# CRISPRed wheat helps farmers control weeds

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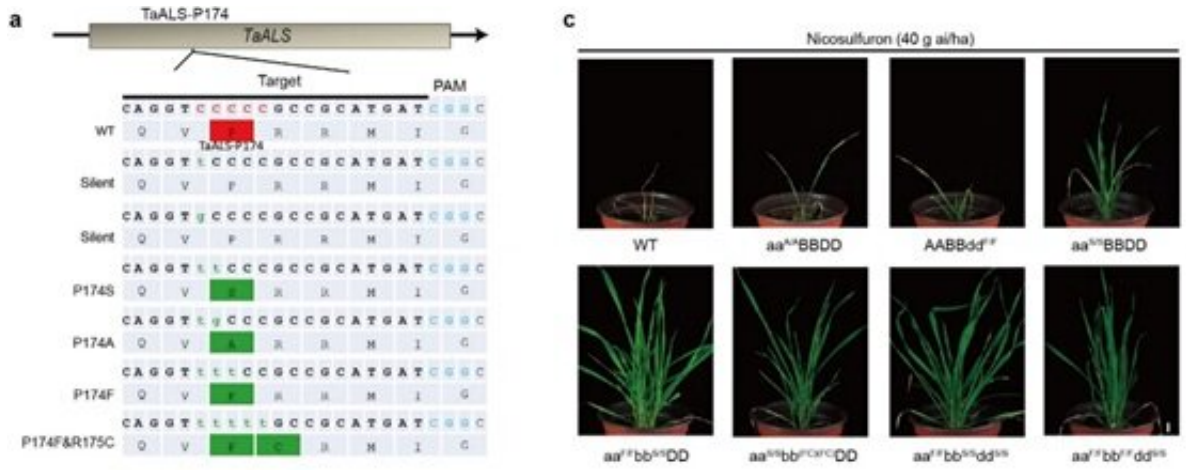



Nicosulfuron tolerant wheat. Credit: IGDB

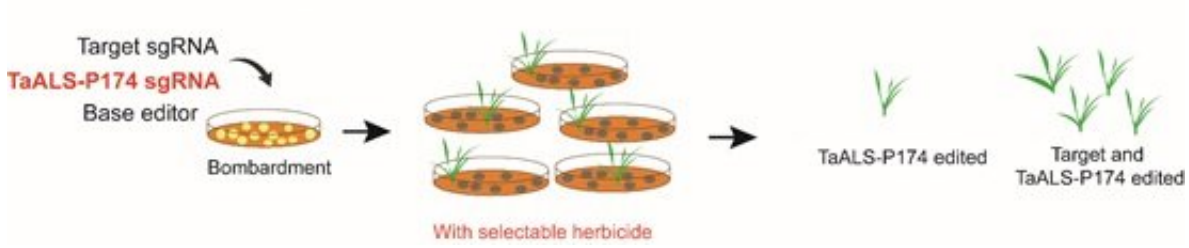
Chinese farmers are facing worsening problems with the weed jointed goatgrass (Aegilops tauschii), a close relative of wheat.

Currently, mesosulfuron is the only wheat-registered foliar-applied herbicide that provides control of jointed goatgrass in China, but it often damages the wheat. Non-transgenic wheat varieties tolerant to imidazolinone (IMI) herbicides can solve these problems by allowing the use of IMI to control goatgrass. However, IMI herbicides persist in the soil and severely damage sensitive crops planted months and even years later. Therefore, non-transgenic crops with herbicide tolerance traits, coupled with low-risk herbicides, are badly needed by millions of multi-

cropping farmers in their battle against weeds.

Recently, a research team led by Profs. GAO Caixia and LI Jiayang at the Institute of Genetics and Developmental Biology of the Chinese Academy of Sciences (IGDB, CAS), together with Associate Prof. JIANG Linjian at China Agricultural University (CAU), generated several herbicide-tolerant wheat germplasms using base editing to facilitate weed control in wheat fields.

The researchers generated wheat germplasms harboring herbicide tolerance mutations that confer tolerance to sulfonylurea-, imidazolinone- and aryloxyphenoxy propionate-type herbicides by base editing the acetolactate synthase (ALS) and acetyl-coenzyme A carboxylase genes of commercial wheat cultivar Kenong199.




Selectable co-editing systems. Credit: IGDB

The mutations at wheat ALS P174 codon (TaALS-P174) endow tolerance to nicosulfuron, a sulfonylurea herbicide with a relatively low risk to subsequently planted crops, indicating great application value in field production.

The mutations at both the TaALS-P174 and TaALS-G631 positions conferred tolerance to imazapic, an IMI herbicide, at three times and

even five times the field-recommended rate. The researchers also obtained quizalofop-tolerant wheat by editing TaACCase-A1992.

Moreover, they found that base editing at TaALS-P174 endowed wheat with sufficient resistance to nicosulfuron herbicide in MS growth medium to allow selection. When the TaALS-P174 editor was coupled with editors for other targets of interest, co-editing occurred in the nicosulfuron-resistant plants, and selection for resistance in growth medium enriched the frequency of coupled targets by several-fold. As TaALS-P174 is conserved across plant species, similar selectable co-editing systems could be readily established to facilitate base editing in other plant species.

The paper, titled "Generation of herbicide tolerance traits and a new selectable marker in wheat using base editing," will be published online in *Nature Plants* on April 15, 2019.

**More information:** Generation of herbicide tolerance traits and a new selectable marker in wheat using base editing, DOI: 10.1038/s41477-019-0405-0 , www.nature.com/articles/s41477-019-0405-0

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