

The Venomous Cabbage, is it true or not? And how does it work

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Itinerary

- A trip through time
- Why do this?
- Scientific processes
- Role of enzymes in these processes
- DNA Synthesis
- Biotechnology and the venomous cabbage
- What are the pros and cons
- Summary
- Bibliography



(BIO, 2018)



A trip through time

Initial study and development

The actual pesticide was first developed in the late 1980's which was modified with the scorpion DNA to be sprayed over crops.

Late 1980's

(Benson, 2013)

First experiment

In 1994 was the first attempt at making the venomous cabbage, but the creators wore full protective suits. They didn't trust it themselves!

1994

(Explore Biotech, 2018)

Test on human cells

2002 was when the first major study on the effects of the scorpion venom on human cells was performed, and where I found my primary source.

2002

(JI et al., 2002)

Several reports on the former experiments

In 2013 there were several more reports on the 2002 study, commenting on how without the FDA's approval, the GMO may to be in mainstream consumption already.

2013

(Daily, 2013), (Benson, 2013)

So why do this?

For Scorpions at least, their venom is one of the most important tools to predate and to defend themselves. The effective components are 30-80 amino acids resulting in groups of proteins which possess neurotoxicity.

The main reason behind using a potentially deadly poison in food is to keep insects, caterpillars and other animals out of cabbage gardens and crops without the use of insecticides that cost more. So you could say it's a money saving scheme as well as a cross species genetic experiment.

(JI et al., 2002)



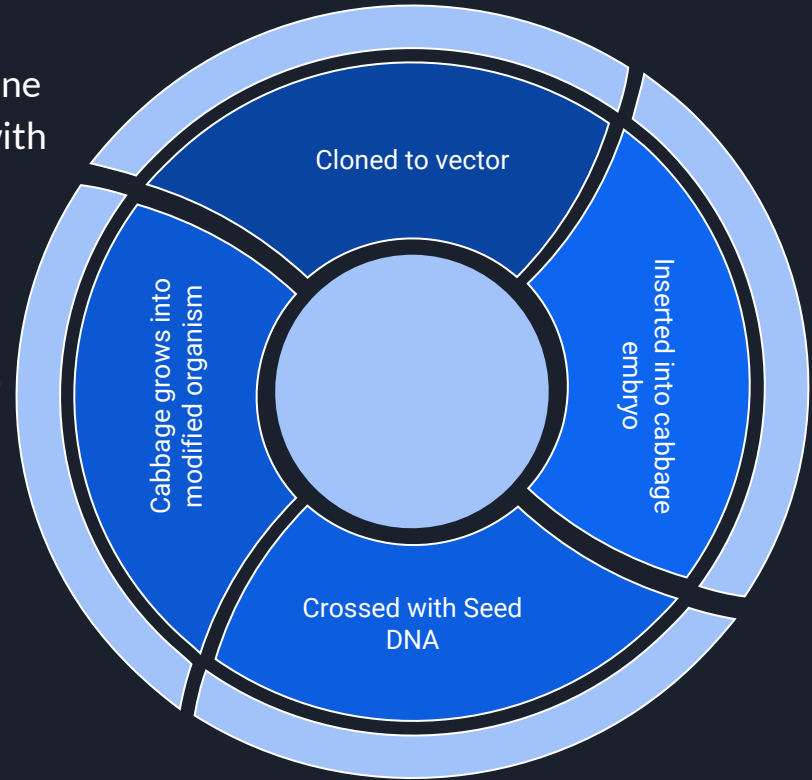
The *Androctonus australis hector* Scorpion

Scientific processes

In simple terms, scientists use a specific gene from the scorpion poison to cross-breed with the cabbage.

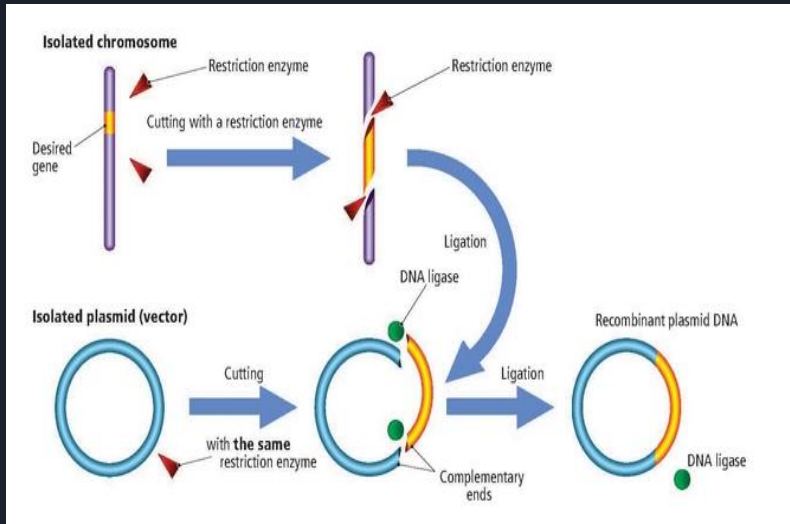
Fact check!

