

## Développement de la résistance, mécanismes de fonctionnement

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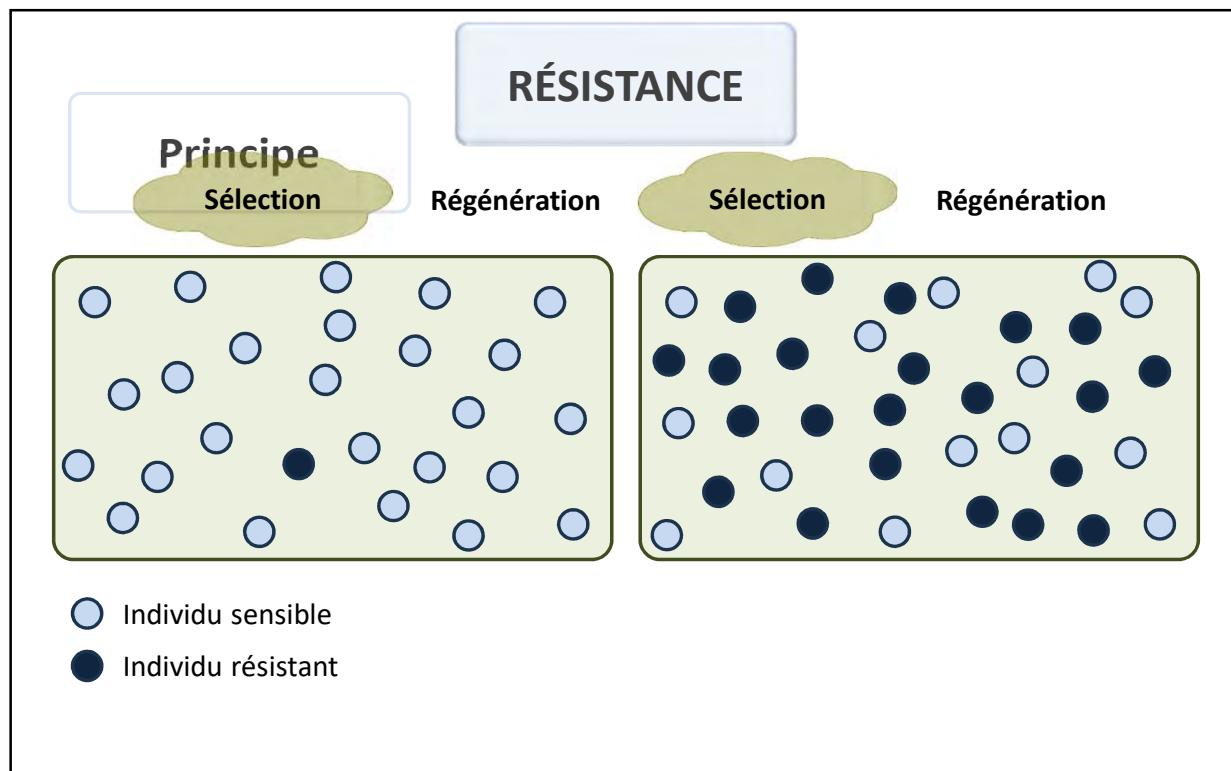
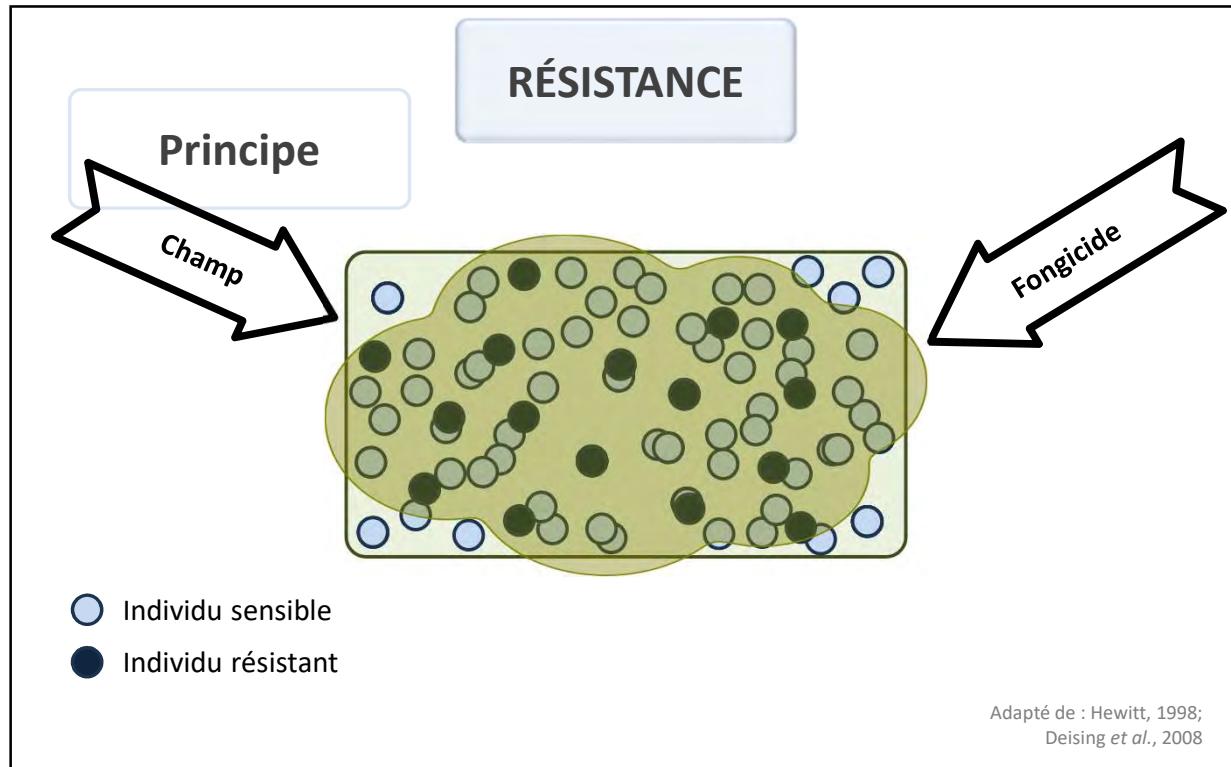
UNIVERSITÉ  
LAVAL

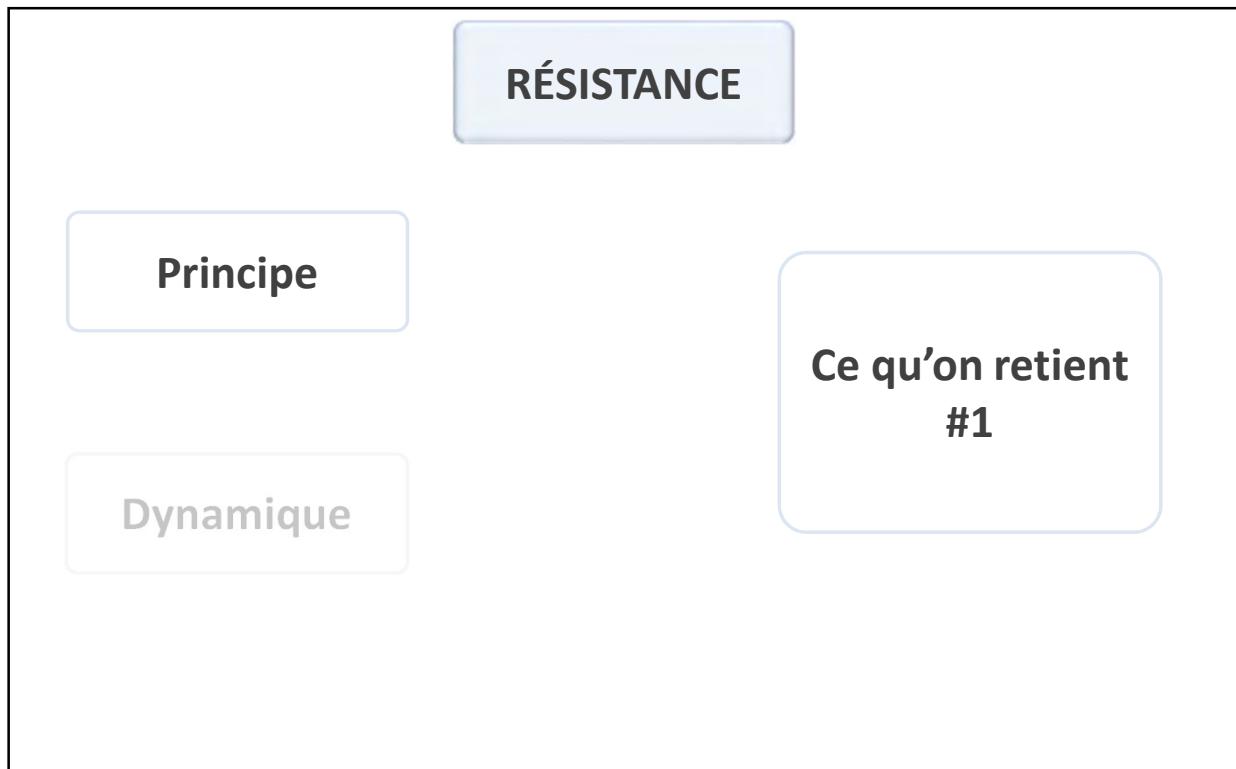
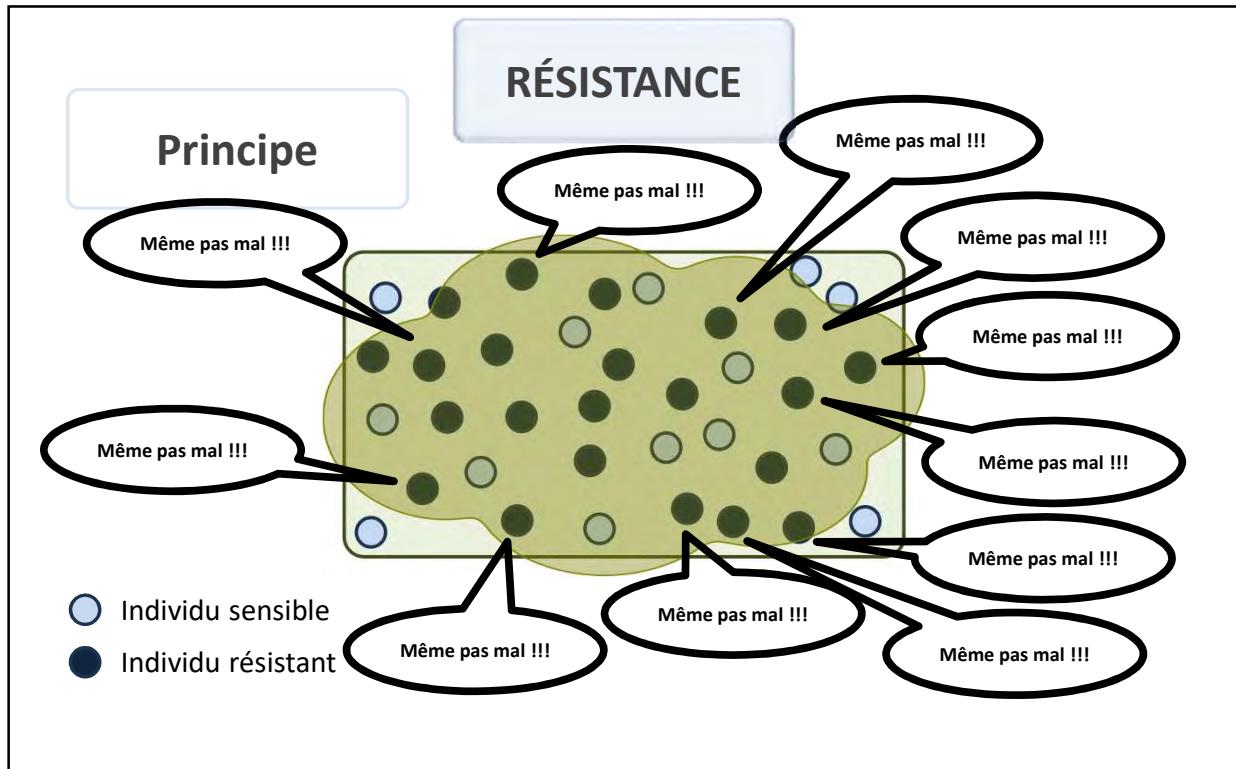
### RÉSISTANCE

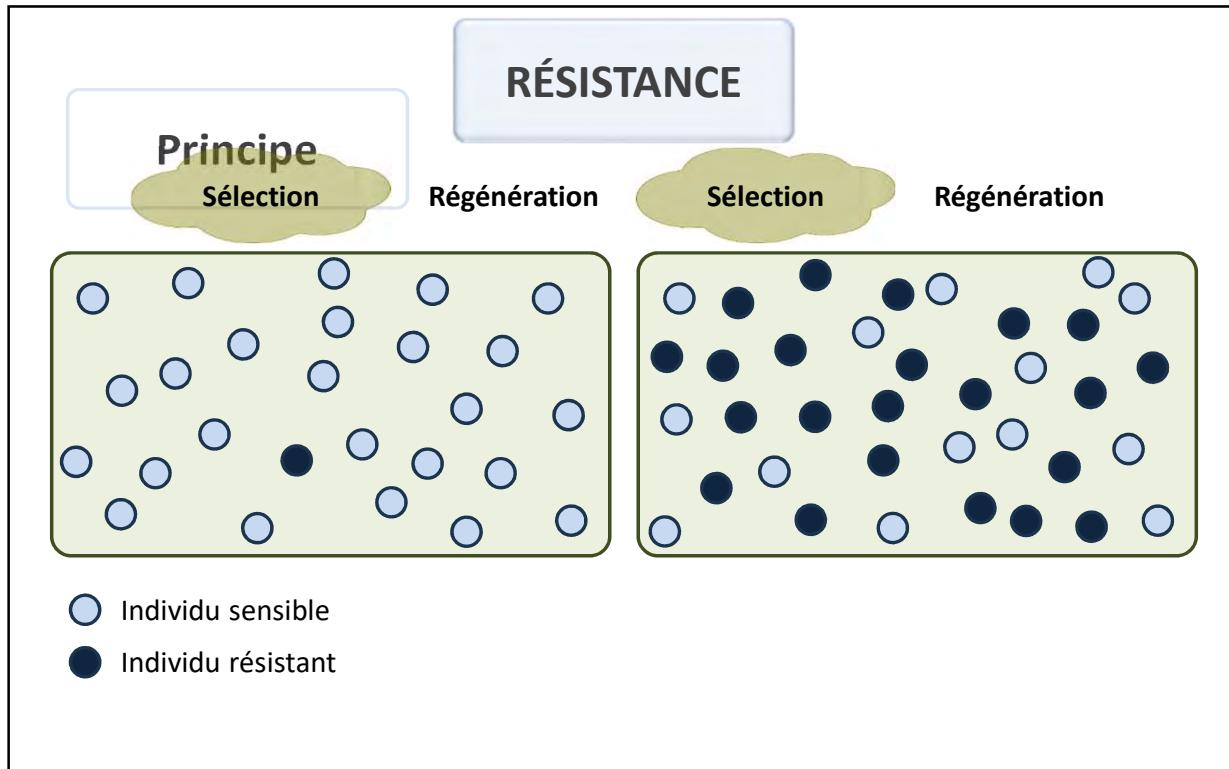
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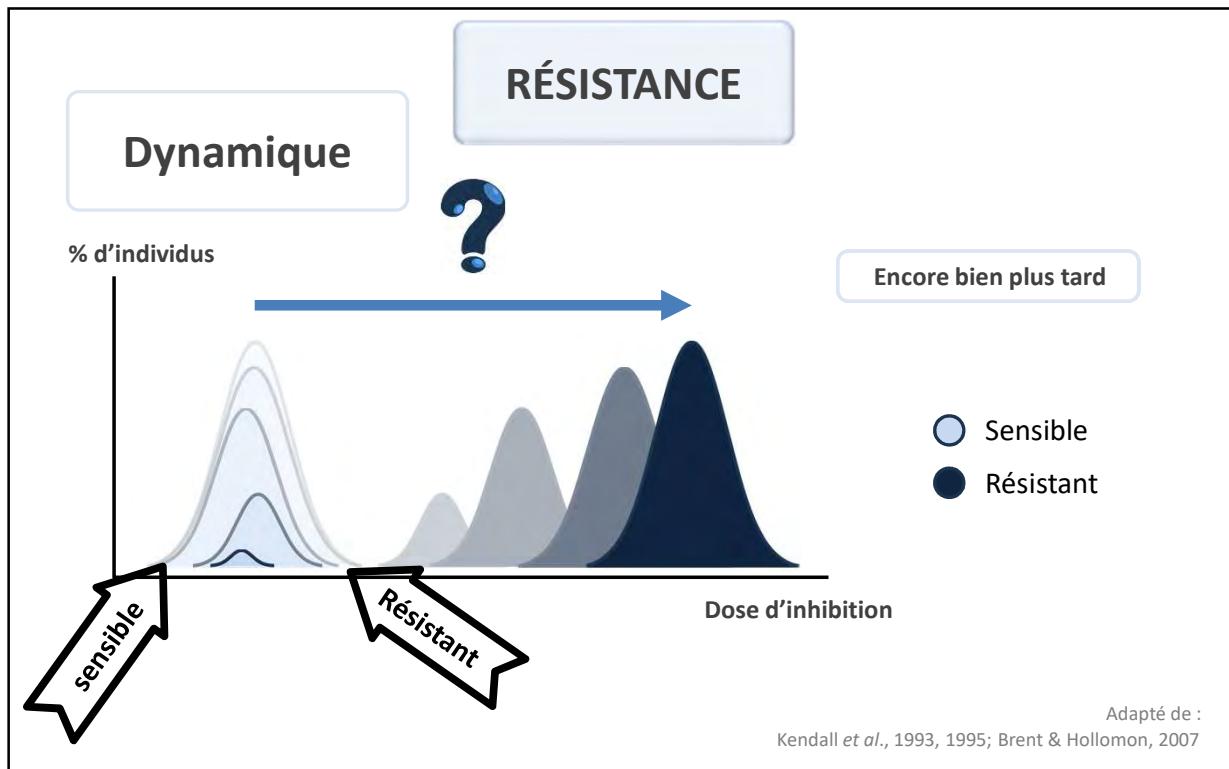
Dynamique

