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## Introduction

### Cytokinins (CK)<sup>1</sup>

- Growth hormones
- Key players in regulating source-sink transitions
- Important for plant stress resistance

### Herbivory-induced defense (HID)<sup>2, 3</sup>

- Activated by herbivore-specific cues like fatty acid-amino acid conjugates (FAC)
- Phenolamides (e.g. caffeoylputrescine) are strongly induced by FACs in *Nicotiana attenuata*

### Optimal Defense Theory (ODT)<sup>4, 5</sup>

Unequal distribution of defense metabolites in plants according to fitness value and attack risk of the tissues.

## Questions

- Are CK regulated by herbivory?
- Is the CK pathway influencing HID?
- Are CK mediators of the ODT?

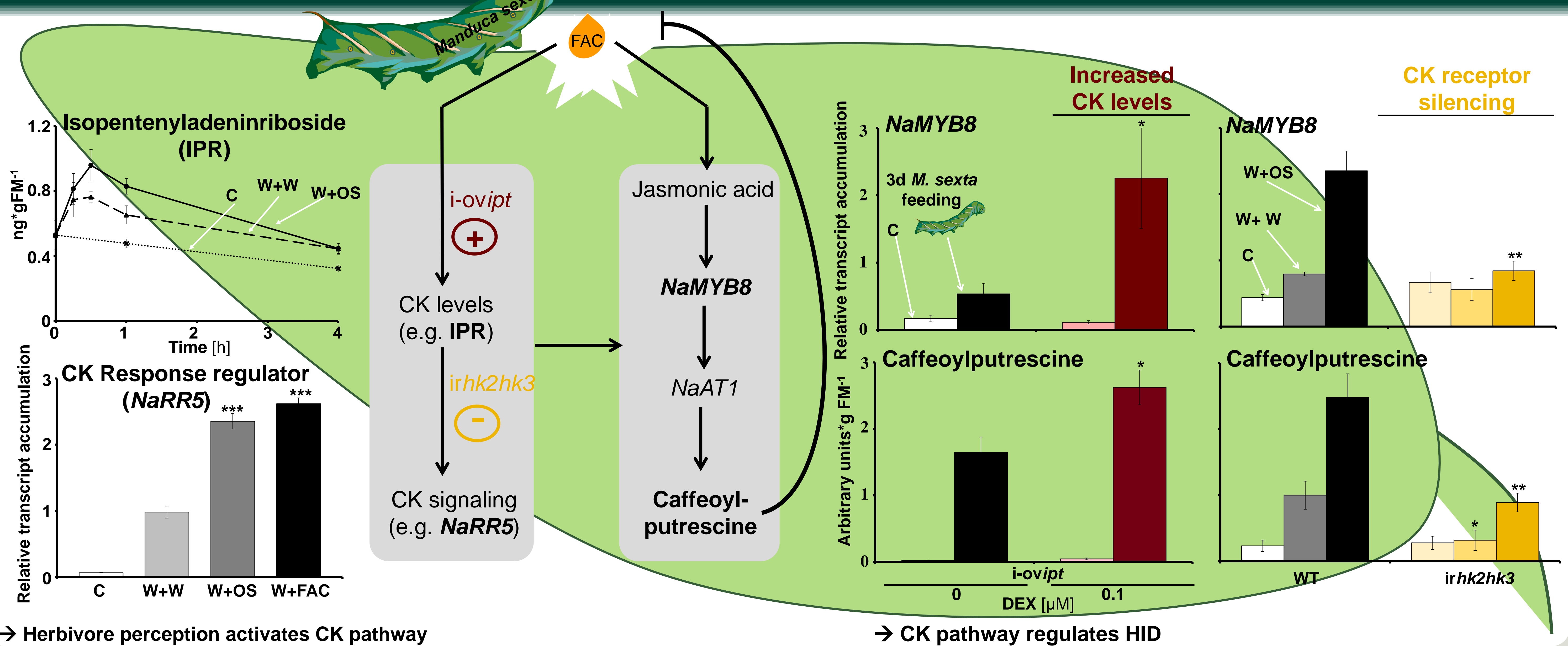
## Tools

**Simulating herbivory** Wounding and application of water (W+W), *Manduca sexta* oral secretions (W+OS) or FAC (W+FAC), control (C)

