

CHAPTER V

DISCUSSION

Among various kinds of spices, pepper is the one which is in great demand of people around the world. Marketing of pepper around the world each year is approximately 25-33% compared to the marketing of other spice demanding of pepper from the world marketing is approximately 120,000 tons per year and having the tendency to increase 1.7% each year.

However, in the past 5 years the production and exportation of pepper around the world is increased in higher level, which come up to 2.5-2.7% each year. Therefore, the cost of pepper in the world market decreased rapidly. According to this situation; farmers who grew pepper for their career fell into trouble. In order to compensate, the government had to subsidize the farmer, and giving the idea of decreasing an area of growing pepper including the way to reduce the foundation of pepper. The other way to compensate is to change the natural pepper especially the black pepper into "oleoresin" by the process of extraction.

Comparison between the graph of changing in the selling price of black pepper and white pepper and the graph of the selling price of oleoresin during 1987-1992. (Figure 25 and 26) It was found that the cost of pepper in the world market was falling down rapidly while there was small changing in the cost of oleoresin. For example, in the year 1993 oleoresin costed 520 Baht per kilograms while black pepper costed 25 Baht per kilograms. From these point of view; the oleoresin is going to be an important material in the world market. Thailand can produce black pepper approximately 9,000 tons per year. If the

black pepper can be changed into oleoresin, and export will be a great help to farmers.

The purpose of this study is to develop the preparation of oleoresin from Thai black pepper. The extracted oleoresin should have the same quantity as pepper. By doing this it will be easy to keep, to transfer and to export oleoresin into the world market. Resulting in improve the way of living of farmers as well.

1. Study on the effect of some organic solvents on oleoresin preparation.

The 3 organic solvents : acetone, hexane and methylene chloride were used to extract oleoresin from black pepper for maceration. The residual product was removed by the process of filtration. The solution underwent evaporation under vacuum, resulting in oleoresin. Weigh the prepared oleoresin and evaluate the amount of volatile oil and piperine indicated the extraction efficiency of the solvent.

The quality of extracted oleoresin was evaluated. The evaluation had to be done in both : the amount and the type of volatile oil at the same time had to be evaluated in every step. The method of the study was performed under distillation. Under this condition; steam distillation could separate volatile oil from oleoresin. Finally, vapour of volatile oil was condensed into volatile oil. The volume of the volatile oil will indicate the amount of volatile oil which consist in oleoresin. By using GC, the composition of the volatile oil was differentiated.

Avr. price (Baht/kg)

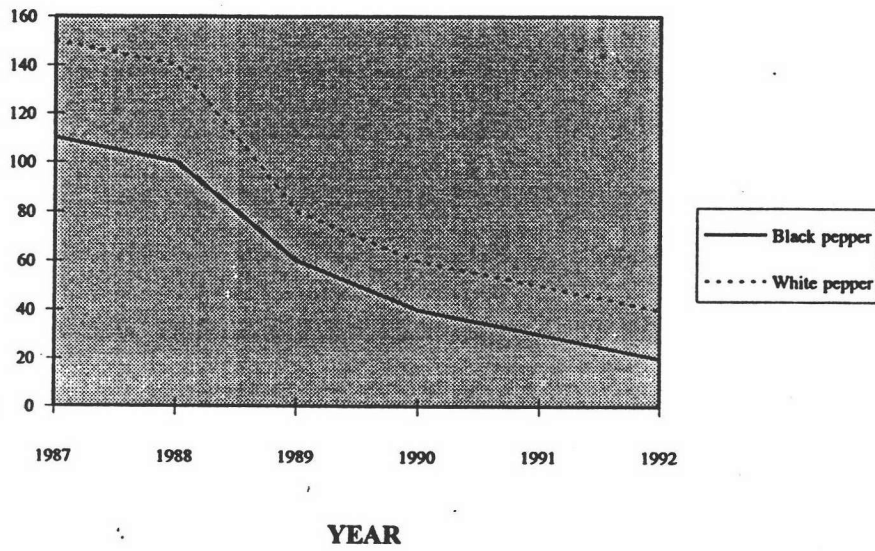


Figure 25 Average price of black and white pepper at Chantaburi

Avr. price (Baht/kg)

