

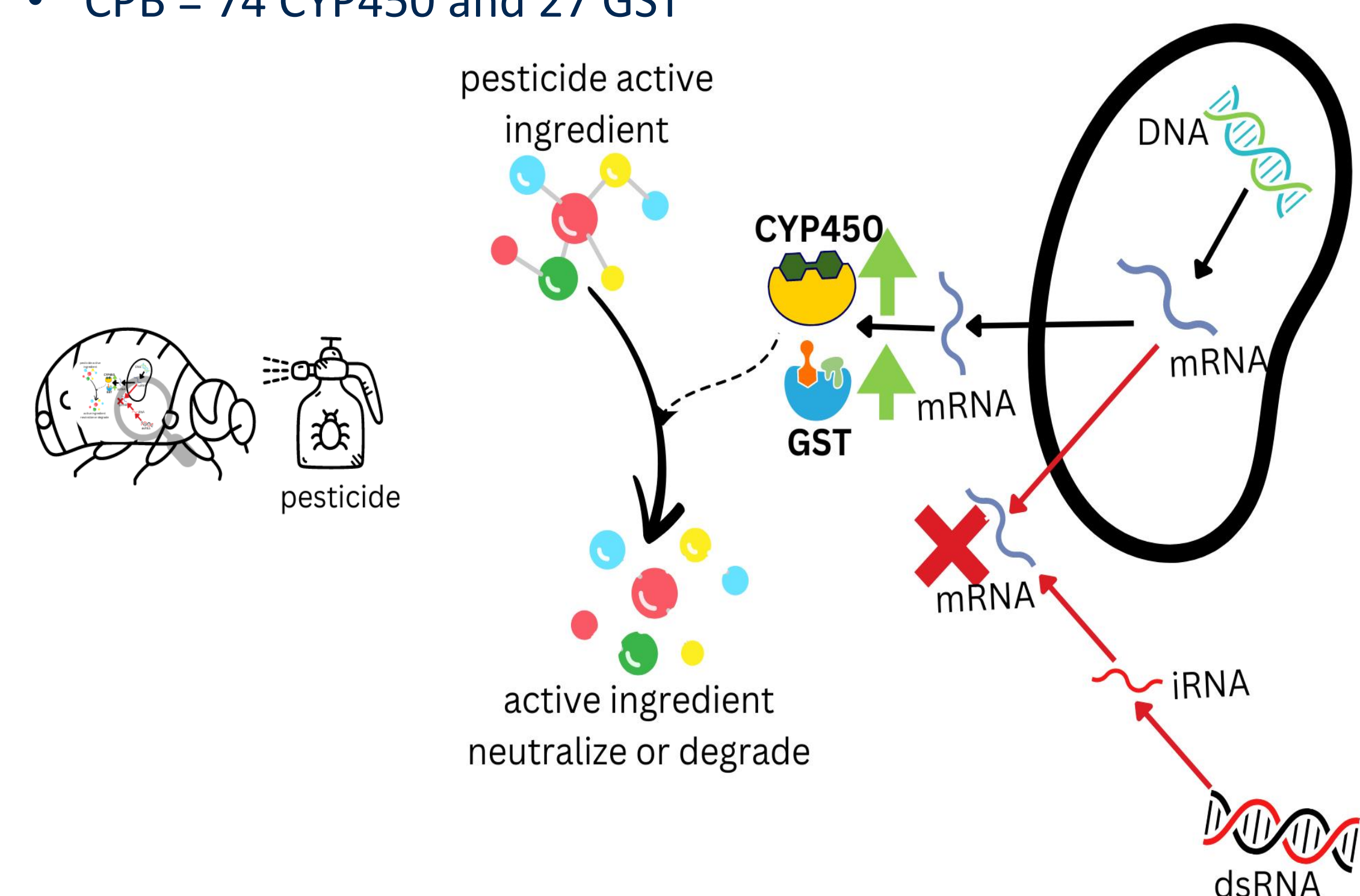
Molecular characterization of Colorado potato beetle insecticide resistance and target validation using RNA interference

