CiB centro de informação de biotecnologia

INNOVPLANT PROTECT

Novas Técnicas Genómicas

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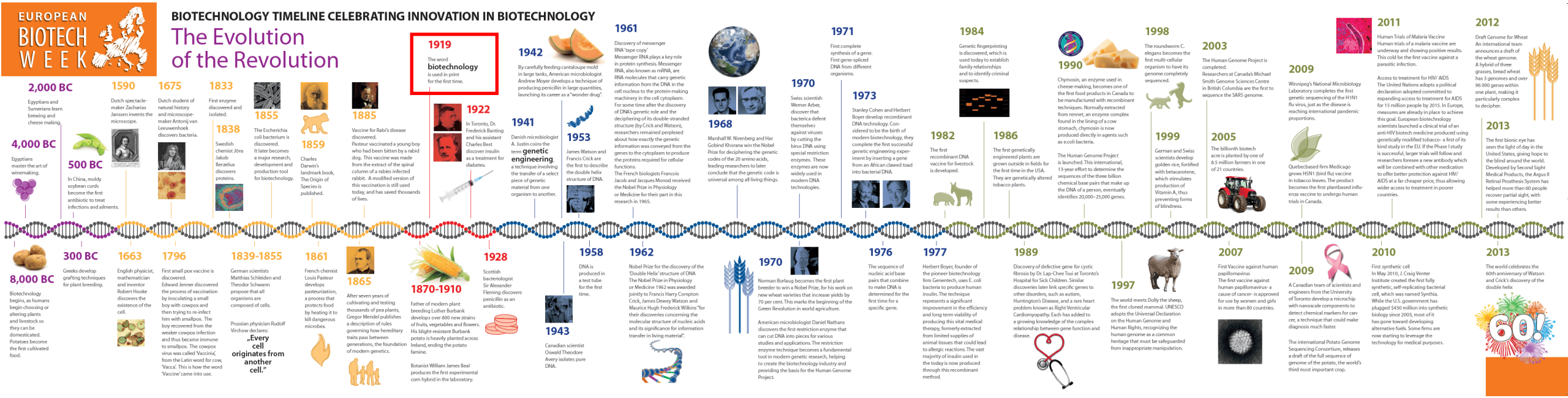
MI MISSÃO INTERFACE · ANI AGÊNCIA NACIONAL DE INOVAÇÃO · PRR Plano de Recuperação e Resiliência · REPÚBLICA PORTUGUESA · Financiado pela União Europeia NextGenerationEU · ALENTEJO 2020 · PORTUGAL 2020 · UNIÃO EUROPEIA Fundo Social Europeu

BIOTECNOLOGIA

“Qualquer tecnologia que utilize sistemas biológicos, organismos vivos, ou seus derivados, para fabricar ou modificar produtos ou processos para uma utilização específica.”

(ONU, Convenção de Biodiversidade 1992, Art. 2)

