

# Genome editing using crispr cas 9 technology and plants

[Science](#), [Genetics](#)



Genome editing using CRISPR/Cas 9 technology has progressed rapidly in recent times. Clustered regularly interspaced short palindromic repeats (CRISPRs) were first discovered in DNA from *Escherichia coli* in the late 1980's. They remained an interest for nearly 20 years and were mainly studied for their function in bacterial antiviral defence. Then, over five years ago an astounding breakthrough occurred. The system was successfully designed into an efficient tool for cleaving and adapting DNA sequences. Scientists believe that this technology has the ability to accelerate plant breeding.

However, legislators in the United States and Europe are arguing on whether it is or is not genetic modification. This briefing examines the potential and ethics of regulating CRISPR-modified plants as GMO's. The United States Department of Agriculture (USDA) has allowed many gene edited plants to be grown and sold without regulation. The agency has cleared *Camelina sativa*, or false flax, with increased omega-3 oil. And last October, they also cleared a drought-tolerant soybean variety made with CRISPR. Companies will likely make more edits to the plant line and use the technology with other varieties. These examples are only two of at least five CRISPR/Cas9-edited plants to bypass the USDA's regulatory system. Crops modified with new gene editing technologies such as CRISPR/Cas 9, do not need USDA approval because the resulting plants do not contain DNA from "plant pests" i. e. bacteria or viruses. These organisms were required in early gene-editing tools, namely *Agrobacterium*-mediated transformation, which prompted regulatory oversight in the 1980s and 1990s.

While the USDA recently assessed their old biotechnological framework, up to this point, newer gene editing techniques such as CRISPR/Cas 9 are outside the scope of the agency's regulations. The United States takes a functional view of GMO's, concerning itself with the effects of the manipulations rather than the technologies that create the plants. The situation is very different across the Atlantic. On the 25th of July 2018, the Court of Justice of the European Union (ECJ) ruled that gene-edited crops are to be held to the same strict regulations as GMO's. This decision came as a huge setback for many scientists and supporters of gene-edited crops. The court concluded that plant developed using newer gene-editing technologies are to be subject to a 2001 mandate. Many plant breeders and researchers maintain that CRISPR/Cas 9 should be seen as mutagenesis. But in its decision, the ECJ stated that mutagenesis techniques had been used in many applications and had a proven safety record. Organisms developed after 2001 with new gene-editing techniques such as CRISPR/Cas 9, are therefore not exempt. Stefan Jansson, a plant physiologist from Sweden who developed a CRISPR cabbage, believes that this legislation will have a chilling effect on research. However, he also thinks that discussions surrounding regulations on gene-edited crops are far from over. It seems that legislatures on both sides will need to continue to work towards a more rational and clear approach to modern gene-editing technologies.