THE STIGO PROJECT: DECIPHERING THE MOLECULAR DIALOG OF O. CUMANA SEEDS GERMINATION

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ABSTRACT

Orobanche cumana is an obligate non-photosynthetic parasitic plant that attaches to the roots of the sunflower (*Helianthus annuus*) for acquiring water and nutrients for its development. Broomrapes (up to 100/sunflower plant) are then new sink for sunflower and lead to yield losses. To date, resistant sunflower varieties are the most effective way to control *O. cumana*. However, it is still necessary to understand the underlying resistance mechanisms in sunflower. While the vast majority of plants germinate thanks to internal hormonal signals and environmental cues, broomrape seeds do not germinate spontaneously and must perceive a biochemical signal produced by the host roots that induces the germination. Sunflower is the only cultivated host species for *Orobanche cumana*. To date, only three major resistance genes have been mapped in sunflower and none of them is involved in the induction of *O. cumana* seed germination. However, a better understanding of this key stage in the interaction between the sunflower and *O. cumana* will lead to new control methods. The *LGS1* gene in sorghum is involved in modulating the production of molecules inducing *Striga* seeds germination, enhancing the resistance to *S. hermonthica*, an obligate photosynthetic root parasitic plant. So far, two types of allelopathic signals have been identified, the strigolactones (SL) and sesquiterpenes (eg. dehydrocostus lactone, DHL), but a larger panel of germination stimulant (GS) molecules is expected and remains unknown in sunflower. Our objectives are to develop effective and selective methods of control against *O. cumana by:* (i) identifying the allelochemicals exudated by sunflower and responsible of *O. cumana* seed germination and the genes and alleles involved in their biosynthesis (ii) identifying and characterizing the GS receptor(s) of *O. cumana*, and developing specific germination inhibitors based on their activity towards these receptor(s), (iii) developing new control methods against *O. cumana* and new varieties for sunflowers with low stimulant germination activities.

Key words: orobanche cumana, seeds, sunflower root exudate, germination stimulant, GS receptors