Fonte: https://www.iberdrola.com/innovation/what-is-biotechnology

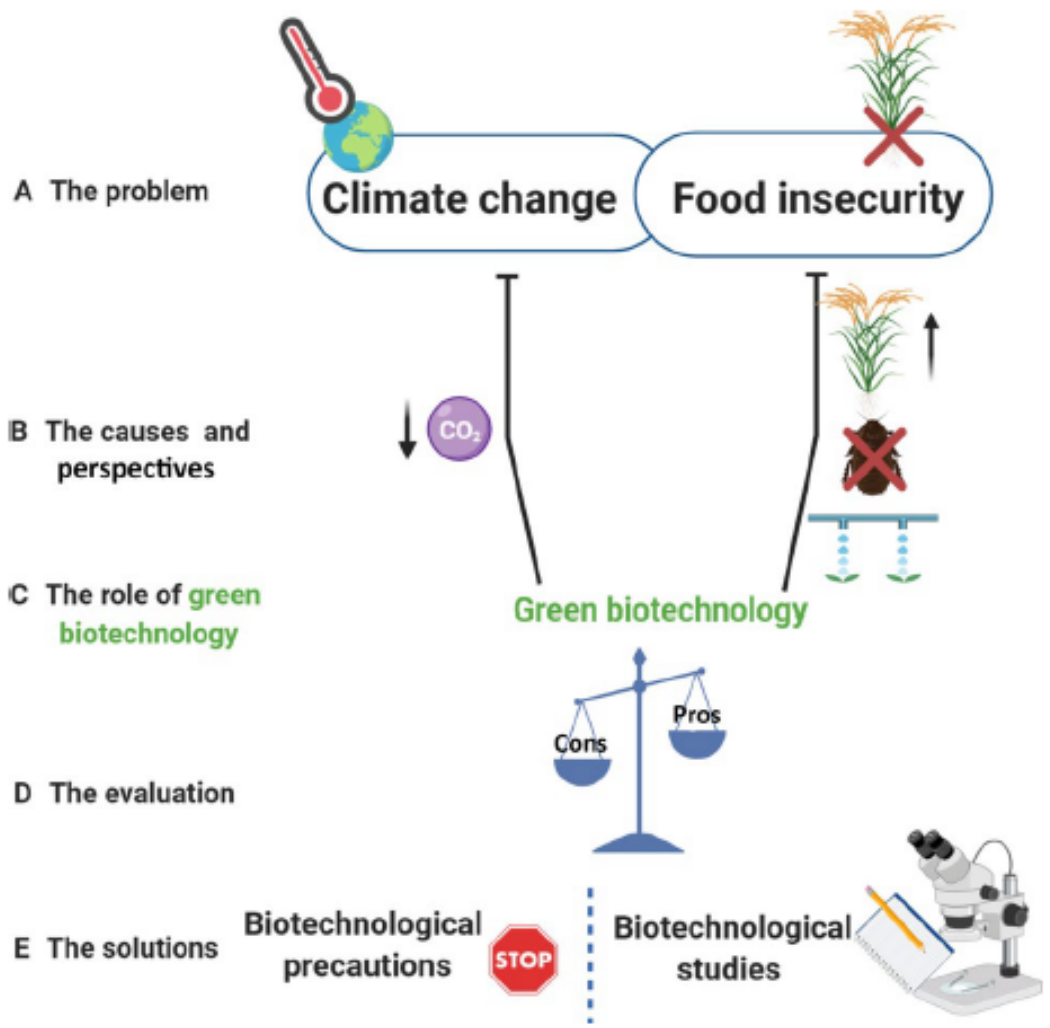


Biotecnologia Verde pode ser definida como a **aplicação de técnicas biotecnológicas em plantas, com o objetivo de modificar características das mesmas** e contribuindo para uma agricultura mais eficiente e sustentável.

