Determining the Effect of the Novel CarL2 Strigolactone Analog on the Seed Germination of Parasitic Weeds

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Parasitic weed Striga accounts for estimated yearly crop losses over $20 billion in the United States alone. Seeds of parasitic weeds germinate in response to signaling molecules called strigolactones (SLs), released by host plants roots. One of the control strategies is developing SL analogs to stimulate parasitic seed germination in the absence of a host plant, known as suicidal germination. The goal of this research is to test the features of a newly developed SL analog called CarL2 in comparison with GR24. This project is the first to determine the efficiency of a SL analog through a multidimensional methodology: germination bioassay conducted on 8057 parasitic seeds, investigating effect on plant architecture via data collected from 20 Shiokari and dwarf10 mutants, genetic testing on 52 Arabidopsis plants, and HPLC analysis. The experimentation included testing CarL2 on Striga heromonthica and Phelipanche ramosa parasitic seeds, d10 mutant rice, and Arabidopsis, Then, CarL2 and GR24 were run through multiple HPLC cycles for chemical stability analysis. The results show that parasitic seed germination induced by CarL2/CarL2 derivatives reached 16%/79% for Striga and 23%/89% for Phelipanche, respectively. CarL2 can replace SLs in inhibiting tillering in dwarf10 mutants. Moreover, after operating the HPLC cycles, the relative quantity of remaining GR24 was 0.825% and CarL2 was 2.109%, which means CarL2 is chemically more stable than GR24 and therefore SLs. These results display the encouraging response of CarL2 as a new SL analog that can be utilized as a suicidal germination agent to economically combat root parasitic weeds.

Awards Won:
Second Award of $2,000