CHAPTER 1

INTRODUCTION

Tropilaelaps clareae Delfinado and Baker is a serious pest of *Apis mellifera* Linnaeus in tropical Asia and may become a serious pest of honey bees throughout the world (Burgett et al., 1983; Rinderer et al., 1994). Concurrent infestations of *T. clareae* and *Varroa* spp. are commonly found in *A. mellifera* colonies in countries of the region. However, the numbers of *T. clareae* are often higher than those of *Varroa* mites in Thailand (Burgett et al., 1983).

Several studies have been conducted to find effective control measures against *T. clareae* in *A. mellifera* colonies. Chemical, physical, biotechnical control and combinations of chemical and biotechnical methods provide some relief to colonies but nothing offers complete control (Wongsiri and Tangkanasing, 1987; Tangkanasing et al., 1988). In addition, these methods are either labor intensive, costly, reduce bee populations or contaminate hive products.

The use of stocks resistant to *T. clareae* has been thought to be a better control solution to the *Tropilaelaps* problem in Asia. However, no studies have been done to find *A. mellifera* stocks resistant to control *T. clareae*. The benefits of using honey bees resistant to parasitic mites include: less chance of contaminating hive products with undesirable chemicals, low cost of labor and materials and less risk of the mite developing resistance to acaricides. Stocks (ARS-Y-C-1 and ARS Primorsky honey bees) resistant to other parasitic mites such as *Acarapis woodi* are now commercially available in the United States (de Guzman et al., 1996, 2001). The Primorsky honey bees are also known to be resistant to *Varroa jacobsoni* (Rinderer et al., 1997, 1999, 2001). However, potential resistance of Primorsky honey bees to *T. clareae* has yet to be established.

Apis dorsata Fabricius is known to be naturally resistant to its indigenous parasite, *T. clareae* (Burgett and Krantz, 1984). Several defense mechanisms of *A. dorsata* to *T. clareae* infestation have been investigated. One of the mechanisms involved in regulating *T. clareae* infestations is the bees' ability to migrate every dearth season (Koeniger and Muzaffar, 1988; Wongsiri et al., 1989). *T. clareae* can only survive for 2-3 days on adult honey bees (Koeniger and Muzaffar, 1988; Rinderer et al., 1994). Hence, this behavior results in a broodless condition and thus, no favorable host for the parasite. New colonies of *A. dorsata* are found nearly free from *T. clareae* parasitism due to these broodless periods (Mardan, 1989; Thapa, 1998). The inability of *T. clareae* populations to grow to a dangerous level is also due to the bees' grooming behavior (Koeniger and Koeniger, 1980; Wongsiri et al., 1989; Rath and Delfinado-Baker, 1990). However, grooming behavior of *A. dorsata* as measured by natural mortality of *T. clareae* through time has not been investigated. In addition, the effects of resistant hosts on different life history parameters of *T. clareae* have yet to be established.

Objectives

1. To determine the defense mechanisms of *A. dorsata* to *T. clareae*.
2. To evaluate the potential for resistance to *T. clareae* by ARS Primorsky honey bees, *A. mellifera*.
3. To investigate resistance mechanisms of ARS Primorsky honey bees to *T. clareae*.

Anticipated benefit of this research

T. clareae is a natural brood parasite of *A. dorsata* but it is not considered to be a serious pest of this bee species (as it is compared to *A. mellifera*) because *A. dorsata* has defense mechanisms (such as migrations, broodless periods, grooming and hygienic behavior) to *T. clareae*. Findings of this research concerning the defensive mechanisms of *A. dorsata* will provide understanding about how to control *Tropilaelaps* populations and offer knowledge about the life history of *T. clareae* on their resistant host,

A. dorsata. Furthermore, the knowledge about the defense mechanisms of *A. dorsata* to *T. clareae* might be applied to control the mite populations in *A. mellifera* colonies.

Since *T. clareae* is a serious ectoparasite of *A. mellifera* in tropical Asia. Each year, beekeepers suffer a loss of large numbers of *A. mellifera* colonies and a decrease in the production of honey bee products because of this mite. In practice, chemical substances have been usually used to control *Tropilaelaps* populations in *A. mellifera* colonies. However, acaricides are costly, dangerous to honey bees, contaminate bee products, and have short-term value since mites can develop resistance to them. Consequently, the use of strains of *A. mellifera* resistant to *T. clareae* is thought to be the best method to control for the long-term control of this mite. At present, a stock of *A. mellifera* resistant to *T. clareae* has yet to be found. Thus, this research may open the way to selecting for stocks of *A. mellifera* which are resistant to *Tropilaelaps,* and also may provide recommendations to beekeepers regarding the control of *Tropilaelaps*. In addition, findings of this research about resistant mechanisms of *A. mellifera* to *T. clareae* can be used in breeding programs to produce the resistant strains of *A. mellifera* in the future.