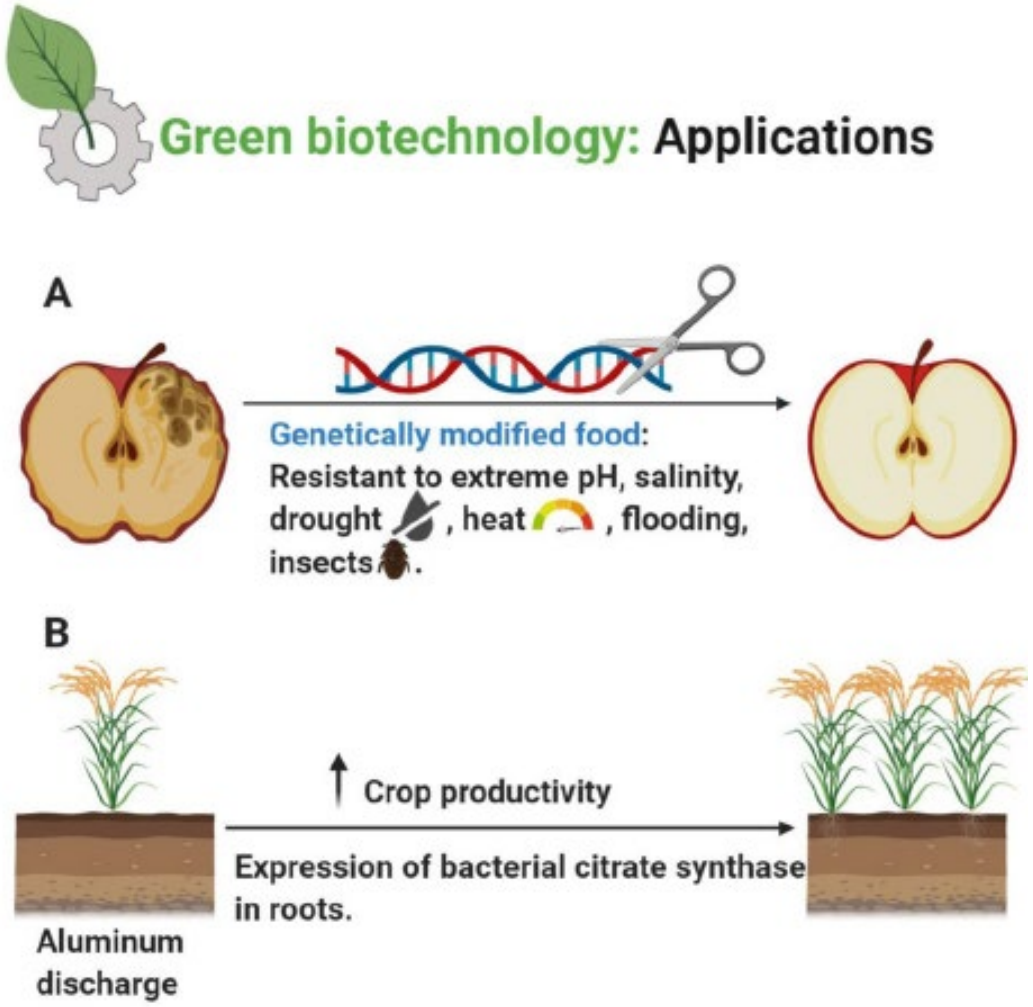
Fonte: https://biotechweek.org

A domesticação provocou alterações nas plantas

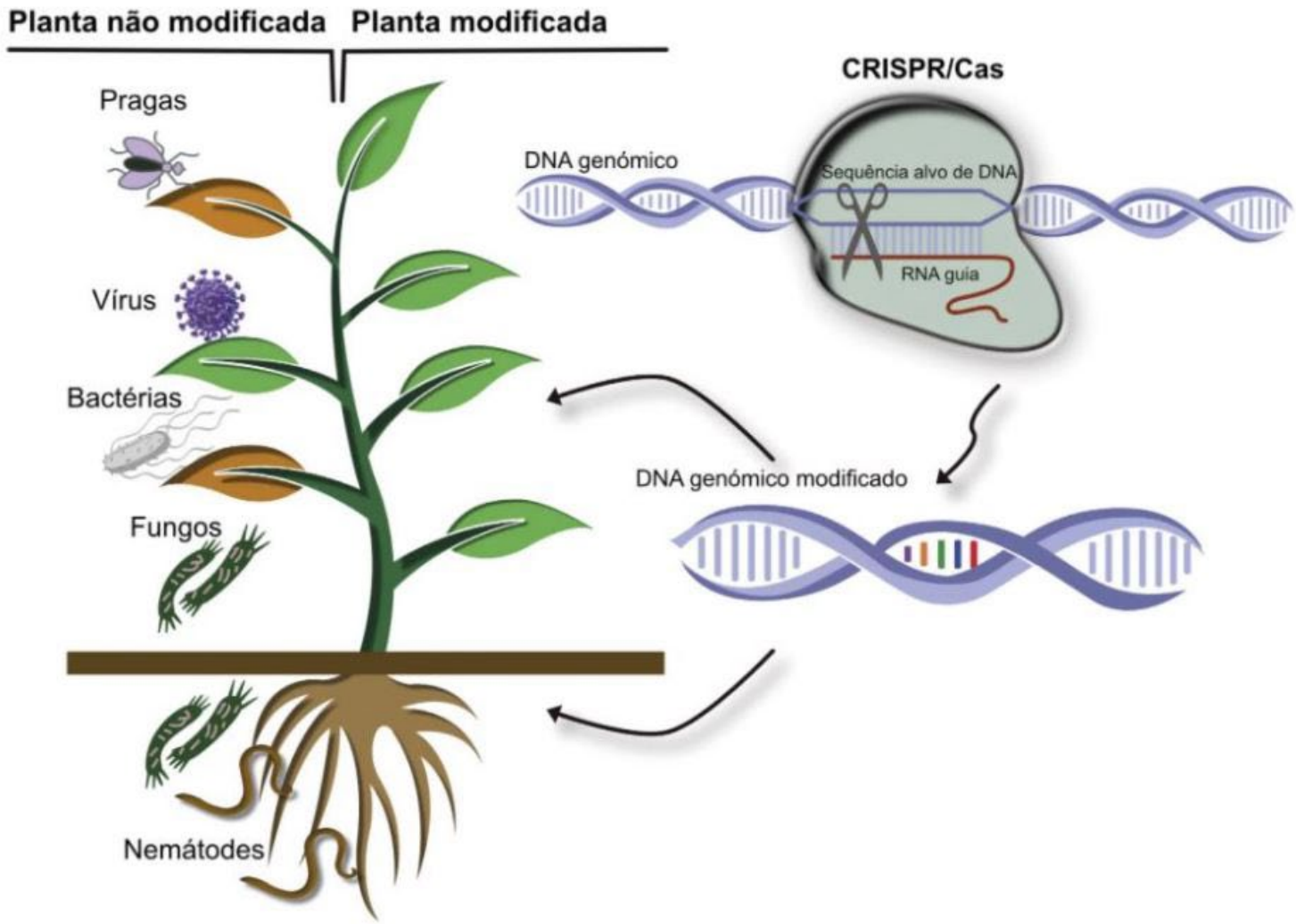
Desafios



Aplicações



Euro-Mediterranean Journal for Environmental Integration (2021) 6:29
https://doi.org/10.1007/s41207-020-00240-5



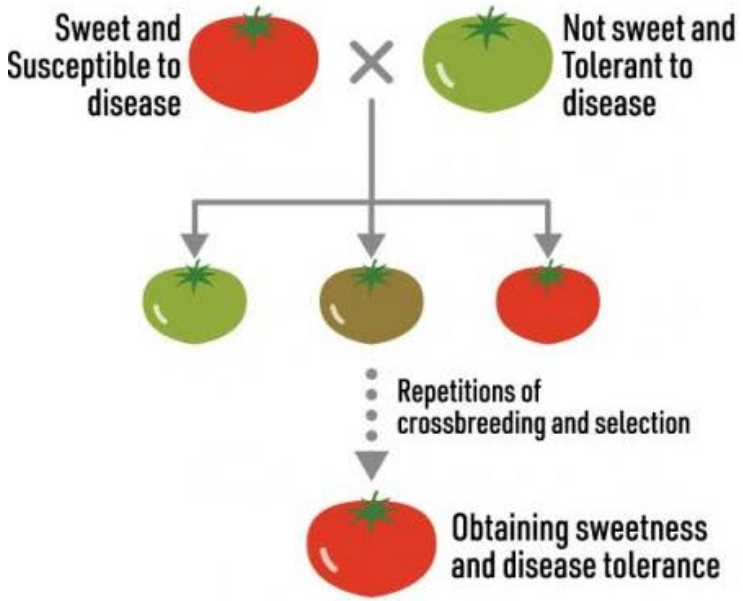
As culturas estão invariavelmente expostas a **pragas e doenças**.

No sentido de acelerar o processo de melhoramento de plantas, as **NOVAS TÉCNICAS GENÓMICAS**, como as tecnologias de edição de genoma, permitem introduzir mecanismos de resistência ou remover suscetibilidade de forma rápida e precisa.

