

# CHEMICAL AND PHYSICAL PROPERTIES OF SEPANG (*Caesalpinia sappan L.*) INSTANT DRINK: REVIEW OF PROPORTION OF WHITE EGGS, MALTODEXTRIN, FEASIBILITY OF THEIR BUSINESS

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## Abstract

Sepang drink made of sepang wood, lemon grass leaf, cloves, ginger and sugar. This Beverages included in the category of soft drinks which can be used to cure coughs, dysentery and stomach pain. The purpose of research is to assess the effect of egg white and maltodextrin on the chemical and physical properties of instant drink (*Caesalpinia sappan L.*), and determine the feasibility of making a sepang of instant beverages. This study used a completely randomized design factorial  $2 \times 3$  with three replications. Parameter observations carried out on the chemical nature of instant sepang include: moisture and ash content and a sepang of instant physical properties include: pH, solubility and viscosity; and financial feasibility. The results showed that the water content and low ash content achieved in the interaction of egg white treatment 7.5% and maltodextrin 15%, respectively 2.947% and 1.036%. Treatment concentrations of egg white does not give a real effect on the pH and viscosity instant sepang, but significant effect on the solubility of instant sepang with the highest solubility of 85.45% on 2.5% egg white treatment. Maltodextrin significant effect on pH, solubility, viscosity instant cup with a pH of 7.79, solubility 86.90%, and viscosity 1.046 cP at 15% maltodextrin treatments. Analysis of a sepang instant beverage business has a value of 296.43 Kg BEP or USD 8,172,509.89; PP 2.92 or 2 years 9 months; ROI 33.30%; NPV USD 60,809,276.62; and PI 1.2 thus the business of making a sepang instant beverages is feasible.

**Keywords:** chemical-physical properties, feasibility, sepang instant drink

BEP: Break Even Point

PP: Payback Periode

ROI: Return On Investment

NPV: Net Present Value

PI: Profitability Index

DMRT: Duncan's Multiple Range Test

## 1. Introduction

Beverage "sepang" is one of Indonesian traditional herbal medicine derived from Java. Sepang drink made from the leaves of lemon grass, cloves, ginger, wooden sepang, and sugar. The manufacturing process is simple, that is to boil the fifth ingredient with a specific composition in hot water. This herbal medicine including soft drinks that can be used to cure coughs, dysentery, abdominal pain, and menstrual noncurrent [10].

Indonesia is a country rich in spices and herbs have long been utilizing herbs as a traditional herb that is beneficial for the health of the body, due to the anti-oxidative properties of spices are needed to protect the body from various diseases. Traditional ingredients are generally shaped drinks, and is known as an herb that is a concoc-

tion of different types of spices. Traditional herbal medicine is part of the nation's wealth to be preserved, so that in time will become an alternative medicine that can be recognized medical usefulness [11]. Today the tendency for people to consume traditional medicine is increasing, as more safe, has no side effects, and affordable prices.

Direct consumption as a beverage sepang soft drinks have constraints on a relatively short shelf life, besides that not everyone likes this nutritious herbal drinks because of the proverb that states that "herbal medicine tastes bitter", therefore we need a breakthrough in its presentation to be liked many people. Made in the form of fast powder (Instant) is a good alternative to providing a healthful beverage and practical.

Various studies have been conducted on the benefits of the wooden sepang, empirically used as cure wounds, productive cough, dysentery, dirty blood, antidote, syphilis, stop bleeding, disinfectants, anti-diarrheal, to stop the bleeding that is the role of tannin and gallic acid. Tannin is as an anti-bacterial and astringent or astringent intestinal wall damaged by acid / bacteria. Levels tannin of

wooden sepang extracts obtained by boiling for 20 minutes was 0.137% [12].

