

## CHAPTER 1

### INTRODUCTION

#### 1.1 General

Medicinal plants and herbs contain substances known to modern and ancient civilizations for their healing properties. Nowadays, the natural medicines draw more attention as the source of active components capable of curing man's ailments and are widely used in the world.

In some Asia countries, *Acanthus ebracteatus* Vahl. has been used as traditional medicine. For example, its leaves and the boiled seeds are commonly used in Malaysia to make a cough medicine, the seeds are also used for poulticing boils or a decoction is drunk against boils. In China, the plant is prescribed against hepatosplenomegaly, hepatitis, lymphoma and asthma. In Thailand, *A. ebracteatus* Vahl. is one of the four medicinal plants from the mangrove forest that are most commonly used (Kunstadter P. *et al.*, 1992). In Thai traditional medicine, the plant is widely used as a purgative and an anti-inflammatory, as well as the leaves dispensed with pepper (*Piper nigrum* L.) as tonic pills for longevity (Kanchanapoom T. *et al.*, 2001). *A. ebracteatus* Vahl. is also used for kidney stone treatment. The whole plant is boiled in fresh water, and the patient drinks the solution instead of water, half a glass at a time, until the signs and symptoms disappear (Kunstadter P. *et al.*, 1992).

In Thai Market, there are a lot of herbal tea forms of this plant. The products were claimed as herbal medicine to relieve superficial skin infection, nasopharyngeal inflammation and anti-asthma and promote longevity. A publication of Herb and Candles (Thailand) demonstrates the use of *A. ebracteatus* Vahl. leaf by adding to the steam bath for the treatment of certain ailments.

*A. ebracteatus* Vahl., a mangrove plant, belongs to the family Acanthaceae. This shrubby herb is found in Southeast Asia and in various northern sites as well as dykes of the Western Catchment's Area. It is known as English name "sea holly" and the Thai name is "Ngueak Plaa Mo Dok Khaao".

*A. ebracteatus* Vahl. has high constituents of alkaloids, flavonoids, fatty acids, triterpenoids and saponins. The extract from *Acanthus sp.* has been tested for anti-tumor and anti-cancer potentials (Srivatanakul and Naka, 1981, Tiwawech, Siripong and Kupradinun, 1993, Picha *et al.*, 1994). Masathien *et al.* (1991) reported the

immune potential effects of *A. ebracteatus* Vahl. roots on human lymphocytes. Tiwawech *et al.* (1993) reported the inhibition effect of *A. ebracteatus* Vahl. extract on hepatic foci in rats. However, the incidents of kidney damages in tested rats were observed during the treatments with *A. ebracteatus* Vahl. extracts (Siripong P. *et al.*, 2001), which could be related to a high level of salts contained in the crude extract due to the location of *A. ebracteatus* Vahl. in brackish water. Therefore, desalinization of *A. ebracteatus* Vahl. extract is required before the utilization of the extract as herbal medicine or supplement.

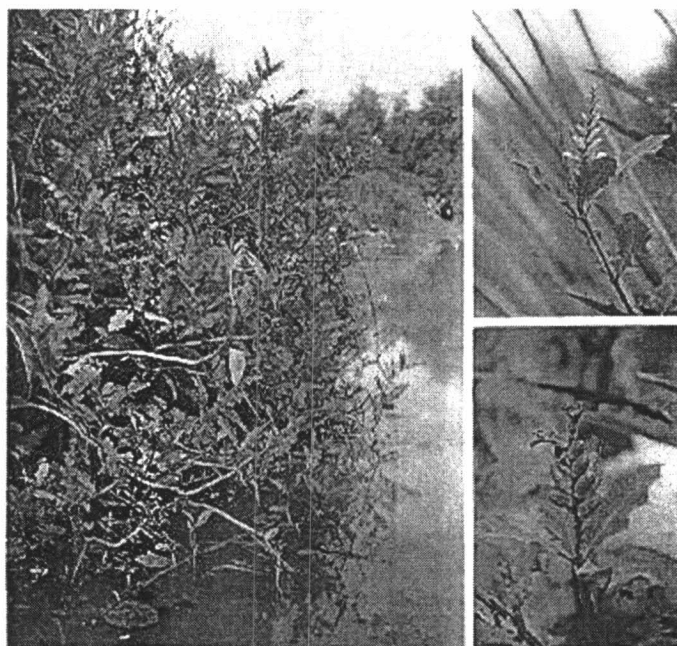


Figure 1.1: *A. ebracteatus* Vahl. Plant

For years, membrane, the technique looked at as one of five technologies changing public works (American City & County, 1997) are playing a key role in bio-separation for purifying water, producing drugs and ultrapure chemicals and processing food. Membrane technologies have been established as very effective and commercially attractive options for separation and purification process. Their advantages are cost-effective, energy-efficient, simple and mild condition for separation and purification process.

In order to desalinate *A. ebracteatus* Vahl. extract, the nanofiltration membrane is chosen. Nanofiltration can be operated at low pressure and allow water and monovalent salts such as sodium chloride to pass through the membrane but

retains and concentrates organic constituents. Thus, the concentration of salts in *A. ebracteatus* Vahl. extract could be reduced.

## **1.2 Research objectives**

The purpose of this research work is to determine the optimal conditions for the desalinization of aqueous extract of *A. ebracteatus* Vahl. by nanofiltration (NF) using membrane NTR 7540 (Nitro Denko). These optimal conditions then were used to evaluate performance of the NF membrane in diafiltration mode, also the cytotoxic activity of aqueous extract of *A. ebracteatus* Vahl., the permeate and the retentate of this process have been investigated. Further more, for better understanding about the transport phenomena cross the membrane, the mathematical models for NF membrane have been tested and used for the explanation of the separation in the system.