**Supplemental Table S2.** Protein sequence of GSTs up regulated in multiple herbicide resistance *Alopecurus myosuroides* populations. The sequences data combines from transcriptomic and proteomic analysis. Accession number *Am*GSTU1 (CAA09188), *Am*GSTF1a (CAA09190), *Am*GSTF1b (CAA09191), *Am*GSTF1c (CAA09192), *Am*GSTF1d (CAA09193).

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| --- | --- |
| **Protein** | **Amino acid sequence** |
| *Am*GSTU1 | MAGGDDLKLLGTWPSPYAIRVKLALAHKGLSYEYAEEDLANKSELLLSSNPVHRKIPVLIHNGVPVCESNIILEYIDEAFAGPSILPADPYERAMARFWAAYVDDKLLAAWATMVFKGKTEEEKLEGKKALFAALETLEGALAKCSDGKDFFGGDTVGLVDMVLGSHLSFLKATEAMAGEEILRSDRTQLLAAWMARFSELDAAKAALPDVDRVVEFAKMRQARLAAAAAAASNN |
| *Am*GSTU2a | MAAGDDLKLLGVWASPFVSRVKLALSFKGLSFENVEEDLGNKSKLLLSSNPVHKKVPVLLHNGKPICDSVVIVQYIDEAFSGTGPSLLSSDPHERAIARFWAAYIDDKLIVAWRQAFSSMTEEDKSEGTKQMFAALDTLEGALRECSKGQGYFGGESVGLVDVSLGSLLSWLKASAVHSGIKIFDPVKTPLLAAWVERFSELDGAKAALPDVDRLVEFAKTRKLL |
| *Am*GSTU2b | MAAGDDLKLLGVWASPFVSRVKLALSFKGLSFENVEEDLGNKSELLLSSNPVHKKVPVLLHNGKPICESLVIVQYIDEAFAGTGPSLLSSDPYERAIARFWAAYVDDKLLVAWRQAFRGKTEEEKSEGTKQMFAALDTLEGALRECSKGQGYFGGESVGFVDVSLGSLLSWLKASAVHSGIKIFDPVKTPLLAAWVERFSELDGAKAALPDVDRLVEFAKTRKLL |
| *Am*GSTU3 | MTSPASVKVIGAFDSPFSHRAEAALRLKGVPYELVLEDLRNKSELLLTHNPVHKKVPVLLHGDRAVCESLLIVEYVDEAFEGPRLLPADPHGRAMARFWSRFIDDKCSKSFWLAMWTDGEAQKGFMKEIKENFALLEAQLEGKRFFGGDTIGLVDIAACGFAHWLGVCEEITGVNLVTKEEFPRLSRWAVEYAGDEKIRACLPDRAVLLEHFTAKKEMFAAMAKSMLPN |
| *Am*GSTU4 | MARLEELKLVGTWASPYVLRAQLALSFKGLSFENVEEDLSNKSDLLRTSNPVHMAVPVLLHNGKPVCESLIIVEYLDEAFGAAGPPLLPADPYERAIARFWAAFIEDKLVASWQNVFRAKTEEEKAERMKQTLAVVDVLEGGLEECSKGGSFFGGDTVGYVDIVLGGAVPWVHATEVLSGARLFDASRVPLLAAWLECFGALSAAKAVMPDVERLVELAKMKQAEVVAAGAAGDN |
| *Am*GSTU5 | MAGGDELRLIGTWASPYVLRVQIALRLKGLSYEDVEEDLKNKSELLLKSNPVHKKVPVLIHNGKPVCESTVIVQYIDEAFAGAGPSLLPADPYERAVARFWAAFIDDTLLKASTQASSGKTEEEKAEGKEKAAAAIVTLEGALSECSKGKPFFGGESAGFVDVILGGLLGWVRAIEAMQGVKTFDPSTTPLLAAWAERFGQLEQVEAVMPDVQRLTEYAYARAMASAAAAAADSTN |
| *Am*GSTU6 | MDGEGDVKVLGTVVSPFALRVRMALYLKGVSYEYLEQDLFDKSELLVASNPVHKKVPVLIHGGKPICESLAIVQYVDEFWAGAAPILPADPYHRAVARFWAAYVDDKVFPAWIGILRAATEEERCEKLAATLAVVAPMEEALAACSDGEAFFSGGDSLGYLDLALGCHLFWLEALRTMFGMTVIDGGRTPRLAAWAKRFLETKAAKTVAPPTNSMEEYAGKLRAIWAAAAATK |