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CONTEXT

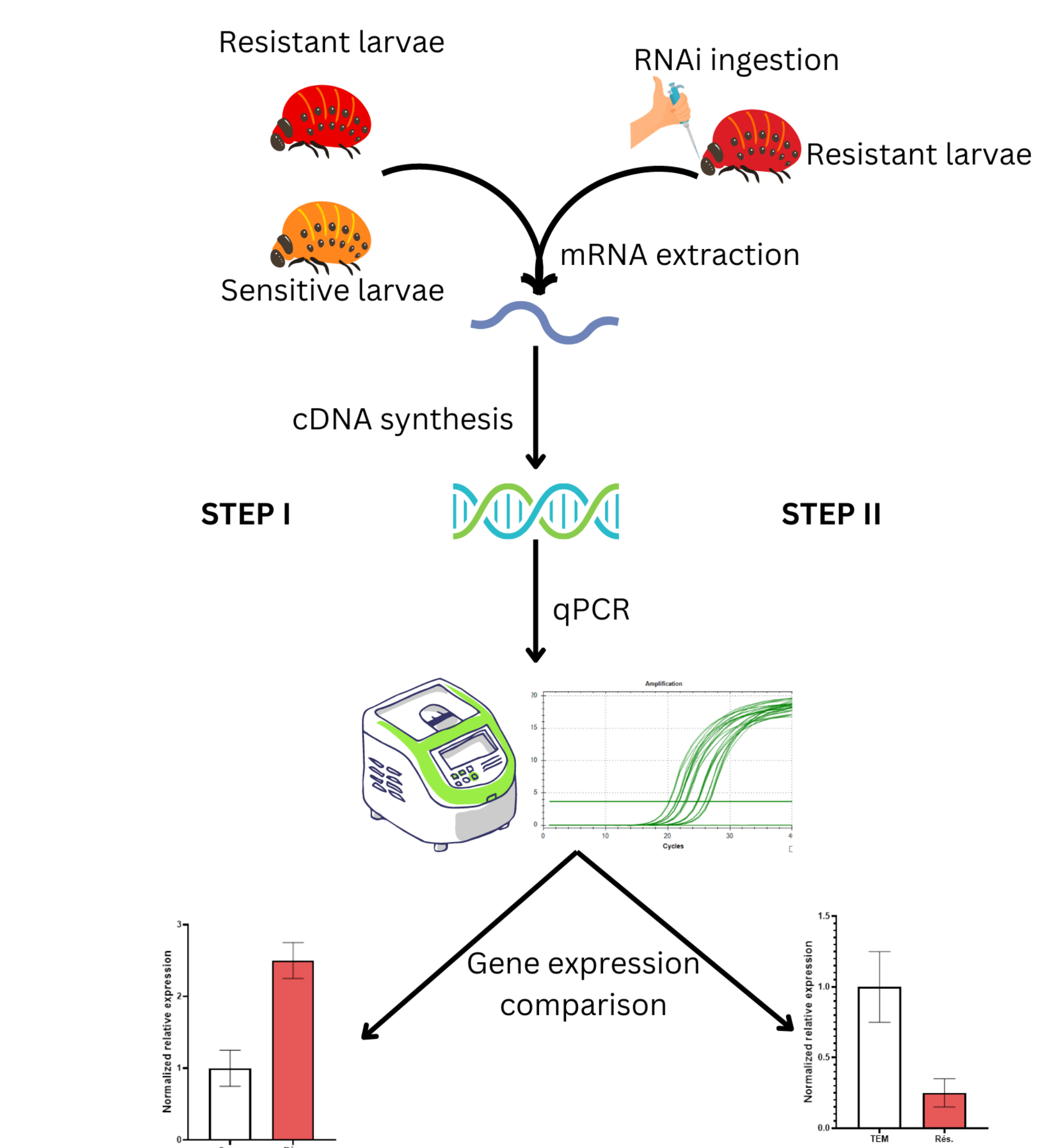
- The overexpression of detoxification genes as CYP450 and GST allows insect to develop insecticide resistance
- The Colorado potato beetle (CPB) is one of twelve resistant pest in the world, able to resist to more 52 active ingredients
- CPB = 74 CYP450 and 27 GST



