CHAPTER 1

INTRODUCTION

Currently, Aroma is quite more important in daily life. We can accept aroma odor from CD player with CD that records data of selected popular fragrances and we can smell blood, coffee, flower from TV that sends ultrasound wave to our brain. These new electronics has just been invented for impulsion of olfactory perception from them in stead of using flavors and fragrances. However, an essential oil is extremely used in perfumes, cosmetics, incenses, food flavorings, household products and medicine. At present, the demand of essential oils was increased in those products and especially used much more in spa and aromatherapy. Last year the spa in Thailand imported incomes 32,000 million baht and essential oil perfumery was imported from abroad about 17,000 million baht. Besides perfume oils were more imported annually during 2001-2005 while essential oils were less [1]. Most flavors and fragrances are now produced via chemical synthesis or extraction. The consumer prefers natural flavors and fragrances to the synthetics and the demand of natural products has been increased. This demand has pushed attempts to produce them by the new process. The possible productions were biotechnological process using microorganisms, plant cells or isolated enzymes. The biotechnological processes, i.e. biotransformation or bioconversion and fermentation or *de novo* synthesis, can be used a new way to convert aroma precursors or intermediates into the natural flavors and fragrances [2].

The one product from fermentation is bio-fermented products (BFP). EM-X® that derived from ferment of unpolished rice, papaya and sea weeds with effective microorganisms is widely available in South East Asia as a prophylactic beverage in the treatment of cancer, hypotension, diabetes, rheumatism, various allergies and

chemical substance hyper sensitivity, HIV/AIDS, tuberculosis, and other infectious diseases [3]. They are presently being used with significant agricultural and environmental success in many countries worldwide to increase crop production, decrease the bulk and odor of sewage and reduce dioxin contents [4]. In addition the nuclear magnetic resonance of them can neutralizes the radiation in soil for example some Russian researches in case of Chernobyl radiation disaster [5].

In Thailand, BFP have been used for at least 9 years at Asoke communities and the others. These well known products that derived from ferment of plants, fruits or their wastes, brown sugar and water with or without using probiotic microorganisms can be used to replace chemical fertilizers, pesticides, herbicides, chemical hormones, household cleaning products and sewage disposal. Now, BFP are popular with the belief of disease prevention as an anti-aging neutraceuticals. Thus BFP in combination with the extracts from medicinal plant, i.e. *Morinda citrifolia* Linn and *Houttuynia cordata* Thunb, are utilized as beverages, food supplements and medicinal cosmetics. The recent years, some scientific data on safety evaluation and their properties have just been evaluated from many researches of BFP to reveal a safety aspect of them for consumption, household cleaning products and medicinal cosmetics [6-12].

Due to intense sour smell of these products in beverages, food supplements and medicinal cosmetics which were not satisfied by consumer, so perfume oils and fragrances will be added into these health products. Perfume oils and fragrances are different from essential oils because they lack the components that occur in the essential oils [13]. Perfume oils and fragrances contain unnatural chemicals and do not provide the therapeutic benefits of essential oils [14]. Fortunately, there is the enrichment of a diversity of odorous plants and beneficial microorganisms in Thailand, the fermentation of odorous plants with appropriate bio-fermented products may be used easily to directly increased aroma in BFP instead of perfume and no needs to add inoculated microorganisms as starter of fermentation. It is also an alternative production of essential oil from the huge waste of odorous plants, due to benefits of BFP properties: preservation property and development of a diversity of

flavors and aromas of fermentation. The quality of fermented essential oil depends on many factors such as the reactions during fermentation, the fermentation process, raw materials, the extraction and time. However there are no scientific data on physicochemical properties and chemical components to insist that the quality of fermented essential oil is still suitable for uses.

In order to solve these problems, it is necessary to study to obtain the scientific data, information and fact that how the essential oils change during fermentation with bio-fermented products, which indicate the quality and safety of essential oil in bio-fermented products for health products and the new essential oil production. Distilled lime oil is popular used in beverage flavorings and perfume industry that USA imports it in the 3rd order under orange peel oil and lemon oil [15]. This research uses pressed peel of lime called Manao Namhom (*Citrus aurantifolia* Swingle), the various ten-ton wastes from lime drinking industry in Chiang Mai, to investigate for increasing evaluation of these huge wastes. The aim of this research is to study physical properties and chemical components of distilled lime oil in BFP after fermentation analyzing by TLC, GC and GC/MS comparing with distilled lime oil from pressed peel of lime before fermentation.

Objectives

1. To study the physicochemical properties of lime oil in bio-fermented products after fermentation comparing with lime oil from pressed peel of lime before fermentation.
2. Investigation of chemical components of lime oil that changed during fermentation with bio-fermented products.