**Transgenic plants**

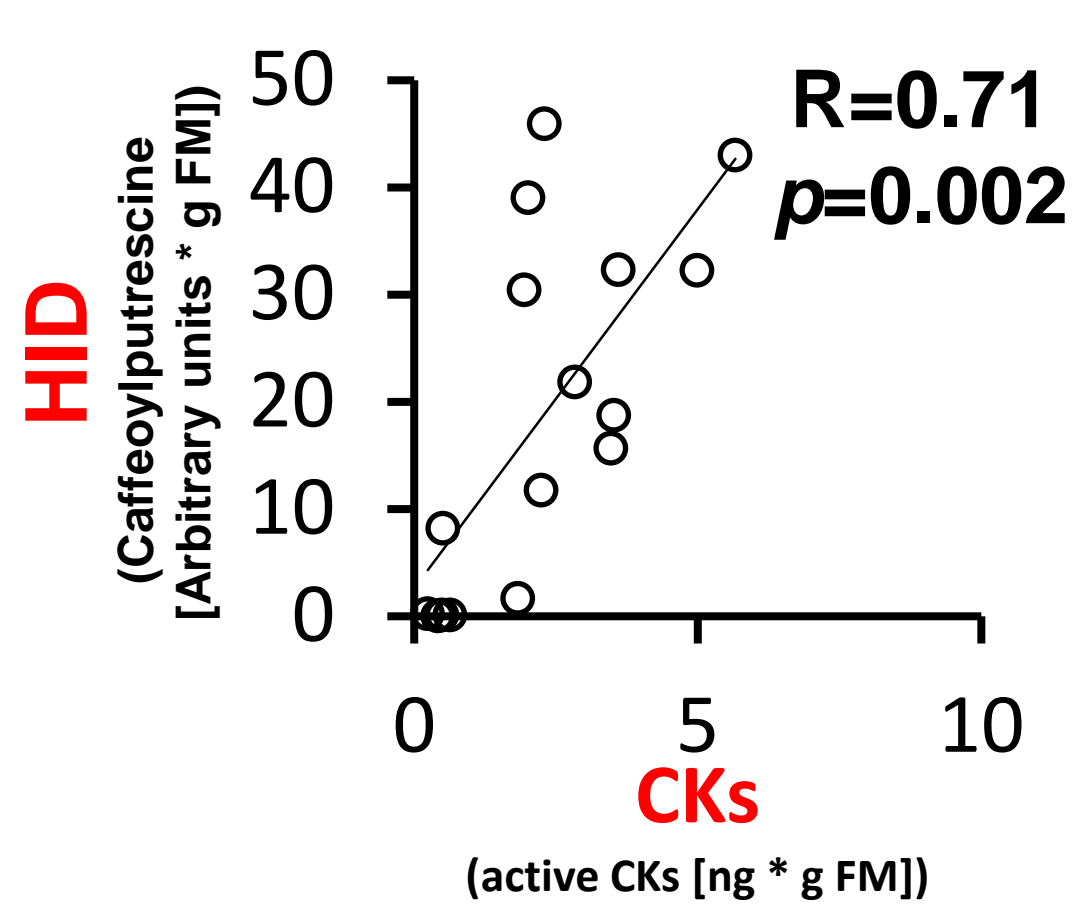
- i-ovipt***: dexamethasone (DEX)-inducible expression of *ipt* gene (higher CK levels)
- irhk2hk3***: RNAi mediated gene silencing of CK receptors (*NaHK2* and *NaHK3*)
- SAG-ipt4***: ontogeny-dependent regulation of CK biosynthesis (anti-ageing)

