CHAPTER 4
DISCUSSION

4.1 Wine Sensory Tasting

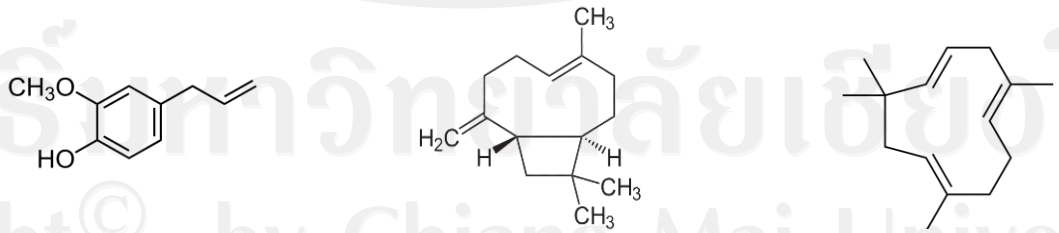
Six types of 120 days-aged wine using 6 types of different wood chips, Luna nut wood (*Lepisanthes fruticosa* Leenh.), Longan wood (*Dimocarpus longan* Lour.), Black poum wood (*Cleistocalyx nervosum* var. paniala), Neem wood (*Azadirachta indica*), Drumstick wood (*Moringa oleifera* Lam.) and Oak wood (*Quercus sp*.) were prepared and evaluated for satisfactory by 50 trained volunteers. The evaluation table form (Pradit, 2002) was used for the satisfactory evaluation. Every bottles of wine samples were labeled in random number for the purpose of unconcealed in type of each wine. Tasting method was done by setting with tasting cup followed by all of wine bottle. The methodology indtroduction of the sensory tasting condition were explained such as how to evaluate the clarity of winesample that must be clear and no precipitate matter. Especially, the sour (acidity) taste of wine and acetic acid flavor should be understood. One of the problems observed is that some of the volunteers could not identify the difference between the sour taste of acetic acid and general sour taste of wine. Normally, the acidity taste of good quality wine should be of a proper quality. High levels of acidity lead to the sour taste of acetic acid in that wine. Acetic acid in wine not only gives high acidity in wine but it gives a pungent flavor in wine at the same time. Wine with high acidity due to acetic acid is a fault wine called “oxidation wine” Therefore, to correctly describe the test, the volunteers should previously test commercial wine to understand about the real sour taste. In case of texture testing of aged wine, the concentration of substances that makes the volunteers feel among wine sample in their mouth. These substance are, for example alcohol, sugar, etc. In the low texture wine, the volunteers can get the same feeling as they drink a pure whisky or brandy. On the other hand, the wine of high texture seems to make the volunteers feel like drinking a non pectin fruit juice. For this reason, in the texture tasting, the texture of fruit juice compared to the diluted whisky was recommended.

Table 3.1 showed that the Longan wood aged wine had the highest score of 18.5, and followed by Drumstick wood (17.73). Both wines present score close to wine aged with Oak wood of 17.63. According to the analysis by SPSS computer application program, the pair t-test

showed significantly difference between both Longan wood aged wine and Oak wood aged wine and Drumstick wood aged wine. For the acceptance by sensory evaluation, Longan wood aged wine gave the most acceptance value. The roasted Longan wood has burnt odor and a trace amount of fragrance aroma that may support the acceptance, there is burnt odor than stronger Longan wood. In conclusion, Longan wood aged wine is the most acceptable product.

