

## Chapter 1

### Introduction

Aphids are an extremely successful insect group which occurs throughout the world, with the greatest number of species appears in the temperate regions (Dixon, 1973). In Thailand, a list of more than 60 species is documented, although at least 11 species of them are reported injurious to agricultural crops (Bänziger, 1976). Aphids are small (2 mm) soft-bodied insects which line on plants in dense colonies. Two forms of adult occur: the apterae, which are wingless, and the alatae, which are winged. The latter appear particularly in crowded conditions. Aphids have very high reproductive rate, feeding on plant sap by inserting the slender stylets through the plant tissue and into sieve tubes. The aphids weaken the host plant by draining its resources and may cause severe distortion of growth and transmitting plant viruses from infected to healthy plants (Hussey and Scopes, 1985).

The cabbage aphid, *Lipaphis erysimi* Kaltentbach (Aphididae) is an economically importance pest of Cruciferous and other vegetables leading to significant reduction in quality and quantity of the yield product. They cause damage directly through feeding and indirectly through the transmission of more than 10 viral plant diseases (Malanont, 1981)

For decades, most Thai farmers depend solely on chemical pesticides for their crop protection. These toxic pesticides are applied conventionally and intensively, often on a fixed schedule. The combination of pesticide resistance, pest resurgence, and unleashed secondary pests causing greatly increased production costs are more evidenced in recent years. Production cost increase has reached the point where the crops are unable to be grown and market profitably, besides pesticide residues on the agricultural products are unacceptable to processors and the fresh market. In addition, pesticide applications cause direct hazards to humans, non-target and beneficial animals, as well as contamination in the food chains and the environment (Kameya and Ratanabhumma, 1998).

Integrated Pest Management (IPM) concept is not fully appreciated by many agricultural countries. Several groups of toxic insecticides are currently applied conventionally and intensively for controlling insect pests. The applications of agricultural chemicals as a tool for agricultural practices are likely to increase during the next few decades. The threat of pesticide contamination in the human food chains has been considerable one of the most public concern. National food safety control system provides the accepted standards for quality and purity of the agricultural products (Käferstein and Abdussalam, 1999). Thai farmers need to adjust their agricultural practices to meet with national and international standards to enhance their competitiveness and secure their market share in both the local and the global markets.

These safety standards aim to improve safety and quality of the agricultural products to ensure the human health and environment protection.

Botanical pesticides, such as rotenone, which is a naturally occurring compound, produced by extraction from the roots and stems of several tropical and subtropical plant species, including, *Derris* spp., *Lonchocarpus* spp., and *Tephrosia* spp., found primarily in Malaya, South America and East Africa, respectively. Rotenone is formulated in pesticide products to control insects, mites, ticks, spiders, and unwanted fish species (EPA, 2002; Wikipedia, 2007). *Derris elliptica* Bentham and *Derris malaccensis* Prain (Leguminosae) have previously been known as important sources for bioactive compounds, rotenone, with pesticidal properties. They grow extensively in southeast Asia countries, and their extracts have been used over centuries as piscicide and insecticides. Rotenone has been used for years against fleas and lice, but is also effective against aphids, beetles, caterpillars, maggots, bagworms, cabbage worms, thrips, leafhopper, Japanese beetles, vegetable weevils, codling moths, sawflies and slug sawflies (Ray, 1991). Rotenone is classified by the World Health Organization (WHO) as moderately hazardous. It is mildly toxic to humans and other mammals, but extremely toxic to insects and aquatic life including fish (Wikipedia, 2007). Rotenone is quickly degraded in sunlight and water. Soil application studies of rotenone demonstrated its very short persistency with a half-life range of only 1-3 days (Caldwell *et al.*, 2005).

#### Objective of the experiment

With present review of the available data, botanical insecticides could be a promising pest control alternative to conventional insecticides without posing unseasonable risk to public health and the environment. The ultimate goal of current study is to establish formulated product from derris root against the cabbage aphid, *Lipaphis erysimi* (Kaltenbach) through detail investigations on various aspects, including, derris plant species identification, rotenone root quantity, and morphological characteristics as determined by isozyme pattern method, ascertainment of rotenone content in accordance with plant ages and container sizes, modification techniques for rotenone extraction, determination of rotenone degradation for sprayed residues, and the shelf-life extension and efficacy of the derris formulated product for controlling the cabbage aphid. Botanical insecticides compared to conventional synthetic insecticides may be secured for the environment are generally less expensive and easily processed, administered, and adopted by most farmers and small industries. This research outcome should yield the new derris formulated product as additional tools for better pest management tactics relevant to the future sustainable vegetable production and protection of Thailand, in addition with strong encouragement to the national sufficiency economy policy by building up the local capability for self-reliant production of Thai farmers.