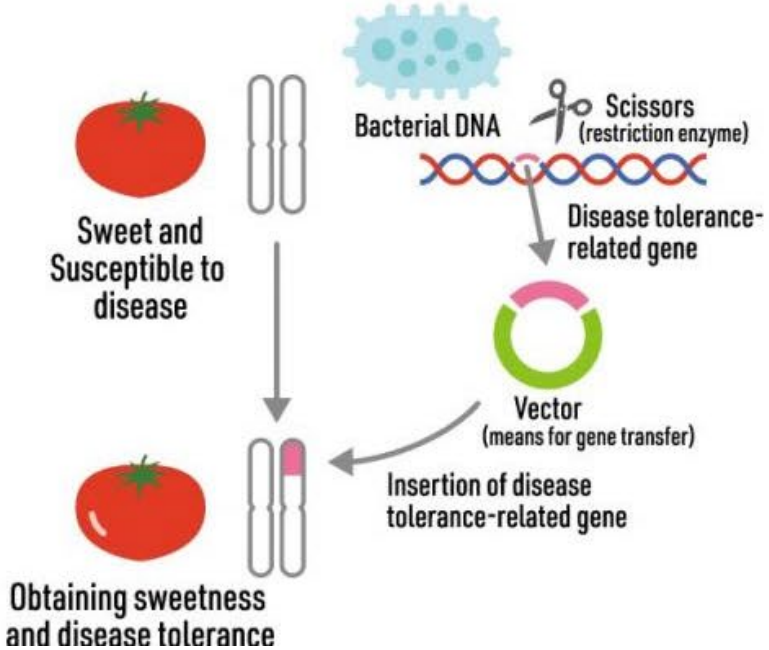
Fonte: InPP

Como obter uma planta melhorada?

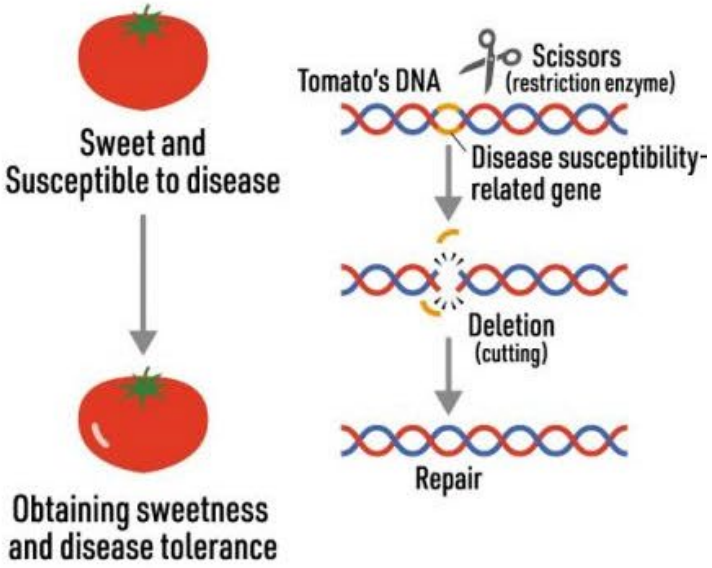
Melhoramento convencional



Modificação genética



Edição genética

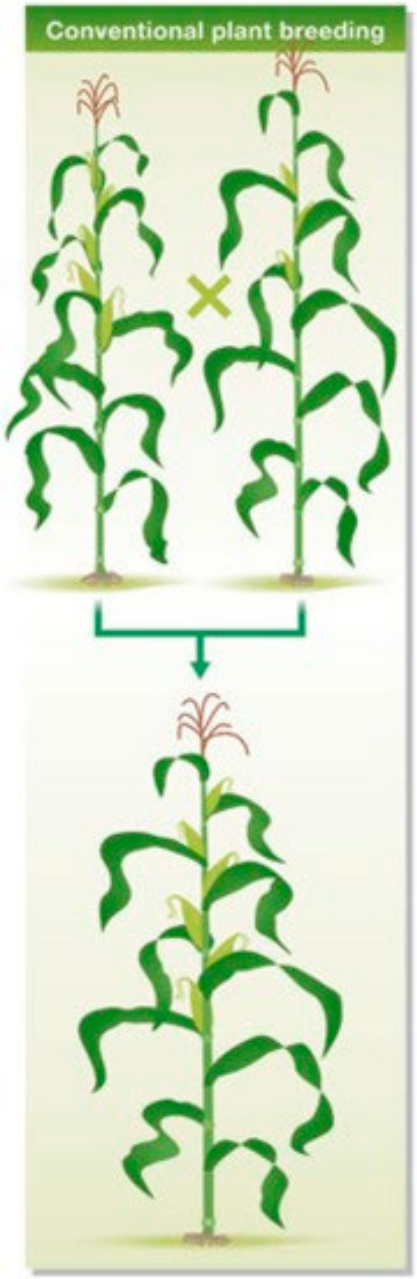


Fonte: https://news.agropages.com/News/print-34172.htm

Como obter uma planta melhorada?

Non-precise	Traditionally, plant breeding relies on natural recombination, or natural or induced mutagenesis followed by trait selection.	Melhoramento convencional
Precise	An introduced messenger turns off a gene. The crop DNA sequence is not altered.	RNA-directed DNA methylation (RdDM)
Precise	One to a few DNA letters are changed in a targeted way.	Targeted mutagenesis
Precise (when carried out by genome editing)	DNA from a close relative (sexually compatible) is inserted into a crop.	Cisgenesis
Precise (when carried out by genome editing)	DNA from two or more (sexually compatible) close relatives is combined in a new way and inserted into a crop.	Intragenesis
Precise	DNA sequences from one organism are inserted **at a target location** into the genome of another organism	Transgenesis (GM)