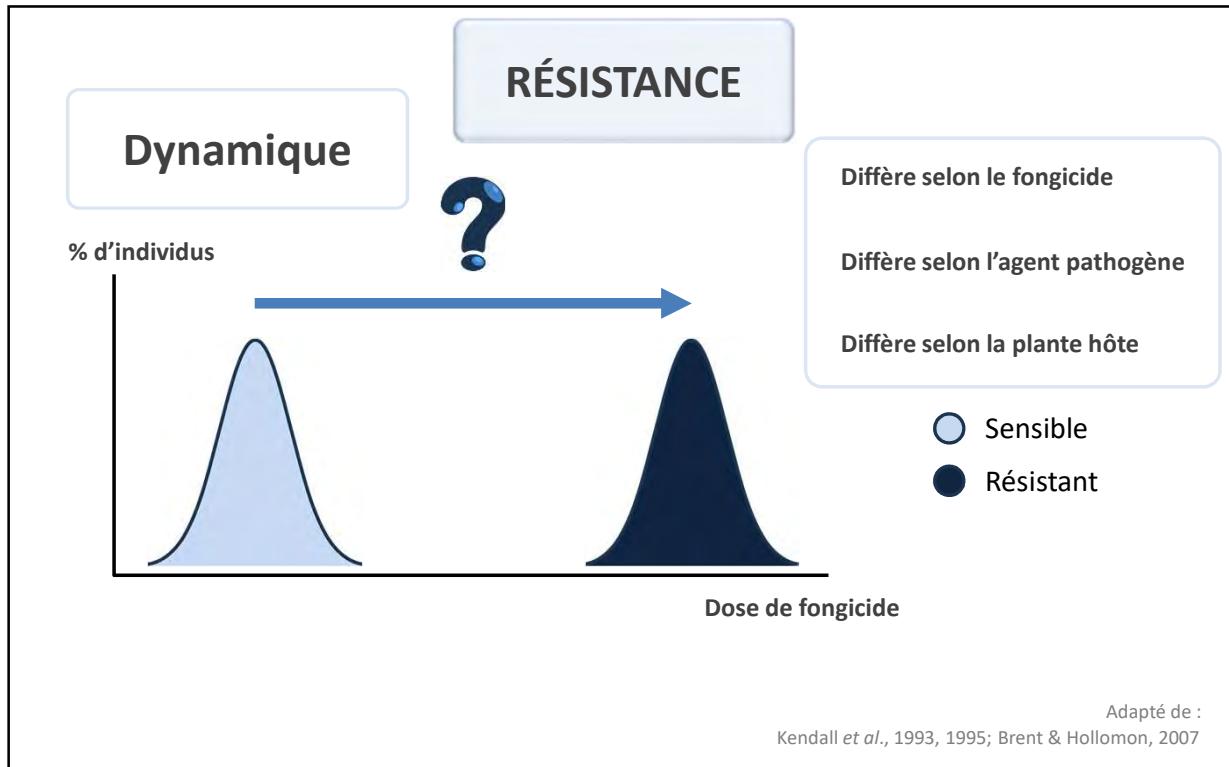


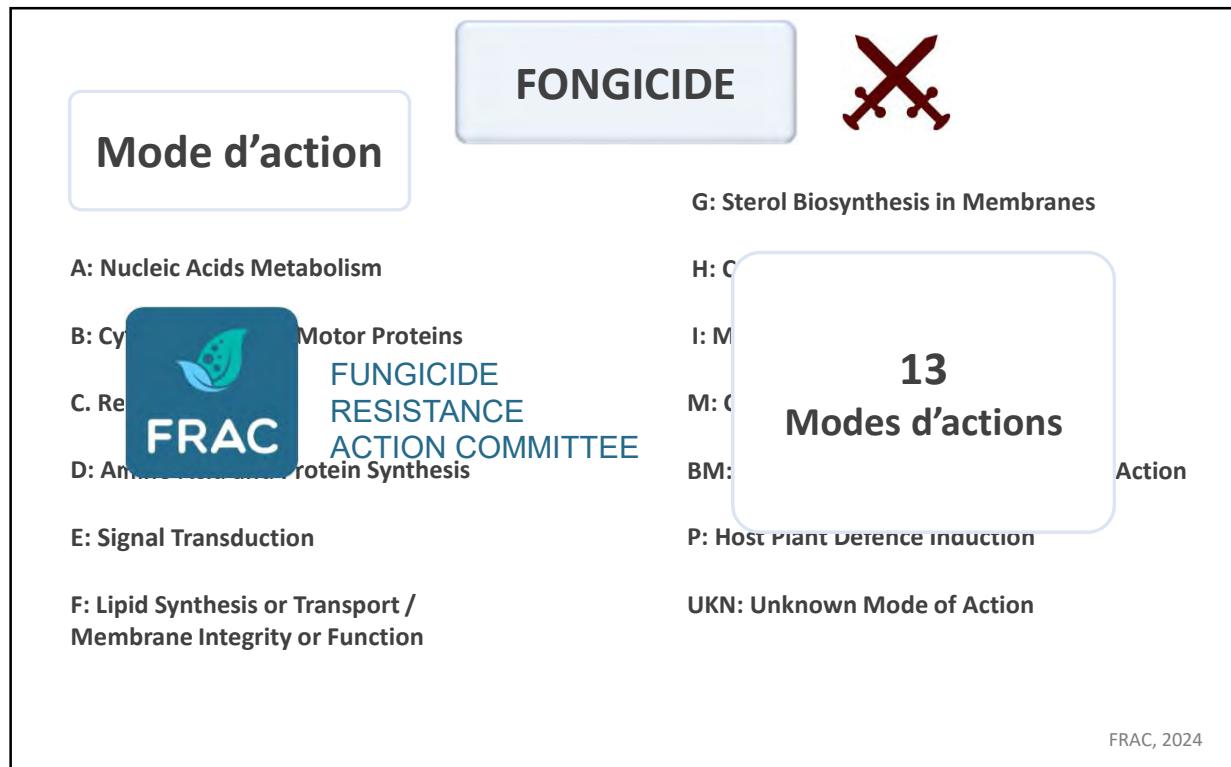


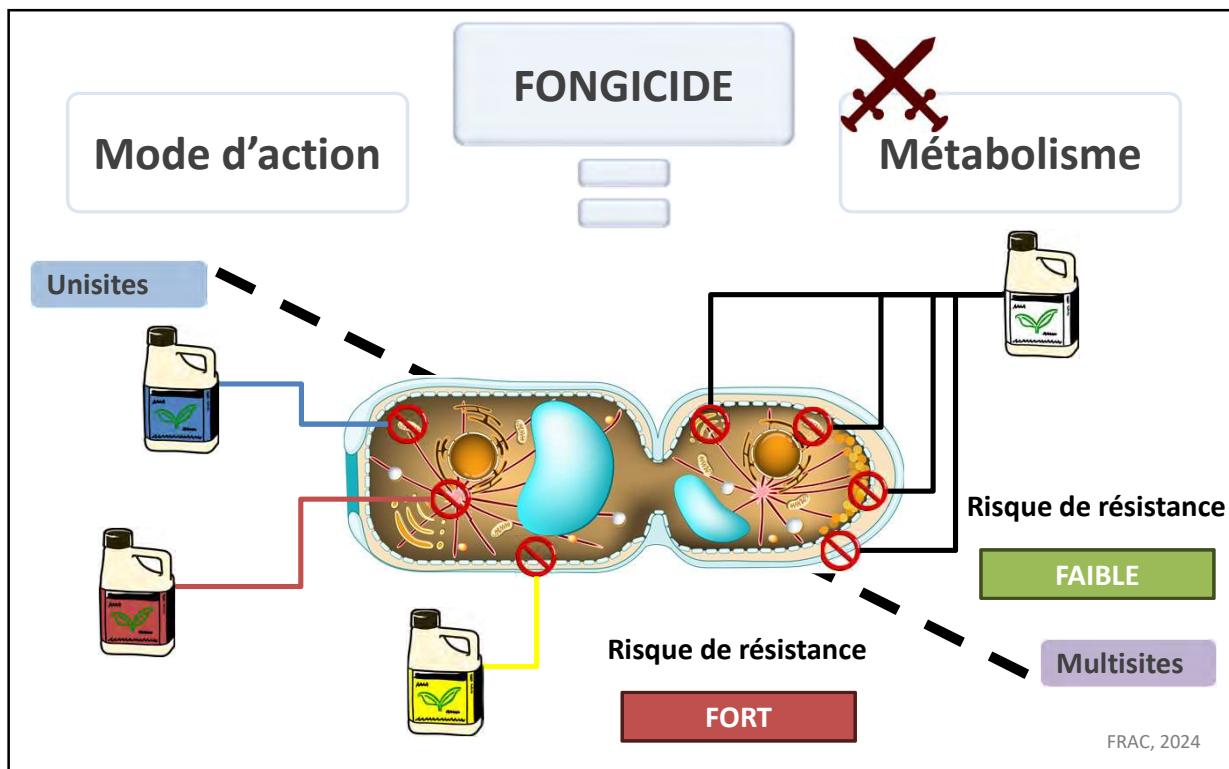
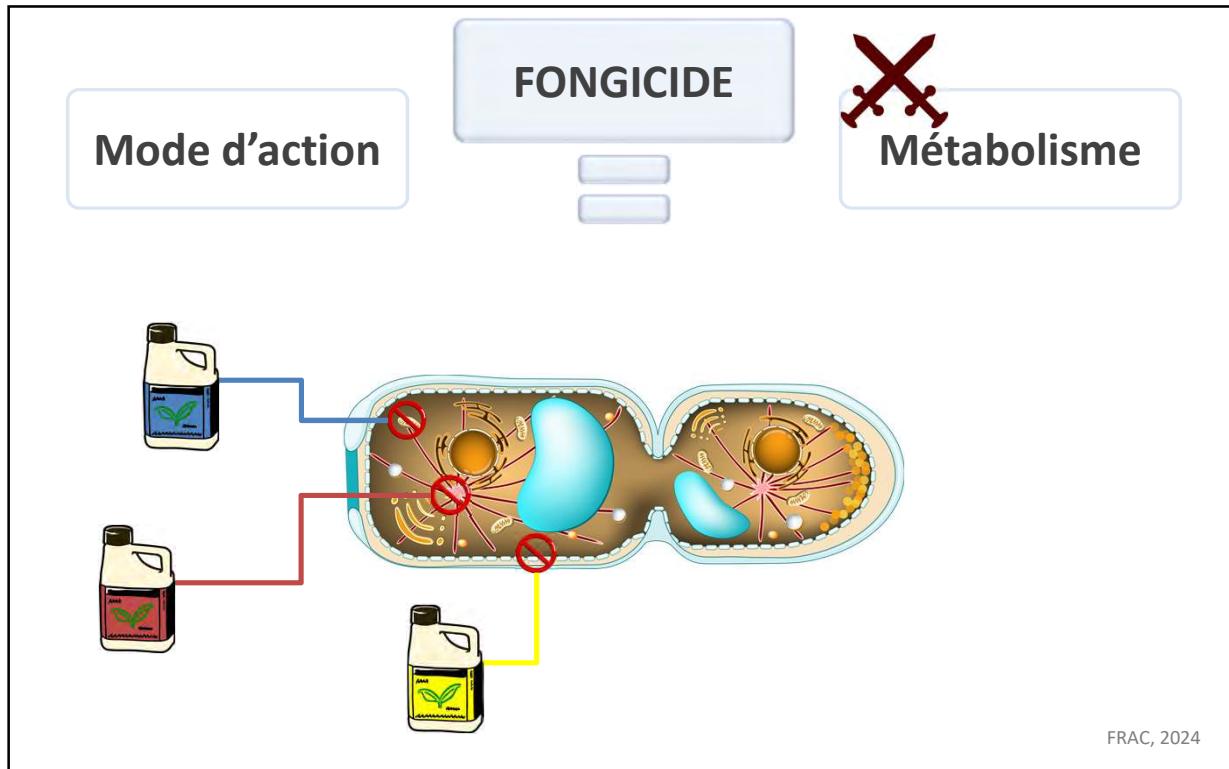


