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Development and use of Modified Plants and Seeds that are Resistant to Herbicides and Environmental Stress

Method to generate crop plants that are resistant to picolinate (auxinic) herbicides, and tolerant to environmental stress

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Field
Herbicide resistance,
Stress/Drought tolerant crops

Technology
Genetic mutation, mutant protein

Key Features

- Inhibition of picloram transport at plant cellular level
- Mutation of novel gene
- Easily replicable in other dicot crops

Stage of Development
Proof-of-concept achieved in model plant Arabidopsis;

Status
Seeking commercial development and/or licensing partner

Patent Status
US Application filed
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Background

Picloram, and related picolinate compounds are commonly used as selective herbicides that specifically kill broad-leaf (dicot) weeds found in monocot crops such as wheat, maize, sorghum, and also in turfs. These herbicides cannot be used in dicot crops (e.g. Soybean, tomato, potato) as dicot plants are susceptible to picolinate herbicides. There has been no successful generation of genetically modified crops for auxinic herbicides so far. There have been efforts for 2,4-D resistance, and identifying AFB4, AFB5 and SGT1b proteins for picloram resistance but these approaches focus on internal gene modification and do not prevent picloram from getting inside plant cells. AFB4 is a weak candidate for this purpose and mutations in AFB5 and SGT1b may compromise plants ability to tolerate environmental stress.

Technology & Competitive Advantage

Inventors at Texas State University have developed a method for generating crop plants that are resistant to picolinate herbicides by specifically generating mutations in a protein that is involved in transport of picolinate herbicides. The same genetic mutations and specific mutant proteins can also be used to generate drought tolerant plants. The key advantage of this invention is that it presents a novel mechanism to generate piloram resistant crop plants by inhibiting the picloram transport into the plant cells at the cellular level using mutations of a novel gene. This mutation can also make plants tolerant to drought and can be generated in any dicot crop.

Opportunity

Herbicide-resistant (HR) crops, particularly glyphosate-resistant (GR) crops, have transformed the way many growers manage weeds. However, after three decades and billions of dollars invested in research, only a few transgenic herbicide traits are commercially available. The increased use of dicamba and other auxin herbicides in auxin-resistant crops has the potential of injuring other broadleaf crops and reducing biodiversity in field edges and nearby non-crop habitat if unmanaged. Because auxin herbicides act rapidly at multiple receptors and compete with an essential plant hormone pathway, making crops resistant by modifying the site of auxin action is difficult. The mutations discovered in this invention not only make plants resistant to picloram, but also make plants drought tolerant making it attractive to agriculture industry.