Creating Two Novel Strigolactone (SL) Analogs (C-13 and C-26) for the Benefits of Combatting Parasitic Seed Infestation

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A paramount issue that contemporary agriculture faces is the worldwide infestation of soil with parasitic weeds. Strigolactones (SLs), a family of carotenoid-derived plant hormones, act as germination stimulants and are known to combat parasitic weed infestation by inducing “suicidal germination.” However, they are extremely inefficient to extract due to their structural instability and scarce production amounts. Thus, there is a need to develop new, simple, and effective SL analogs that are cheaply synthesized. In the present study, I designed two novel SL analogs (C-13 and C-26) and tested their efficacy in performing the functions of natural SLs and ability to induce parasitic seed germination. Specifically, I tested the SL analogs’ ability to regulate rice tillering, inhibit Arabidopsis hypocotyl length, and reduce lateral root density. Additionally, to test the degree to which plant SL receptors perceive the SL analogs as natural SLs, I measured the transcription levels stimulated by C-26 and C-13 in the d27 and d53 rice genes. C-26 showed a very promising response in all of these experiments. The newly developed SL analogs also showed considerable activity in inducing parasitic seed germination, as compared to the standard SL analog, GR24, and its originator, AR-8. Moreover, C-26 and C-13 have shown minimal daily degradation when housed in water for 8 days, indicating their chemical stability. Owing to its structural simplicity and potential for mass production, C-26 can be used as a cost-efficient alternative to the well-known SL analog, GR-24, and can be used to induce suicidal germination to combat parasitic seed infestation.

Awards Won:
Second Award of $2,000
China Association for Science and Technology (CAST): Award of $1,200
Shanghai STEM Cloud Center: STEMCloud Award of $1800 in Plant Science