PROJECT TITLE

Using aeroponics to measure autotoxicity tolerance in crops releasing natural herbicides.

CONSORTIUM

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SUMMARY OF THE REPORT

To suppress competitors, some plant species have evolved a biochemical strategy called allelopathy: these ‘donors’ secrete herbicidal chemicals (‘allelochemicals’) to inhibit neighbours. Allelopathy can be exploited in agriculture to combat weeds because many crops have the capacity to synthesize such allelochemicals. However, a major caveat of allelopathic crops is that allelochemicals can also inhibit the growth of the donor, a phenomenon known as ‘autotoxicity’, with consequences for crop growth and yield. While little is known about the mechanisms by which donors counteract autotoxicity, understanding these processes is crucial to efficiently use these endogenous weed suppression strategies in sustainable agricultural practices.

The overall aim of our project has been to identify the genetic factors that confer tolerance to autotoxicity in barley (*Hordeum vulgare*). Barley is an ideal model to screen for allelochemical autotoxicity tolerance: it produces many effective allelochemicals and is tractable to quantitative trait loci (QTL) mapping. The proposed research uses the recombinant inbred barley composite cross II (CCII) panel, which was generated by inter-crossing 28 diverse landraces and early cultivars, and selfing the progeny for 58 generations. Using the Aeroponics platform at UCL, we aimed to determine autotoxicity tolerance by exposing the roots to an allelochemical-containing mist of nutrient solution, measuring the response of different genotypes.

In the pilot experiment at UCL, a dose response to gramine was determined in the aeroponics environment. These data then allowed a large-scale experiment with 145 different genotypes, including the parental landraces, the Morex reference cultivar, and 116 different progeny lines from the crosses between parental landraces. The data will be analyzed to map the genomic loci underlying the differential response to the allelochemical.