Fonte: https://www.foodstandards.gov.scot/



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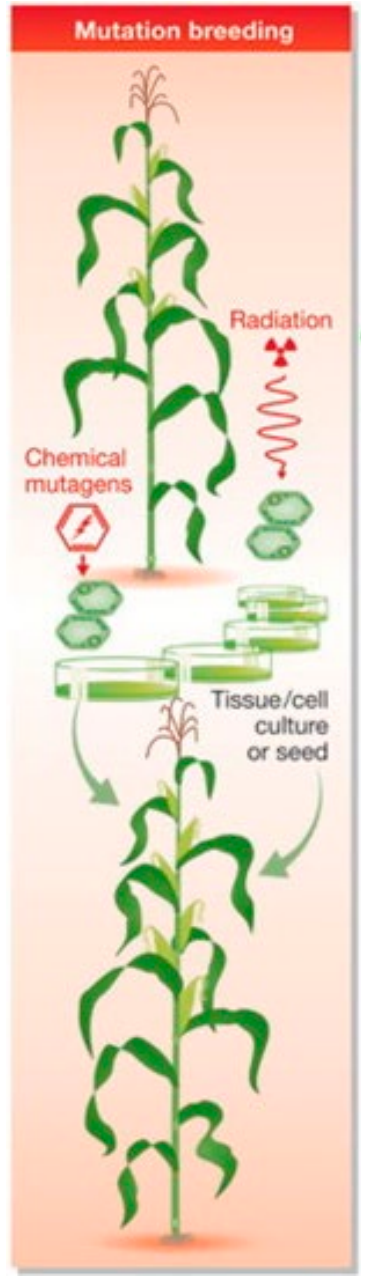

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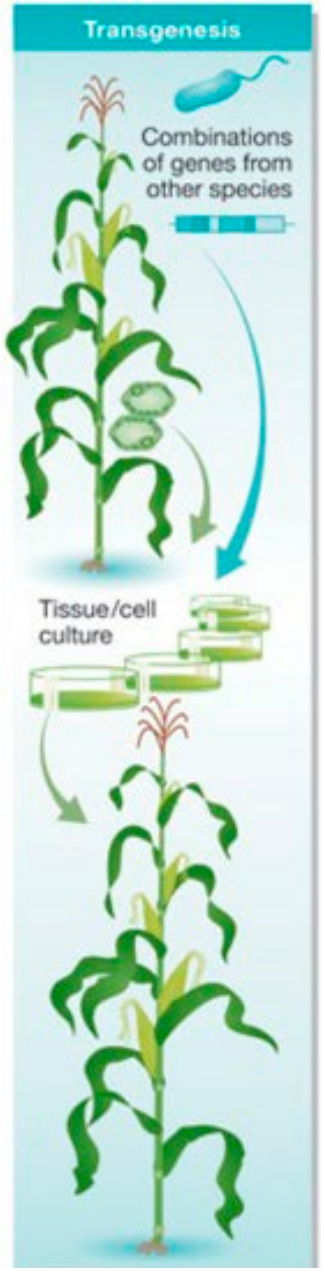

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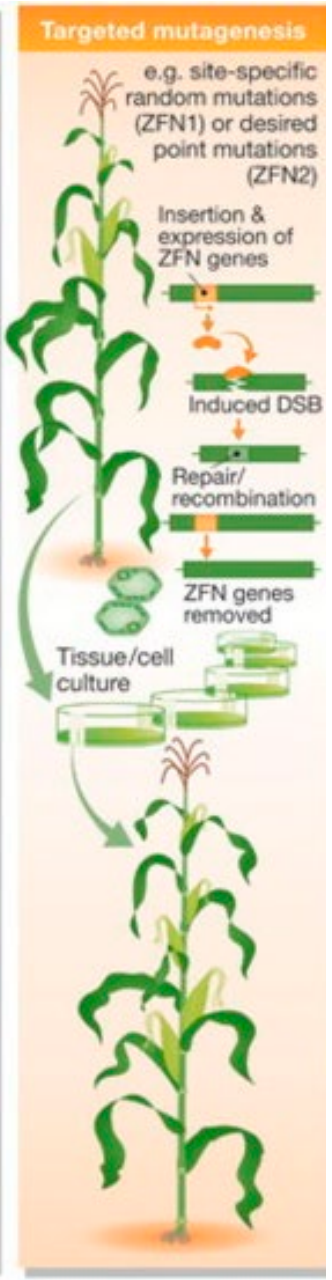

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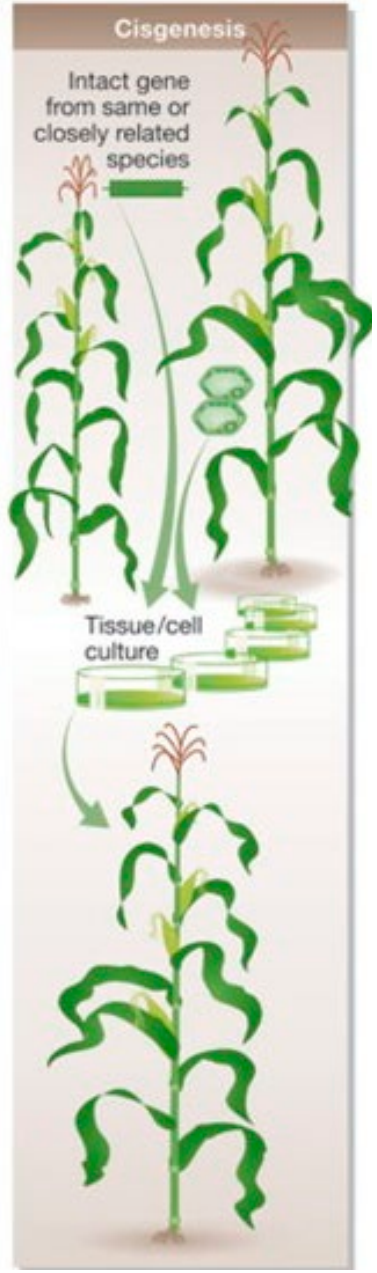