OBJECTIVES

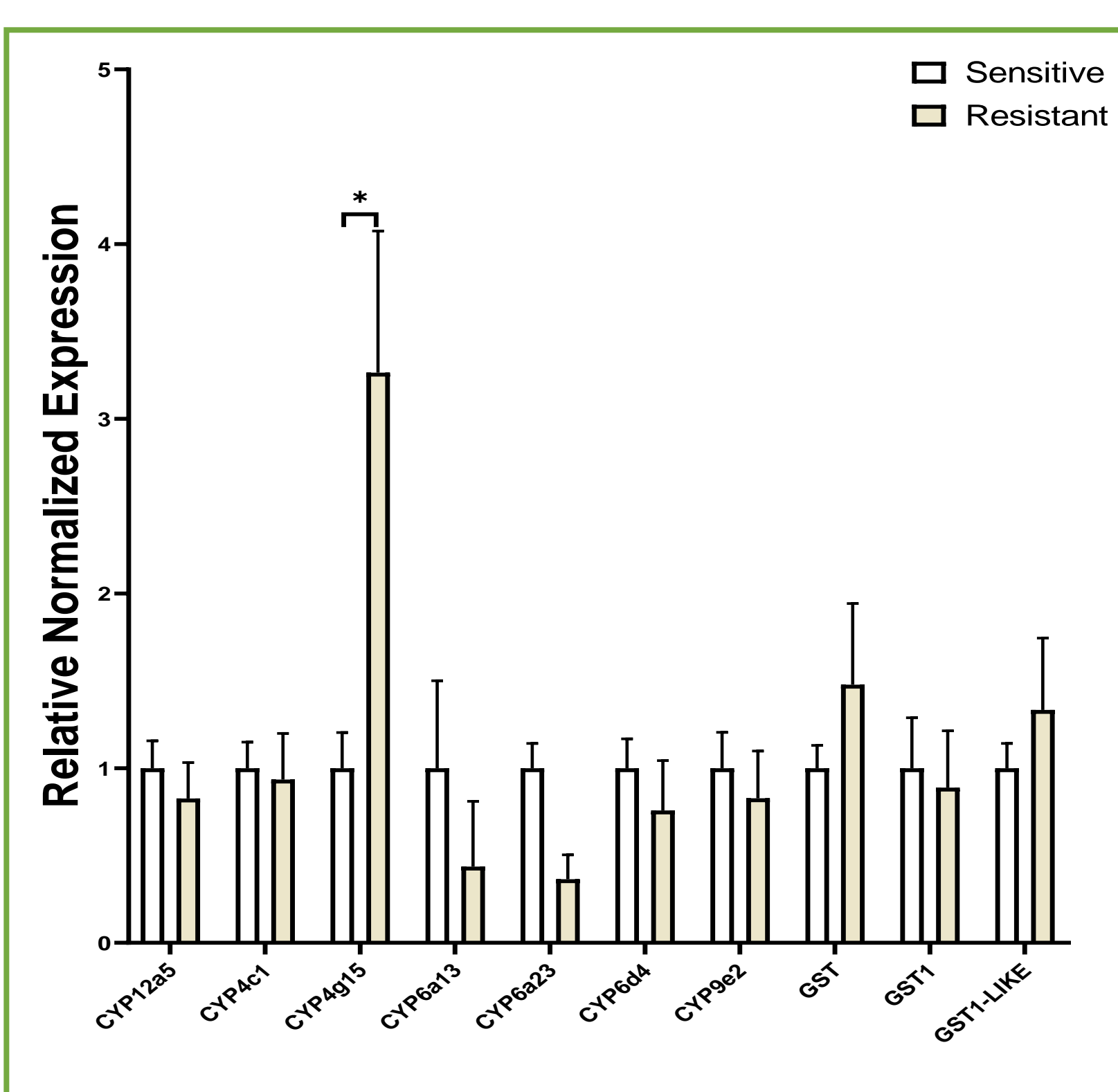
- Comparison of gene expression between sensitive and resistant field strains.
- The genes are **7 CYP450 and 3 GST**.
- Quantification of target gene expression by **RT-qPCR**.
- Demonstrating the efficacy of **RNAi**.

METHODOLOGIES



Comparison between sensitive and resistant populations

11 wild populations exposed to 9 insecticides from 4 chemical groups.

