Abstract

Plants in the Brassicaceae family have developed complex defensive mechanisms involving specialized cells that produce toxic chemicals that repel herbivores insects and pathogens. Two types of these cells can be distinguished: myrosin cells and ER body-containing cells. The progress of molecular biology technology has enabled us to a better understanding of the molecular mechanisms of specialization of these cells. The aim of this project was to explain the mechanisms of hormonal regulation of the development and functionality of myrosin cells and ER body-containing cells.

In the first part of the thesis, it is shown that long-term MeJA treatment enhances the expression of myrosinases TGG1 and TGG2, which activate glucosinolates. Interestingly, this reaction occurs independent of the canonical jasmonic acid signaling pathway involving COI1 and MYC2,3,4, indicating that an alternative signaling mechanism may be is involved.

In the second part, the relationship between vascular tissues and epidermal cells that contain L-ER bodies was studied. The findings reveal that MeJA plays a critical role in the formation of L-ER bodies, which accumulate β-glucosidase enzymes for the synthesis of toxic metabolites. Furthermore, I found that auxin regulates vascular development, which indirectly affects the pattern of L-ER body-containing cells, though it is not directly involved in their production.

The findings of the study highlight the complex interactions among two phytohormones, myrosin cells, ER body-containing cells, and vascular tissues, which coordinates an effective defense response to herbivores and pathogenic attacks. Developing crop varieties with higher resistance may be facilitated by a comprehensive understanding of these mechanisms.