There are three ways to make instant powder products, namely adding additives such as emulsifiers, mechanical treatment of agglomeration, and the combination of the two. A third way requires drying [6]. A common problem in the manufacture of instant powder is the damage caused by the drying process which generally requires a high heating temperature (over 60°C) such as missing or damaged components as well as the deposition of flavor when the powder is dissolved in water, so as to anticipate the need to look for methods of drying the good and the use of filler material that serves to coat the components due to the drying process.

One method of drying is used to make instant powder is foam-mat drying method. [7] suggested that the method of drying foam-mat drying is a drying method that is sufficient to provide advantages, such as the removal of water more quickly, allowing the use of lower temperature, the resulting product has the quality, color, and taste good as well as easier soluble in water.

The egg white has a price relatively cheaper and easier to obtain. Research by [6] in the manufacture of turmeric sinom instant drink use egg whites as much as 2.5% as a foam-forming material, is able to produce a product with a solubility of 99.94%. While fillers can be added to give a high yield is maltodextrin, have the nature of water-soluble and has a relatively low viscosity compared to starch, has a spiral helix structure that reduces loss of volatile components during processing [3].

In addition to making a sepang of instant powder with foam-mat drying method used simpler equipment, thereby saving time and operational costs, drying by this method have the investment costs are much lower. With this background, the research titled "Physical and Chemical Properties Sepang Instant Beverages: Overview proportion Egg White and Maltodextrin and Feasibility of Their Business" need to be implemented to get a sepang of instant products to the chemical and physical properties that suit the tastes of consumers and determine the feasibility of their business.

## 2. Objectives

Assessing the impact of egg whites and maltodextrin on the physical and chemical properties in the manufacture of sepang instant drink, and to assess the feasibility of making of sepang instant beverages.

## 3. Methods

### 3.1. Making Sepang Instant Beverage:

To Made of sepang instant beverages in research conducted in the following manner :

Ginger peeled in order to obtain a clean, washed, crushed with the help of a blender with the addition of water = 1: 5 so that the resulting ground ginger. Filtered and the obtained liquid ginger, and allowed to stand for a while to separate the precipitate to obtain a clean ginger liquid without precipitate.

Liquid without precipitate ginger cooked with lemon grass leaves, cloves, and a cup of wood that has been washed clean. The result is then filtered to obtain a cup of liquid, and then allowed to cool.

Egg whites 7.5% v/v and maltodextrin 15% w/v is added in sepang of liquid that has been chilled, then whipped with a mixer for 10 minutes until foam is formed.

Foam poured over pan that has been coated with plastic and then dried in a cabinet dryer (cabinet drier) or oven at a temperature of 60°C for 8 hours.

Once dry mixed with sugar with a ratio of 1:1 and then smoothed by Blender, sieved with a 100 mesh sieve to obtain uniform powder instant sepang size, then packed in dark bottles.

### 3.2. Design of Experiments :

The experimental design used in this study was a Completely Randomized Factorial Design, 2 x 3 with three replications. The factors of treatment in this study were: Factor A: The proportion of egg whites, namely A<sub>1</sub> = 2.5%, A<sub>2</sub> = 5.0% and A<sub>3</sub> = 7.5%. Factor B: The proportion of maltodextrin, namely B<sub>1</sub> = 5%, B<sub>2</sub> = 10% and B<sub>3</sub> = 15%. Thereby obtained experimental unit is 3 x 3 x 3 = 27 units.

### 3.3. Laboratory Analysis:

#### Chemical Analysis :

Chemical analysis were carried out by analysis of water content (gravimetric method), ash (furnace method).

#### Physics Analysis :

Analysis of physical properties include: solubility, pH, and viscosity.

#### Determining the Best Alternative :

Determining the best alternative is determined based on the results of laboratory analysis that includes analytical chemistry and physics [8].

#### Technical Data Analysis:

Data obtained on the physico-chemical analysis were calculated statistically by ANOVA and if there are significant differences between treat-

ments followed by Duncan's Multiple Range Test [5].

### Feasibility Analysis

The basic method of this research is descriptive analytical, the data is collected, analyzed, and then interpreted, to obtain an overall picture of the object under study. Research was carried out by using survey techniques, namely the data collected by observation and inquiry critical to get clear information about a certain problem by interview and questionnaire measuring instrument [9].