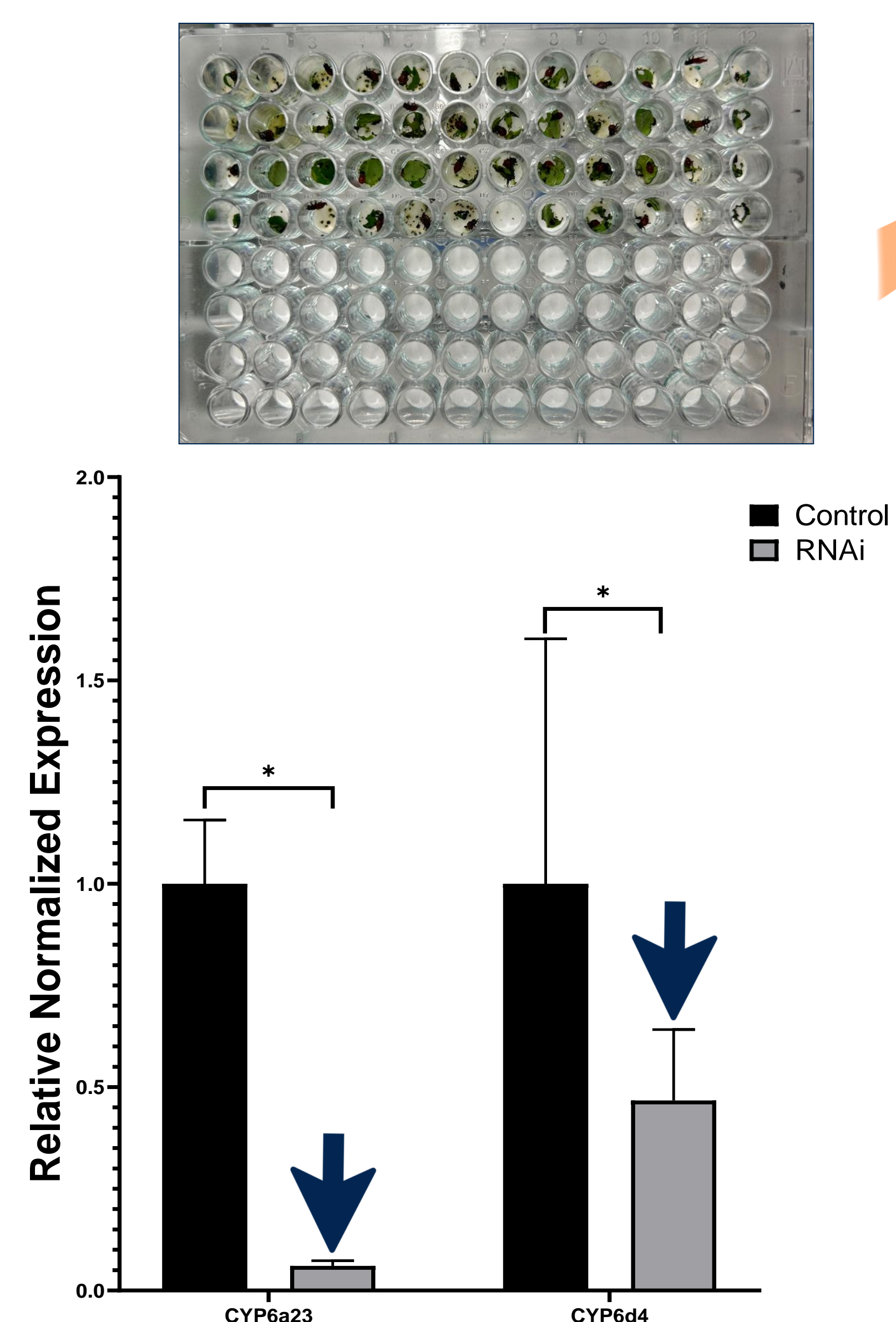


Expression profile of populations exposed to Delegate™ (5; spinetoram)