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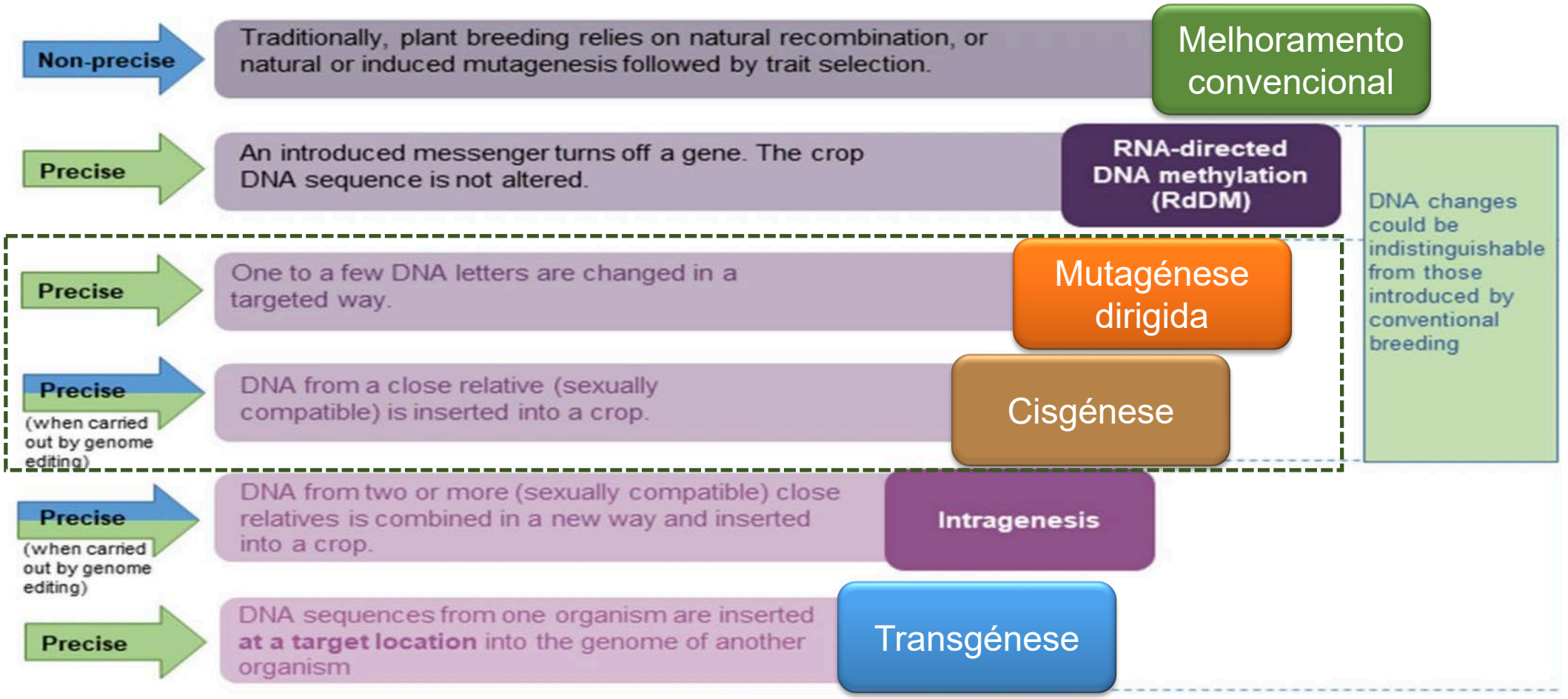