The data collected is fixed cost and variable costs of the business of making a sepang instant beverages. Fixed costs include the cost of the use of tools: pan, mixer, oven, sieve, mortar-hammer, stove, baking pan. Variable costs include: the cost of raw materials (wooden sepang, ginger, lemon grass, clove and sugar), and additives (egg white and dextrin), labor, and operating costs.

Data analysis tool that is used to determine the feasibility of making a sepang instant beverages, by [2,4] are as follows:

#### 3.4. Analysis Break Even Point (BEP)

BEP or break even point occurs when the amount of revenue the company equal to the cost of the company. Determining the break-even can be done by the following equation:  

$$TR = TFC + TVC$$

$$P \cdot X = TFC + TVC \cdot X$$

$$(P-TVC)X = TFC$$

$$X = \frac{TFC}{P - TVC}$$

$$BEP(X) = \frac{TFC}{P - TVC} \quad (1)$$

#### Return on Investment method (ROI)

This method is also called Accounting Rate of Return (ARR) or Profitability. This method measures the magnitude of the rate of profit from the investment are used to obtain these benefits. Results of ROI or ARR is a relative number (percentage) is calculated using the following formula:

$$ROI = \frac{\text{net profit} - \text{depreciation} + \text{interest}}{\text{capital investment}} \times 100\% \quad (2)$$

The larger value of the ROI is better, as it shows the greater amount of return on invested capital. Criteria for the assessment is a proposed investment is considered feasible, if the rate of the ROI is greater than the cost of investment / capital employed or the interest rate that the bank

required, then the investment is feasible and vice versa.

#### Payback Period (PP)

The payback period (PP) is the period required to cover expenses of an investment return or calculating the length of time needed to cover the capital invested. Calculate the payback period can be expressed by the following formula:

$$PP = \frac{\text{capital investment}}{\text{net profit} + \text{depreciation} + \text{interest}} \times 1 \text{ year} \quad (3)$$

Assessment criteria for a proposed investment is acceptable if the present value of cash inflows is greater value than the present value of cash outflows. In other words, the investment is considered feasible to be implemented, if the present value of net cash flow positive (PP > 0) and vice versa.

#### The Net Present Value (NPV)

NPV method already accommodate the time value of money in an investment. The NPV method is a method for finding the difference between the present value of net cash (net) to the present value of an investment. Calculation of NPV can be expressed by the following formula:

$$NPV = \sum_{t=1}^{t=n} \frac{At}{(1+0)^t} - I_0 \quad (4)$$

Assessment criteria is an investment proposal is accepted if the present value of cash inflows is greater than the present value outflows. In other words, the investment is considered feasible to be implemented, if the present value of net cash flow positive (NPV > 0) and vice versa.

#### Method Profitability Index (PI)

PI method or Benefit Cost Ratio (B / C Ratio) is a method that has the same result of the decision by the NPV method means that if an investment is received by using the NPV will be accepted anyway if calculated using this PI. Formula PI method is as follows:

$$PI = \frac{\text{Total PV of Cash Inflow}}{\text{Capital Investment}} \quad (5)$$

Decision whether a proposed investment would be acceptable (feasible) compared with the number 1. If P I > 1 then the investment plan is accepted, whereas if P I < 1 then not worthy of the investment plan is not accepted or rejected.

## RESULTS AND DISCUSSION

Instant Sepang is one of the processed products with the main ingredient of sepang and ginger, in powder form which is easily soluble in water.



