

## Diversity and extent of mutations endowing resistance to AHAS-inhibiting herbicides in *Sisymbrium orientale* in Australia

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**Summary** Indian hedge mustard (*Sisymbrium orientale*) (IHM) is an important broadleaf weed of crops in Australia. Resistance to sulfonylurea (SU) herbicides that inhibit acetohydroxyacid synthase (AHAS) is extensive in IHM populations in Australia, but resistance to imidazolinone (IMI) herbicides has only recently been a problem. The AHAS-mutation profile of 65 IHM populations collected randomly from crop fields was examined to better understand the extent and types of resistance present. Screening with the herbicides chlorsulfuron and imazamox showed that 40.4% of the random populations were resistant to SU herbicides and 10.8% were resistant to IMI herbicides. Various mutations were identified in SoAHAS by sequence analysis, which included not only the reported amino-acid substitutions on the

Pro-197 and Trp-574, but also the new substitutions on Pro-197 and the new mutation on Asp-376 for this species. One population with possible non-target-site resistance was identified. Furthermore, germination studies with fresh seed demonstrated that the mutations in SoAHAS resulted in lower and slower germination; however, other factors had a larger effect on germination ability in *S. orientale*. The molecular basis of AHAS-inhibiting herbicide-resistant populations of *S. orientale* was endowed by mutations in the SoAHAS in all but one population. Mutations at Pro-197 endowing resistance to SU herbicides were most common; however, mutations at Trp-574 that provide resistance to IMI herbicides are becoming more common.

**Keywords** Acetohydroxyacid synthase (AHAS), *Sisymbrium orientale*, germination test.