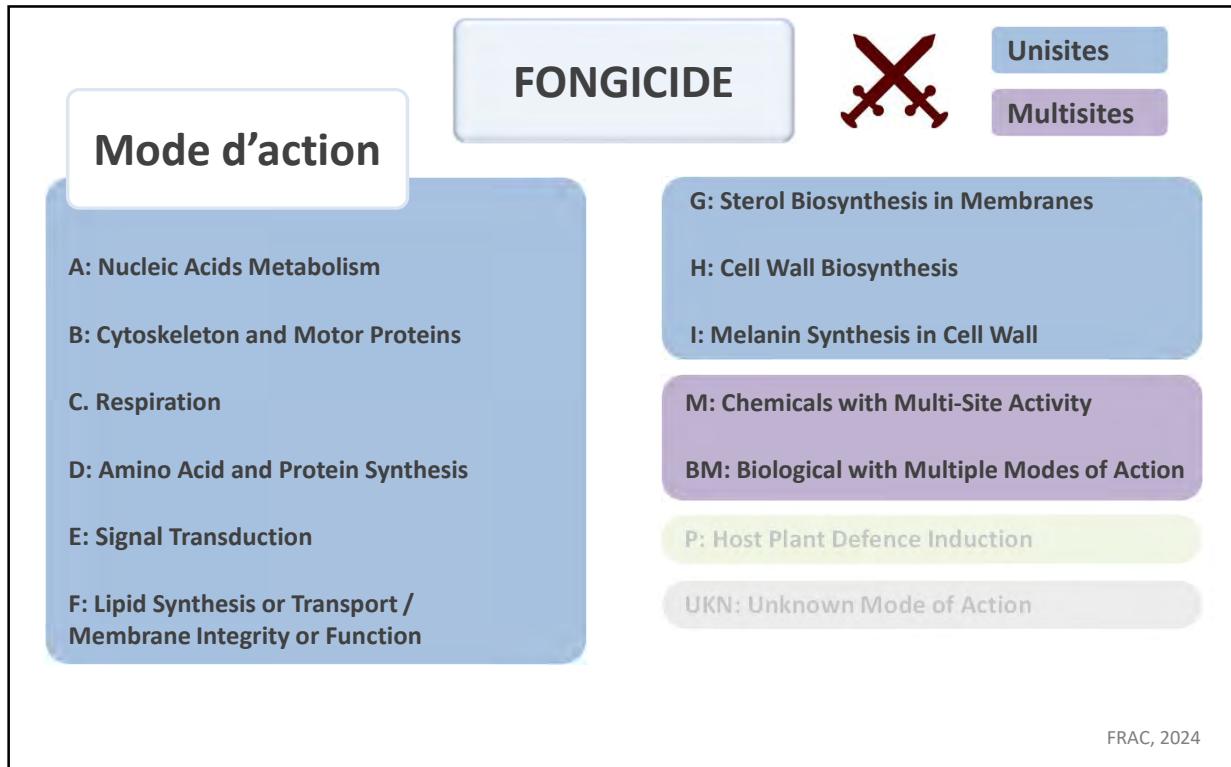


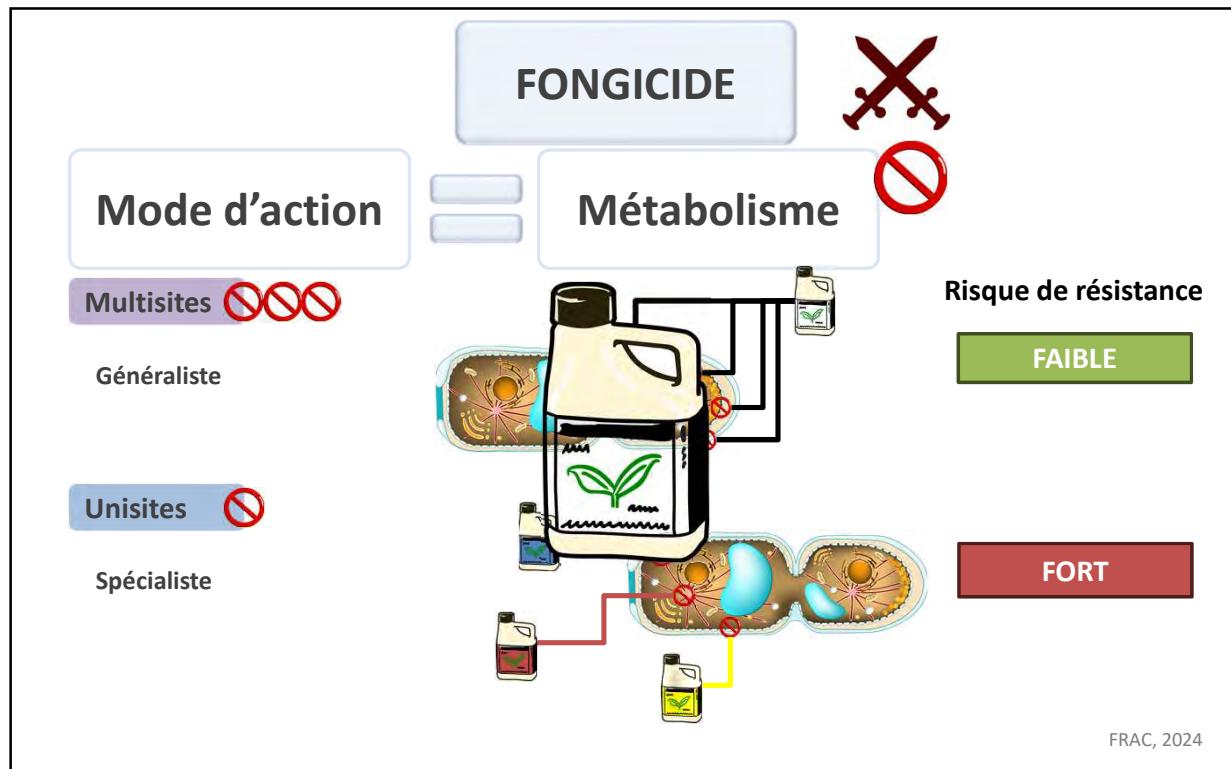


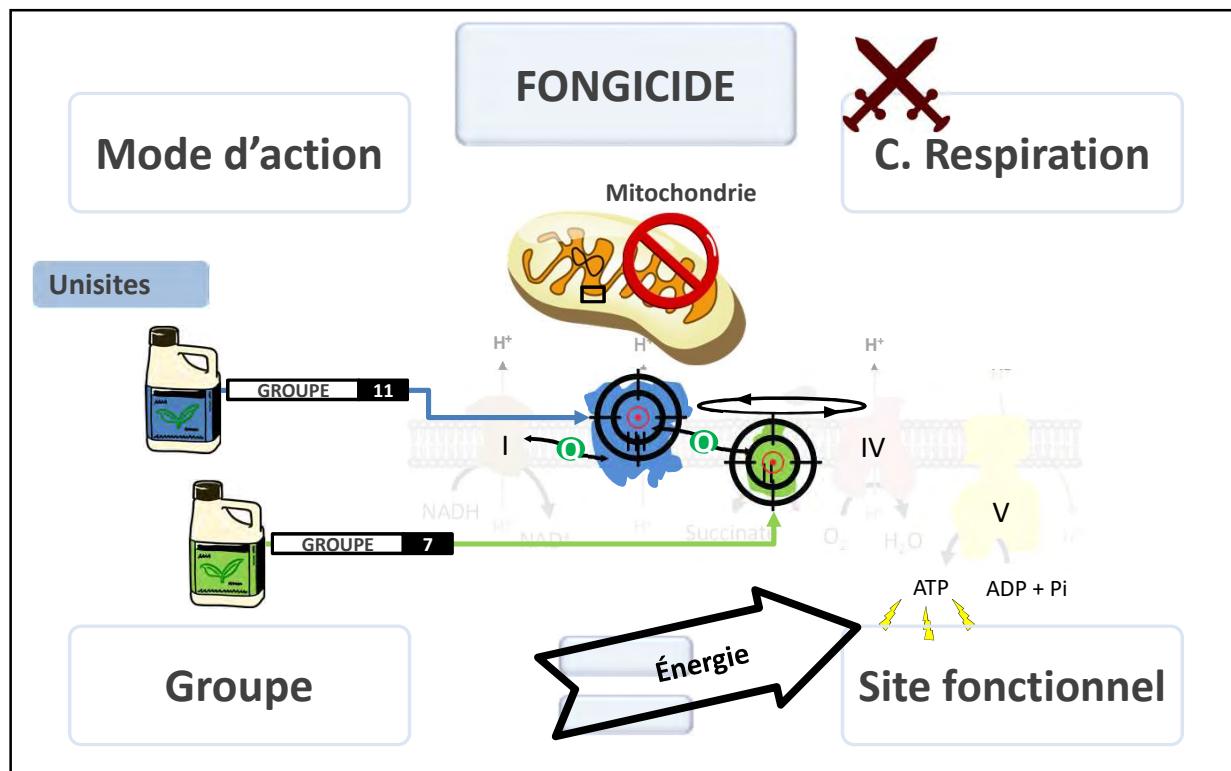
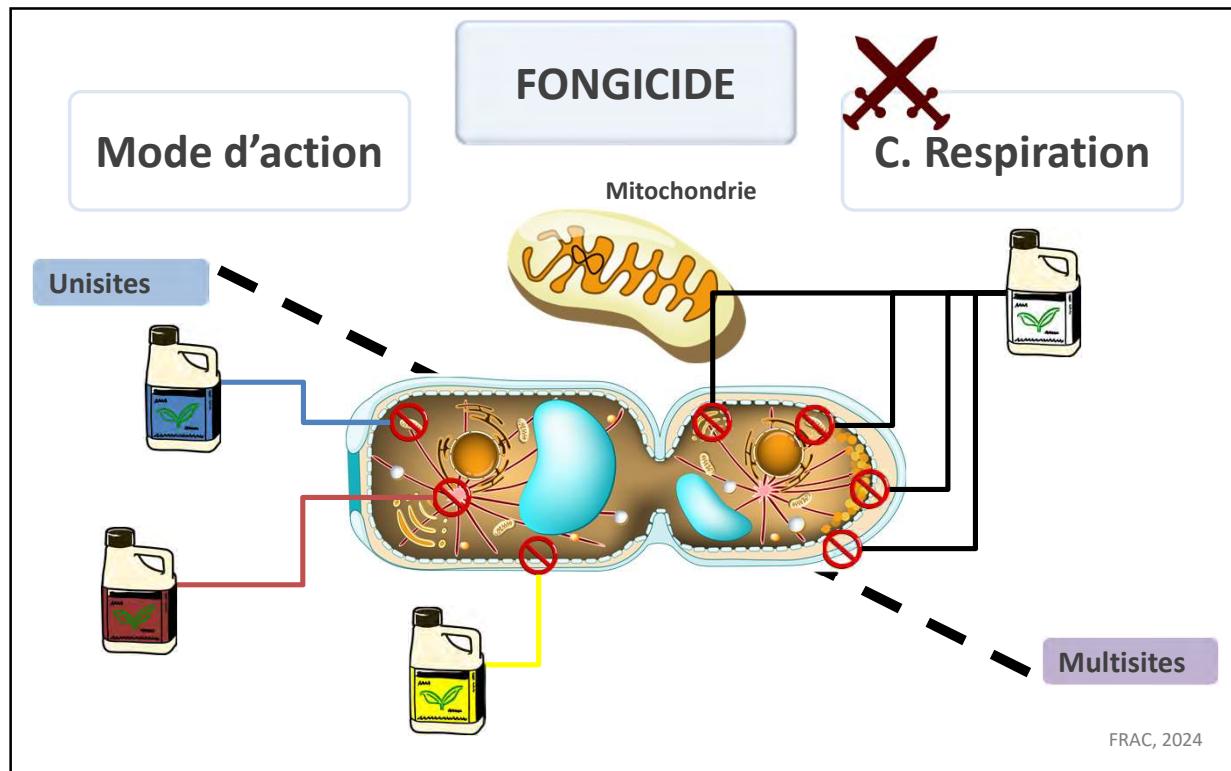


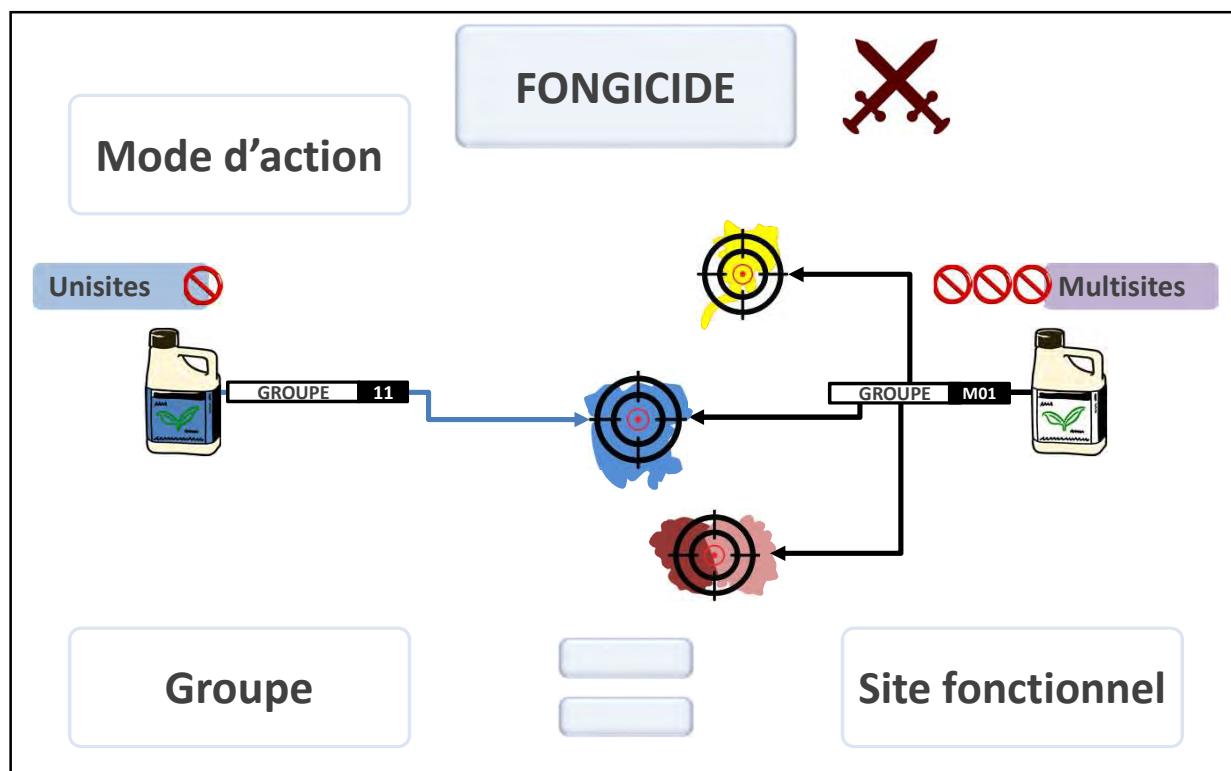
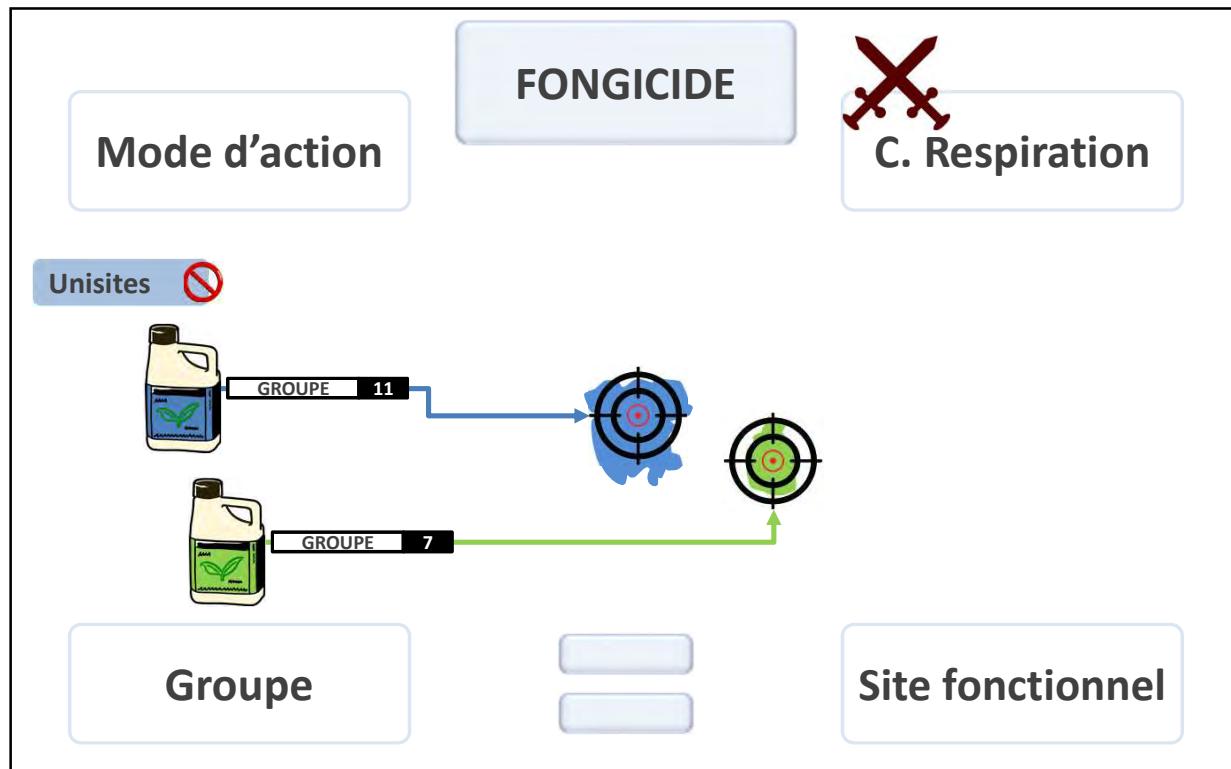