Figure 1. Products of Sepang Instant

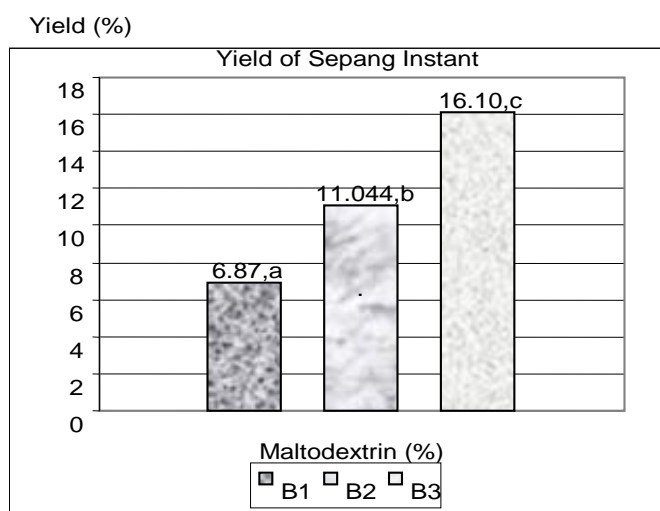


Figure 2. Effect of Maltodextrin Concentration on Yield of Sepang Instant.

(Description: if notation of letters behind the numbers are different, the treatment showed significantly different effect).

The results of further analysis in the form of DMRT can be seen in Figure 2. In figure 2 it is shown that the concentration of 15% maltodextrin gave the highest yield, ie 16.10%. From Figure 2 it appears that with the increasing concentration of maltodextrin is added will cause an increase in the yield of sepang instant powder. This is due to the high maltodextrin konsesentrasi will lead to higher total solid the yield obtained was also great.

### 4.1. Chemical Properties

This analysis was conducted to determine the chemical nature of sepang instant powder arrives include moisture content and ash content.

### Moisture

The moisture content is the amount of water retained in the material. The results of further analysis in the form of DMRT can be seen in Figure 3.

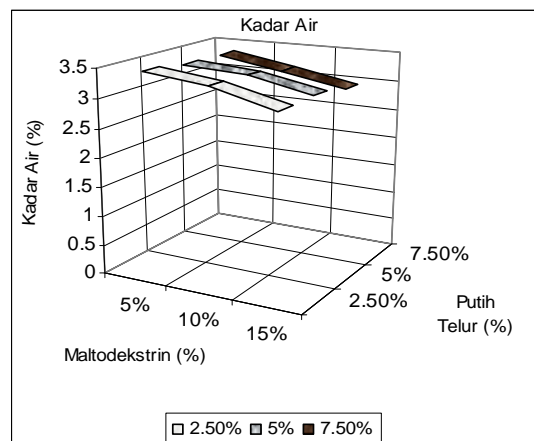


Figure 3. Interaction Effect of Egg White and Maltodextrin Concentration on the Rate of Water Sepang Instant (Description: if notation of letters behind the numbers are different, the treatment showed significantly different effect)

Figure 3 shows that both at a concentration of 2.5% egg white that interact with maltodextrin at concentrations of 5%, 10%, 15%; concentration of 5% egg white that interact with maltodextrin at concentrations of 5%, 10%, 15% and 7.5% concentrations of egg white that interact with maltodextrin at concentrations of 5%, 10%, 15% occurred tendency sepang instant moisture reduction, decreased levels of the water is flat.

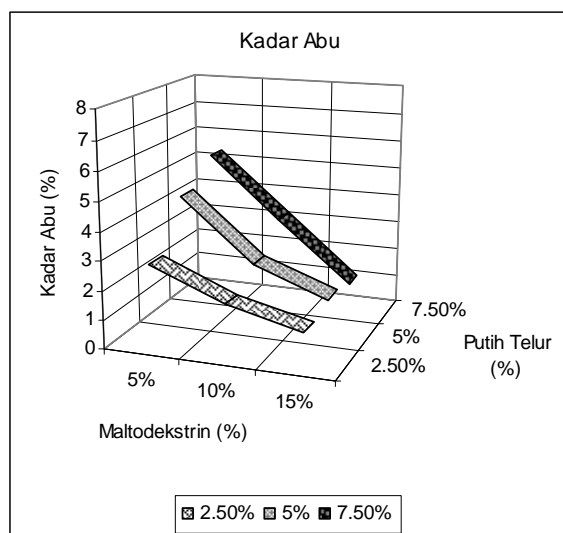
It can happen because by the time the egg whites to interact with maltodextrin are both not lose its functional properties that are capable of binding water molecules around it. Egg whites are a good source of protein capable of binding with the surrounding water molecules in a reactive group, while the maltodextrin binding water molecules around the hydroxyl group through hydrogen bonding with the hydroxyl group of other fellow monomers.

