

CHAPTER 1 INTRODUCTION

1.1 Background

Nowadays, human population all over the world is increasing exponentially. The growth rate was initially low, but over many generations the growth rate increases more and more rapidly. As of June 13th, 2010, the world population estimated by the United States Census Bureau was 6,826,900,000 [1]. Because of the increasing number of human population all over the world, the problem of food requirement becomes one of the most important concerns. This concern leads to the attempt to increase crop production. There are many useful technologies invented in order to enhance farming efficiency.

Mulching, one of the typical technologies, has been used in many agricultural industries. Basically, it is used to reduce crop water requirement and also reduce the evaporation of water in soil that affects significantly the crop water requirements. Moreover, plastic mulch is considered as one of the best weed control methods [2]. Plastic mulch or agricultural mulch itself is not a degradable material. Growers need to get rid of it after a growing season. Hence, the technology called biodegradable polymer is introduced as an agricultural plastic mulch to facilitate growers in decreasing the cost of plastic elimination [3].

Fertilizer, one of the common technologies widely used in farming and also household users. Urea, the lowest known cost of nitrogen-contained materials, is used as a fertilizer in order to fasten the growth rate of plant. Unfortunately, there is a significant drawback that urea is likely to transform rapidly to ammonia, carbon dioxide and water. This means that urea is available only a short period of time. This brings to the study of controlled release. On the other hand, nematocide is presented as a useful application in crop production to get rid of nematodes problems. The agricultural renewable resources called furfural is introduced as a nematocide to prevent nematodes [4].

This research studies about how to enhance the functional performance of the material by considering the nature of the furfural-urea complex. Moreover, this complex also reduces the urea release rate. Generally, urea is used as a fertilizer and furfural is used as nematocide. Therefore, the combination of nematocide and fertilizer is invented by synthesizing the furfural-urea complex. In addition, there is an agricultural application called agriculture plastic mulch. This material is made from polymer which is naturally difficult to decompose. Therefore, a biodegradable polymer is introduced as a mulch material. In this research, poly(butylene succinate-co-butylene adipate) or PBSA is selected as a biodegradable plastic. This is the reason why a new product, furfural-urea complex imbedded within a biodegradable polymer, is also studied in this research.

1.2 Objective

1. To determine the effective method to synthesize the furfural-urea complex and the combination with PBSA polymer

1.3 Expected results

1. The furfural-urea complex is able to act both nematocide and fertilizer.
2. The complex material, imbedded within biodegradable polymer can increase the longevity of urea available in the polymer.