CHAPTER I

INTRODUCTION

The growth of plants and their quality are mainly a function of the quantity of fertilizer and water. So it is very important to improve the utilization of fertilizer nutrients. Nitrogen is the most vital nutrient for plants. Urea is considered as one of the world's leading nitrogen fertilizer due to its high nitrogen content (46%), comparatively low cost of production, and commercial availability. However, urea fertilizer is very easy to dissolve in water and rapidly undergoes hydrolysis. This causes high nitrogen losses through ammonia volatilization. Plant uptake of urea is generally below 50%. About 40-70% of nitrogen of the applied normal fertilizer is lost to the environment and cannot be absorbed by plants, which causes not only large economic and resource losses but a very serious environmental pollution [1, 2, 3, 4].

One method of improving the utilization of fertilizers involves the use of slowed or controlled-release fertilizers. Encapsulation fertilizers are physically prepared from granules of conventional fertilizers encapsulated with materials that reduce their dissolution rate. The materials applied most frequently as coating are inorganic materials, such as sulfur, phosphates and silicates: synthetic organic materials, for example, dicyclopentadiene polymers (OsmocotTM), polyethylene [5], and ureic resin: and natural organic materials, including resin, rubber and wax [6]. The material for the controlled release of a fertilizer is important because it will determine the production cost and, hence, the purchase prices.

Cashew nut shell liquid (CNSL) constitutes nearly one third of the total nut weight; thus, much amount of CNSL is formed as by-product from mechanical processes for the edible use of the cashew kernel. Thermally treated CNSL, whose main component is cardanol, a phenol derivative having a *meta*-substituent of a C15 unsaturated hydrocarbon chain mainly with 1-3 double bonds, has various potential industrial utilizations file [7]. Cardanol was particularly suitable as coating materials because of low cost and commercial availability. However, it was found to be suitable

for the film. The properties of cardanol film could be improved by prepolymerization or applying cardanol that was prepolymerization with drying oil.

Drying oils are natural fatty oils, largely composed of mixtures of triglycerides. The drying power of oils is directly related to the chemical reactivity conferred on the triglyceride molecules by the double bonds of the unsaturated acids, which allows them to react with the oxygen and with one another to form rigid polymeric network within a reasonable time [8]. The common drying oils are tung oil, linseed oil and soybean oil. Drying oils are used mainly in paints, waterproof coating and drying agent in varnishes and inks.

The objective of this thesis is to improve and develop fertilizer for rice cultivation which gave slow released within 1 month.

Objectives

1. To optimize condition on coating urea fertilizer by cardanol coating.

2. To study the effect of pH, temperature, and thickness on releasing rate.

Scope of work

The stepwise investigation was carried out as follows.

1. Literature survey for related research work.

2. Preparation of slow-release urea fertilizers using cardanol by pan coating method.

3. Investigation and optimization of coating process.

4. Characterization of a synthesized product.

- ^{1}H-NMR
- GPC for measuring molecular weight of polycardanol
- FT-IR for identifying a functional group of film

5. Investigation on slow-release fertilizers morphology and thickness by Scanning Electron Microscope (SEM).

6. Investigation on releasing rate, such as, pH, temperature, and thickness on releasing rate.

- UV-Visible spectroscopy for determining urea content