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Production of *Raphanus sativus* (C_3)-*Moricandia arvensis* (C_3-C_4 intermediate) Monosomic and Disomic Addition Lines with Each Parental Cytoplasmic Background and their Photorespiratory Characteristics

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Abstract: We are maintaining five *Moricandia arvensis* monosomic addition lines of *Raphanus sativus* carrying *R. sativus cytoplasm* (autoplasmic MALs) and twelve *M. arvensis* MALs of *R. sativus* carrying *M. arvensis* cytoplasm (alloplasmic MALs) from BC_6 to BC_8 generation, and newly produced five *M. arvensis* disomic addition lines of *R. sativus* (autoplasmic DALs) and seven *M. arvensis* DALs of *R. sativus* carrying *M. arvensis* cytoplasm (alloplasmic DALs) from selfing and sib-crossing of the MALs and DALs in S_3BC_5 and S_2BC_6 generations. The structural, biochemical and physiological characteristics related to photorespiration of these MALs and DALs were compared to study the genetic mechanisms of the C_3-C_4 intermediate photosynthesis in the individual chromosomes of *M. arvensis*. The CO_2 compensation point of the autoplasmic and alloplasmic DALs (RMa-b and MaR-b DALs) with one pair of *M. arvensis* 'b' chromosome were 29.4 and 30.1 μmol mol^{-1}, respectively, which were significantly lower than that of other DALs and MALs as well as *R. sativus* (34.5 μmol mol^{-1}). An immunogold electron microscopic study of the P-protein of glycine decarboxylase (GDC) in photosynthetic cells of the RMa-b DAL revealed that the bundle sheath cell (BSC) mitochondria were more intensively labeled for the protein than the mesophyll cell (MC) mitochondria. The ratio of the

labeling density of the BSC mitochondria to that of the MC mitochondria was 1.13, which lies between values in *M. arvensis* (2.66) and *R. sativus* (0.76). These data suggest that the 'b' chromosome of *M. arvensis* genome controls the expression of C_3-C_4 intermediate characteristics.

Keywords: C_3-C_4 intermediate plant, CO_2 compensation point, Disomic addition line (DAL), Monosomic addition line (MAL), *Moricandia arvensis*, Photorespiration

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