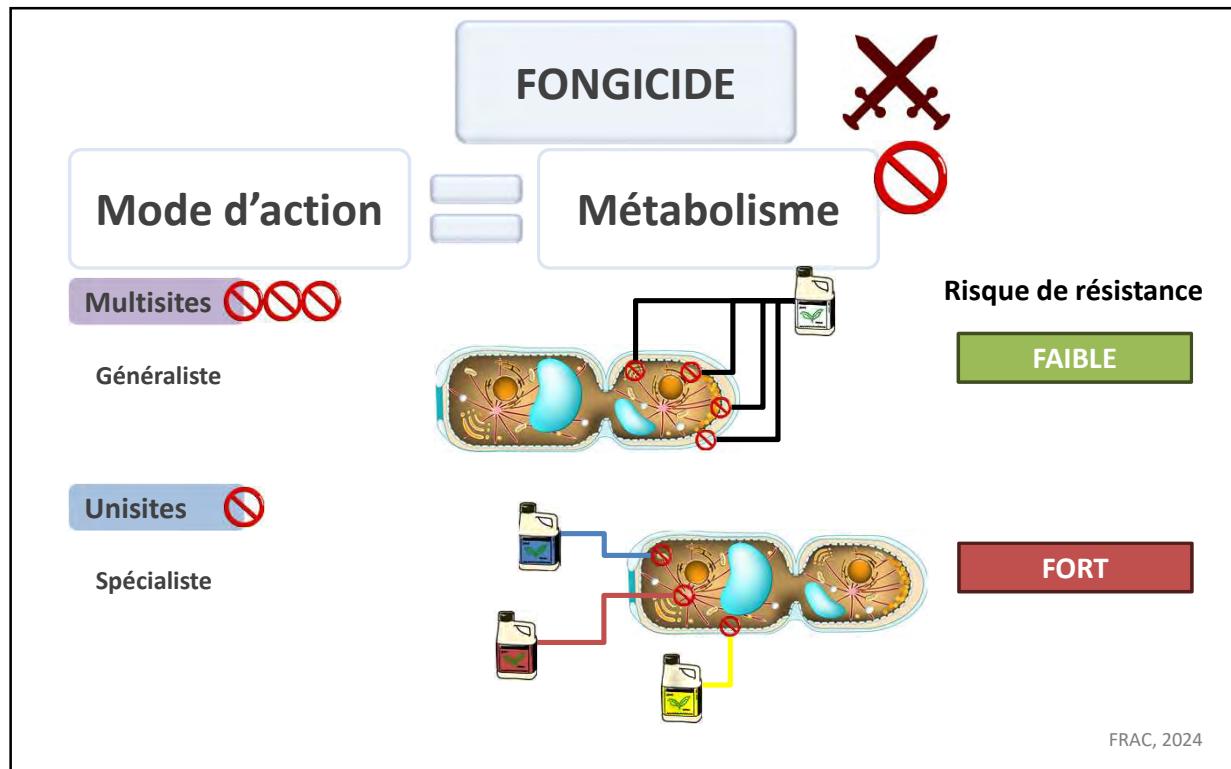


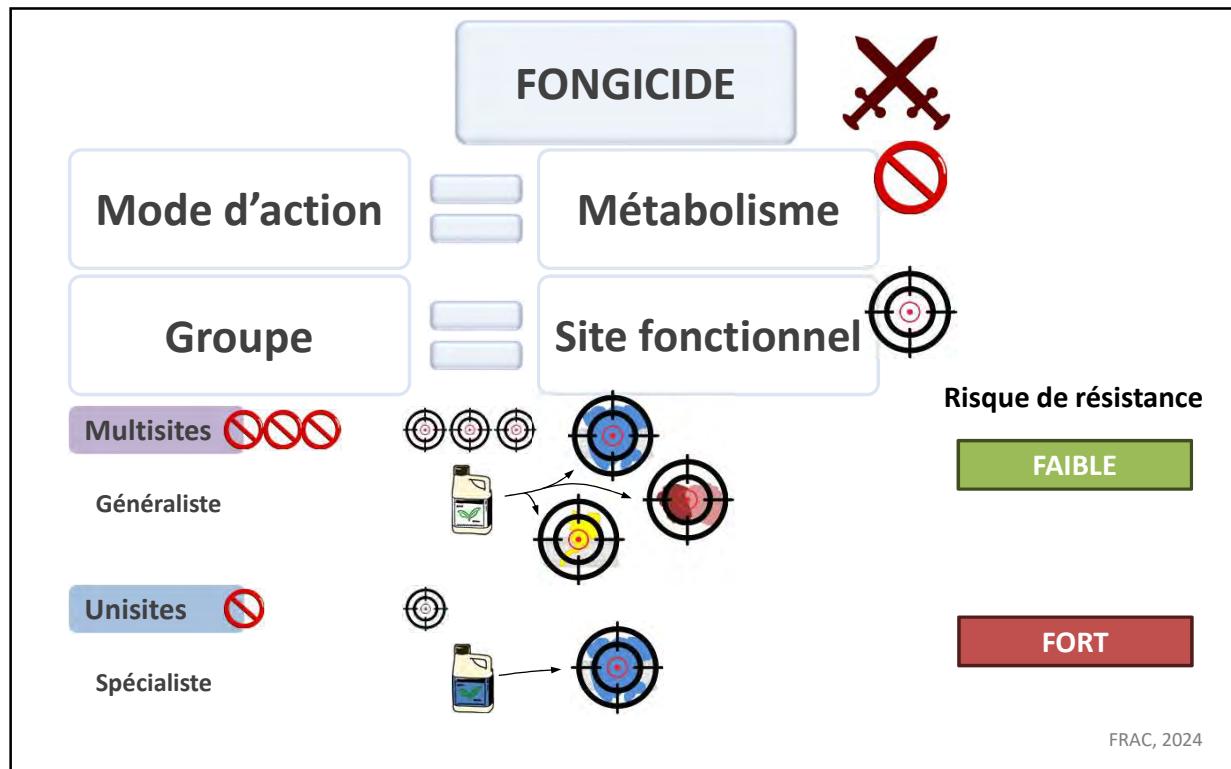


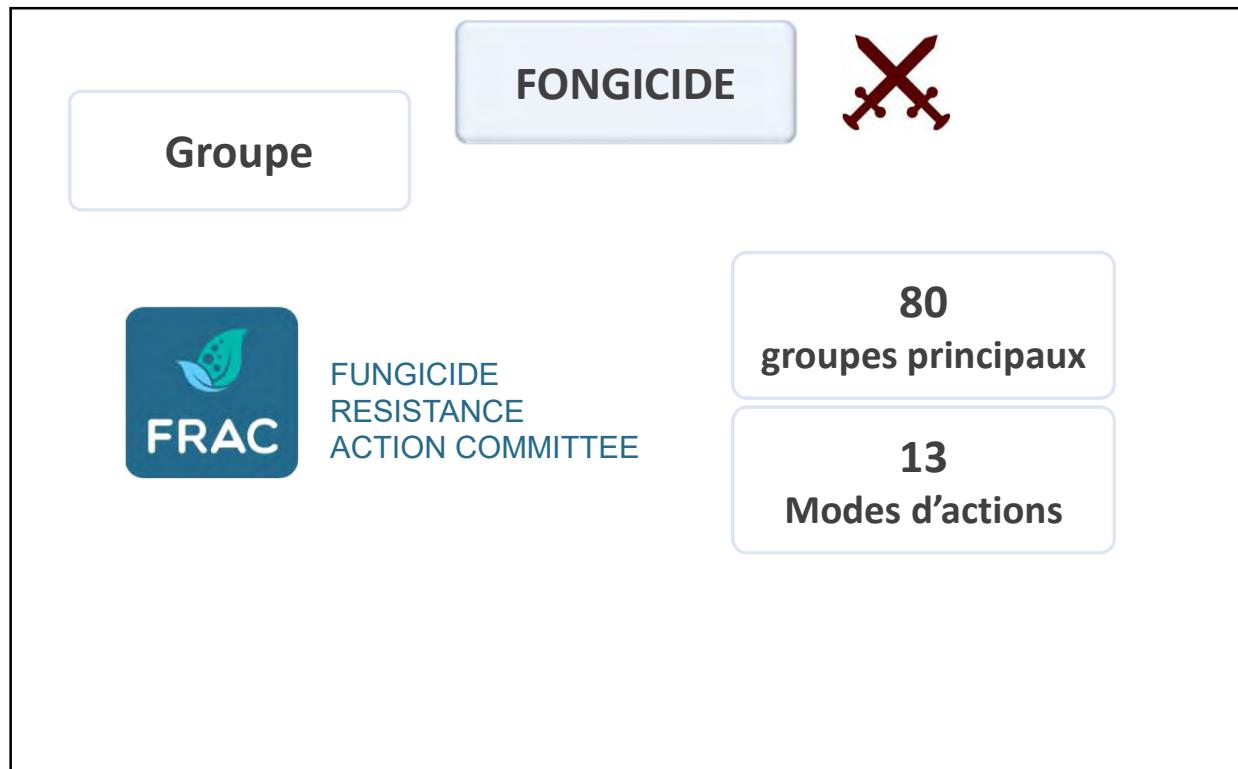
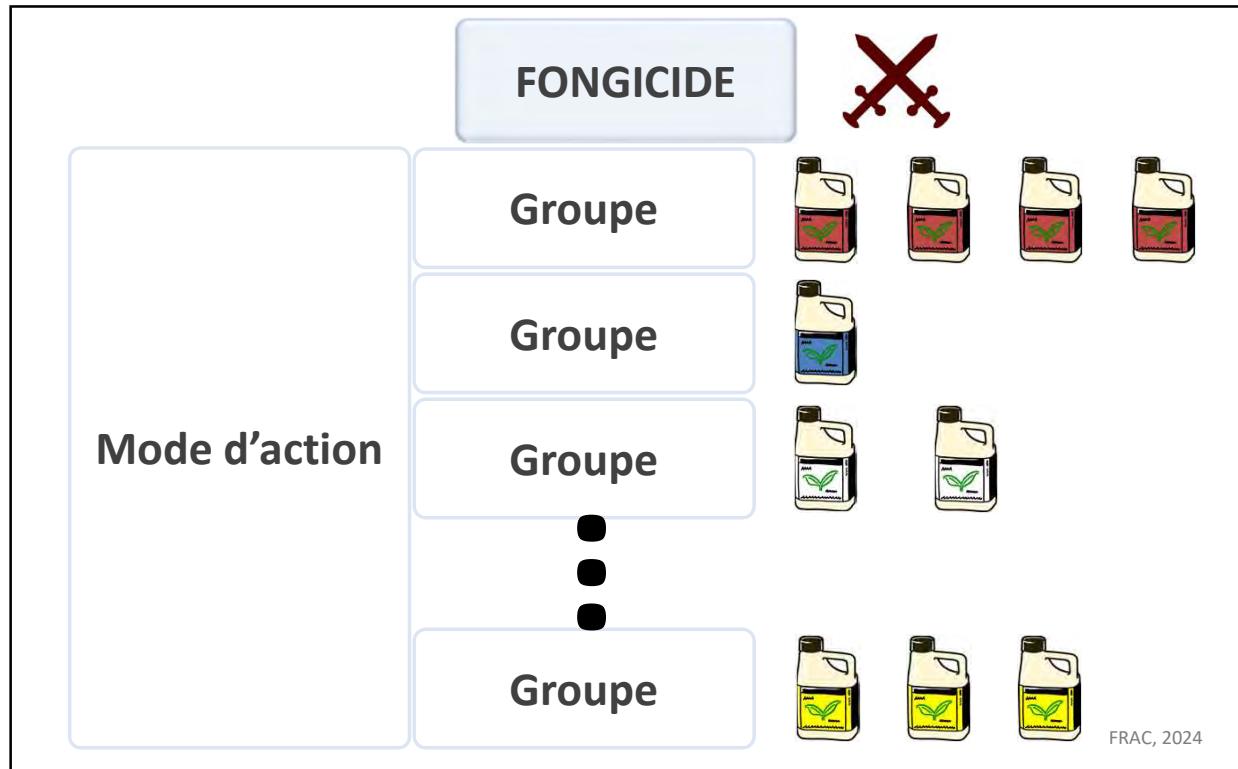


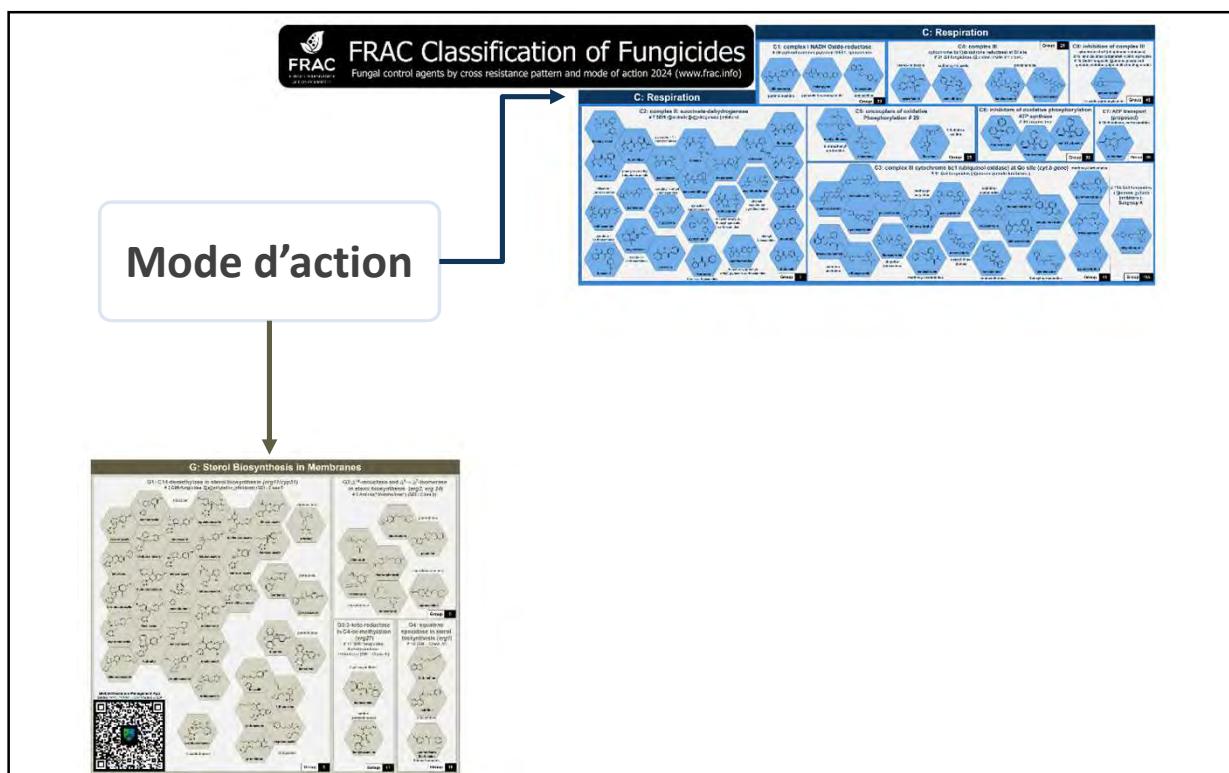
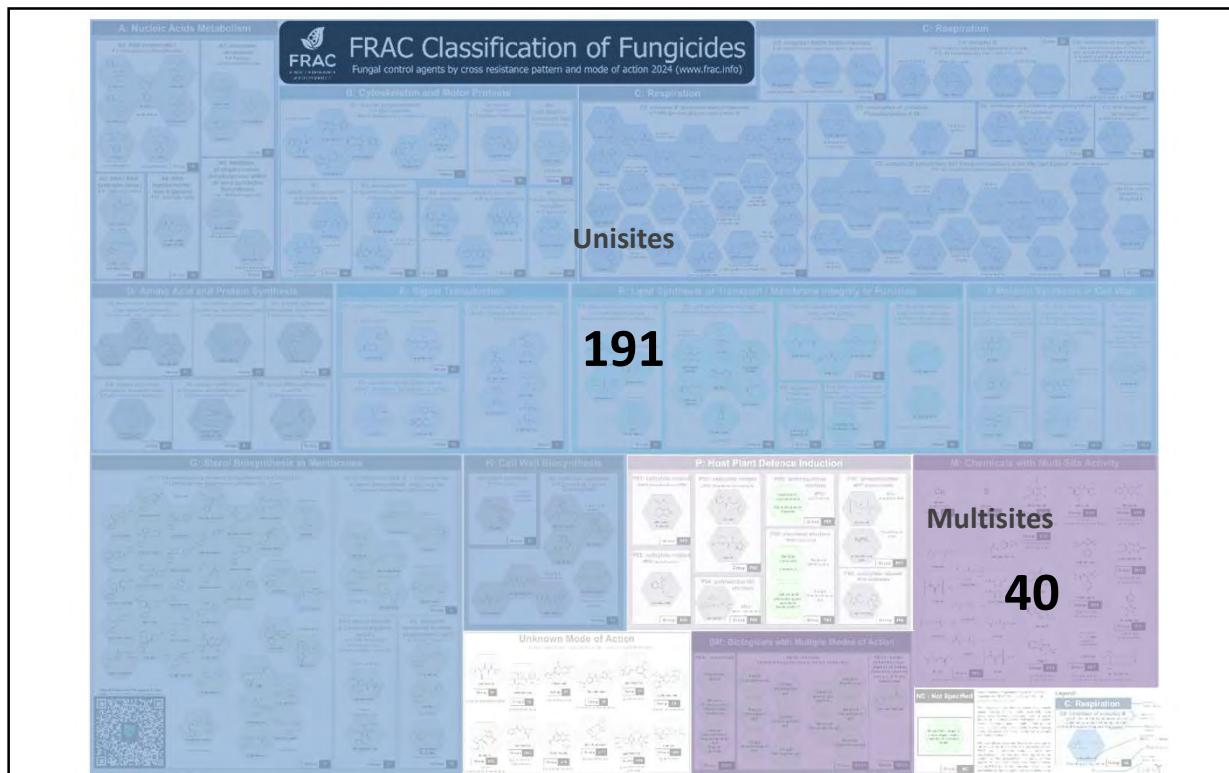












**FRAC Classification of Fungicides**  
Fungal control agents by cross resistance pattern and mode of action 2024 ([www.frac.info](http://www.frac.info))

**Mode d'action**

**Groups**

**C: Respiration**

**C1: complex I NADH Oxido-reductase # 39 pyrimidinamines, pyrazole-MET1, quinazoline**

**C2: complex II: succinate-dehydrogenase # 7 ster1 (S-adenosyl-D-homoglutamate (Inositol))**

**C3: complex III cytochrome bc1 (ubiquinol oxidase) at Qo site (cyt b gene) # 11 Quinolines (Quinone outside inhibitors)**

**C4: complex III cytochrome bc1 (ubiquinone reductase) at Qo site # 21 Quinolines (Quinone inside inhibitors)**

**C5: uncouplers of oxidative phosphorylation # 29**

**C6: Inhibitors of oxidative phosphorylation ATP synthase # 30 organotins**

**C7: ATP transport (proton-pump) # 29 disulfonaphthalimides**

**C8: Inhibition of complex III cytochrome bc1 (ubiquinone reductase) at Qo site (Quinone inside binding mode) # 21 Quinolines (Quinone inside binding mode)**

**Group 7**

**Group 21**

**Group 23**

**Group 11A**

Mode d'action

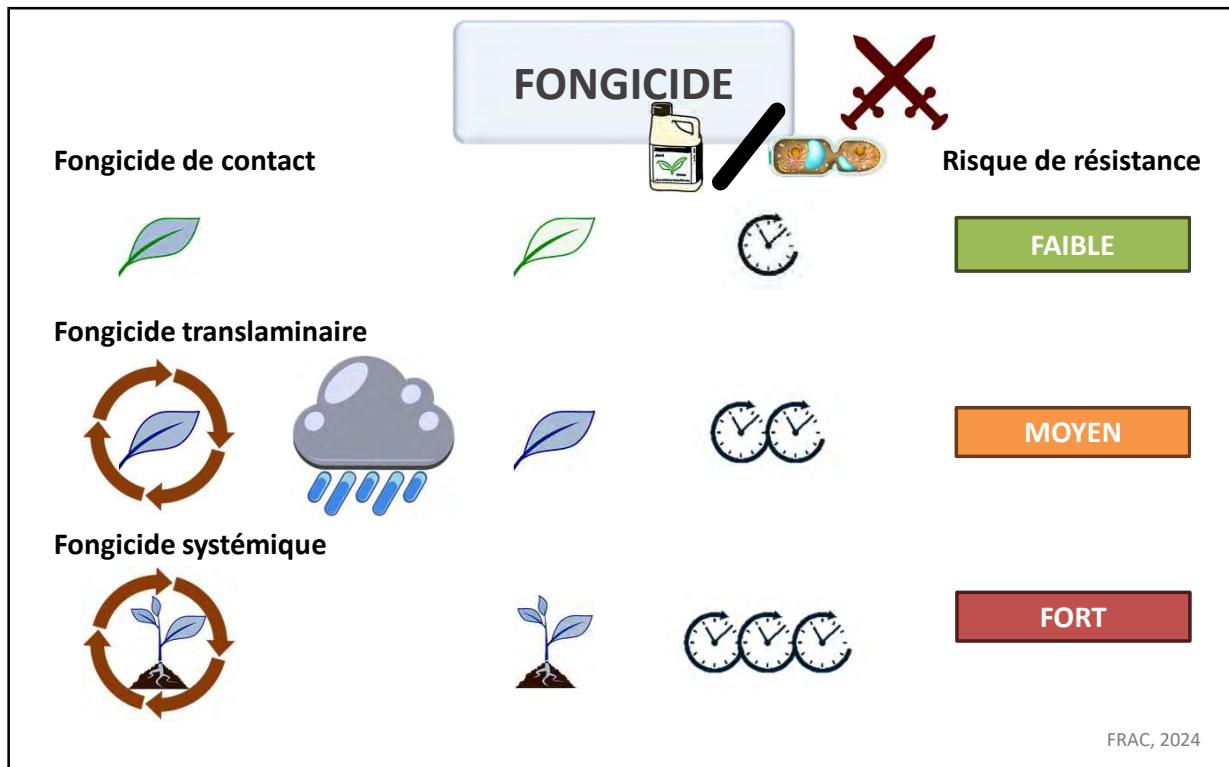
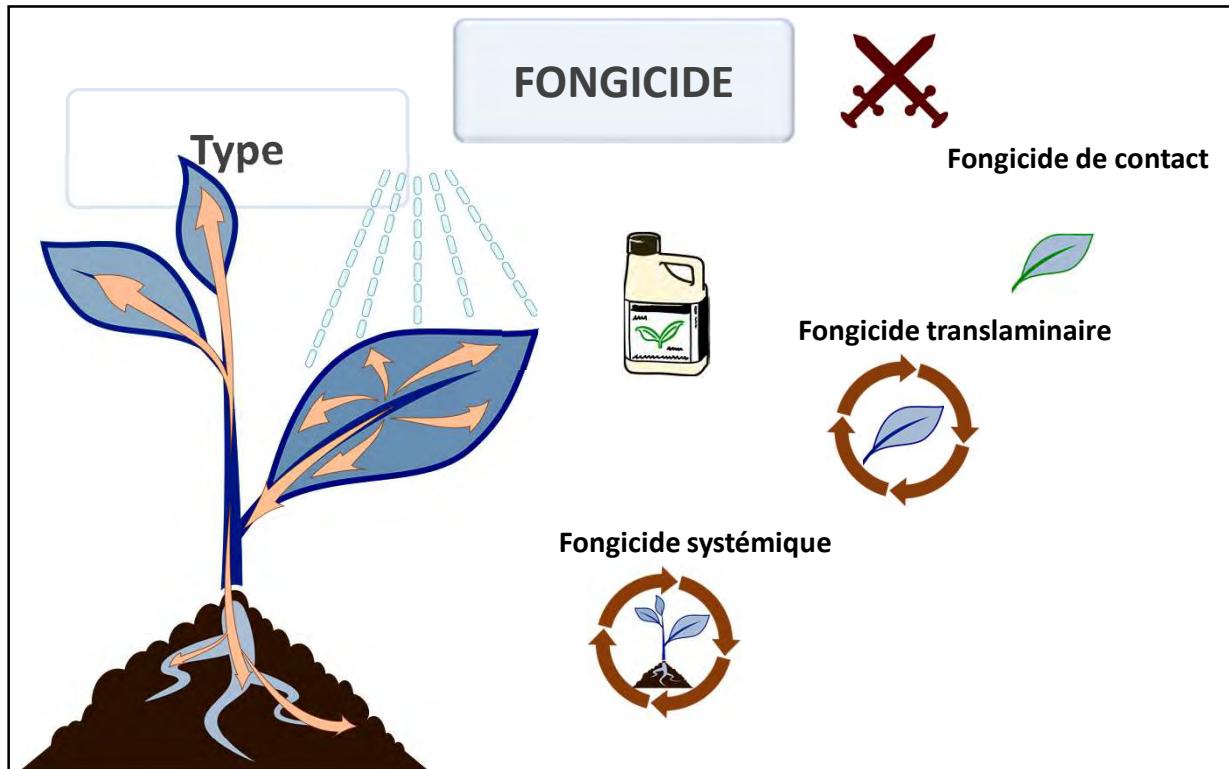
Groupe