## Role of cytokinins in herbivory-induced defenses

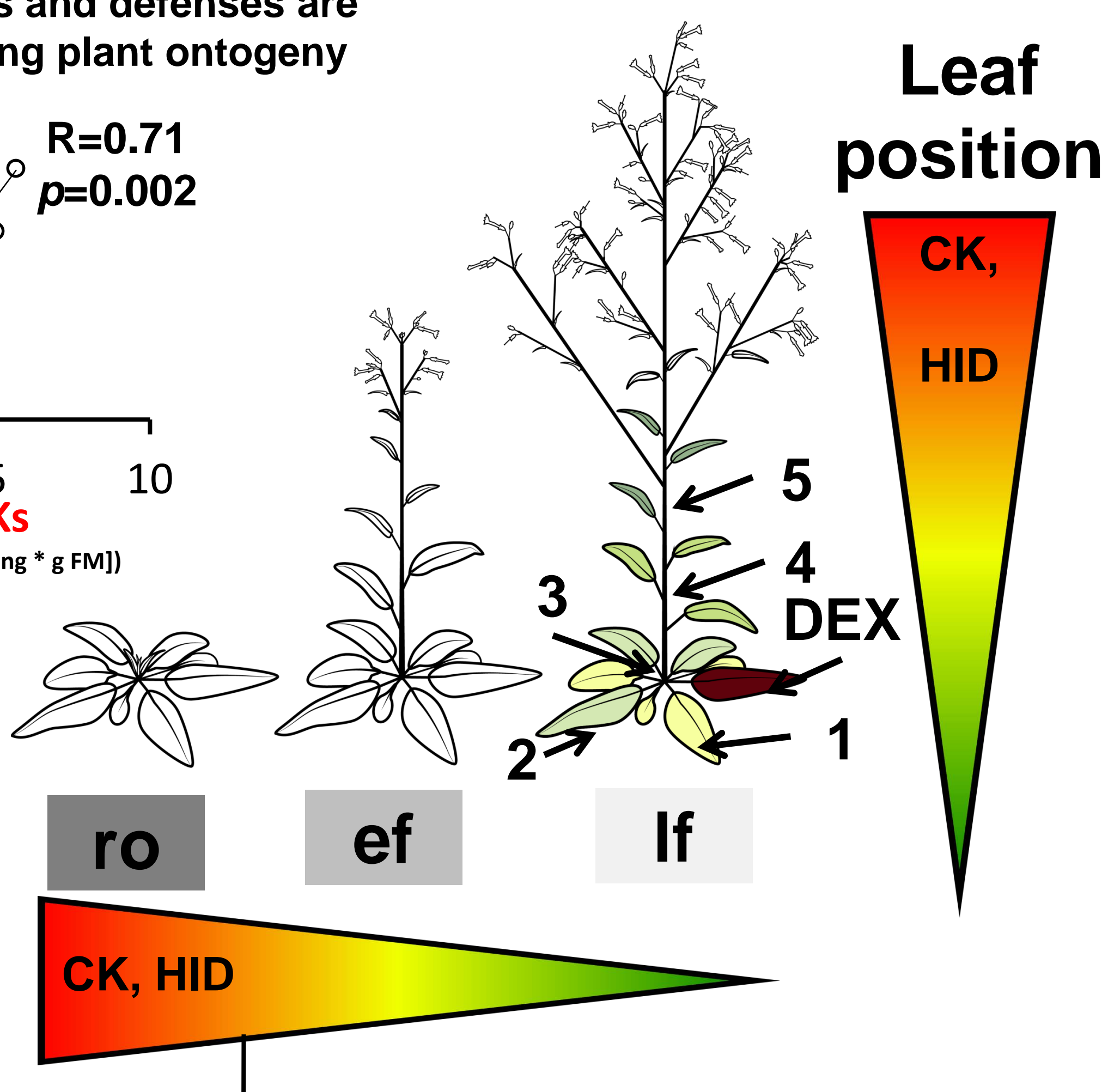


## Cytokinins regulate optimal defense