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| Table S1: List of plant species used for the evolutionary analyses. |
| Species | **Reference to the genome data** |
| *Arabidopsis halleri* L. | Briskine, R.V., Paape, T., Shimizu-Inatsugi, R., Nishiyama, T., Akama, S., Sese, J., *et al*. Genome assembly and annotation of *Arabidopsis halleri*, a model for heavy metal hyperaccumulation and evolutionary ecology. Mol. Ecol. Resour. 17, 1025-1036 (2017). |
| *Arabidopsis lyrata* L. | Hu, T.T., Pattyn, P., Bakker, E.G., Cao, J., Cheng, J.F., Clark, R.M., *et al*. The *Arabidopsis lyrata* genome sequence and the basis of rapid genome size change. Nat. Genet. 43, 476-481 (2011). |
| *Arabidopsis thaliana* (L.) Heyhn | Arabidopsis Genome Initiative. Analysis of the genome sequence of the flowering plant *Arabidopsis thaliana*. *Nature* 408, 796-815 (2000). |
| *Barbarea vulgaris* W.T. Aiton | Byrne, S.L., Erthmann, P.Ø., Agerbirk, N., Bak, S., Hauser, T.P., Nagy, I., *et al*. The genome sequence of *Barbarea vulgaris* facilitates the study of ecological biochemistry. *Sci. Rep*. 7, 40728 (2017). |
| *Boechera retrofracta* (Graham) Á. Love & D. Love | Kliver, S., Rayko, M., Komissarov, A., Bakin, E., Zhernakova, D., Prasad, K., *et al*. Assembly of the *Boechera retrofracta* genome and evolutionary analysis of apomixis-associated genes. *Genes* 9, 185 (2018). |
| *Capsella rubella* Reut. | Slotte, T., Hazzouri, K.M., Ågren, J.A., Koenig, D., Maumus, F., Guo, Y.L., *et al*. The *Capsella rubella* genome and the genomic consequences of rapid mating system evolution. *Nat. Genet.* 45, 831-835(2013). |
| *Cardamine hirsuta* L. | Gan, X., Hay, A., Kwantes, M., Haberer, G., Hallab, A., Dello, R., *et al*. The *Cardamine hirsuta* genome offers insight into the evolution of morphological diversity. *Nat. Plants* 2, 16167 (2016). |
| *Crucihimalaya himalaica* (Edgew) Al-Shehbaz, O’Kane & R.A. Price | Zhang, T., Qiao, Q., Novikova, P.Y., Wang, Q., Yue, J., Guan, Y., *et al*. Genome of *Crucihimalaya himalaica*, a close relative of *Arabidopsis*, shows ecological adaptation to high altitude. *Proc. Natl. Acad. Sci. USA* 116, 7137-7146 (2019). |
| *Erysimum cheiranthoides* L. | Züst, T., Strickler, S.R., Powell, A.F., Mabry, M.E., An, H., Mirzaei, M., *et al*. Independent evolution of ancestral and novel defenses in a genus of toxic plants (*Erysimum*, *Brassicaceae*). *eLife* 9, e51712 (2020). |