Wolbachia (WO) and bacteriophage WO for agricultural benefits

What are they?

Bacteriophage *Wolbachia* (WO)

Bacteriophage WO is a virus which can be used as an active ingredient to kill *Wolbachia* directly, or harnessed to modify the *Wolbachia* genome in order to reduce pest populations or promote the spread of desired traits among them.

Wolbachia (WO)

Wolbachia are intracellular symbiotic bacteria infecting 40% of all insects. *Wolbachia* are maternally inherited and can hijack pest reproduction to expand its own population. *Wolbachia* act as reproductive parasites in pests, thus can be used as a novel environmentally friendly target to control pest populations.

Insects

Agricultural **pests** have been a major economic burden due to massive destruction of crops.

Spotted fruit fly (*Drosophila suzukii*)
- Infests fruits
- Severe economic impacts (losses up to US$500 million per year)

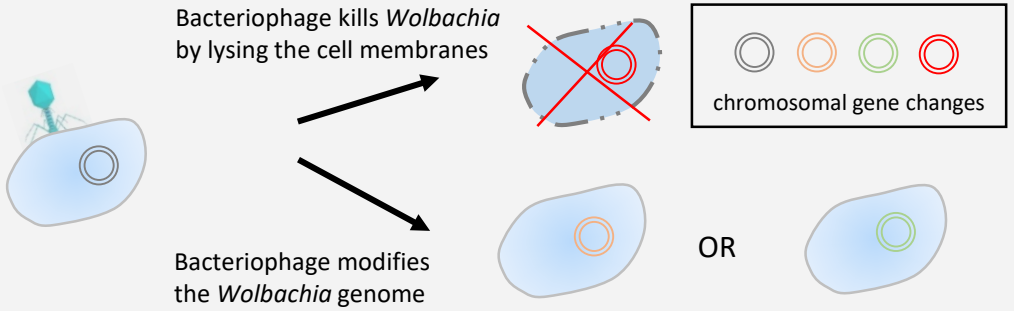
European cherry fruit fly (*Rhagoletis cerasi*)
- Infests fresh cherries
- Losses of up to 100% fruits if left uncontrolled

How do we control them?

Utilize **bacteriophage WO** to control agricultural pests

- Eliminate *Wolbachia* known to infect pest species that infests crops.
- Manipulate *Wolbachia* genome so that it can suppress natural populations of pest.

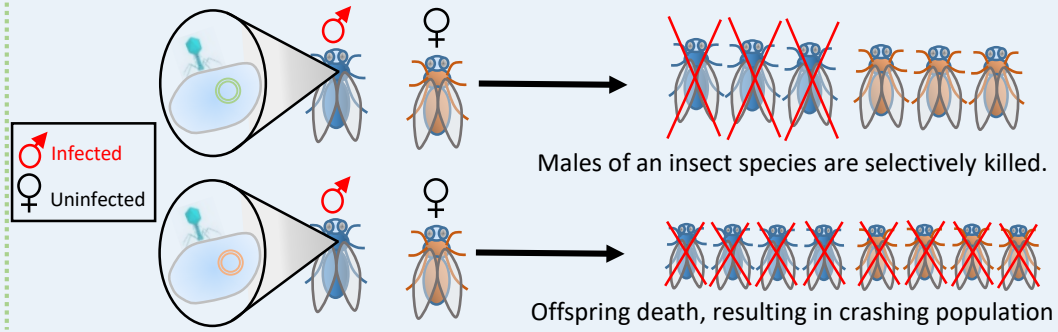
How does a bacteriophage WO control *Wolbachia*?



Manipulate ***Wolbachia*** to control agricultural pests

- Infect known crop pests with *Wolbachia* expressing certain genes to selectively kill male populations of pests.
- Infect insect species with genetically modified *Wolbachia* to crash populations of pests.

Expressing certain genes in *Wolbachia*, creating genetically modified *Wolbachia*



Manipulate **insects** for agricultural advantages

- Express certain genes in pest germline directly, creating transgenic pest to selectively deplete male pest population or crash known pest populations.
- Transgenic pests can also be used to spread beneficial traits such as making them less invasive to crops, or less likely to transmit plant pathogens.

Expressing certain genes in insects, creating transgenic insects