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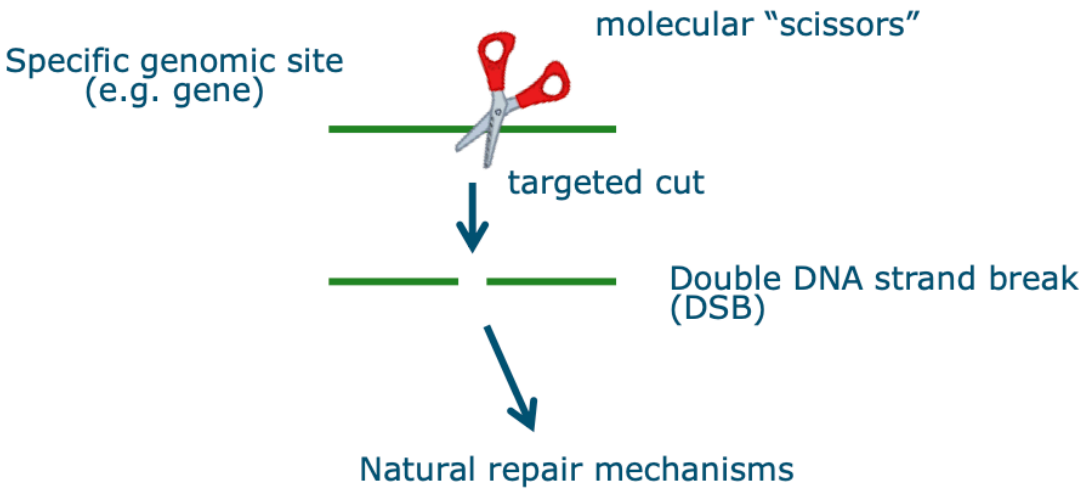
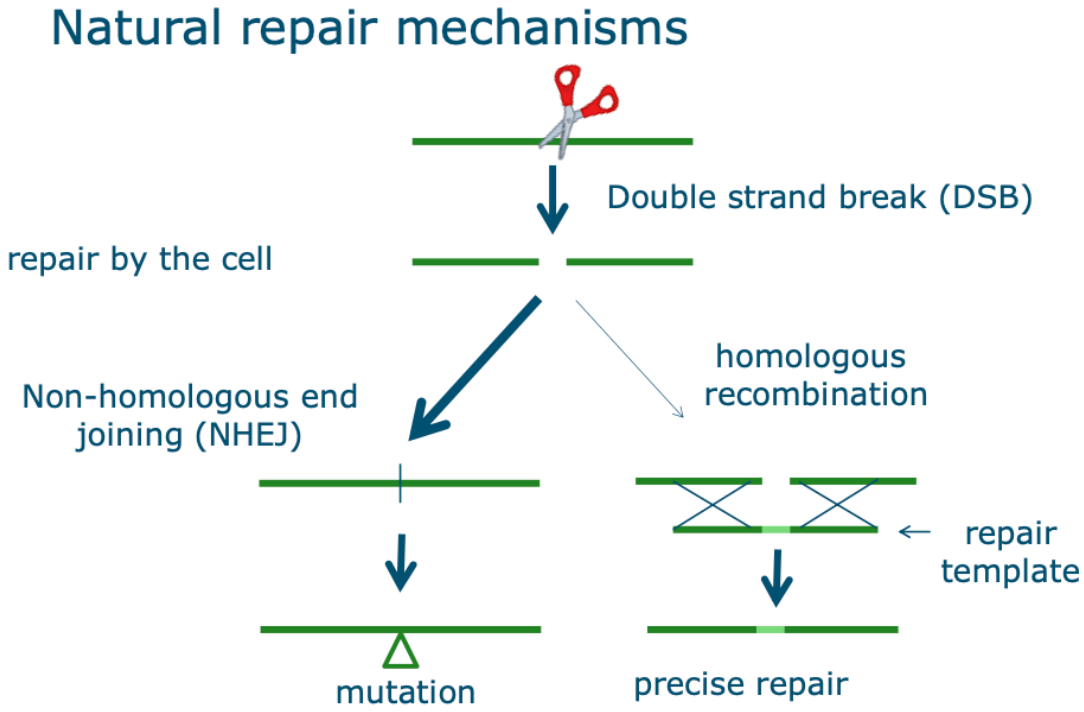
Mutagénese dirigida