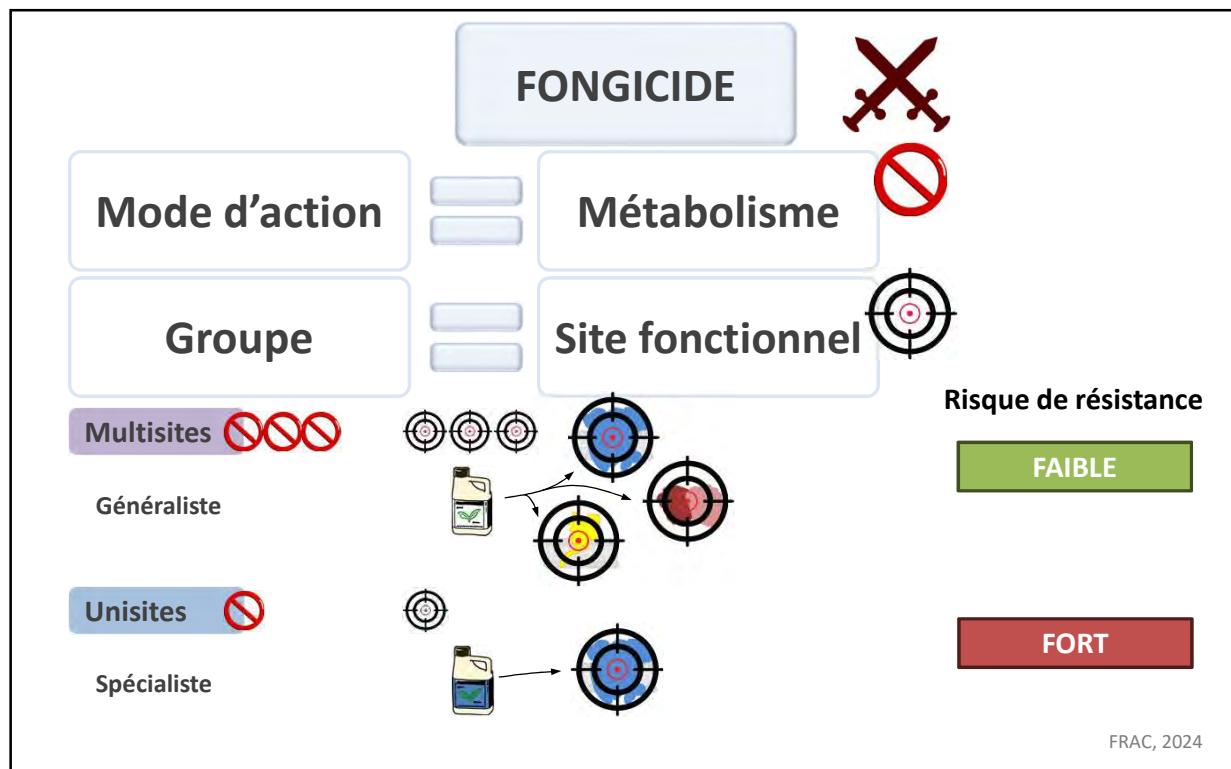
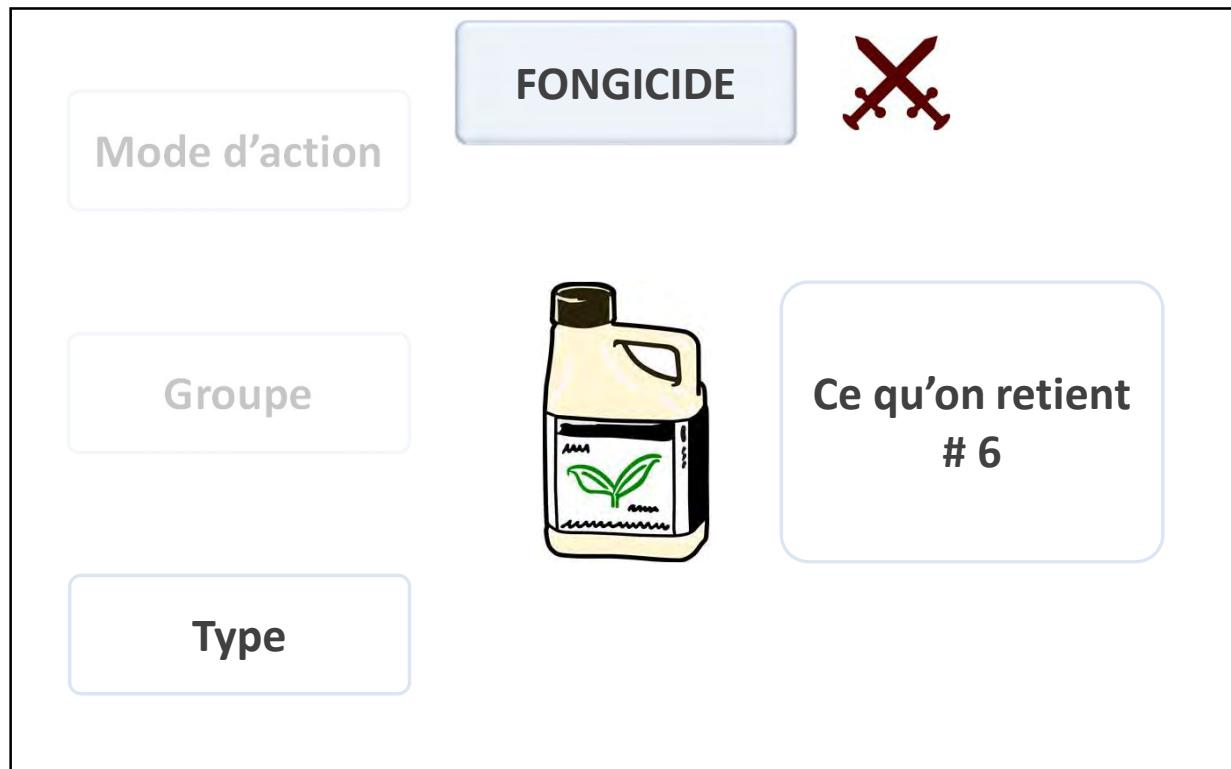
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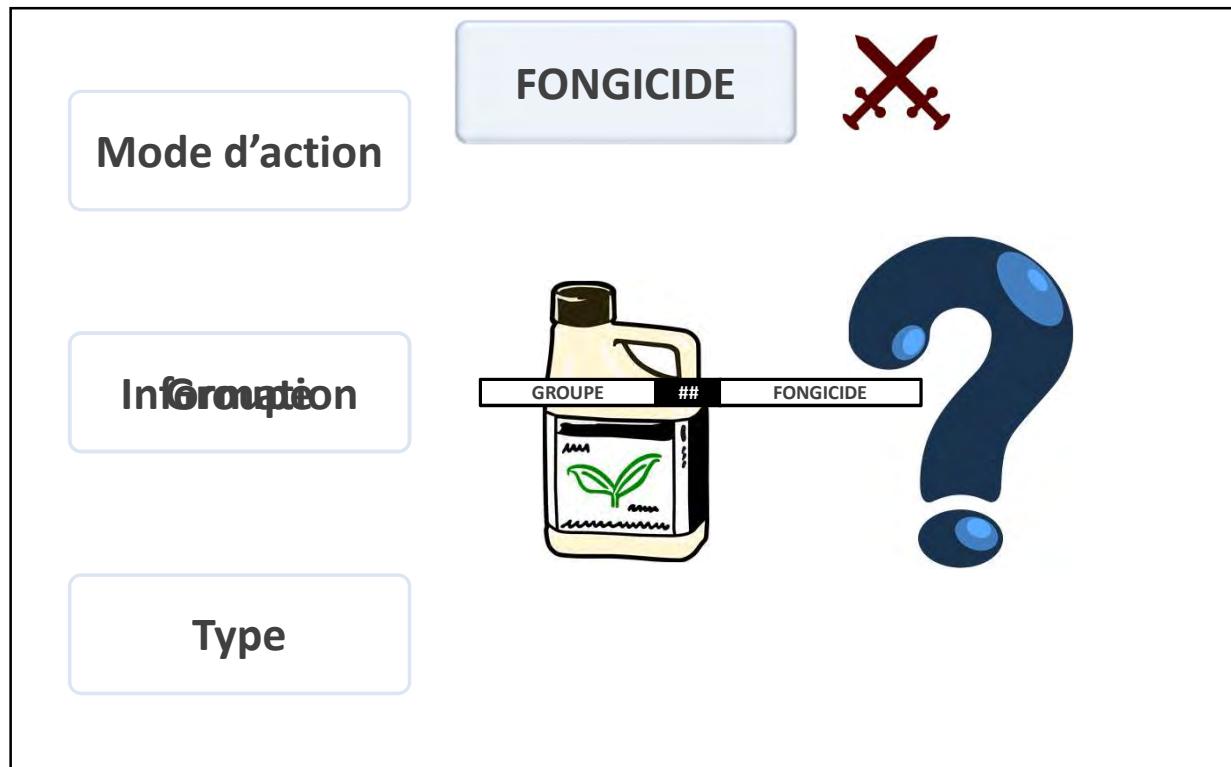
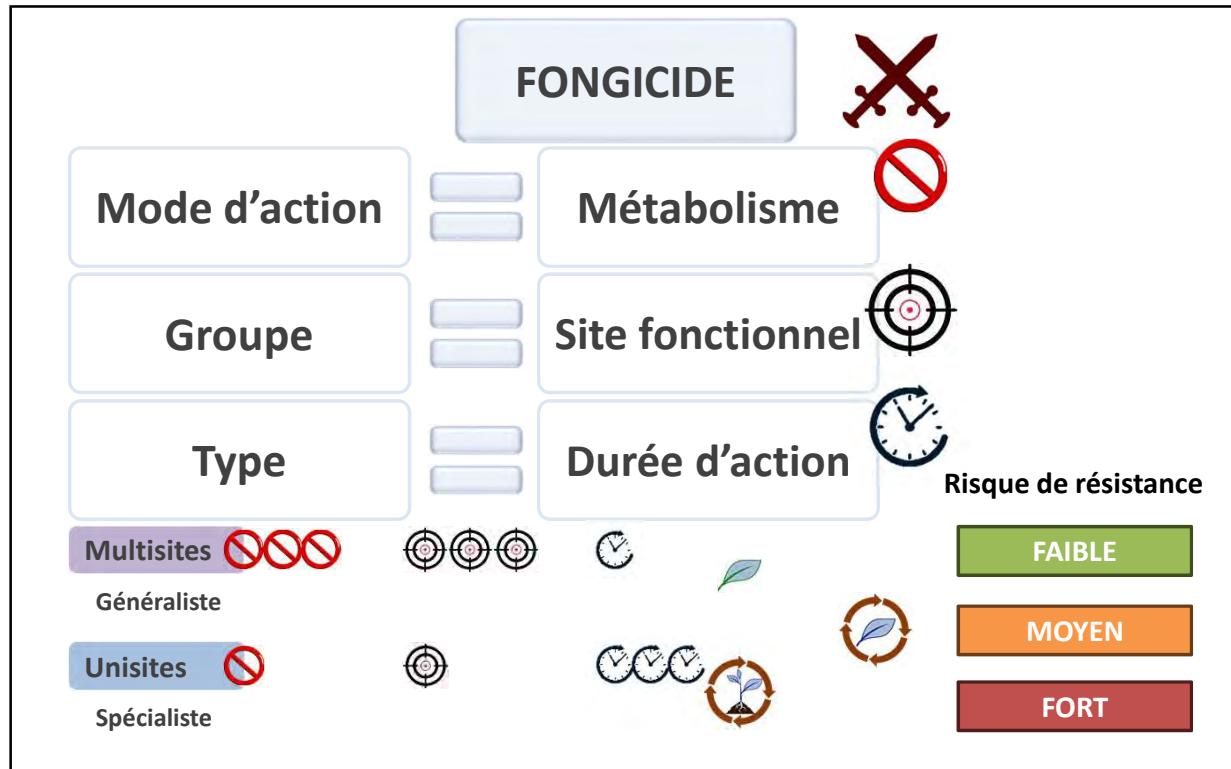
**FONGICIDE**

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✗







**FONGICIDE**

**Google Scholar**  
<https://scholar.google.com/>

**Information**



**FRAC**  
FUNGICIDE RESISTANCE  
ACTION COMMITTEE

<https://www.frac.info/>





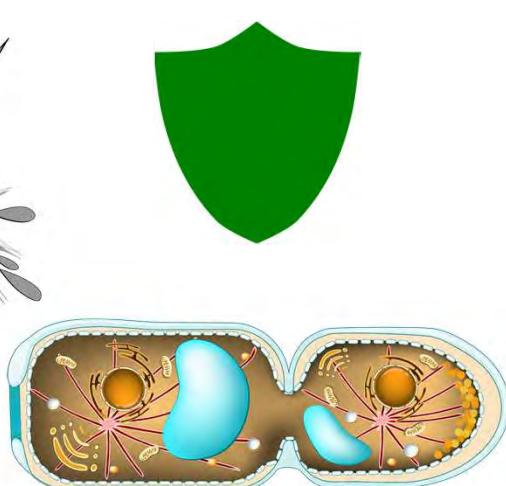
**FONGICIDE**

**RÉSISTANCE**

**CHAMPIGNON**

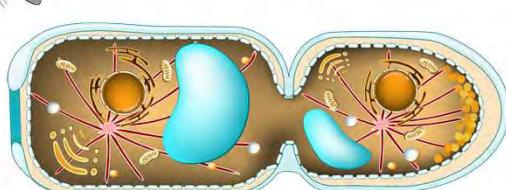










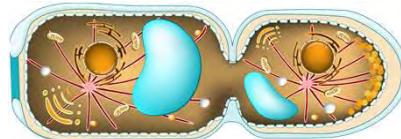


Mécanismes de défense

CHAMPIGNON



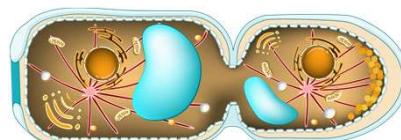
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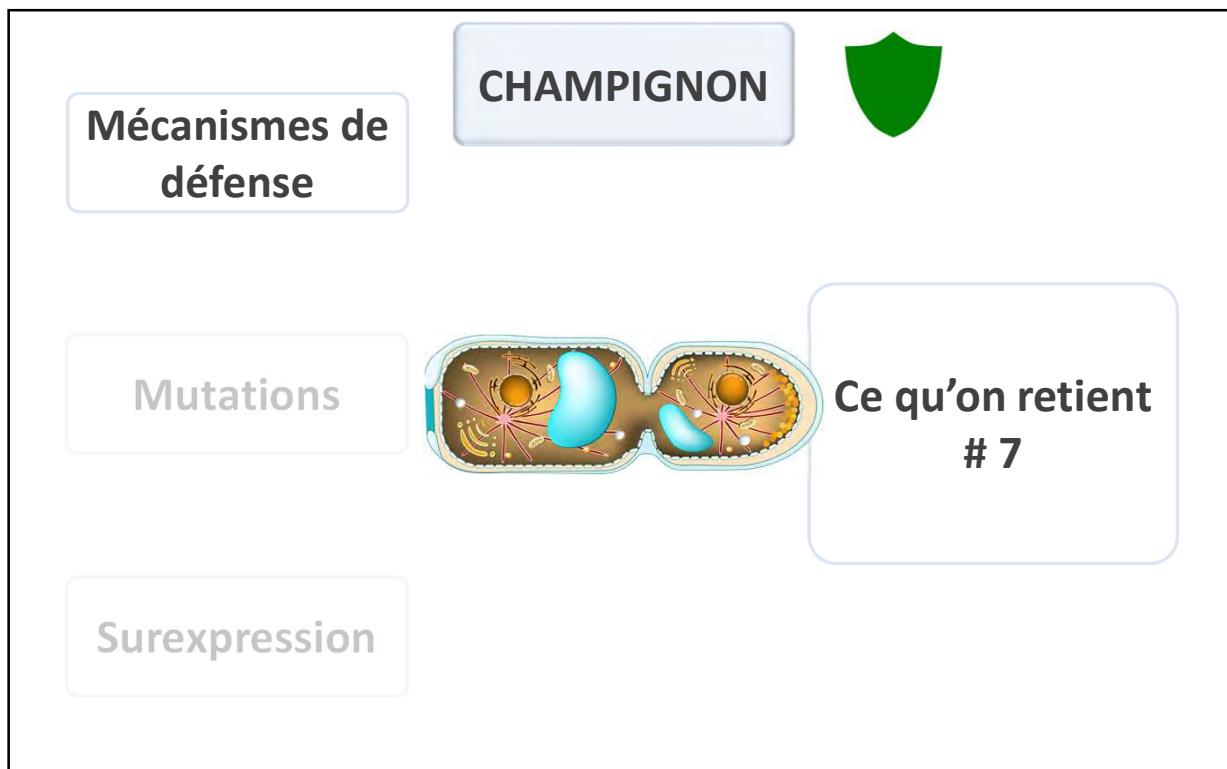
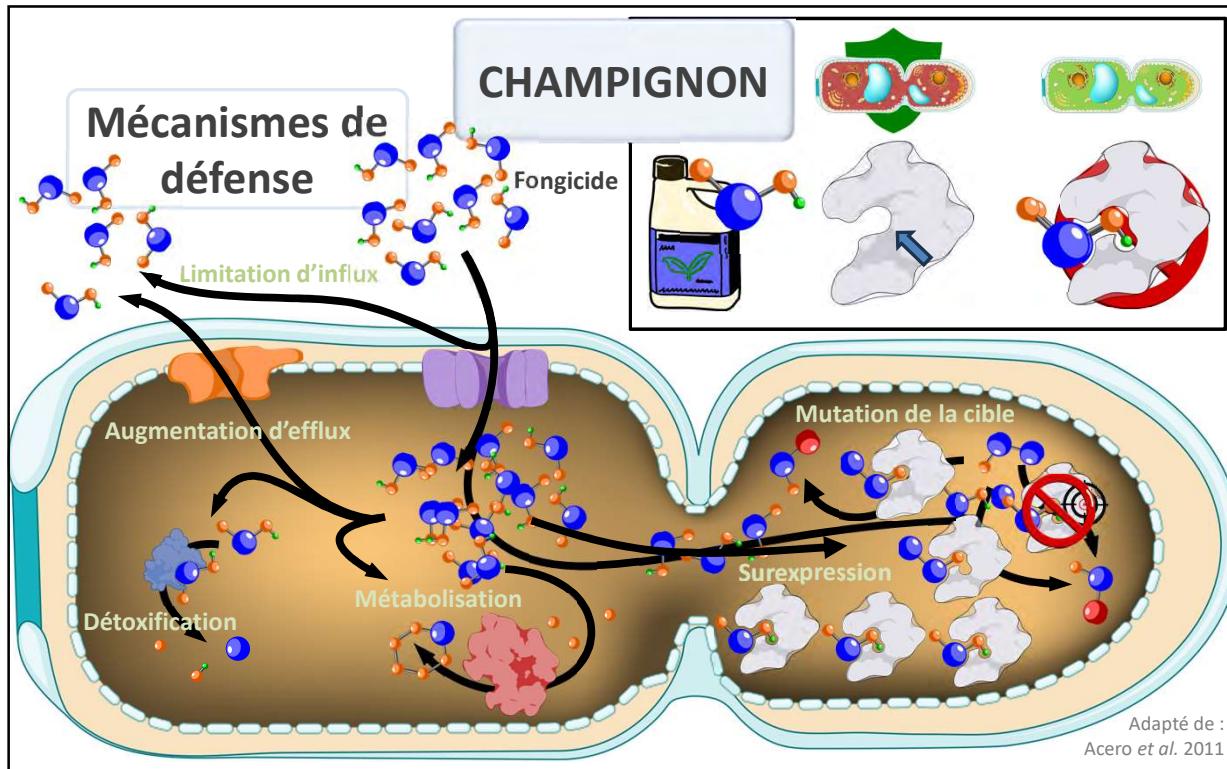


