**Alleviation of chlorimuron-ethyl toxicity to soybean by branched-chain amino acids or naphthalic anhydride**

* [Mamdouh M. Nemat Alla](https://link.springer.com/article/10.1007/s12210-019-00838-0#auth-1) &
* [Nemat M. Hassan](https://link.springer.com/article/10.1007/s12210-019-00838-0#auth-2)

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**Abstract**

Soybean seeds, soaked in branched-chain amino acids [Valine, Isoleucine and Leucine (VIL)] mixture or dressed in naphthalic anhydride (NA), were germinated for 10 days and treated with chlorimuron-ethyl for 120 h. Chlorimuron-ethyl significantly inhibited acetolactate synthase (ALS) activity in shoots of all samples during the first 72 h. Moreover, it increased *K*m but decreased *V*max, *K*cat, *K*cat/*K*m and *V*max/*K*m as well as the endogenous levels of valine, isoleucine and leucine particularly during the first 72 h. In concomitance, there were significant decreases in protein content and activities of nitrate reductase (NR), nitrite reductase (NiR), glutamine synthetase (GS), glutamate synthase (GOGAT) as well as growth parameters during the first 72 h. However, VIL or NA mitigated the herbicide effect. So, the drop in *V*max, *K*cat and *K*cat/*K*m by chlorimuron-ethyl declares decreases in enzyme concentration, catalytic rate and catalytic efficiency, respectively. Whereas the increase in *K*m could indicate that chlorimuron-ethyl induced an inhibition for ALS of the mixed-type which would affect synthesis and structural integrity of the enzyme. This inhibition would diminish the formation of branched-chain amino acids and protein, particularly with the inhibition of *N* incorporation enzyme (NR, NiR, GS and GOGAT). Consequently, retardation and disturbances in formation of structural and functional protein would arise. Nonetheless, VIL mixture overcame chlorimuron-ethyl toxicity via compensating the drop in the endogenous branched-chain amino acids while NA might cause mitigation by detoxifying the herbicide.