### Ash levels

Ash is the number of gray levels that reflect the existence of residual inorganic substances a result of burning organic material [8]. Results of further analysis in the form of DMRT can be seen in Figure 4.

Figure 4 shows that the treatment concen-

trations instant cup egg whites 2.5% and 5% respectively interact with maltodextrin at concentrations of 5%, 10% and 15% ash content decreasing trend occurred instant sepag that looks ramps. While instant sepag at treatment concentrations of 7.5% egg white that interact with maltodextrin at concentrations of 5%, 10% and 15% ash content decreasing trend occurred instant cup that looks "sharp".



**Figure 4.** Interaction Effect of Egg White and Maltodextrin Concentration on the Rate of Ash Sepang Instant.

Description: if notation of letters behind the numbers are different, the treatment showed significantly different effect

With the increasing concentration of egg white (2.5%, 5%, and 7.5%), each of which interacts with maltodextrin concentration is increasing as well (5%, 10%, and 15%), the more molecules of substances hydrophobic which already form a system of uniformly dispersed solution with maltodextrin is bound by egg white proteins due to the hydration process that ultimately affect the solubility or the solubility of proteins in molecular substances hydrophobic. This has led to the formation of clots (coagulant). If the molecules of substances that have undergone a process of coagulation is used as the ash remaining inorganic compounds less and less activity so the lower the ash content.

#### Nature of Physics

This analysis was conducted to determine the nature of the steeping liquor produced instant sepag include pH, solubility, and viscosity.

#### pH

pH is the concentration of H<sup>+</sup> ions in the material. The results of further analysis in the form of DMRT can be seen in Figure 5.