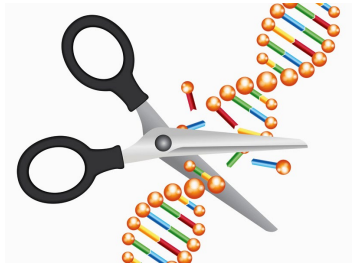


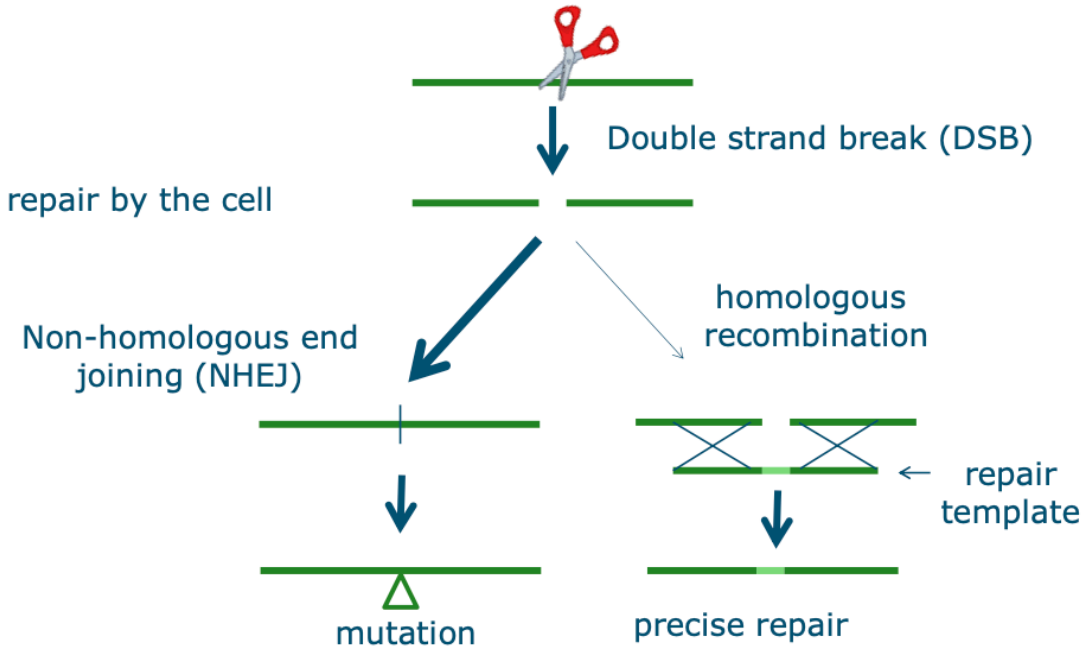


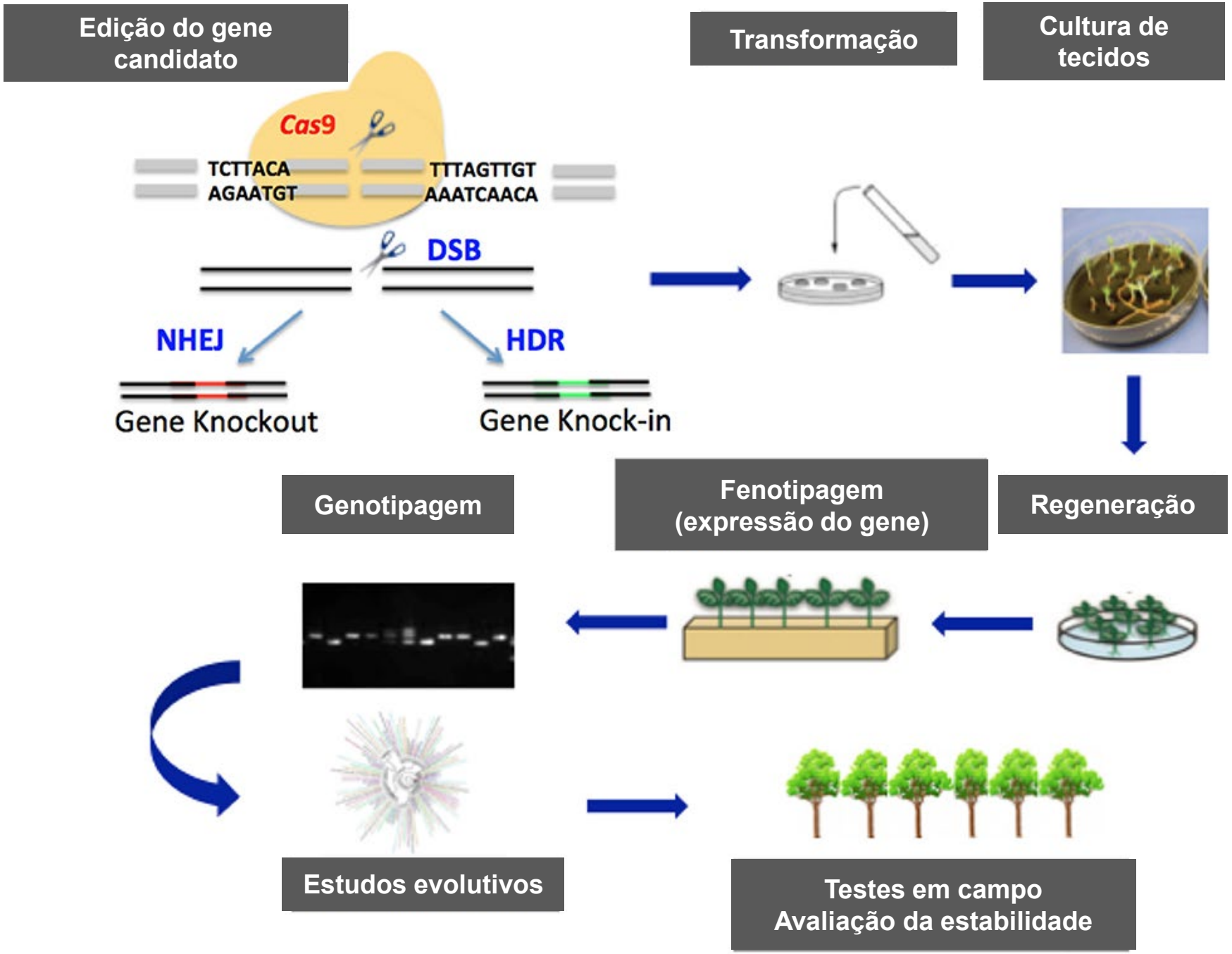
Mutagénese dirigida

Site-Directed Nucleases (SDN):

- ✓ **Zinc Finger**
- ✓ **TALENs** (transcription activator-like effector nucleases)
- ✓ **CRISPR/Cas9 systems** (Clustered Regularly Interspaced Short Palindromic Repeats - associated protein-9 nuclease (Cas9))
- ✓ **...**







Fonte: Ferramentas de edição genética New Breeding Technologies (NBTs)

Crop	Trait	Edited genes	Stage
 Banana	Disease resistance (BXW, Fusarium wilt, BSV)	*DMR6*, BSV sequences	3,1
 Cassava	Disease resistance (BB)	*SWEET* gene promoters	3
	Food safety (cyanide-free)	Linamarin synthase	3
	Quality (waxy starch)	*GBSS1*	3
 Maize	Disease resistance (MLN)	*C6 QTL*	1
	Weed resistance (*Striga*)	Strigolactone	3
 Potato	Disease resistance (PVY[a], late blight)	*eIF-4E, StDMR6-1, StCHL1*	2
 Rice	Disease resistance (BLB, RHB)	*SWEET* gene promoters, *AGO4, STV11*	4,3
	Food safety (low arsenic and cadmium)	*OsNRAMP5, OsPT8, LS1, LS2*	3
	Nitrogen remobilization, and methane emission reduction	Unpublished	3
	Insect resistance[a] (BPH)	BPH resistance alleles	2
 Wheat	Disease resistance (rusts, mildew)[a]	*Lr67* and others	3

Fonte: Pixley et al. Nat Genet 54, 364–367 (2022). https://doi.org/10.1038/s41588-022-01046-7

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OBRIGADA!

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