CHAPTER 5

# CONCLUSION AND SUGGESTION

The LDPE and starch-LDPE films were degraded by outdoor exposure and soil burial. In order to study the behavior of cassava starch and iron stearate in the LDPE films and the change of degradation rate, eight different formulas were used. For the formula 1 to 4, cassava starch was added to the LDPE films in a concentration of 5, 10,15 and 20% by weight and for the formula 5 to 8, cassava starch was added respectively in a concentration of 5, 10, 15, and 20% with 0.1% by weight of iron stearate. All films were exposed outdoor and buried in soil for 6 months. The samples were collected and then were stored in the dark until testing. The properties which were observed before and after tests are as follows: tensile strength, elongation at break, molecular weight by viscosity method and fourier transform infrared absorption. The changes in physical and chemical properties of each formula were studied. The result are summarized as follows:

(1) When the starch is introduced into the plastic, the matrix plastic contributes its own unique problem. Starch is hydrophilic, while polyethylene is hydrophobic, and so the two are virtually not compatible with one another. Epolene wax E-43p, a solid dispersing agent, was used to improve the incorporating properties. As the amount of starch increased, the tensile properties decreased. LDPE film rendered tensile strength of 19.7 $N/mm^2$. The starch-LDPE films with 5, 10, 15 and 20% cassava starch had tensile strength of 14.7, 12.9, 11.6 and 10.6 $N/mm^2$, respectively. For the iron stearate-starch-LDPE films with 5, 10, 15 and 20% cassava starch, the tensile strength were 14.4, 13.1, 12.3 and 11.3 $N/mm^2$, respectively.

(2) The degradation behavior was followed by monitoring tensile strength and elongation at break during outdoor exposure and soil burial test. These tensile properties of LDPE film were gradually decrease with the exposure

time. At equal amount of the incorporated starch, the films with iron stearate degraded faster than the films without iron stearate. Especially under outdoor exposure, tensile strength and elongation at break suddenly decreased to zero in the first month.

(3) As examined by *Aspergillus niger* and *Penicillium pinophilum* fungi, the biodegradability of LDPE-starch films increased as the quantity of starch increase but no detectable biodegradability of virgin LDPE was seen throughout the period of study. From the experiments, there was no significant effect between the starch-LDPE films with and without iron stearate.

(4) This work shows that the presence of iron stearate as a prooxidant additive, was essential for initiating the LDPE degradation. The rapid disintegration of plastic in the environment was probably due to the initial biodegradation of starch which provided greater surface area in the matrix for oxidative breakdown of the polymer, followed by the microbial digestion of the degradation products.

Suggestions

At present, there are more advance in the use of degradable plastics, but at the same time the steadily increasing proportion of plastic in mow causing major problems of handling and disposal of domestics and industrial wastes. Thus this work contributes a little to the solution of plastic waste problem by incorporation cassava starch into plastics. When these plastic are exposed to UV light or soil burial, their deterioration of properties of plastic started. However, plastic degradation should be studied further in the aspect of :

1) The improvements of degradable starch-plastic having a better tensile strength. The plastic should also be relatively inexpensive to manufacture and still have a product which is easily blended, and have a possibility to be processed in a desired form.

2) A degradable polyethylene plastic from other agricultural product such as rice-straw as a filler.

3) The effect of other types of prooxidants