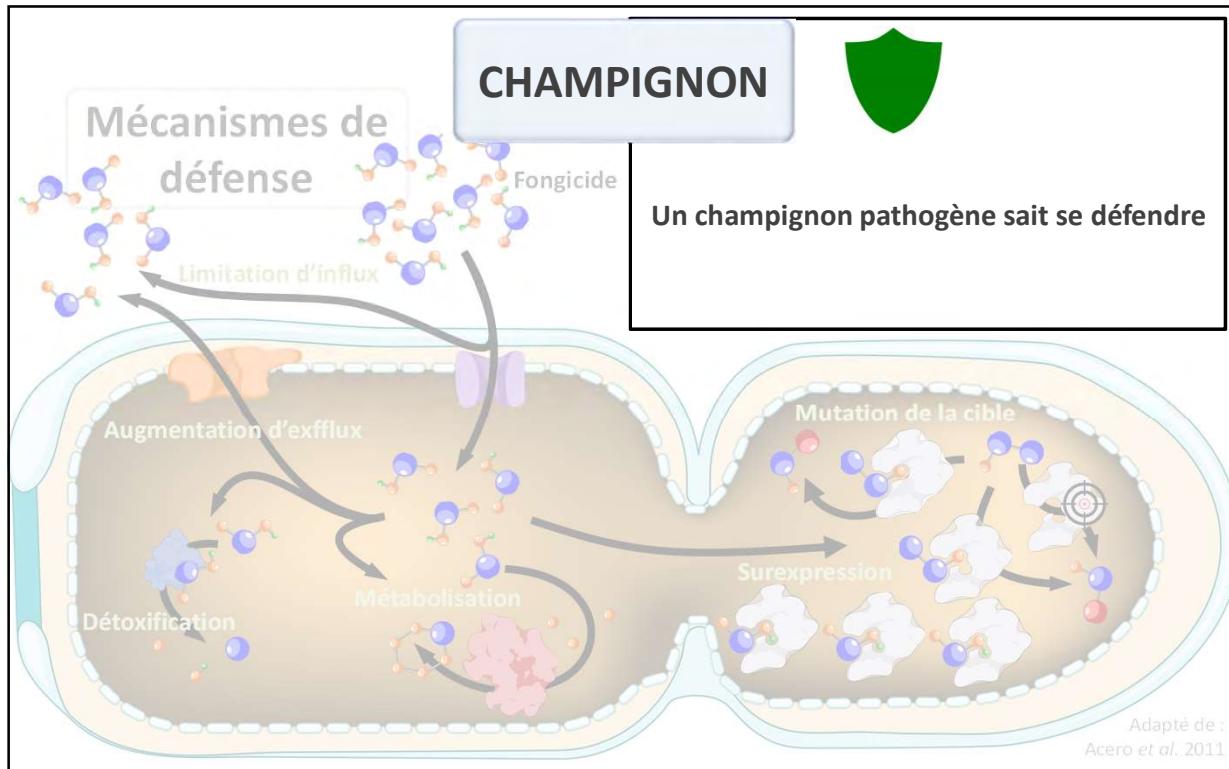
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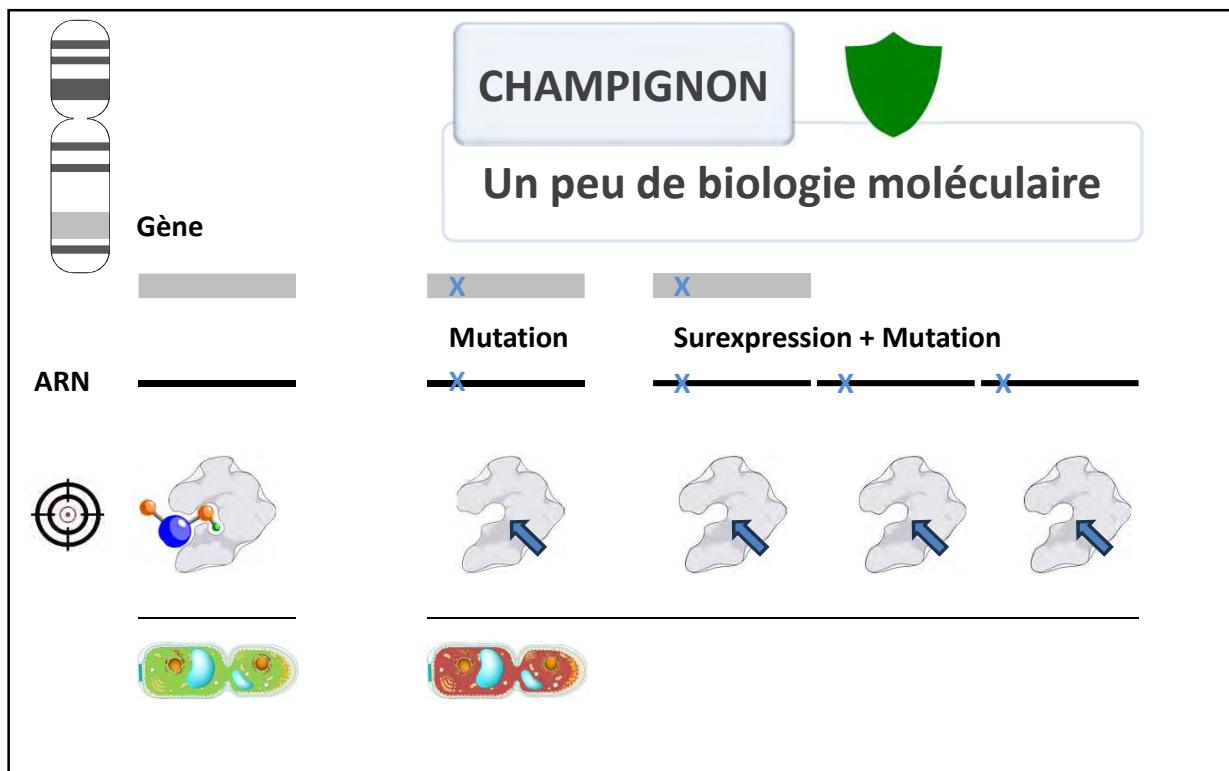
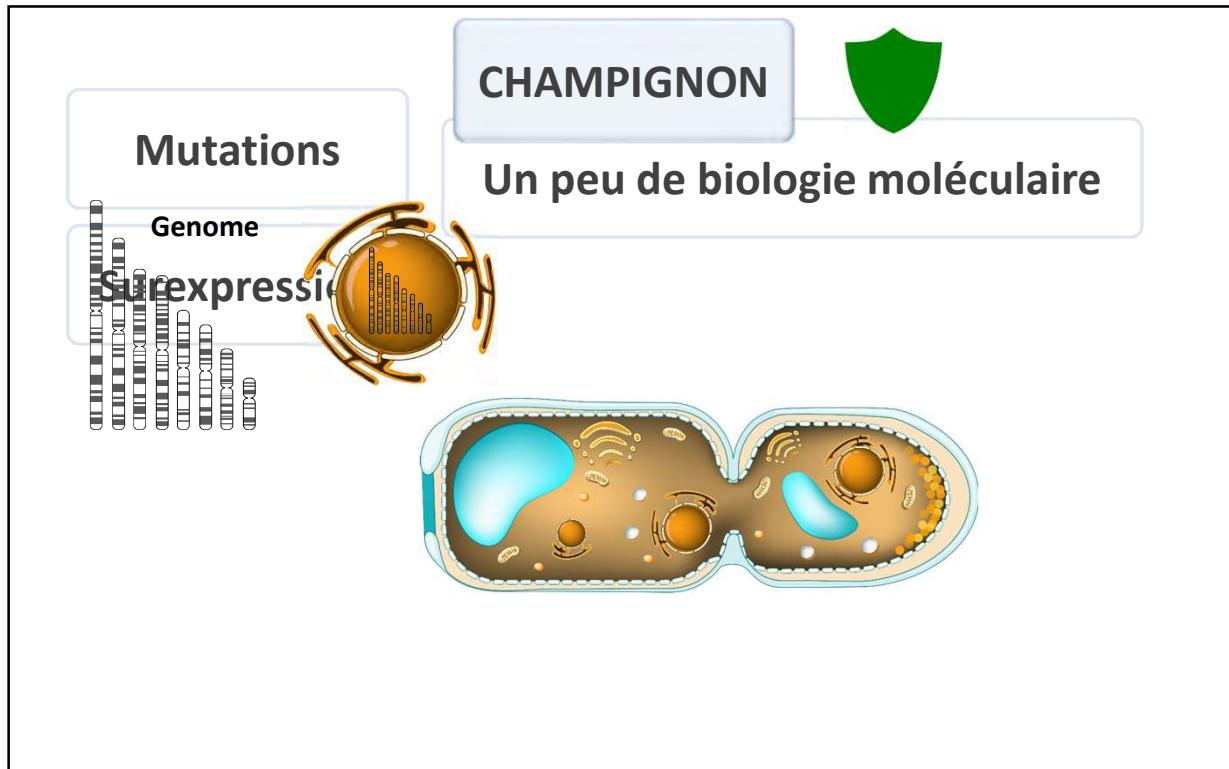
Mécanismes de défense

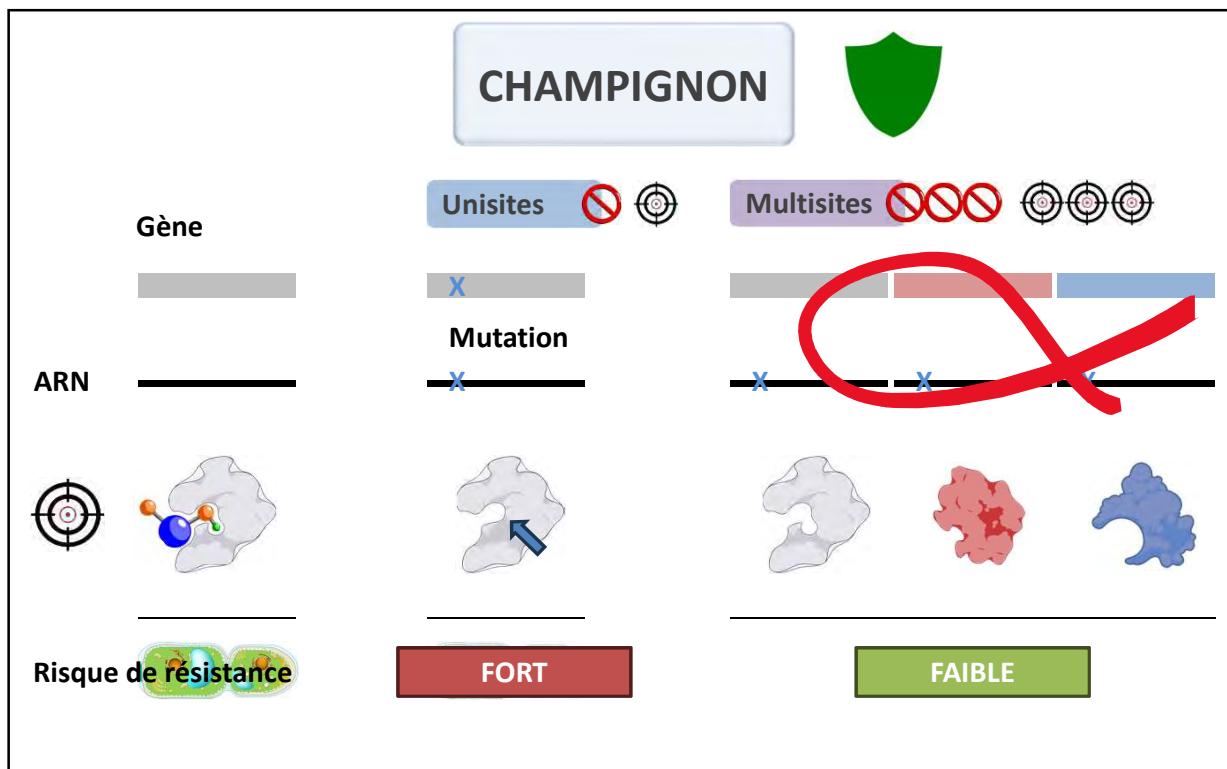
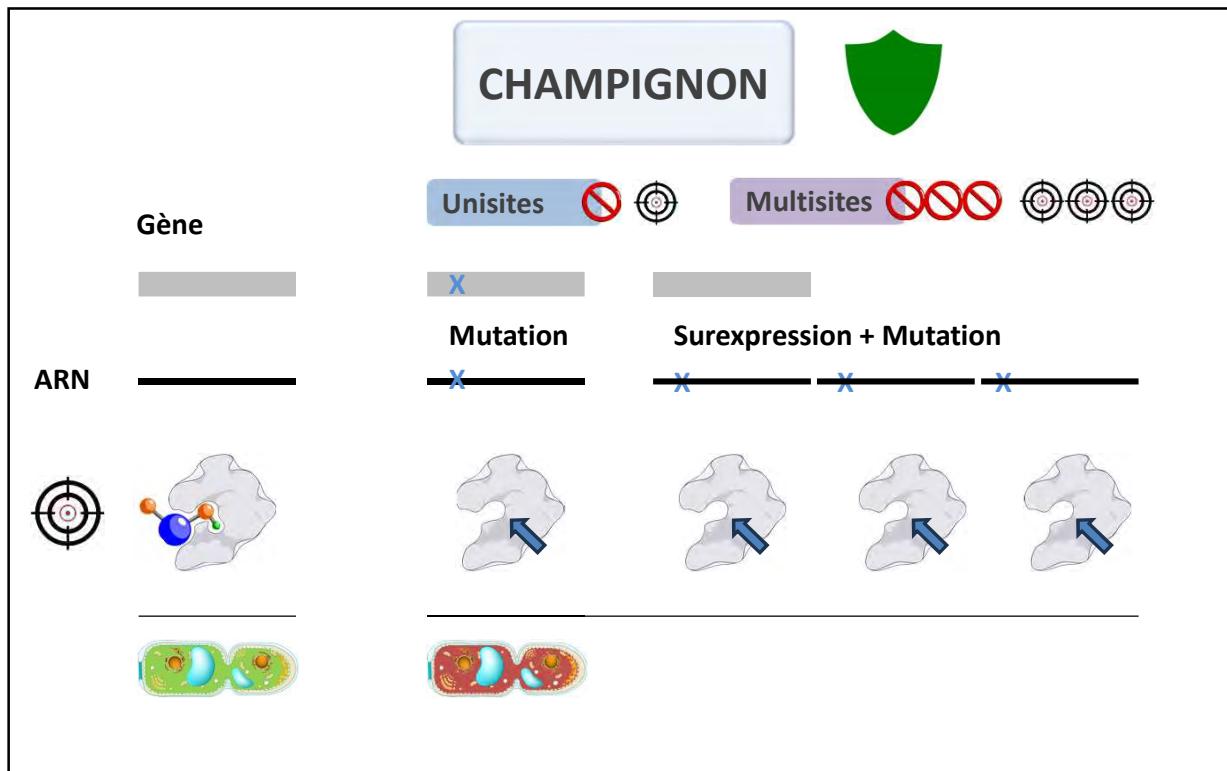
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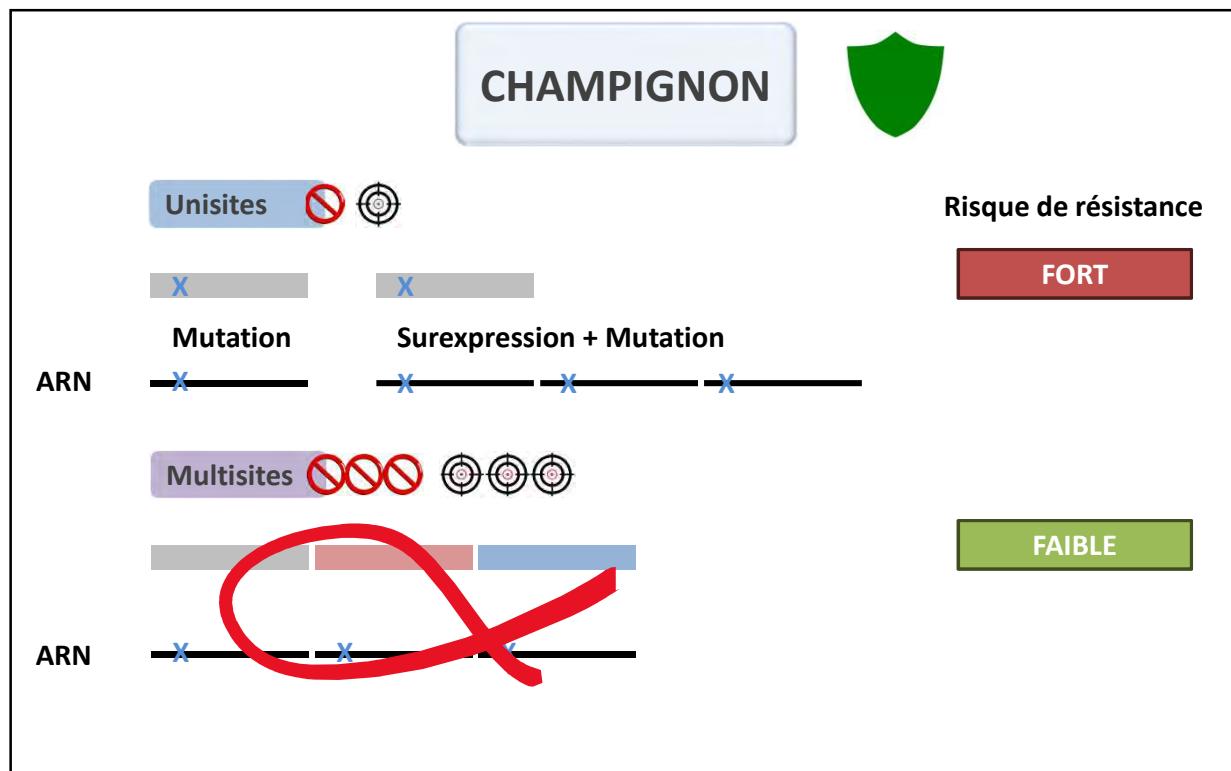








