CHAPTER I
INTRODUCTION

I.1 Background

Indonesia which famous as an agricultural country has many kind of plant species, and some of them have not been developed very well. One of that many species is castor seeds that can produce castor oil. Castor plant grow very well at all tropical and subtropical countries like Indonesia.

Castor oil is also known as Ricinus oil, oil of Palma Christi, tangantangan oil, and Neoloid. Typical of most fats, the oil is a triglyceride of fatty acids. What is unique is that the fat contains 87-90% ricinoliec acid, cis-12-hydroxyoctadec-9-enoic acid, a rare resource of an eighteen carbon hydroxylated fatty acid with one double bond. Castor oil, sometimes described as a triglyceride of ricinoleic acid, is one of the few naturally occuring glycerides that approaches being a pure compund.

The number of castor oil based plant in Indonesia is. Uses of castor oil can be acknowleged as the uses of ricinoliec acid because of the high concentration of ricinoliec acid inside of it.

In industrial world many castor oil derivatives come from ricinoliec acid, which can be used in coating, varnish, lacquer, grease, lubricant, pastic engineering, leather treatment, surfactant, ink, and other industrail uses. Castor oil and its derivates have become an important commodity and became topic of interest in chemical industries in USA since 1900.

Table I-1. Castor Oil Import Data from BPS

Year	Mass, kg
1998	571,615
1999	810,248
2000	1,016,633
2001	1,195,167

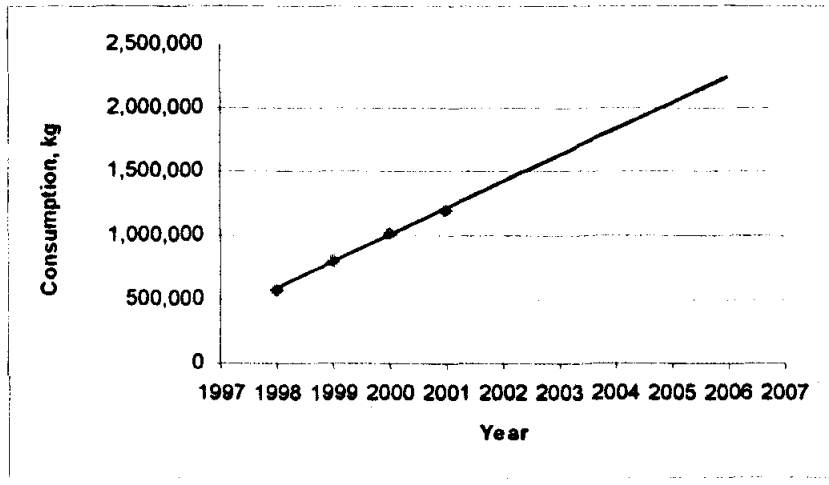

Figure I-1. Castor Oil Consumption in Indonesia

Based on data above, it can be predicted that the consumption of castor oil in Indonesia is about 2250 tonne in 2006. The production of our plant set to be 15.6 percent of the total castor oil consumption in Indonesia, which is 1 tonne per day or 350 tonne per year.

I.2 Raw Material and Product Properties

Castor oil is the main raw material of ricinoliec acid plant. The average fatty acid composition of castor oil is as follows:

Ricinoliec acid : 89.5%

Dihydroxystearic acid : 0.7%

Palmitic acid : 1.0%

Stearic acid : 1.0%

Oleic acid : 3.0%

Linoliec acid : 4.2%

Linolenic acid : 0.3%

Eicosanoic acid : 0.3%

Standards for industrial quality of castor oil as specified by the ASTM can be seen in Table I-2.

Table I-2. Properties of Castor Oil

Aid value	2.0 Max
Clarity	Clear
Color (Gardner)	2 Max
Hydroxyl Value	160-168
Loss on Heating, %	0.2 Max
Refractive Index 25°C	1.4764-1.4778
Saponification Value	176-184
Solubility in Alcohol	Complete
Specific gravity 25°C	0.957-0.961
Unsaponiflable matter, %	0.7 Max
Viscosity Stokes	6.5-8.0
Iodine Value	84-88

(Otmer, 1979)

The properties of Potasium phosphate, $CrCl_3$ (metal clhoride), and Lipase used in the hydrolysis of castor oil can be seen in tables below.

Table I-3. Properties of Potasium Phosphate

Molecular Formula	K_3PO_4
Molecular Weight	158.355
Melting Point	1152
Boiling Point	1300
Density	2.76
Solubility in water	Soluble

(www.sigmaaldrich.com)

Table I-4. Properties of $CrCl_3$

Molecular Formula	$CrCl_3$
Molecular Weight	159.5
Melting Point	1340
Density	2.564
Specific Gravity	2.564
pH	11.9
Solubility in water	Soluble

(www.sigmaaldrich.com)

Table I-5. Properties of Lipase

Molecular Formula	Triacylglycerol acylihydrolase
Molecular Weight	± 29000
Density	816
Isoelectric Point	5.8
Specific activity	760 mu kat/mg protein
Solubility in water	Insoluble

(www.au-kbc.org)

The Ricinoliec acid plant yield ricinoliec acid as main product.

Table I-6. Properties of Ricinoliec Acid

Molecular Formula	$C_{18}H_{31}O_3$
Molecular Weight	289.46
Melting Point	808°C at 760.00 mmHg
Boiling Point	1642.86°C at 760.00 mmHg
Density	941.7
Specific Gravity	0.94
pH	5
Solubility in water	Insoluble

(www.chemfinder.com)

I.3 Product Utility

The goal of ricinoliec acid production is to add more value than castor oil. Below is some uses of castor oil in chemical industrial:

1. Main raw material for sebacic acid production that used for cold resistant plasticizer, nylon polyester, sinthetic lubricant, etc.

2. Main raw material for castor wax production that used for grease, cosmetics, lubricants, paint additives, etc.
3. Main raw material for aminobutylbenzene production that used for medicine intermediate.

(www.chemfinder.com)