Divergent mass selection has been widely used in plant breeding as it can generate groups of individuals that share the same genetic background but with extreme values for a particular trait. We report here the first results of direct divergent selection for glucosinolate (GSL) content in order to develop *Brassica oleracea* genotypes with divergent concentration of the three major GSLs, sinigrin (SIN), glucoliberin (GIB), and glucobrassicin (GBS). Divergent selection program was started in 2006 by using seeds of a local kale population and then after three selection cycles, six plant genotypes were obtained which had high or low concentration of the major GSL. Selection was carried out in leaves. The aims of this study were to determine if the three divergent selections were successful in leaves and then, to study how each divergent selection affected the GSL content in other organs such as flower buds and seeds.

For the aliphatic GSL (SIN and GIB), differences among cycles of the divergent selections were observed for all of organs under study (leaves, flower buds and seeds). After three cycles, GSL concentration in leaves and flower buds were significantly different than the original cycle (CO). Significant and positive simple linear regression coefficients for SIN concentration were observed in leaves ($R^2$=0.9684), flower buds ($R^2$=0.8810) and seeds ($R^2$=0.6889). In the case of GIB divergent selection, significant and positive simple linear regression values were also found in leaves ($R^2$=0.9311), flower buds ($R^2$=0.8889) and seeds ($R^2$=0.6068).

For the indolic GSL, GBS, differences among cycles of the divergent selection were also found in the three organs under study. Flower buds showed the best response to increase or to reduce of the GSL content. Significant and simple linear regression coefficients were found in the three organs, leaves ($R^2$= 0.6574), flower buds ($R^2$= 0.9635) and seeds ($R^2$= 0.9677).

We can conclude that it is possible to modify the GSLs concentration with a classical divergent mass selection program in leaves. Furthermore, we can observe that there is a correlated response in other organs as flower buds and seeds, indicating a similar genetic regulation in the different tissues. In addition, we are studying the relationships between the modifications of these three major GSLs with other GSLs present in kales to increase our knowledge on the GSL biosynthesis pathway. These genotypes provide an excellent source of variation for future studies about the effect of GSLs in different biological processes.