- Chemical group 3
- Matador®: 9 targets overexpressed
- Chemical group 4
- Actara® - CYP6a23 (**4.31-fold**)
 - Titan® - CYP6a23 (**7.14-fold**)
 - Sivanto Prime® - CYP6a23 (**6.06-fold**)
- Chemical group 5
- Delegate™ - CYP4g15 (**3.26-fold**)
 - Entrust™ - CYP9e2 (**4.95-fold**)
- Chemical group 28
- Verimark® - CYP6d4 (**2.08-fold**)
 - Coragen® } **No**
 - Vayego® } **overexpression**

RNAi efficacy after 24 hours

1 laboratory susceptible population exposed to 1 µg of RNAi for 24 hours



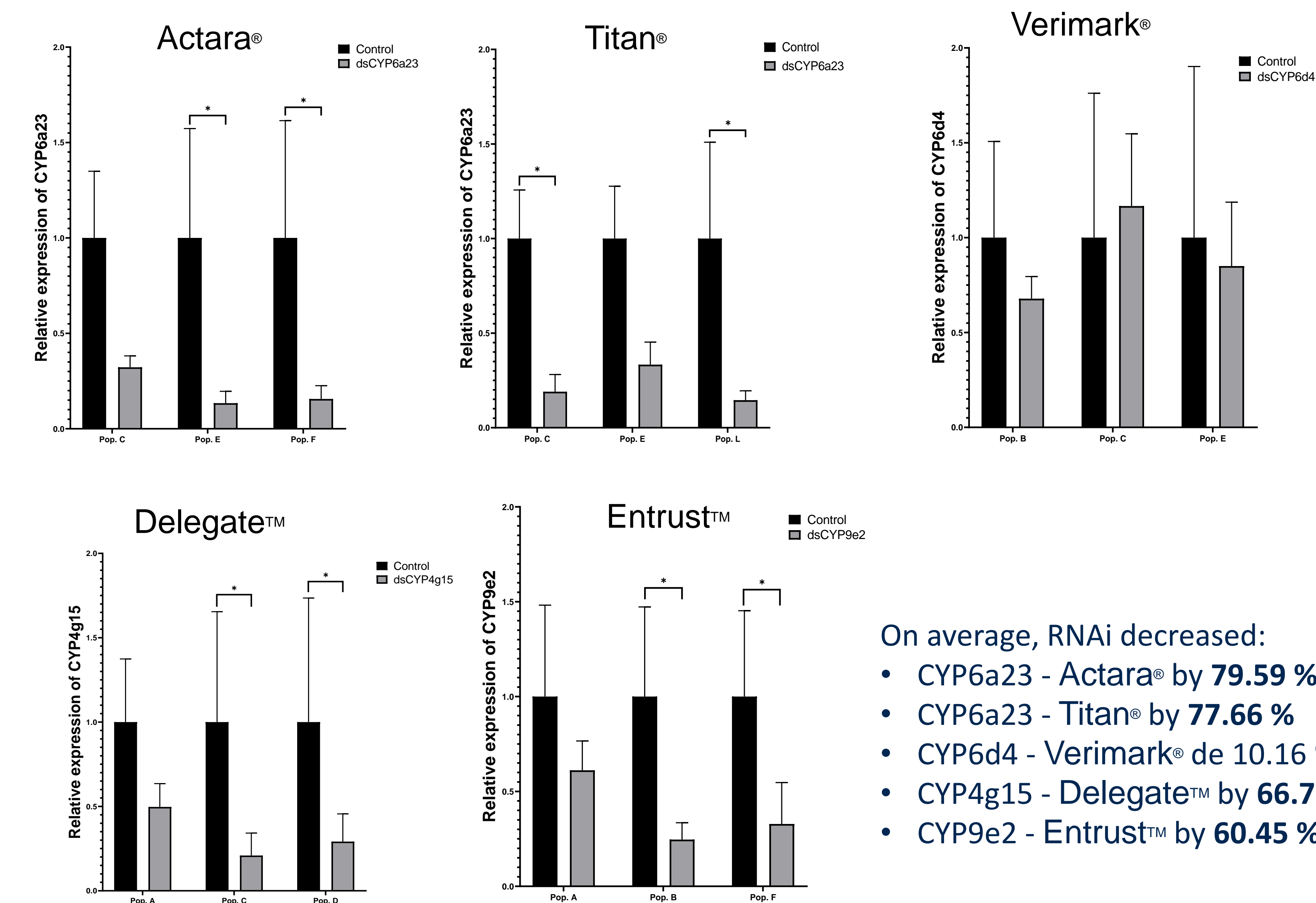
- RNAi-mediated decreases of:
- CYP6a23 by **93.92 %**
 - CYP6d4 by **53.24 %**

The **same result** was obtained after **48 hours**.
A **24 hours** exposure was **preferred** for the wild population exposure.

