CHAPTER V

DISCUSSION

Testing and evaluation of the chemical composition and antimicrobial activity of essential oil is difficult because of their volatility, their water solubility, and their complexity (Jansen, Scheffer and Baerheim-Svendsen, 1987).

The leaves of *Cinnamomum camphora* was gathered at two locations, Bangkok (Middle parts of Thailand) and Rayong (Eastern part of Thailand). Both of them had the same major constituents in comparable quantities, as shown in Table 23, they were camphor, limonene and α-pinene. This was in agreement with the result previously reported (Pe'lissier *et al*, 1995).

Oil yields obtained from the leaves and the stem bark of *Cinnamomum porrectum* were different, 0.5% and 0.1%, respectively. It was evident that both of them contained sesquiterpene and phenylpropanoid. Interestingly, monoterpene was found only in leaf, whereas oxygenated sesquiterpene and aliphatic alcohol (dodecanal) were found only in bark oil. The amounts of safrole, the major components in both oil, were very high (leaves, 97.3% ; stem bark 96.85%). This major component was in agreement with that previously reported (Dung *et al*., 1995). Safrole was an important raw material in the synthesis of heliotropin. In addition to sassafras oils (Lauraceae) (Grieve and Leyel,1975), *C. porrectum* oil might be another source of safrole in commercial. Many species from which safrole could be obtained were members of the Lauraceae family (Lawrence, 1992).

Previous studies reported two types of *L. cubeba* leaf oil linalool type and cineol type (Nath *et al*, 1996). However, there was no report on the occurrence of sabinene as the major component.

The oil obtained from leaves and stem bark *of Litsea petiolata* were 2.1% and 0.17%, respectively. Each oil was found to be pale yellow to almost colorless, the occurrence of cinnamaldehyde and *(Z)*-isosafrole in the leaf oil up to 57.7 % and 35.36%, respectively, whereas these compounds were absent in the stem bark oil.

When comparing the chemical constituents in essential oils from three species of *Litsea*, it was found that the major component was present specifically in individual species. They were sabinene in *L. cubeba*, *(E)*-β-ocimene in *L. glutinosa*, *(E)*-cinnamaldehyde and *2*-methyl-undecanal in *L. petiolata*. These major components might potentially be used as the marker for identification of these individuals.

Nine unidentified speices were investigated from three provinces of Thailand (Rayong, Khon-Kaen, Bangkok). The leaf oil yield of some *Cinnamomum* sp. were around 0.08-3.0% (v/w).

Laurus nobilis (True bay), an evergreen shrub from western country, was cultivated from the northern parts of Thailand. It was found that *1,8*-cineole (45.48%), *3*-thujyl acetate (12.58%), methyl eugenol (8.44%) and sabinene (7.39%) were the major component. The presence of cineole (30-50%) and eugenol as the major component were in agreement with the results from an earlier study (Guenther, 1972). True bay oil could be a useful natural resource of methyl eugenol. It showed a significant anti-inflammatory effect and moderate analgesic action (Moretti, Peana and Satta, 1997).

In screening for antimicrobial activity, the agar diffusion techinque was used in order to determine antimicrobial activity of essential oil, the diameter of clear zone more than 6 mm indicated the inhibition activity. As shown in Table 22, all sample had no activities against *P. aeruginosa* and *M. gypseum*. The antimicrobial effectiveness of a compound is often described in term of its minimum inhibitory concentration (MIC). Results in Table 22 showed that there was no direct correlation between the inhibition zone diameter and the MIC. This might be resulted from the difference in physical properties of oil such as solubility and partition coefficient which affected the inhibition zone diameter.

The differences in antimicrobial activities, as shown in Table 22, of the essential oils hydrodistilled from plants grown in different locations (*C. camphora* grown in Bangkok and Rayong) and from different parts of plant (leaves and bark of *L. petiolata*) implied that location and part of plant were the important factors. This suggested that not only the major constituents but also the minor constituents might account for the antimicrobial activities of essential oils. Essential oils of *Cinnamomum* sp1-9 had broader spectrum of activity than those of identified species. These might be resulted from the activities of cineol (Ross et al,1980 ; Muller-Riebau, Berger and Yegen, 1995 ; Carta, Moretti and Peana, 1996), linalool (Morris, Khettry and Seitz, 1979 ; Ross et al, 1980 ; Muller-Riebau, Berger and Yegen, 1995 ; Carson and Riley, 1995), camphor (Muller-Riebau, Berger and Yegen, 1995 ; Carta, Moretti and Peana, 1996), thymal, carvacol (Muller-Riebau, Berger and Yegen, 1995 ; Adams, Kunz and Weidenborner, 1996 ; Sophon *et al*, 2540) terpin-4-ol (Carson and Riley, 1995), cinnamaldehyde (Sophon *et al*, 2540), eugenol (Morris, Khettry and Seitz ,1970 ; Adams, Kunz and Weidenborner, 1996) and *n*-dodecanal (Janssen *et al*, 1985). These compounds had been previously reported as having antimicrobial activities.

C. porrectum leaf oil showed antifungal activity (*C. albicans*), it might be the effect of its major constituent (97%), isosaffrole. However, there was no report on antifungal activity of isosaffrole. It was used in combination with guaiacum or saraparilla for chronic rheumatism, syphilis and skin disease (Grieve, 1975). To conform its effect on *C. albicans*, isosaffrole should be tested.

Litsea cubeba leaf oil showed antibacterial effect against gram-positive bacteria (*S. aureus*) but it had no activity against gram-negative bacteria, yeast and mold. The effect on gram-positive bacteria agreed with previous report (Gogoi *et al.*, 1997) but its effect on fungal pathogen was different.

Essential oil from fruit of *L. glutinosa* and stem bark of *L. petiolata* showed effect on *C. albicans*. This is the first report on their antimicrobial activity. Leaf oil of *L. petiolata* had no antimicrobial activity despite the presence of cinnamaldehyde,

its major component, which was previously reported on antimicrobial activity (Kurita and Koike, 1983). The reason underlying the negative result of this oil might be that some constituents in the oil might interfere each other such as antagonistic effect. However, the precise antimicrobial mechanisms of individual essential oil components have not yet been fully elucidated on the molecular basis.