Response of germinating barley seeds to Fusarium graminearum: The first molecular insight into Fusarium seedling blight

Fusarium seedling blight in cereals can result in significant reductions in plant establishment but has not received much attention. The disease often starts during seed germination due to sowing of the seeds infected by Fusarium spp. including Fusarium graminearum. In order to gain the first molecular insights into the response of the germinating barley seeds to F. graminearum for controlling the disease, germinating seeds were treated with water as control or inoculated with F. graminearum conidia and samples were harvested at 1, 2 and 3 days after inoculation (dai). Although germination rates were not significantly different between F. graminearum-inoculated and control samples, albumins and hydrogen peroxide were accumulated in the inoculated samples at 1–3 dai, indicating that there was an interaction between the germinating seeds and F. graminearum. Subsequently, a gel-based proteomic approach was employed to identify differentially expressed proteins in the seeds responding to fungal infection at 3 dai, which revealed 42 protein spots, 41 of which were identified by mass spectrometry. The up-regulated proteins mainly included heat shock proteins, antioxidant enzymes and the proteins involved in primary metabolism and detoxification whereas the majority of down-regulated proteins were plant protease inhibitors. The results suggest that there is a link between increased energy metabolism and oxidative stress in the germinating barley seeds in response to F. graminearum infection, which provides the first molecular insight into Fusarium seedling blight.