patterns in *N. attenuata*

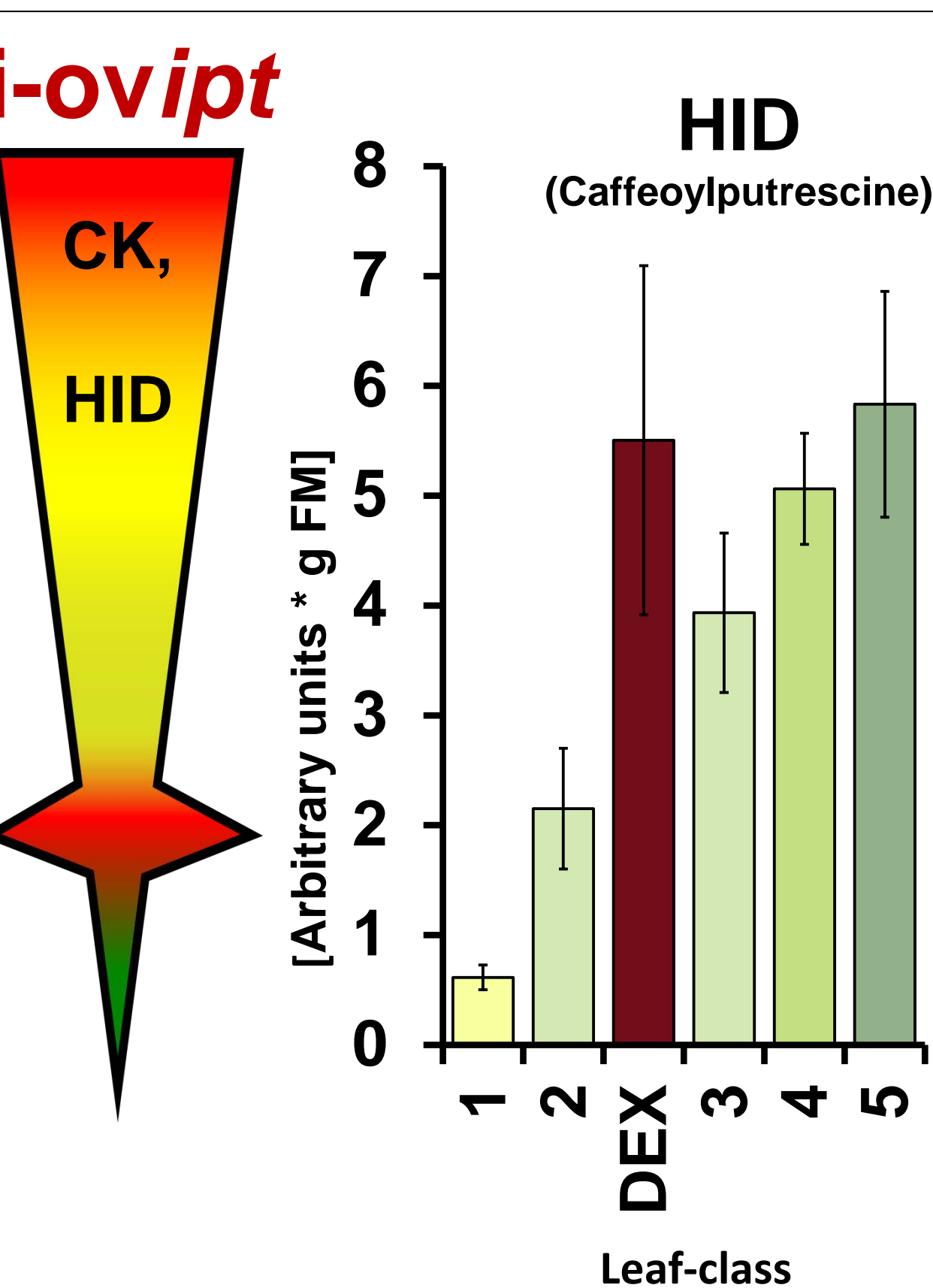
→ cytokinin levels and defenses are correlated during plant ontogeny



