

Chapter 1

Preface

The Russian wheat aphid (RWA) (*Diuraphis noxia*, Mordvilko) is a serious insect pest of wheat (*Triticum aestivum*) in South Africa. Damage from RWA infestations causes severe economic losses due to aphid feeding and the associated costs of insecticide application. This thesis addresses the insect-plant interactions as well as the factors affecting the resistance that the aphid encounters when feeding on resistant wheat.

In Chapter 2 a literature review is presented of the Russian wheat aphid focussing on aphid feeding. The sequence of events are discussed with the aphid initially finding a suitable host, location of the phloem, acceptance of the food source and ultimately with the withdrawal of the stylet. Also discussed is aphid feeding on resistant hosts.

Chapter 3 presents a comparison of Russian wheat aphid development when placed on susceptible ('Tugela') and resistant ('Tugela *DnI*') wheat cultivars that are near-isogenic to each other. This study compares Russian wheat aphid fecundity, longevity and development to determine the influence of the resistant wheat cultivar.

In Chapter 4 an artificial diet was developed for the Russian wheat aphid. This is the first report of an artificial diet for the Russian wheat aphid. The diet developed was simple yet effective and enables potentially resistant compounds to be tested with their inclusion in an artificial diet to determine their effectiveness in inhibiting aphid fecundity and longevity.

Chapter 5 represents a study on the induction of proteins upon Russian wheat aphid infestation of a resistant wheat cultivar, 'Tugela *DnI*'. Two-dimensional gel electrophoresis was used to confirm the presence of induced proteins and to identify these proteins.

Chapter 6 evaluates the influence of leaf epicuticular wax, leaf trichome length and density, of resistant and susceptible wheat cultivars. Their contribution to the resistance that the Russian wheat aphid encounters is discussed.