# Distribution of S-Methyl-L-Cysteine Sulfoxide (SMCSO) in Brassicaceae Tissues: Implications for Defense Against Phytophagous Insects

Laura Bellec*[1], Anne Marie Cortesero[2], Maxime Hervé[2], Nathalie Marnet[3], and Célia Le Maire[4]

[1]Institut de Génétique, Environnement et Protection des Plantes – Université de Rennes I, Institut national de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE) – France
[2]Institut de Génétique, Environnement et Protection des Plantes – Institut National de la Recherche Agronomique : UMR1349, Universite de Rennes 1 : UMR1349, Agrocampus Ouest – France
[3]INRA – Institut National de la Recherche Agronomique - INRA – Domaine de la Motte, 35653 Le Rheu, France, France
[4]Université de Rennes 1 – Université de Rennes I – France

**Résumé**

Insects pose a significant threat to plants, which defend themselves through various morphological and biochemical traits. Among these defense mechanisms, the role of non-proteinogenic amino acids, such as S-methyl-L-cysteine sulfoxide (SMCSO), remains largely unexplored. Previous studies have shown that the distribution of SMCSO in plant reproductive tissues is consistent with the predictions of the Optimal Defense Theory (ODT) and could act as a defense against phytophagous insects. To further investigate the evolution of SMCSO as a defense against phytophagous insects, we analyzed its spatial distribution in tissues of twelve Brassicaceae species and assessed its impact on the feeding behavior of generalist and specialist phytophagous insects.
The twelve plant species were cultivated and their roots (primary and secondary), leaves (young and old), and inflorescence were harvested for SMCSO analysis. Using both specialist (*Delia radicum, Psylliodes chrysocephala, Ceutorhynchus assimilis*) and generalist (*Pachnoda marginata, Spodoptera littoralis, Brassicogethes aeneus*) herbivores of the different plant parts, we conducted feeding tests on artificial diets supplemented with physiological concentrations of SMCSO. Our experimental design aimed to test the hypothesis that generalist herbivores would be deterred by SMCSO, while specialists might exhibit varied responses, including stimulation or no effect.

We found a correlation between phylogenetic distance and SMCSO concentration, with some species not producing SMCSO or at low levels. Among species producing SMCSO, its distribution within plants followed ODT predictions, with higher concentrations in reproductive tissues compared to vegetative tissues, and higher levels in young leaves and primary roots compared to old leaves and secondary roots, respectively.
In addition, we found that physiological concentrations of SMCSO had a deterrent effect on generalist feeding behavior, with the degree of deterrence dependent on concentration.

*Intervenant

The effects on specialist herbivores varied, with a stimulant effect on *D. radicum* and *C. assimilis* and a deterrent effect on *P. chrysocephala*.These results support the defensive role of SMCSO against phytophagous insects, with distribution following ODT predictions and variable effects on specialist herbivores.

**Mots-Clés:** constitutive defenses, plant tissues, S, methyl, L, cysteine sulfoxide, Brassicaceae, insect behavior