PLAIN ENGLISH SUMMARY

It is possible to enhance plants' natural defence systems to provide a broad spectrum resistance against a range of fungal, viral and bacterial pathogens. The process, known as systemic acquired resistance (SAR), requires prior exposure of the plant to certain biological or chemical agents that 'sensitise' the plant leading to a rapid resistance response on subsequent pathogen attack. This postdoctoral project examined the SAR response in cotton and to evaluate a range of biotic and abiotic stimuli under both glasshouse and field conditions against *Verticillium* and *Fusarium* wilts and *Alternaria* leaf spot. Activity of the PR-protein, ß-1,3-glucanase, a marker of SAR, was also examined in cotton seedlings following treatment with various stimuli.

The durability and effectiveness of SAR against leaf infections under conditions conducive to *A. macrospora* and also to *X. campestris* pv. *malvacearum* were clearly demonstrated during the 97/98 cotton-growing season. BTH was applied, and resistance induced, following the initial outbreaks. The protection provided was, therefore, most probably against secondary infections. The percentage leaf area showing lesions was substantially lower on the treated plants, most likely due to a combination of reduced successful infections and delayed symptom expression, all characteristics of SAR.

Premature defoliation, a major symptom of Alternaria leaf spot in cotton, was also significantly lower in the treated plants, compared with the untreated plants. The observed reduction in defoliation is important as the premature shedding of leaves decreases the photosynthetic area of the plant, the primary cause of yield losses in cotton crops severely affected by Alternaria leaf spot or bacterial blight.

In the Verticillium field experiments, 3 applications of BTH or silicic acid to treated plants in the 97/98 and 98/99 seasons, with the first treatment applied prior to foliar symptoms, resulted in significant reductions in disease severity in treated plants compared with untreated plants even though the disease outbreak was severe. Therefore, application of the activator prior to foliar symptom expression and with booster applications appears to decrease disease severity even when severe disease development occurs in the field.

A significant decrease in stunting was observed in the Fusarium field experiments in the 97/98 and 98/99 seasons following BTH treatment of plants. Reductions in disease incidence were also noted in treated plants.

The reduced susceptibility of plants to Alternaria leaf spot, bacterial blight and Verticillium and Fusarium wilts is therefore attributed to the induction of systemic resistance following application of BTH and silicic acid. This work demonstrates that SAR has potential for minimising effects of three major cotton pathogens under field conditions. With further field studies plus a greater understanding of the process of SAR, this method of plant protection could join the integrated pest management ensemble in an effort to control these pathogens under commercial conditions.