

## Role of ABC Transporters in Non-Target Site Herbicide Resistance in Black Grass (*Alopecurus myosuroides*)

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**Abstract :** Non-target site based resistance (NTSR) to herbicides in weeds is a polygenic trait associated with the upregulation of proteins involved in xenobiotic detoxification and translocation we have termed the xenome. Among the xenome proteins, ABC transporters play a key role in enhancing herbicide metabolism by effluxing conjugated xenobiotics from the cytoplasm into the vacuole. The importance of ABC transporters is emphasized by the fact that they often contribute to multidrug resistance in human cells and antibiotic resistance in bacteria. They also play a key role in insecticide resistance in major vectors of human diseases and crop pests. By surveying available databases, transcripts encoding ABCs have been identified as being enhanced in populations exhibiting NTSR in several weed species. Based on a transcriptomics data in black grass (*Alopecurus myosuroides*, Am), we have identified three proteins from the ABC-C subfamily that are upregulated in NTSR populations. ABC-C transporters are poorly characterized proteins in plants, but in *Arabidopsis* localize to the vacuolar membrane and have functional roles in transporting glutathionylated (GSH)-xenobiotic conjugates. We found that the up-regulation of AmABCs strongly correlates with the up-regulation of a glutathione transferase termed AmGSTU2, which can conjugate GSH to herbicides. The expression profile of the ABC transcripts was profiled in populations of black grass showing different degree of resistance to herbicides. This, together with a phylogenetic analysis, revealed that AmABCs cluster in different groups which might indicate different substrate and roles in the herbicide resistance phenotype in the different populations

**Keywords :** black grass, herbicide, resistance, transporters

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