4.2 Volatile compounds analysis

SPME (Solid phase micro extraction) method is a technique that is able to analyze volatile compounds, in a space above the solution. The compounds are absorbed by a solid sorbent. In this work, after absorption volatile compounds were extracted by heating and separated by gas chromatographic techniques, mass spectrophotometer was used for the identification. Eugenol, β-caryophyllene and humelene were found in Longan wood aged wine. Normally, eugenol is the substance that could be found in wine and can be released as wood composition during wine aging. Eugenol gives pleasant clove flavor. β-caryophyllene and α-humulene usually found in hop oil and they are important substances in beer. Eugenol, β-carophyllene and α-humulene all together can be found in clove oil as well. In Luna nut wood aged wine, eugenol and α-humulene were also found. β-caryophyllene and α-humulene can be obtained from wood during wine aging. The metabolite pathway of β-caryophyllene and α-humulene formation relate to lipid metabolism in plants. Mevalonic acid is one of the product from lipid metabolism that could lead to the change to fanesyl pyrophosphate (sesquiterpene metabolism) followed by formation of α-humulene and β-caryophyllene (Plant Metabolic Network(a)(b)(c), n.d.).



(a) (b) (c)

Figure 4.1 Structure of (a)eugenol , (b)β-caryophylleneand (e)α-humulene

The presence of β-caryophyllene and α-humulene in Longan wood aged wine may due to the extraction by ethanol, acid or water present in wine sample. This can give a wood flavor as in beer. Other aroma leads to the acceptance with highest sensory score.

Fresh wine was also analyzed, only alcohol and esters compounds were found in fresh wine for example, ethanol, 2- methyl propanol, 2-methyl butanol, 2-methyl ethyl propanoate, ethyl acetate, 2 – methyl ethyl butanoate, ethyl hexanoate, ethyl-2,4-hexadienoate, benzene ethanol (rose flavor) and ethyl ocatonate (orange flavor). After aging, some of these compounds were not detected, which may due to their decomposition between aging. Ethyl acetate was found in all of wine types, this compound may generate between aging by esterification of ethanol and acetic acid. Ethyl octanoate, the orange flavor only found in Drumstick wood aging wine and cannot be found in other wine samples.

Other aroma compounds, including ethanol, were found in all wine samples. Ethanol is a common product, generated in yeast fermentation. While ethyl acetate, an ester of ethanol and acetic acid, could be found in fault wine (oxidation wine). These compounds known to be responsible for nail polish remover, glue or vanish aroma. None of the volunteers could detect ethyl acetate in aging wine. This may due to the concentration of this substance does not reach the threshold of perception or the odor may change due to mixing with complex. The threshold of perception for ethyl acetate was reported to be 150 - 200 ppb (Wikipedia : Ethyl acetate, 2012).

In this research, the wine aging has been proceeded for only 120 days. Hower, in general, the commercial red wines would be aged for at least 1 year. There fore, some compounds may not be found, especially, lactone, a major compound form oak wood which may be found if aging time has been expanded.

4.3 Antioxidant activity of wine samples

DPPH is a stable radical in methanol solvent, giving solution in purple colour. The concentration of DPPH could be monitored by measuring absorbance at the wavelengths of 515-517 nm. Aged wine sample with various dilutions concentrations (0.5,1 , 3, ,5 7 and 9% v/v respectively) were tested by using DPPH reagent and the percentages of absorbance, at 517 nm, were decreased. The ploting of concentration (%v/v) of sample and percentages of absorbance

decrease were created. The concentration at the decrease of 50% absorbance was identified as IC_{50}.

Table 3.11, the best antioxidant activity was found in Longan wood aged wine sample. The important chemical compositions were β-caryophyllene and α-humulene as shown in the result of analysis by SPME-GC-MS method. The result seems to be corresponding to Rodrigo, *et. al.* (2012) who showed a β-caryophyllene was the main antioxidant compound. Wine samples which were used in this research were obtain from Mae Chan Winery. The same varity of grape were used and was in the same harvesting period. Therefore, the difference of antioxidant activity of each wine samples must be related to the types of used wood chips. The study of Jaromir, *et.al*. (2009) showed the correlation between the increasing amount of polyphenolic compounds to the time of aging. The study of Calleja, *et.al*. (2012) also showed also the high anti-oxidation activity of β-caryophyllene. In conclusion, the β-caryophyllene found in Longan wood aged wine may be responsible for the highest antioxidant activity.