What roles do glucosinolates and morphological traits play in limiting *Psylliodes chrysocephala* larval infestation across crop variety and companion planting? A field investigation.

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The cabbage stem flea beetle (*Psylliodes chrysocephala*) is a key pest of winter oilseed rape (OSR, *Brassica napus*); larval stages develop by feeding on petioles and stems during winter. Larval infestation may be influenced by plant traits and cropping systems. We investigated the effects of OSR genotype and cropping system on larval infestation through specific ecophysiological traits, and their interactions. In a field trial with four replicates, three OSR varieties (Mambo, Feliciano and Angelico) were cultivated as monocrops or were sown with faba bean (*Vicia faba*) companion plants. Ecophysiological traits (morphological and metabolic) and *P. chrysocephala* larval infestation were assessed using a two-phase analysis combining direct relationship analysis and a regularized structural equation model.

The varietal factor had a greater influence on larval infestation than companion planting in this experiment. Larval infestation correlated positively with plant fresh weight, glucoraphanin, and butyl glucosinolate (butyl-GLS), and negatively with glucobrassicanapin concentration. The ecophysiological traits of Angelico, with lower concentration of glucoraphanin and butyl-GLS, explained its moderate decrease in larval infestation compared to Mambo. The ecophysiological traits of Feliciano, with a higher concentration of glucobrassicanapin and lower concentration of glucoraphanin and butyl-GLS, partially explained the resistance effect of this variety compared to Mambo.

Contrary to expectations, companion planting slightly increased larval infestation, particularly in Mambo. This may be due to greater plant biomass under companion planting conditions rather than a direct effect of the companion plant on infestation rates. However, OSR grown with companion plants expressed greater concentration of glucobrassicanapin and a reduction in glucoraphanin which may result in an indirect negative effect on the larval infestation. Microclimatic changes were observed when OSR was grown with companion plants, including elevated canopy temperature, reduced photosynthetically active radiation, and a lower red: far-red light ratio compared to monocropped OSR.

The variation in *P. chrysocephala* larval infestation in OSR plants may be partly explained by an interplay of specific concentrations of GLS and morphological traits such as plant biomass. The influence of crop microenvironmental alterations on glucosinolate production warrants further investigation, as these factors may be involved in plant-insect interactions.