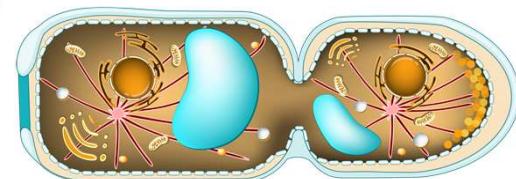




FONGICIDE

RÉSISTANCE

CHAMPIGNON

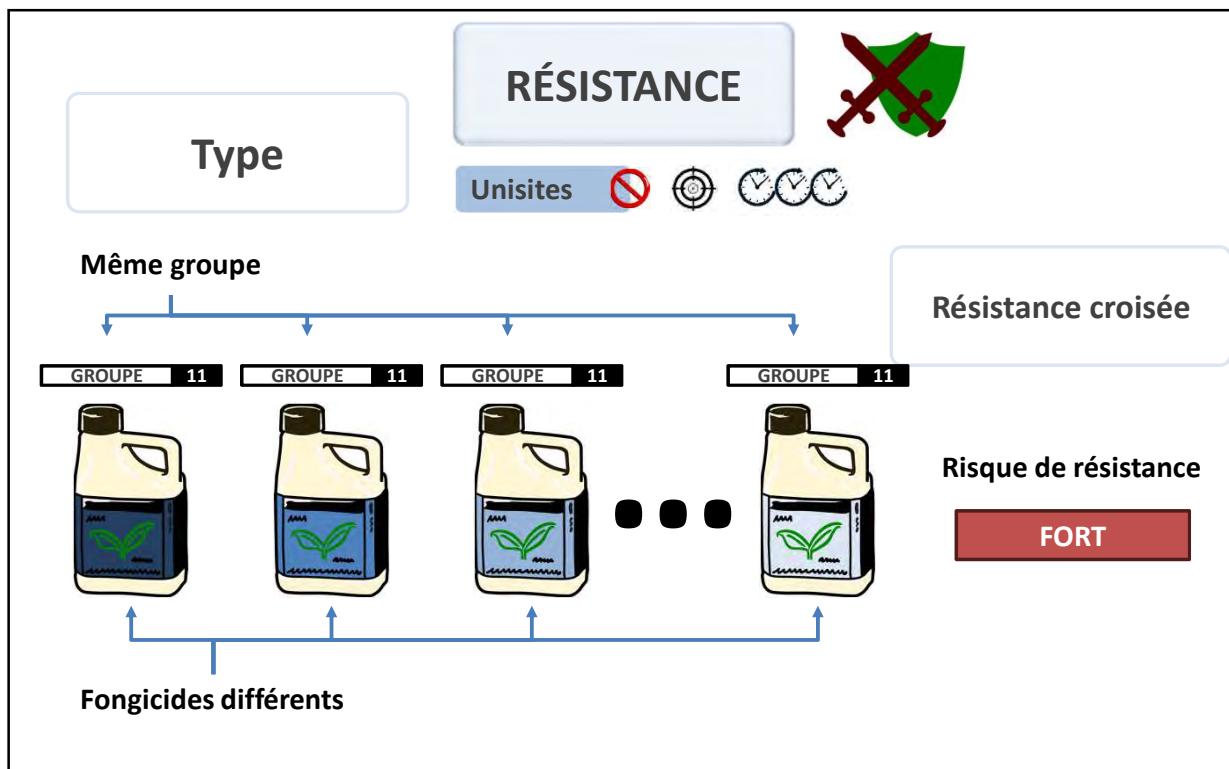
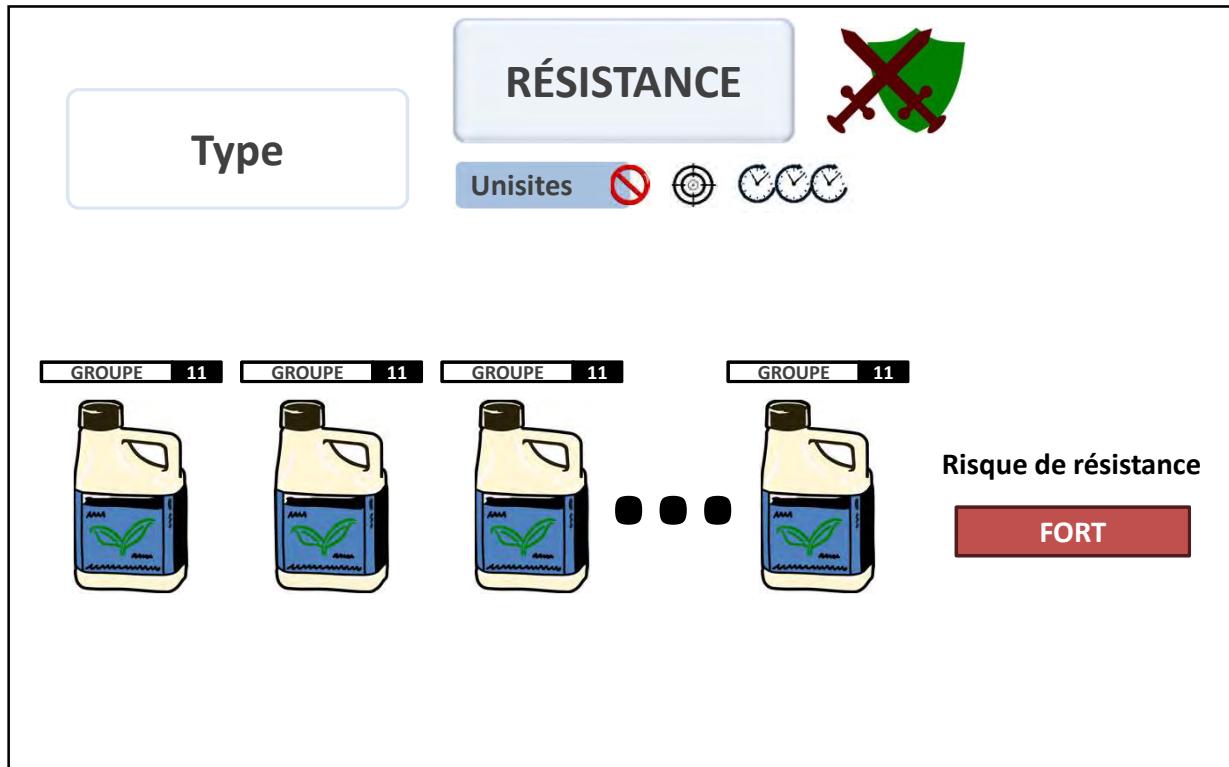


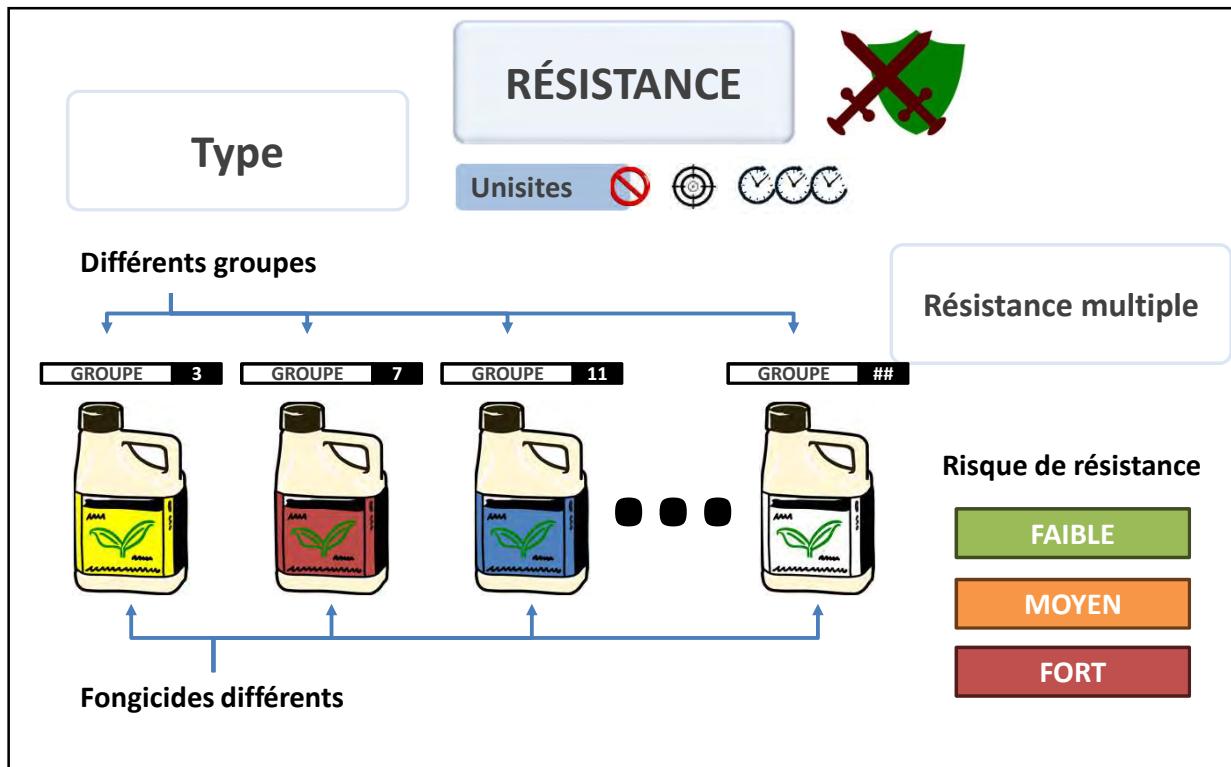
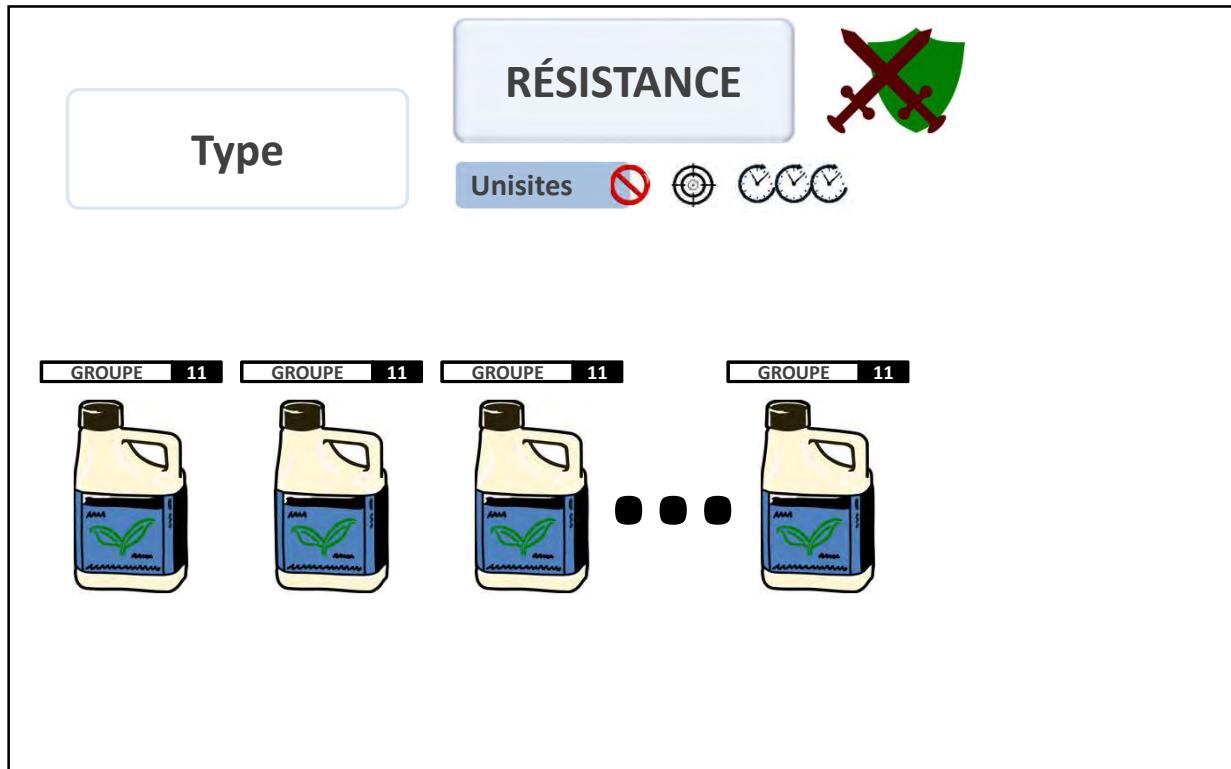
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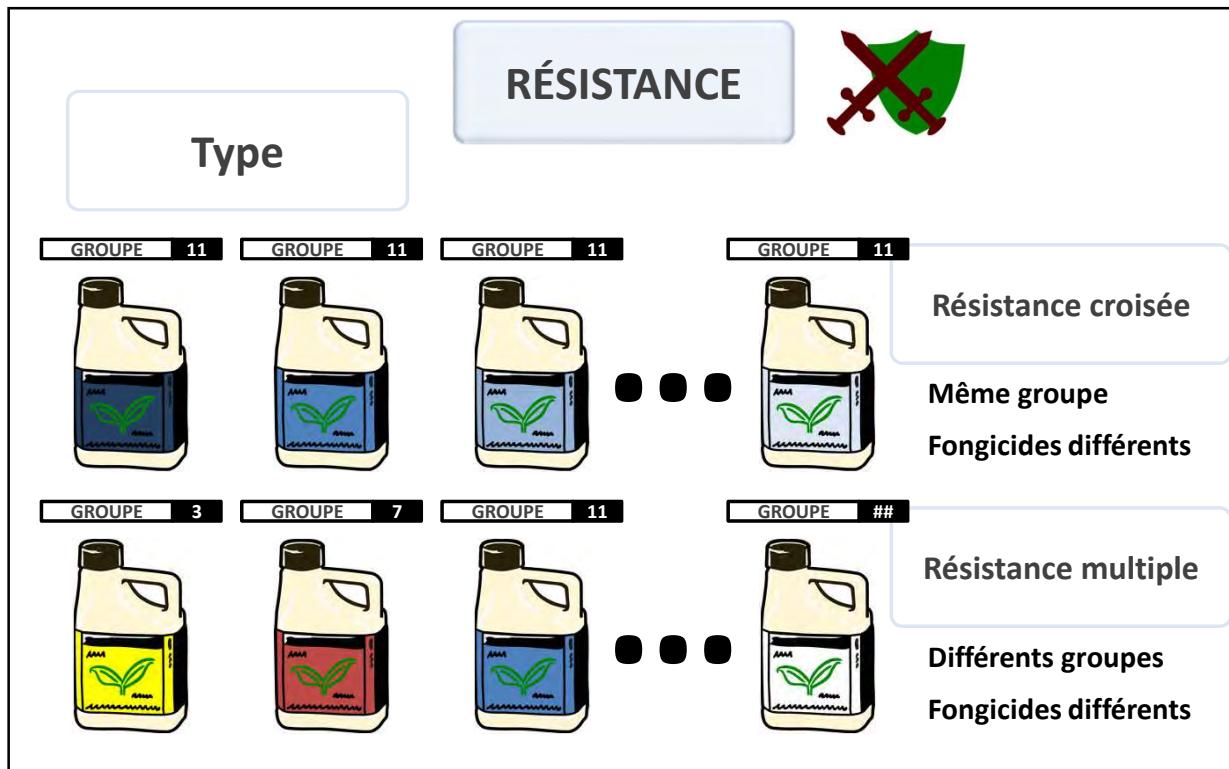
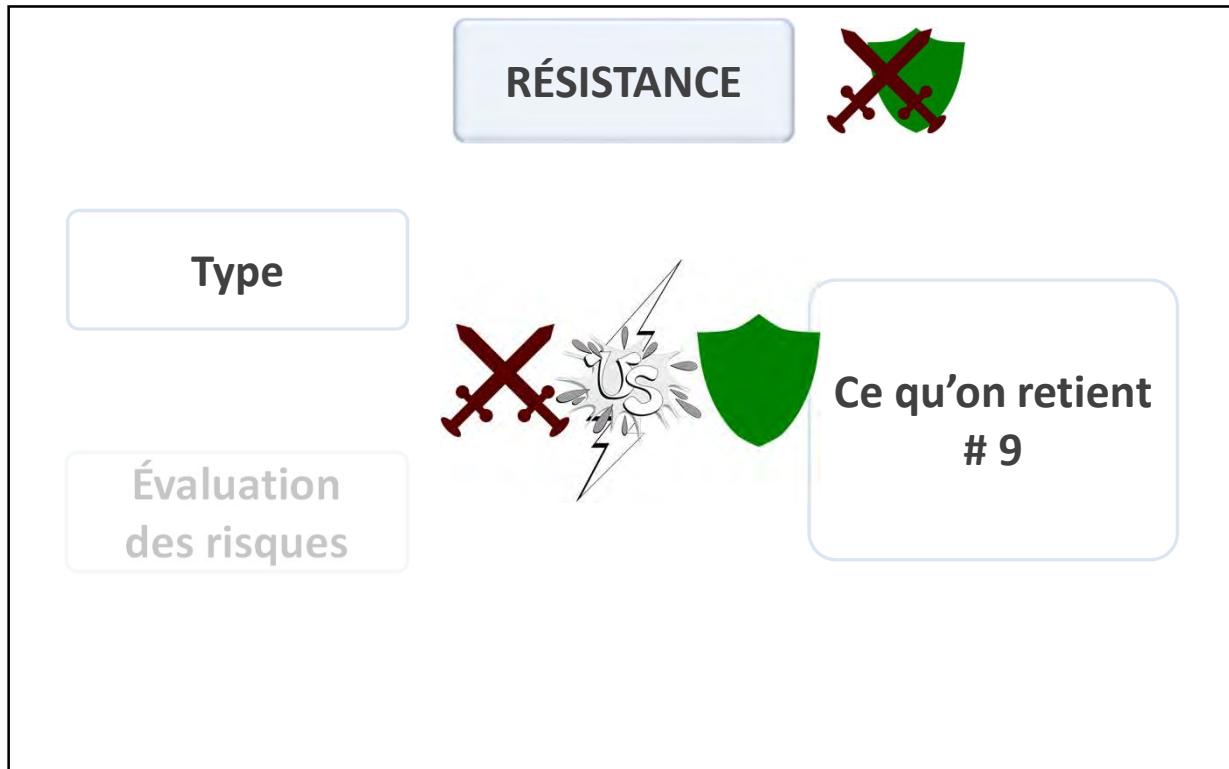
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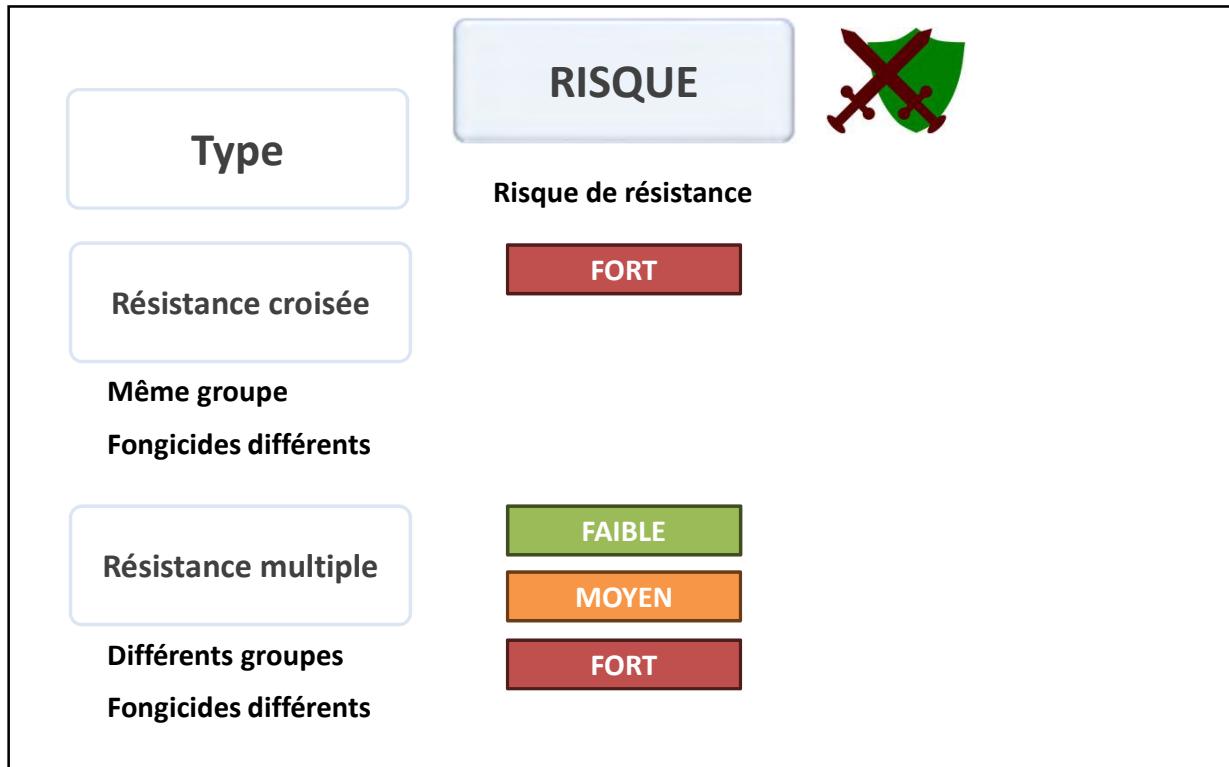
Évaluation  
des risques