| *Am*GSTU7 | MASTDGLELLDFWVSPFGQRVRIALAEKNLPYTYTEEDLLAGKSERLLKSNPVHKKIPVLLHGGKPINESLIILQYLDEAFPESRPLLPPPSDPYARAQARFWADYVDKKVYDCGSRLWKLKGEPQAQARAEMLEILKTLEAELGEKEFFGGEHGFGFVDAALAPFTAWFESWGRFGDYKVAEVAPGIEAWAKRVGERESVAKSLYSPDKVYEFIGELKKRYGIE |
| *Am*GSTF1a | MAPVKVFGPAMSTNVARVILCLEEVGAEYEVVNIDMKGQEHKSPEHLARNPFGQIPAFQDGDLLLWESRAISKYVLRKYKKDEVDLLREGNLEEAAMVDVWTEVEAHTYNPALSPIVYQCLIGPMMRGVPTDEKVVAESLEKLKKVLEVYEARLSKHSYLAGDFVSFADLNHFPYTFYFMATPHAALFDSYPHVKAWWDRLMARPAVKKIAATMVPPKA |
| *Am*GSTF1b | MAPVKVFGPAMSTNVARVILCLEEVGAEYEVVNIDMKSQEHKSPEHLARNPFGQIPAFQDGHLLLWESRAISKYVLRKYKKDEVDLLREGNLEEAAMVDVWTEVEAHTYNPALSPIVYQCLIGPMMRGVPTDEKVVAESLEKLKKVLEVYEARLSKHSYLAGDFVSFADLNHFPYTFYFMATPHAALFDSYPHVKAWWDRLMARPAVKKIAATMVPPKA |
| *Am*GSTF1c | MAPVKVFGPAMSTNVARVTLCLEEVGAEYEVVNIDFNTMEHKSPEHLARNPFGQIPAFQDGDLLLWESRAISKYVLRKYKTDEVDLLRESNLEEAAMVDVWTEVDAHTYNPALSPIVYQCLFNPMMRGLPTDEKVVAESLEKLKKVLEVYEARLSKHSYLAGDFVSFADLNHFPYTFYFMATPHAALFDSYPHVKAWWDRLMARPAVKKIAATMVPPKA |
| *Am*GSTF1d | MAPVKVFGPAMSTNVARVTLFLEEVGAEYEVVNIDFNTMEHKSPEHLARNPFGQIPAFQDGDLLLWESRAISKYVLRKYKTDGVDLLREGNLEEAAMVDVWTEVEAHTYNPALSPIVYQCLINPMMRGIPTDEKVVAESLEKLKKVLEVYEARLSKHSYLAGDFASFADLNHFPYTFYFMATPHAALFDSYPHVKAWWERLMARPAVKKIAATMVPPKA |
| *Am*GSTF2 | MAPAVKVYGWAVSPFVARALLCLEEAGVEYELVPMSREAGDHLRPDFVARNPFAQVPVLEDGDLTLFESRAIARHVLRKHKPELLVGDGSPEAAAMVDVWLEVEAQQHQAPTAAITVQCIVAPLLGGSRDQAIVDENVPKLKKVLEVYEARLSASRYLAGESVSLADLSHFPMMRYFMETEYKALVEELPHVKAWWEELKARPAARKVTEFMPADFGIGKKAD |
| *Am*GSTF3 | MSPMKVYGWAVSPWMARVLVCLEEAGAEYELVPMSRHGGDHRRPEHLARNPFGEIPVLEDGHLTLYQSRAIARHILRKYRPDLLRSDKVEEAAMVDVWVDVEAHQLEPIIRPVVFNVITGPFVGRECDQDVVDQSMEKLNKTLEVYEARLSRSRYLAGDFLSLADLSHFSFMRYFMATKYADVVEAYPHVKAWWEALLARPSVKKVMAAMPPDFGFGSGNIP |
| *Am*GSTL | MSSLAFLYGLSALTPASTLPVPTSPCIKIPRSRRTAHRHLHRLAARTSSRTVAMAAAAPVISPKENLPPSLTSTSEPPPLFDGTTRLYVAYHCPYAQRAWIARNYKGLQDEIKIVGIDLADRPAWYKEKVYPGNKVPALEHNNQVKGESLDLVKYIDSNFEGPALLPDDSEKKQFAEELLAYTDEFNKALYSSITSKGDVSEETVAALDKIEAALGKFTDGPFFLGQFSLVDIAYVPFIERFQIFFSGIKNYDITKGKPNIQKFIEEVNKIDAYTQTKLEPQFLLEQTKKRLGIE |