A maize landrace possesses an inducible (*E*)-caryophyllene synthase gene

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INTRODUCTION

- Maize (*Zea mays*) cultivars differ in their ability to produce defence signals against harmful pests. Moreover, certain maize cultivars respond at the egg laying stage to pest attack.
- Studies on the genetic basis of production of the defence signal, coupled with studies on the ecology of the tritrophic interactions, could provide valuable insights for developing novel and effective pest management strategy against destructive crop pests.

OBJECTIVES

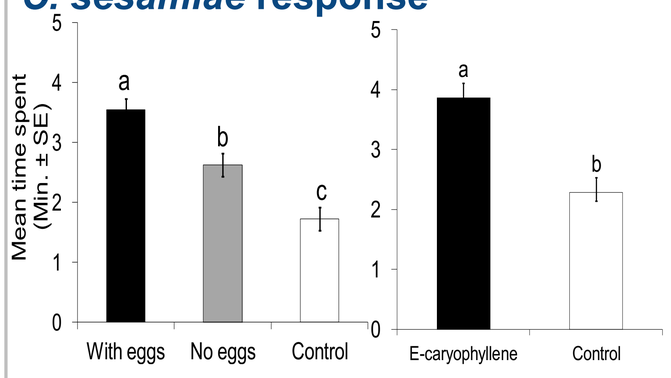
- To determine response of parasitic wasps (*Cotesia sesamiae*) to egg-induced volatiles of South American maize landrace Braz1006.
- To determine the mechanisms regulating (*E*)-caryophyllene biosynthesis, one of the egg-induced plant defence components.
- To compare volatile profiles and (*E*)-caryophyllene synthase gene (TPS23) expressions of Braz1006 with the standard European maize line, Delprim, and the North American line, B73.

METHODS

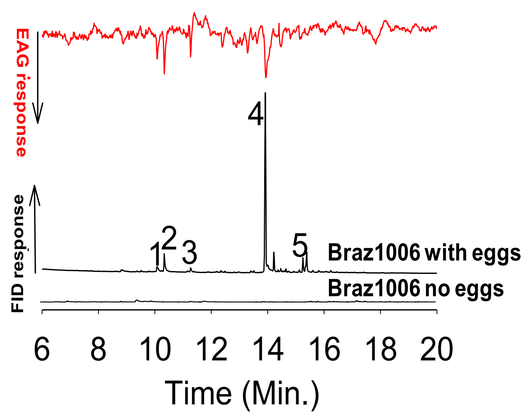
- Parasitoid response to egg-induced Braz1006 volatiles and authentic (*E*)-caryphyllene was determined using four-arm olfactometer bioassay and electrophysiological analysis.
- Volatile profiles and TPS23 expressions were analysed using gas chromatography-mass spectrometry (GC-MS) and quantitative real-time PCR (qRT-PCR), respectively.
- The amino acid sequences from Braz1006, Delprim, and B73 TPS23-alleles were compared to establish variations that might determine different expression levels.

RESULTS

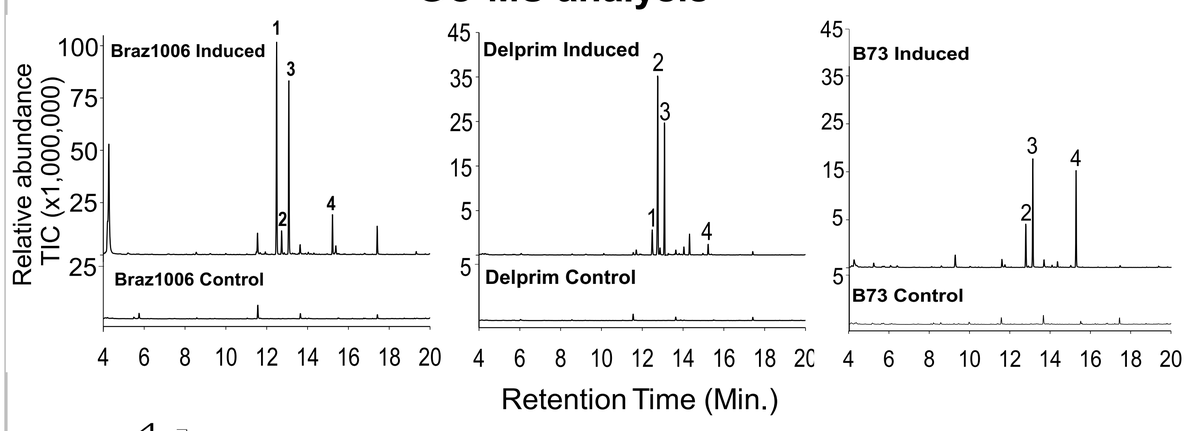
C. sesamiae response



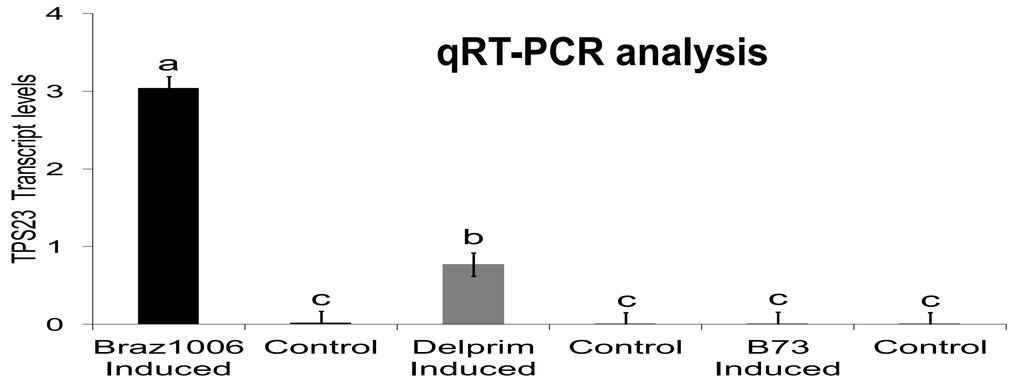
GC-EAG analysis



GC-MS analysis



qRT-PCR analysis



CONCLUSIONS

- Egg induced volatiles from Braz1006 and synthetic *(E)*-caryophyllene were attractive to *C. sesamiae.*
- After pest attack, Braz1006 released eight-fold higher *(E)*-caryophyllene than Delprim, whereas B73 failed to produce the compound.
- Regulation of TPS23 transcriptional activity is the basis for herbivore-induced (*E*)-caryophyllene production levels in the maize cultivars.
- TPS23 allele from Braz1006 is similar to B73 but encodes an active enzyme.

IMPACT

- Study provides valuable insights into the underlying mechanisms of *(E)*-caryophyllene production in maize landrace, and its role in maize defence against stemborer attack.
- Current findings, coupled with technological developments in crop genomics, set the stage for plant breeding in which herbivore-induced defences can provide better resistance against damaging crop pests.

TPS23 alignment

REFERENCES

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