INTRODUCTION
Fungicides are currently the principle management tool for the control of crop plant pathogens including horticulture and vegetable production. However, there is continuing pressure for safer control methods to be introduced that reduce the risk of residues, reduce the incidence of resistance in the pathogens and reduce harm to the environment (Kuchler et al., 1997). One strategy is to replace fungicides and pesticides with natural or synthetic compounds that induce plant’s natural defenses to control disease. The response is known as systemic acquired resistance (SAR).

These compounds are not dangerous to human health and are inexpensive (Bokshi et al., 2006). Implications of this technology are that they will help to reduce the use of fungicides, reduce health risks during application and minimize pollution to the environment. This project was aimed at finding suitable SAR inducing chemicals for the control of powdery mildew in cucurbit crops grown in polytunnels and in the field. It may be possible to introduce the technology into existing disease control strategies already used by growers.

MATERIALS AND METHODS
Two experiments were conducted in a glasshouse following completely randomised design, one on cucumber var. ‘Lancelot’ and another on zucchini var. ‘Columbia’ to evaluate the efficacy of several SAR chemicals to control powdery mildew. Two week old seedlings with fully expanded true leaves were sprayed with either Bion 50 ppm, Rezist 22 ppm, Milsana 1%, Silicate 300 ppm, or Water. A second spray was applied to the seedlings with the same chemicals one week later.

The disease severity resulting from either challenge inoculation (cucumber) or from natural infection (zucchini) was recorded using a severity scale of 1-5 where 1 = no disease or infection to 5 = highest disease infection (Bokshi et al., 2006). The physiological effects of the elicitors was monitored by analysing the level of chitinase activity in the leaves. A histological study of the leaf tissues of cucumber was also performed to study the response of the host cells in relation to the accumulation of phenolic compounds.

RESULTS
In cucumber a significant reduction of powdery mildew occurred with the application of Bion, Rezist and Milsana but not with Silicate. In zucchini the seedlings treated with Bion or Milsana had a lower disease incidence than the control but Rezist and Silicate did not. In both experiments Milsana produced the highest level of control of powdery mildew on cucurbit seedlings.

Chitinase activity increased in response to the application of some SAR chemicals. The maximum increase of the enzyme occurred with the application of Bion in both cucumber and zucchini plants. A moderate increase in the activity of chitinase was observed in plants treated with Rezist but no increased activity was observed in Milsana or Silicate treated plants. Histological studies of the inoculated and infected leaf discs under the light microscope showed an accumulation of phenolic compounds with restricted fungal growth in Bion and Rezist treated leaves but not in Silicate treated leaves. For the Milsana treated leaves there were fewer infections and the fungal hyphae growth was observed to be restricted but there was no accumulation of phenolic compounds at the infection sites of the pathogen.

DISCUSSION
The results of the experiments indicate that the application of Bion, Rezist and Milsana can control powdery mildew in cucumber and zucchini. A systemic increase in chitinase activity in the leaf tissue and the accumulation of phenolic compounds at the infection sites of Bion or Rezist treated leaves resulted in slow fungal growth. This confirms a systemic response in the host tissue prevented pathogenic invasion.

There was also substantial control of the powdery mildew infection using Milsana. However, there was no systemic increase of chitinase activity or accumulation of phenolic compounds in the inoculated leaves. This suggests that the mode of action of Milsana against the pathogen is unclear and further investigation is required.

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REFERENCES