAF CMS were identified. Cytological observation indicated that the Ogu-NWSUAF CMS line could form four microdiodanges. Pollen abortion of the Ogu-NWSUAF CMS was caused by the over growth of the tapetums and belongs to the uninucleate abortion type. Molecular characterization by gene-specific PCR showed that the Ogu-NWSUAF CMS line could amplify both Ogu CMS system specific gene-orf138 product and Nap CMS system specific gene-orf222 product. The Ogu-NWSUAF CMS has restored etiolation of the Ogu CMS, has normal nectary, and its stamen still aborted thoroughly. The Ogu-NWSUAF CMS has different restoring and maintaining relationship with the Ogu CMS. There existed some differences between them at the cellular and molecular level. So, the Ogu-NWSUAF CMS will find a broader application in rapeseed heterosis breeding program.

Key words: Brassica napus L.; The Ogu-NWSUAF CMS; Restoring and maintaining relationship;
Cytology; Molecular characterization

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