The AAiT is the section of DNA of the scorpion poison that was used



Self created (JI et al., 2002)

Role of enzymes in these processes

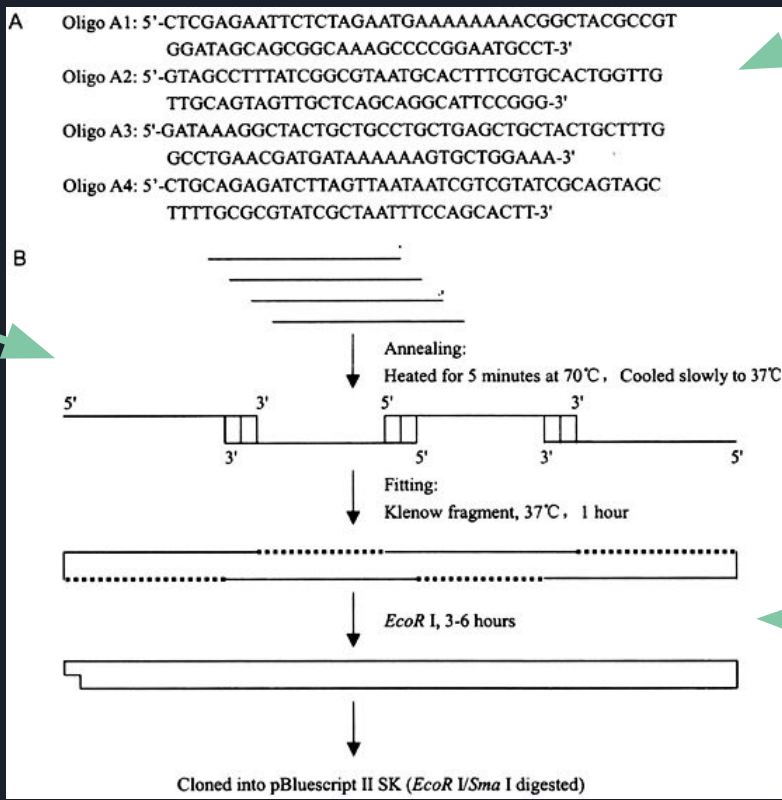


(leavingcertbiology.net,
2017)

1. When creating the AAT strand, the full-length coding sequence was cloned into a pBluescript II SK phagemid to produce the vector pBS-AaIT.
2. The above phagemid has an extensive multiple cloning site with 21 unique restriction enzyme recognition sites.
3. Around this, the multiple cloning site are T7 and T3 RNA polymerase promoters that can be used to synthesize RNA in vitro.
4. Using the synthesized coding sequence, it was then introduced to the cabbage embryo to create the new gene.
5. Once created, the new gene grew into the cabbage with the venom already encoded into its DNA.

(JI et al., 2002), (Addgene.org, 2018)

DNA synthesis



Four oligonucleotides used to produce full-length AaIT sequence

Strategy for constructing the toxin coding sequence

Completed full-length AaIT sequence

(JI et al., 2002)

Biotechnology and the venomous cabbage

Biotechnology essentially means using biological advances for industrial gain.

The venomous cabbage could have boundless opportunities to improve costs for keeping crops alive, because they protect themselves.

The question comes to mind, what are the long term effects of the AAI_T virus, if any? There haven't been any published workings on whether any larger amounts do effect healthy human cells, that is to say, non-cancer affected cells.

While there are advantages, that have the potential to be applied to other vegetables, there are risks that come with these.

(BIO, 2018)



(Chemistry World, 2014)

What are the pros and cons of it?

Pros

- It will result in the use of less pesticide
 - Instead of using pesticides, the cabbages will essentially, protect themselves, which does result in less pesticide.
- It's completely safe - or at least in theory it is
 - The scorpion venom had been selected very carefully so that it won't hurt humans. The section of the genome is called AAiT, which is known to be poisonous to insects, rather than humans.
 - There has also been a study that was performed on MCF-7 cancer cells, not exactly living human, however it showed that the poison was not harmful.

(JI et al., 2002)



(Explore Biotech, 2018)

What are the pros and cons of it? (Continued)

Cons



- The poison that is used (AAiT) is taken directly from scorpions with no further modification.
 - Although the gene section that is taken should only be poisonous to insects, it hasn't been modified further to negate any other underlying effects on other life.
- As mentioned in the previous slide, the poison has only been tested on MCF-7 cells.
 - The disadvantage here is that MCF-7 cells aren't the same as healthy cells. It's like giving the cabbage leaves to an already infected insect.
- It has also not been tested for lethality above 1.3 μM .
 - Potentially, if eaten in large amounts there's the potential that these venomous cabbages could become lethal over time, there is no proof/ scientific studies about the long term effect on humans.

(Daily, 2013)

(JI et al., 2002)



Summary - 8 points to take away?

- It's been an ongoing experiments since the early 90's
- The venomous cabbage can protect itself from insects
- It is not harmful to humans, or at least to MCF-7 cells
- There is potential to apply this study to other foods
- This could make growing crops cheaper
- If eaten in small amounts, the venomous cabbage shouldn't be harmful, nobody knows if prolonged exposure causes further issues.
- The selection process for the DNA section was done very carefully.
- The final aim for this product is to have it made available for the public



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