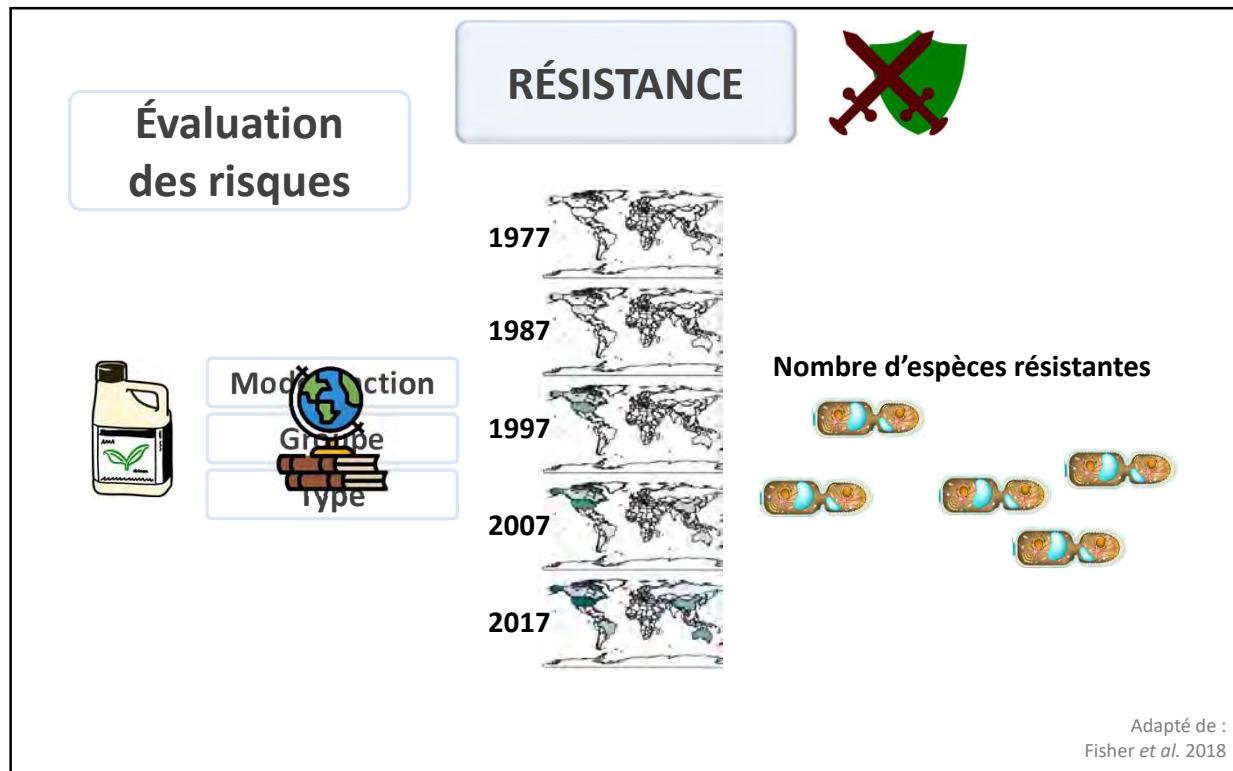
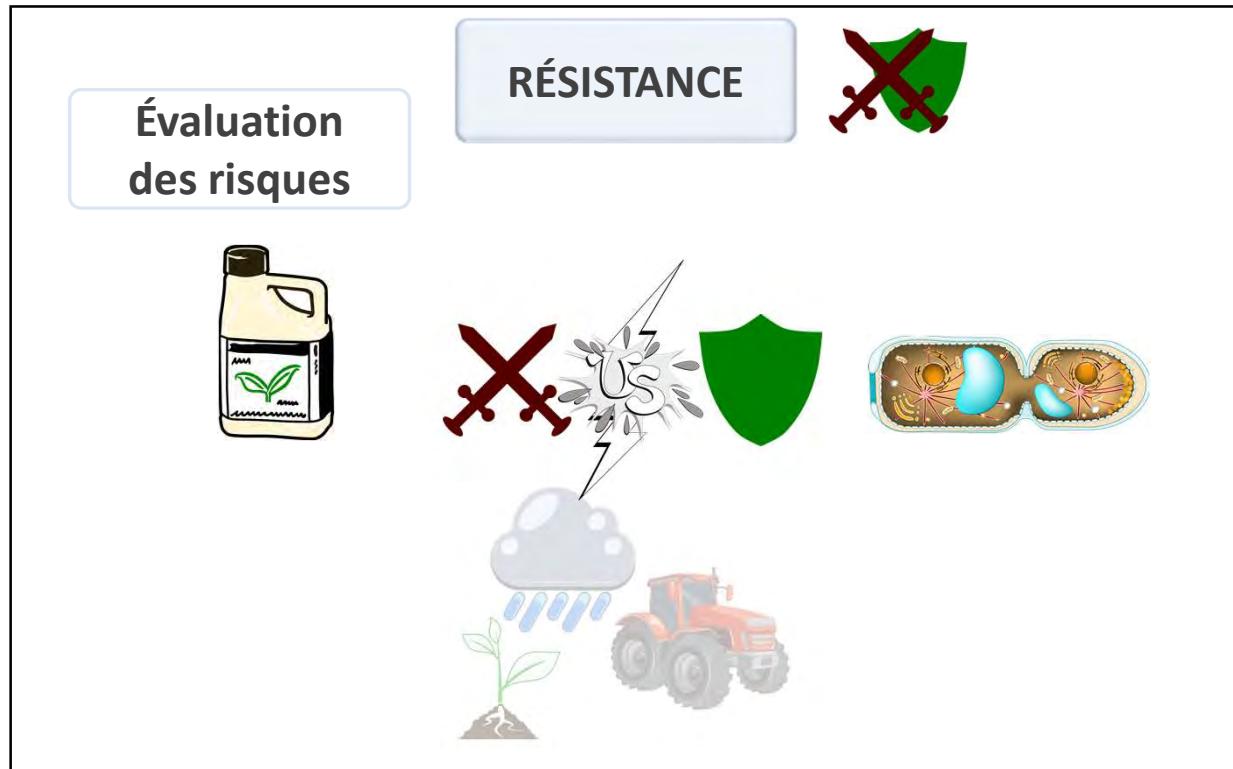


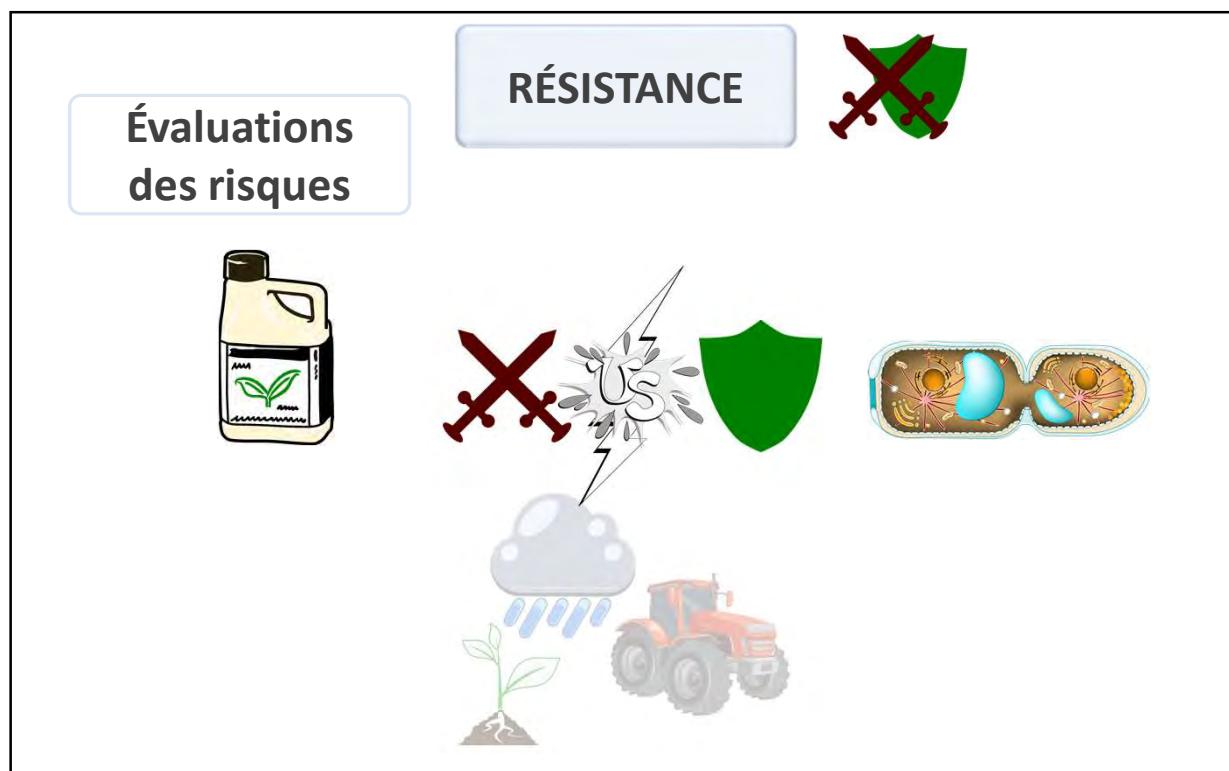
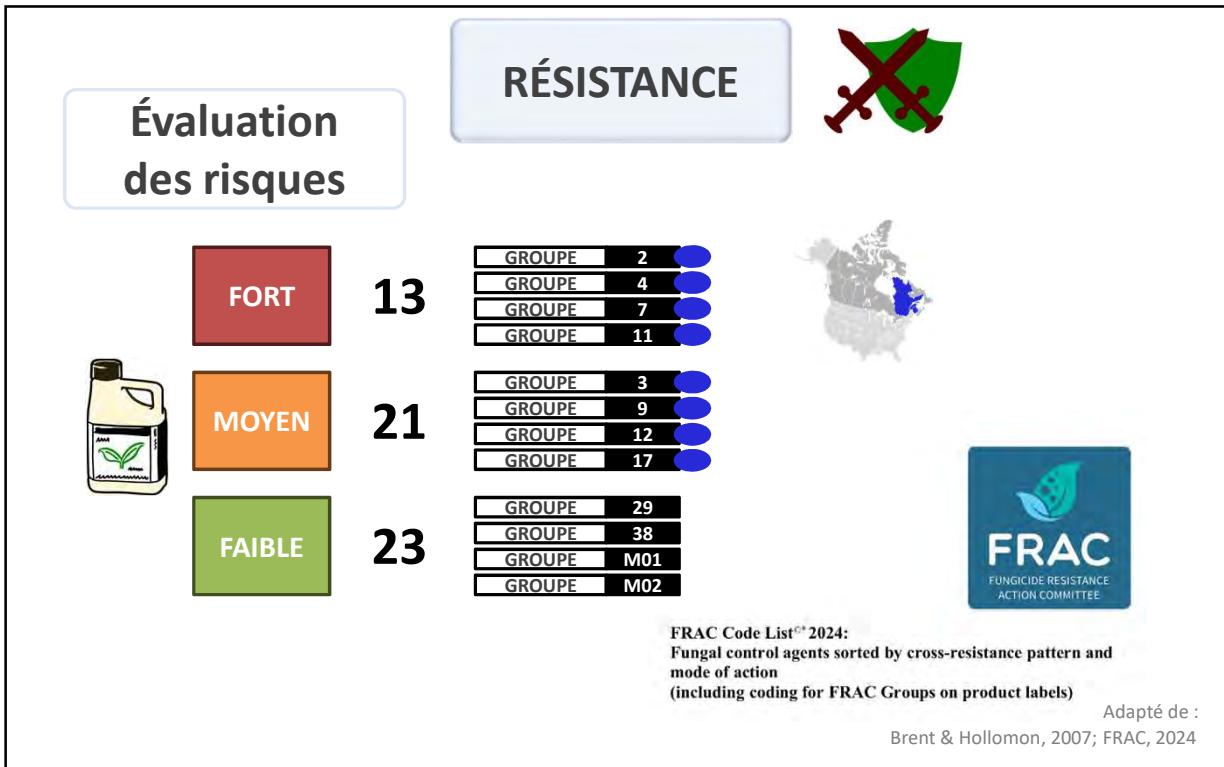






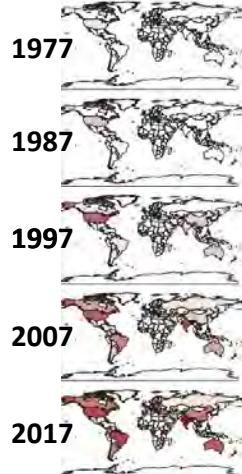
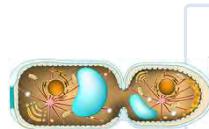




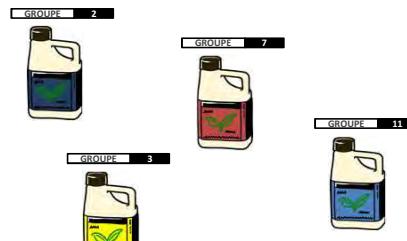


## Évaluations des risques

### RÉSISTANCE



#### Résistant contre quels fongicides



Adapté de :  
Fisher et al. 2018

## Évaluations des risques

### RÉSISTANCE



**FORT**

**15**

*Botrytis cinerea*  
*Botrytis squamosa*  
*Plasmopora viticola*  
*Venturia inequalis*



**MOYEN**

**61**

*Colletotrichum acutatum*  
*Erysiphe necator*  
*Phytophthora infestans*  
*Sphaerotheca macularis*



**FAIBLE**

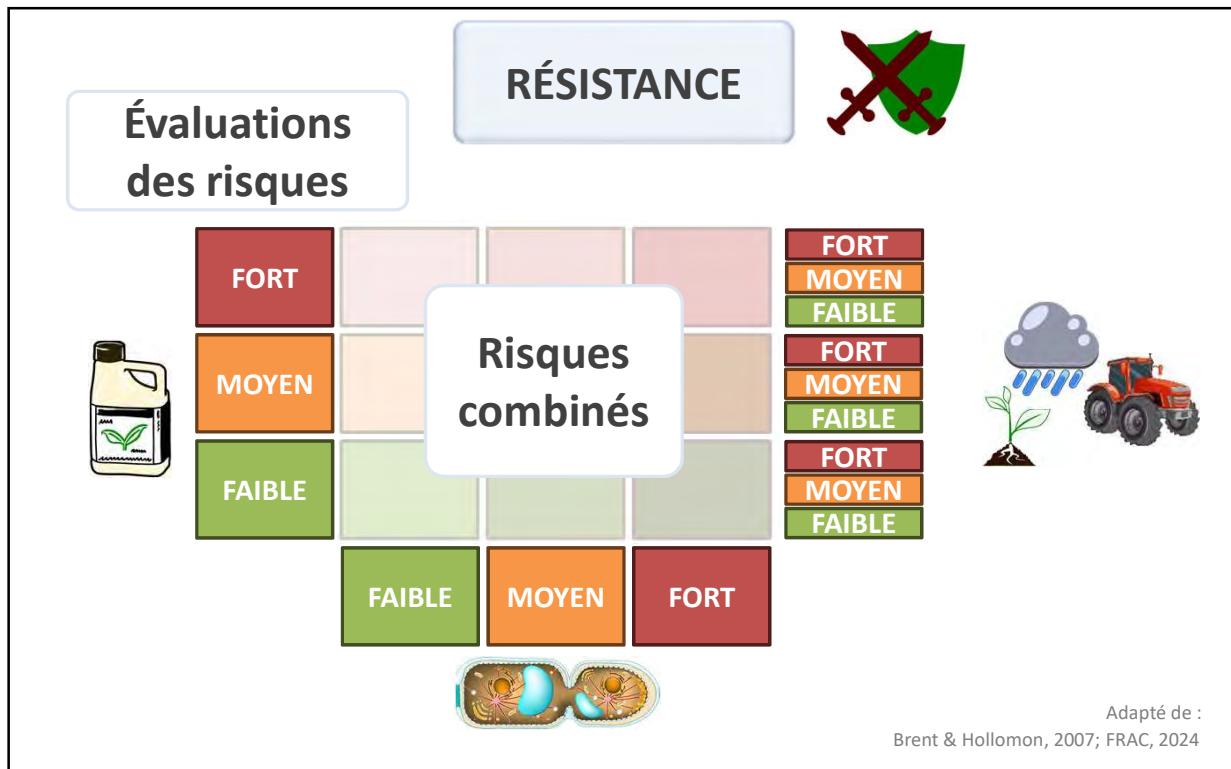
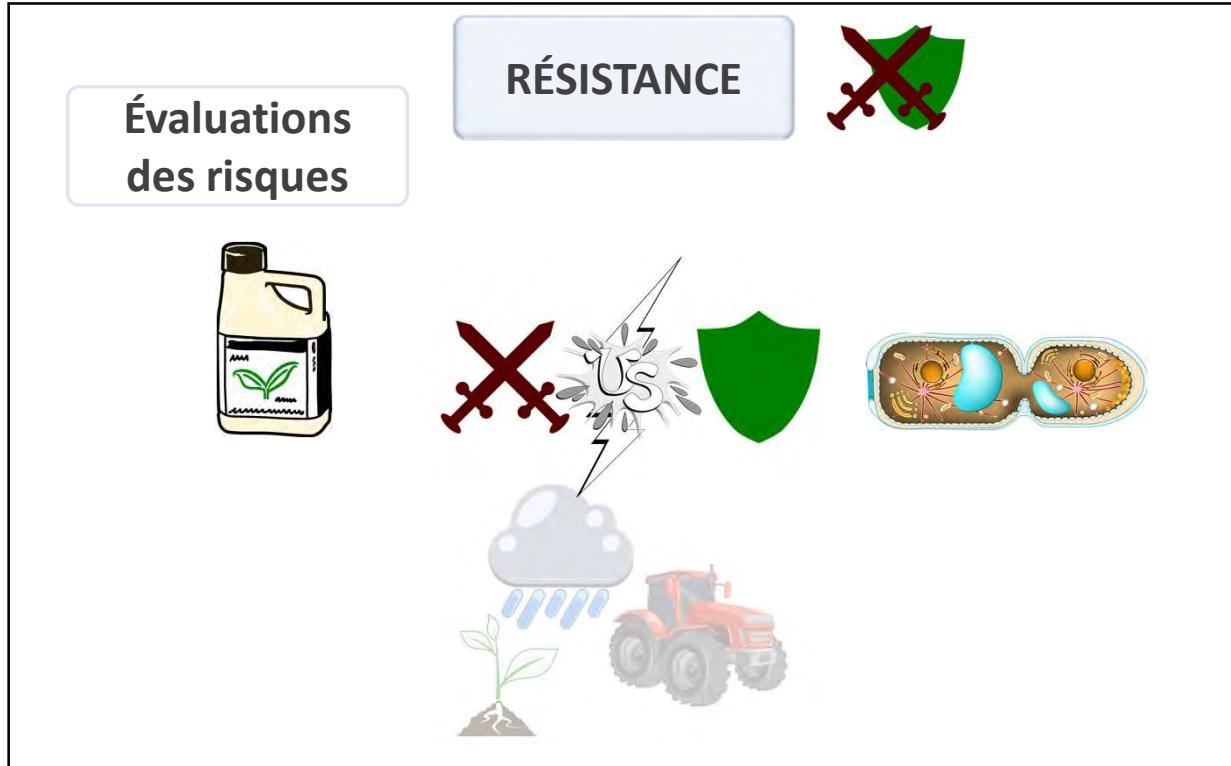
**46**

*Leptosphaeria maculans*  
*Phaeosphaeria nodorum*  
*Phytophthora fragariae*  
*Sclerotinia sclerotiorum*



PATHOGEN RISK LIST  
(September 2019)

Adapté de :  
Brent & Hollomon, 2007; FRAC, 2024





Québec



## Remerciements