

the same toolkit turns into insulin, pest-resistant cotton, and a corrected gene

What genetic engineering buys a crop

benefit	what it means here
tolerance to abiotic stress	survives cold, drought, heat and salt better
less chemical pesticide use	built-in pest resistance, e.g. Bt cotton
fewer post harvest losses	less of the crop wasted after harvest
better mineral use efficiency	slows how fast soil fertility is used up
higher nutritional value	e.g. vitamin A enriched golden rice
tolerance to a plant pathogen	e.g. nematode resistant tobacco, by RNAi

the same recombinant DNA toolkit sits behind every one of these

Bt crops: a borrowed toxin

- soil bacterium *Bacillus thuringiensis* makes cry gene crystal proteins, toxic to specific insect larvae
- toxin is inactive as made; a susceptible insect's alkaline gut activates it
- active toxin binds midgut cells, forms pores: insect stops feeding, dies
- no matching receptor, no effect: that's why the toxin is pest specific

Matching the cry gene to the pest

cry gene(s)	target pest
cryIAC, cryIIAb	cotton bollworm
cryIAb	corn borer

the right cry gene has to be matched to the right crop

Getting a new trait into a crop: two routes

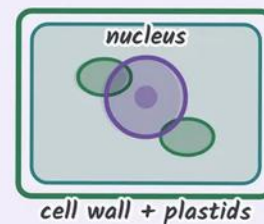
conventional breeding

- needs two sexually compatible parent plants
- transfers the whole genome, not one gene
- the desired gene arrives with unwanted linked ones
- many generations of selection to fix the trait

genetic engineering

- the gene can come from an unrelated species
- only the one chosen gene is transferred
- no unwanted linked genes come along with it
- the first transgenic generation already carries it

Where the Bt gene sits, inside an ordinary plant cell



an ordinary plant cell; in a Bt crop the cry gene sits integrated into this cell's own nuclear DNA, so every cell the plant grows carries it

this is why a bacterial gene can end up in a cotton plant