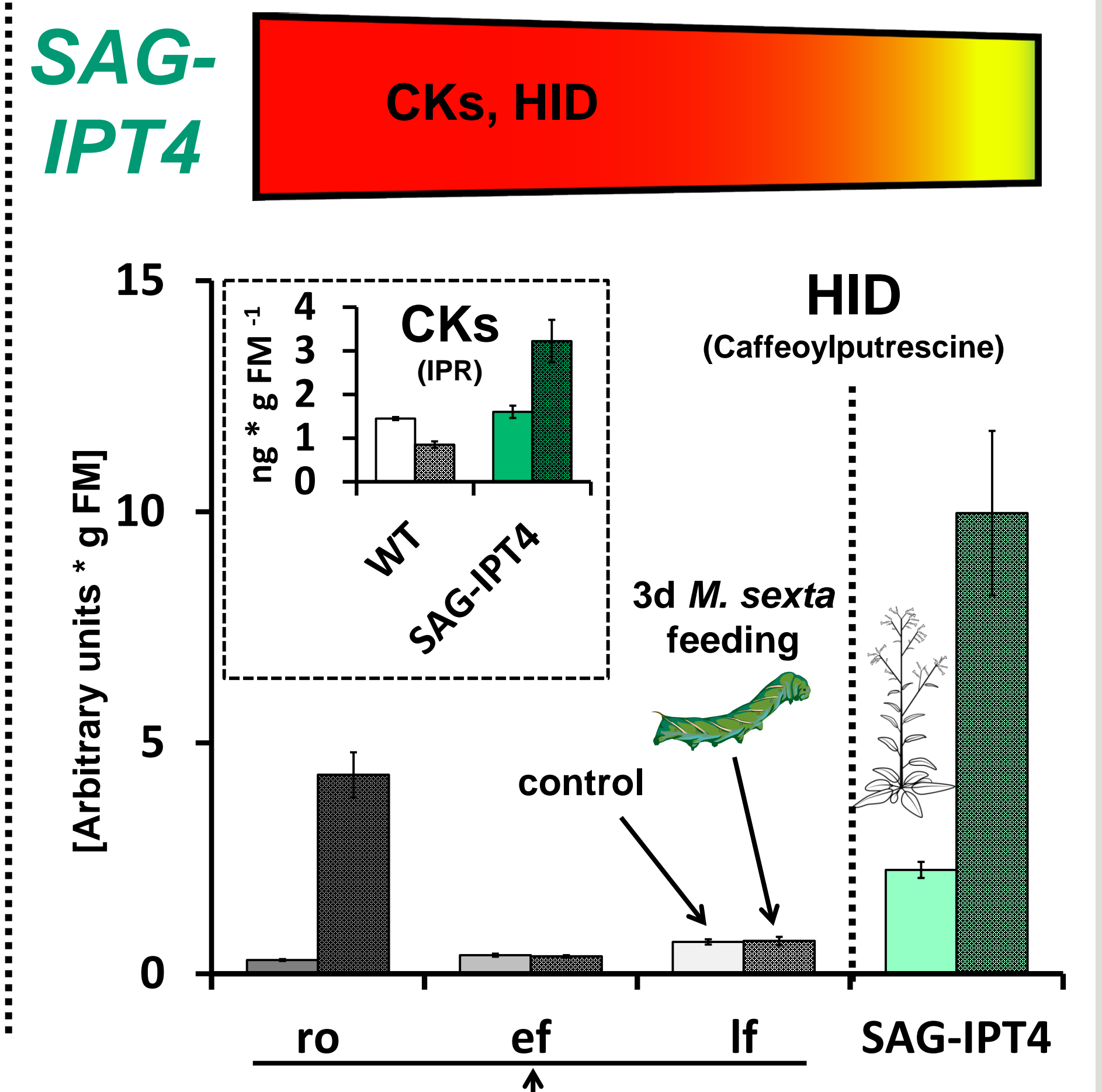
Active CKs: trans-zeatin, trans-zeatin riboside, cis-zeatin, cis-zeatin riboside, isopentenyl adenine, isopentenyl adenine riboside