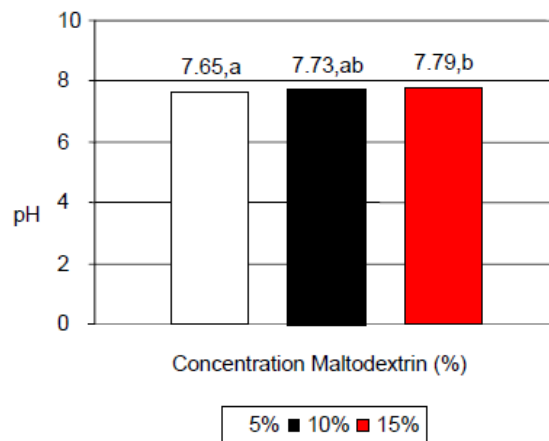


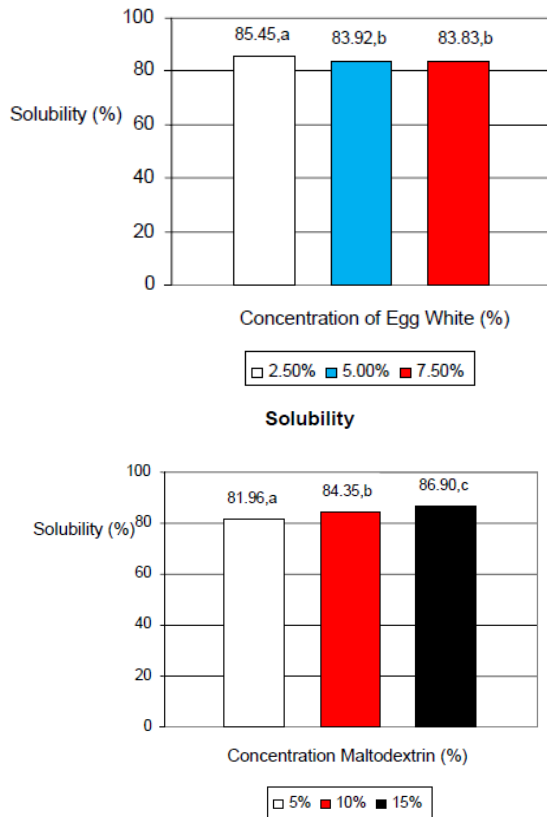
Figure 5 shows that increasing the concentration of maltodextrin is added to cause an increase in the pH of sepag instant powder. Average of sepag instant powder pH was highest in the addition of maltodextrin with a concentration of 15% was 7. Sepang instant drink is the largest component of ginger and sepag [1] mentioned that ginger (*Zingiber officinale*) contains phenolic compounds that form zingiberol, zingerol, zingeron, shagaol and vitamin C. Sepang wood (*Caesalpinia sappan L*) containing gallic acid and tannic [1]. With the addition of maltodextrin containing oligosaccharides, the sour taste in sepag instant as vitamin C in the ginger can be neutralized. While the oligosaccharides is a compound having a hydroxyl group (OH) a lot so as to neutralize the acidic properties.

#### Solubility

Solubility is the ability of dissolved solute to solvent. The results of further analysis in the form of DMRT can be seen in Figures 6 and 7.

The results of the analysis DMRT showed that increasing the concentration of egg white is added causing a decrease in solubility of sepag instant drink. In figure 6 it is shown that the average of sepag instant beverages highest solubility was achieved in addition to the concentration of egg white 2.5 by 85.45%, while the lowest solubility in the addition of egg white with a concentration of 7.5% at 83.83%. This is due to the hydration process that ultimately affect of protein solubility or solubility in water. The increase of water in the material in large quantities will cause the forma-

tion of clots, consequently it takes a long time to break the bonds between the particles so that the decreased ability of the product to dissolve.



**Figure 6.** Effect of Concentration Egg White on the Solubility of Instant Sepang

Description: if notation of letters behind the numbers are different, the treatment showed significantly different effect

Figure 7 shows that increasing the concentration of maltodextrin is added to cause an increase in the solubility of sepang instant powder. Average of sepang instant powder solubility was highest in the addition of 15% maltodextrin with a concentration of 86.80%, while the average low solubility of instant powder on maltodekstri addition of 5%, amounting to 81.96%.

2. Operational

a. Labor (day laborers)

1. Production 2 person = 2 x Rp. 30.000 = Rp. 60,000
2. Packing 1 person = 1 x Rp. 15.000 = Rp. 15,000

b. Others

1. Kerosene 4 Lt = 4 x Rp. 2500 = Rp 10,000
2. Water and Electricity = Rp. 2,000
3. Plastic 100g, 18 unit = 18 x Rp.1000.00 = Rp.18,000

Total = Rp. 105,000  
 TVC/day: Rp.914.000,-+ Rp.105.00,- = Rp. 1,019,000  
 TVC/year: 300.00 X Rp.1.019.00,- = Rp. 305,700,000

**Selling Price per Unit Instant Sepang**

1. Production cost (45 Kg instan sepang)/day= Rp. 1,023,867  
 Marketing cost = Rp. 10,000  
 Administration cost = Rp. 2,000
2. Total Cost = Rp. 1,035.867
3. Cost Per unit =  $\frac{Rp. 1.035.867}{45} = Rp. 1,035,867$
4. Profit desired 20% X Rp. 1,035,867 = Rp. 204,773.40
5. Percentage mark-up per unit =  $\frac{Rp. 204,773.40}{Rp. 1,035,867} \times 100\% = 19,768\%$
6. Mark up per unit = 19,768 % X Rp. 23,019.27 = Rp. 4,550.51
7. Selling price per unit = Rp. ( 23,019.27+4,550.51 ) = Rp. 27,569.78