RESULTS

RNAi efficiency on resistant populations

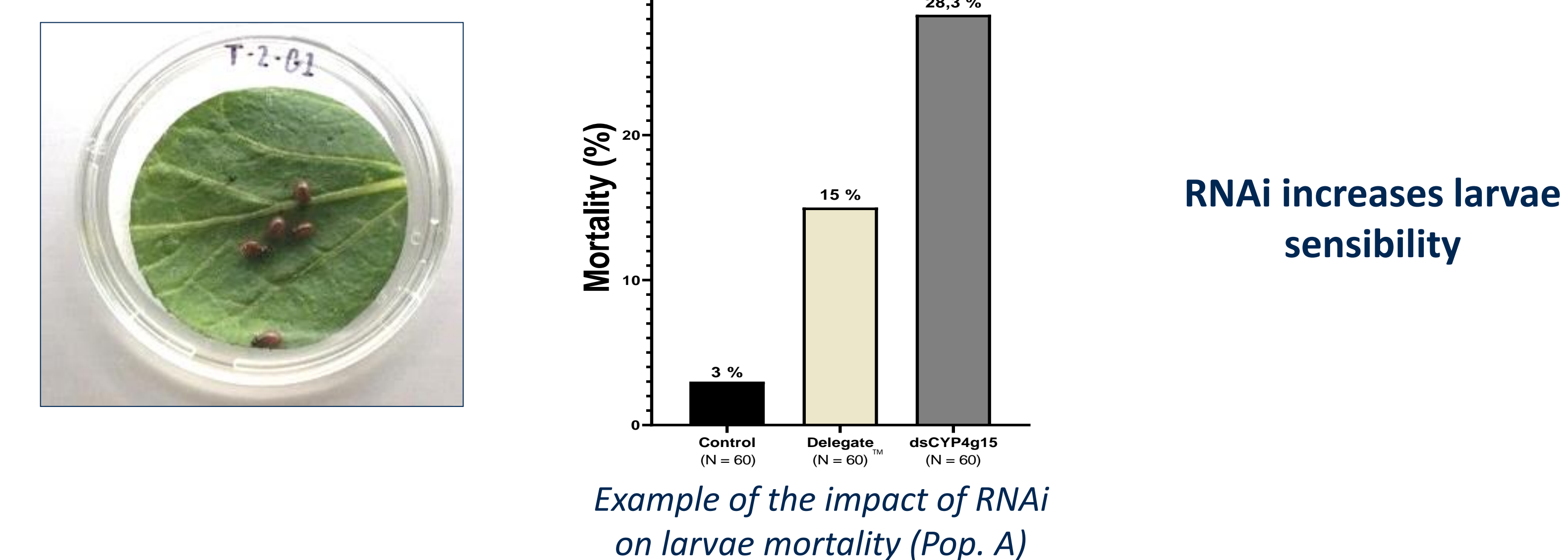
3 wild resistant populations tested for each RNAi (5 pesticides from 3 chemical groups)



- On average, RNAi decreased:
- CYP6a23 - Actara® by **79.59 %**
 - CYP6a23 - Titan® by **77.66 %**
 - CYP6d4 - Verimark® de **10.16 %**
 - CYP4g15 - Delegate™ by **66.79 %**
 - CYP9e2 - Entrust™ by **60.45 %**

Percentage of mortality

6 repetitions with 5 Colorado potato beetles each (Comparison between RNAi and pesticide).



TAKE HOME MESSAGE

- RT-qPCR identified detoxification genes according to populations and pesticides, **offering clues for targeted control strategies**.
- A **24-hour period with 1 µg** RNAi seems optimal for genetic silencers.
- By targeting genes such as **CYP6a23** or **CYP4g15**, RNAi reduces resistance to chemicals, promoting integrated pest management strategies.

Acknowledgements

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