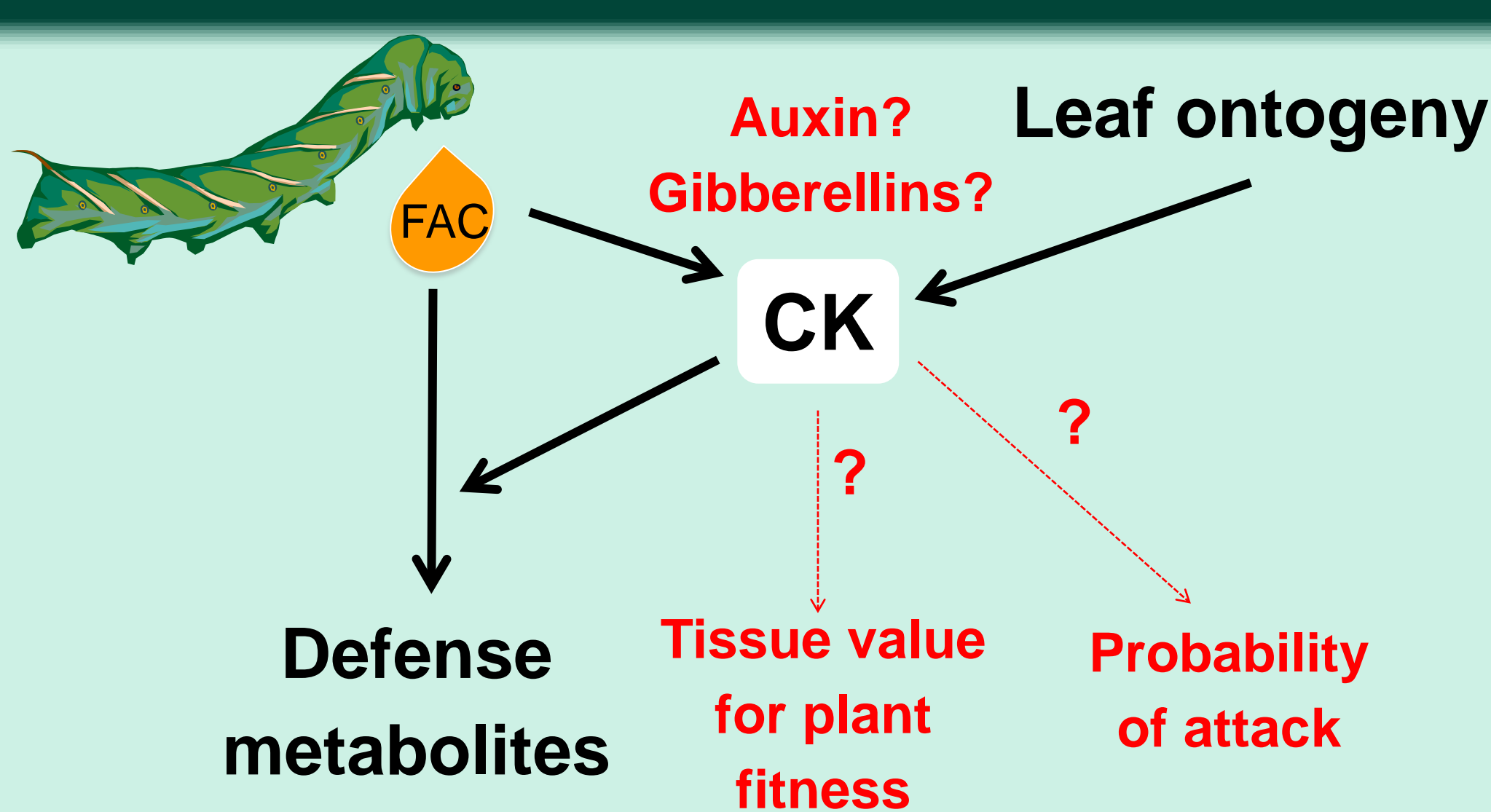
### Leaf position-dependent CK manipulation



### Age-dependent CK manipulation



## Conclusions and Outlook



- Herbivore-specific elicitors regulate CK homeostasis and signaling.
- CK increase herbivory-induced defense responses.
- CK regulate optimal defense patterns in plants

## Acknowledgements

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## References

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- 4 Ohnmeiss et al. (1997) New Phytol
- 5 Diezel et al. (2011) J Integr Plant Biol
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