**Cost and Advantages of Making Instant Sepang/Year**

1. TR/year = (45 x 300) x Rp. 27,569.78 = Rp. 372,192,030
2. TC / year = TFC + TVC = Rp. (1,460,000 + 305,700,000) = Rp. 307,160,000
3. Advantages / year = TR - TC = Rp. 65,032,030
4. R / C ratio =  $\frac{372\ 192\ 030}{307\ 160\ 000} = 1.212$

While analysis of the feasibility of making sepang instant beverage can be seen from the calculation below.

$$1. \text{BEP}(X) = \frac{TFC}{P - TVC}$$

$$= \frac{1,460,000}{27,569,78 - 22,644.44}$$

$$= \frac{1,460,000}{4,925.34}$$

$$= 296.43 \text{ Kg}$$

$$\text{BEP (Rp)} = 296.43 \times Rp. 27,569.78$$

$$= Rp. 8,172,509.89$$

2. Bank Loan = 70% of the investment = 0.70 X Rp. 307,160,000 = Rp.215,012,000

Bank interest 18% / year = 0.18 x Rp. 215,012,000  
= Rp. 38,702,160

$$ROI = \frac{\text{net profit} - \text{depreciation} + \text{interest}}{\text{capital investment}} \times 100\%$$

$$= \frac{65032030 - 1460000 + 38702.160}{65,032,030 + 1,460,000 + 38,702 + 160} \times 100\%$$

$$= 33.30\%$$

### 3. Payback Period (PP)

$$PP = \frac{\text{capital investment}}{\text{net profit} + \text{depreciation} + \text{interest}} \times 1 \text{ year}$$

$$= \frac{307,160,000}{65,032,030 + 1,460,000 + 38,702,160} \times 1 \text{ year}$$

$$= \frac{307,160,000}{105,194,190} \times 1 \text{ year}$$

$$= 2.92 \text{ or 2 years and 9 months}$$

### 4. The Net Present Value (NPV)

$$= \frac{105,194,190}{(1 + 0.18)^1} + \frac{105,194,190}{(1 + 0.18)^2} + \dots - \frac{307,160,000}{(1 + 0.18)^6}$$

$$= 105,194,190. (3.498^*) - 307,160,000$$

$$= 367,969,276.62 - 307,160,000$$

$$= \text{Rp. } 60,809,376.62$$

### 5. Profitability Index (PI)

$$PI = \frac{\text{Total PV of Cash Inflows}}{\text{Capital Investment}}$$

$$= \frac{367,969,276.62}{307,160,000}$$

$$= 1.198$$

$$= 1.2$$

\* This value can be seen in the table present value (PV) and the interest rate (i) 18% / year and a payback period of 6 years.

From these calculations show that the making of sepang instant powder has a value of BEP (Break Even Point) of 296.43 kg or Rp. 8,172,509.89; ROI (Return On Investment) of 33.30%; PP (payback period) of 2.92 or 2 years and 9 months; NPV (Net Present Value) of Rp. 60,809,276.62; and PI (Profitability Index) of 1.2. Thus the business of making sepang instant powder

is feasible.

## 5. Conclusions

1. The concentration of egg white treatment did not significantly affect on yield, pH, viscosity of sepang instant, but the real effect on the solubility of instant sepang. The highest solubility of instant sepang egg whites reached on addition of 2.5% concentration of 85.45%. While the concentration of maltodextrin treatment factors significantly affect on the yield. Treatment of egg white concentration 7.5% and 15% maltodextrin is chosen treatment. Such treatment resulted in 2.947% water content; ash content of 1.036%; pH.7.79; solubility of 86.90%; and viscosity of 1.046 cP.
2. From the analysis of the feasibility of sepang instant drink has the BEP values of 296.43 kg or Rp. 8,172,509.89; PP 2.92 or 2 years and 9 months; ROI 33.30%; NPV Rp. 60,809,276.62; and PI 1.2 thus making venture sepang instant powdered is feasible.

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