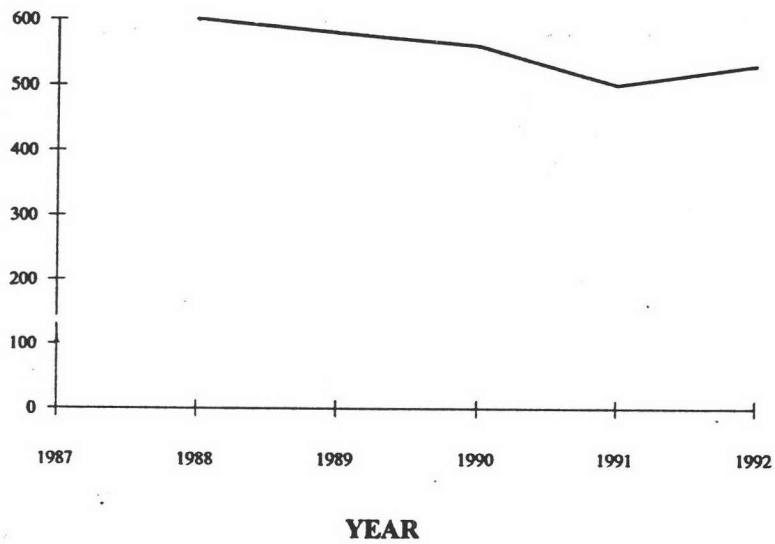


Figure 26 Average price of oleoresin imported in USA.

From the amount and the composition of volatile oil in oleoresin will lead to the conclusion about the smelling effect of the extracted oleoresin in comparison with the amount and type of pepper oil in black pepper.

The same as volatile oil, piperine in oleoresin is the one which having pungency taste is another material needed to be differentiated. The amount of piperine in oleoresin can be evaluated by using UV-spectrometer. The result of the study was shown in Table 5. It was found that acetone is the best organic solvent. It can provide the results which included the weight of oleoresin, composition and content of volatile oil higher than hexane and methylene chloride.

Table 14 The cost of various organic solvents were shown.

Solvent	Price (Baht/12 litres)
Methylene chloride	850
Acetone	650
Hexane	500

From Table 14; the most expensive solvent is methylene chloride and the cheapest one is hexane. Even acetone is not the cheapest one, but it can provide the best result in comparing with the other 2 organic solvents. Therefore, it may concluded that, acetone is the suitable organic solvent for oleoresin preparation.

2. Study on the effect of different grades of pepper on the quality and quantity of oleoresin.

In this experiment, black pepper was used. Normally, Thai black pepper are divided into 4 grades :- A,B,C and D by means of weight. Grade A is the most expensive while grade D is the cheapest one. Because black pepper grade C and D are cheaper than grade A and B. It will be good advantage to use black pepper grade C and D in producing oleoresin to the market.

At present, there have no paper mentions about the amount of volatile oil which can be extracted from each grade of black pepper. Therefore, the purpose of experiment in this section is to evaluate the amount of volatile oil extracted from different grade of black pepper. In the experiment, acetone was used as an organic solvent for black pepper grade A,B,C and D. The results were shown Table6. Study on the weight of oleoresin, content and composition of volatile oil and piperine content. Black pepper grade A,B and C give nearly the same result, which black pepper grade D, give the highest result. When the cost of different grades of black pepper was evaluated. Grade D black pepper appears to be the cheapest one (Table 17)

Table 17 The cost of various grades of black pepper.

Grade	Price (Baht/kg)
A	60
B	50
C	40
D	15

Therefore, black pepper grade D should be used be for oleoresin preparation.

3. Optimization of the maceration time.

Maceration time is another factor that need to be considered. The study was performed by using acetone as an organic solvent of grade D black pepper under different time interval, that is 6,12,24 and 48 hours. The aim of this study is to maximize the quality of oleoresin and minimize the cost of production. Experimental method is the same as in 1. The results of the study was shown in table 7. The weight of oleoresin, volatile oil and piperine content from each maceration time were evaluated. It was found that the optimum maceration time was 48 hours.

4. Study on a step-wise maceration of black pepper for oleoresin extractions.

Series of experiments were performed, in order to find out the suitable organic solvent, grade of black pepper and maceration time for oleoresin preparation. Acetone was found to be the best solvent among the others. Black pepper grade D is less expensive than grade A, B and C but it gave oleoresin almost the same amount as the others. In order to extract oleoresin in great amount but having low expense. The experiment was set in 2 different methods as mentioned before. The results shown in Tables 9 and 10 (for Method 1) and Tables 12 and 13 (for Method 2) suggested that both methods gave good yield of oleoresin from the extraction of black pepper. The quality of the obtained oleoresin also met the standard specification of good-quality oleoresin. However, the process of Method 2 should be the process of choice for large-scale preparation of pepper oleoresin.

5. Study on residual solvent present in the prepared oleoresin.

Generally, after oleoresin preparation there were residual solvent left. The amount of the residual in oleoresin is an index showing the quality of oleoresin. The residual organic solvent in oleoresin can be determined by GC. The specification of oleoresin give the limitation of the residual solvent in black pepper oleoresin to be less than 30 ppm. From the study, the average amount of residual acetone in black pepper oleoresin is 29.33 ± 0.46 ppm. The value is well accepted.