INFLUENCE OF FATTY ACIDS AND SUGARS RELEASED BY GERMINATING SEEDS ON PLANT SPECIES SPECIFIC CONTROL OF *PYTHIUM ULTIMUM* BY *ENTEROBACTER CLOACAE*

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INFLUENCE OF FATTY ACIDS AND SUGARS RELEASED BY GERMINATING SEEDS ON PLANT SPECIES SPECIFIC CONTROL OF *PYTHIUM ULTIMUM* BY *ENTEROBACTER CLOACAE*

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Pythium ultimum is a devastating pathogen of seeds and seedlings. Germination of pathogen sporangia can be elicited by unsaturated long chain fatty acids that are released by germinating seeds. Sporangial activation and germination are critical for initiating *Pythium* disease development. *Pythium* infection can be prevented by applying the bacterium *Enterobacter cloacae* onto seeds and expression of bacterial fatty acid transport and degradation have been found to be important traits for this control. However, the bacterium is capable of protecting only certain seeds such as cotton and cucumber whereas other seeds, such as corn and pea succumb to *Pythium* infection. It has been postulated that differences in sugar released by seeds may explain this differential protection since sugars are able to repress fatty acid metabolism in *E. cloacae*. Corn and pea seeds are documented as seeds that release high amounts of simple sugars that can repress fatty acid uptake and catabolism. Experiments focused on the temporal release of corn and cucumber seed exudates and their induction of sporangial activation, germination, host colonization and the impact *E. cloacae* had on these pathogen responses while concomitant release of exudate sugars and fatty acids was also analyzed. *E. cloacae* is able to interrupt sporangial activation induced by cucumber seeds, but not in the corn spermosphere. This explains

the differential control by the bacterium, since activation interference directly resulted in suppressed seed colonization. Both corn and cucumber seeds released unsaturated fatty acids as early as 15 min after sowing although quantities from corn exceeded that of cucumber. More importantly, corn seeds released much higher concentrations of simple sugars than cucumber already within 15 min. Quantities detected in corn seed exudate are large enough to completely shut down fatty acid degradation of *E. cloacae*. This provided the first evidence that interference with sporangial activation is the cause for plant protection by *E. cloacae* and seeds not protected by *E. cloacae* are incapable of interfering with sporangial activation. The bacterium does not interfere with sporangial activation because non protected seeds release sugars at such quantities that bacterial fatty acid degradation is repressed.

BIOGRAPHICAL SKETCH

Pia Sofia Theresa Windstam was born April 23 1976 in Kiruna, Sweden. In this small mining town north of the Arctic circle, she finished high school in 1992 at Parkskolan. She initially attended a 3 year post secondary education program majoring in Nature and Science in Kiruna but later moved to Skellefteå, Sweden where she finished the program in 1995. After a year of working in the local Luossavaara Kirunavaara iron ore mine she started her MS degree at the Swedish University of Agriculture in Alnarp Sweden in 1996. During her MS studies she got funding to do her thesis research in the lab of Eric Nelson at Cornell University in the fall of 2000. After graduating with an MS in Horticulture in 2001 she started the PhD program at Cornell University in the lab of Eric Nelson in August 2001. She completed the requirements for a PhD in the field of Plant Pathology in March 2007.

To my grandmother Ellen

I will always miss you

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I have always been interested in biology and that was nurtured during my upbringing in a town where most activities revolved around being outside, playing in lakes, woods and the gorgeous mountains found in the north of Sweden. My grandmother Ellen and my father Roger taught me about gardening and the wild berries in the north and whenever we visited my grandparents Ellen would take us outside to fish, pick berries or harvest vegetables. I never imagined as a kid that these interests would some day result in a PhD from Cornell University. My beloved grandmother passed away when I was 12, but I want to believe that she would be proud if she could see me now. I owe her a big thank you for always being patient when teaching an impatient child such as myself.

During my MS studies I got the chance to work with Beatrix Alsanius. She took an interest in me and was the first one to really expose me to research. For that I am forever grateful. I was yet again lucky when coming to Cornell, where I first met with Eric Nelson. Eric has proved to be a fantastic mentor on so many levels. He serves as a great example of what an advisor should be like. Always interested, enthusiastic, encouraging and supportive he also taught me that it is just as important to be a good citizen as it is to be a good scientist.

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