

Public Abstract

Charles Nathan Hancock

Ph.D.

Biochemistry

S-RNase Binding Proteins: Functional Studies of the 120kDa Glycoprotein and S-RNase Oligomerization

Advisor: Dr. Bruce A. McClure

Graduation Term Winter 2005

This thesis focuses on the mechanisms that regulate plant reproduction. *Nicotiana alata* rejects pollen from plants that are closely related (i.e., self-pollen; self-incompatibility) and plants that are distantly related (unilateral incompatibility). Both pollen rejection mechanisms rely on a cytotoxic ribonuclease, S-RNase, to inhibit the growth of undesirable pollen as it grows through the style. In self-incompatibility, S-RNase activity is carefully controlled so that it is only active in self-pollen. In addition to S-RNase, additional factors are required for pollen rejection. Identification of these factors was a critical part of this thesis research. In one approach, I identified S-RNase binding proteins. I found that S-RNase binds to itself (i.e., forms oligomers) and that three glycoproteins: 120kDa glycoprotein, NaPELP III, and NaTTS, also bind directly to S-RNase. The glycoproteins and S-RNase account for about 30% of the soluble pistil protein. S-RNase oligomerization was studied in detail; all S-RNases tested formed oligomers and self-association is favored by reducing conditions, low pH, and high S-RNase concentration. Among the three glycoproteins, the 120kDa glycoprotein emerged as the best candidate for a protein directly involved in pollen rejection because it showed more polymorphism than the others. Suppression 120kDa glycoprotein expression caused a breakdown in self-incompatibility, confirming its role in self-incompatibility. The identification of the 120kDa glycoprotein as a factor required for self-incompatibility will facilitate further studies of this plant reproduction mechanism.