PENGEMBANGAN METODE PREPARASI *CELLULOSE NANO FIBERS (CNF)* RAMI *(Boehmeria nivea)* UNTUK *FILLER* MATERIAL KOMPOSIT BIOPLASTIK DENGAN MATRIKS PATI TAPIOKA

Disertasi

Edi Syafri

1431612004

Pembimbing:

Prof. Dr.rer.net. Ir. Anwar Kasim

Prof. Dr.Ing. Hairul Abral

Dr. Ir. Alfi Asben

FAKULTAS PERTANIAN

UNIVERSITAS ANDALAS

2018

ABSTRACT

The development of bioplastics composites from various natural polymers reinforced with cellulose nanofibers (CNF) from ramie (Boehmerianivea (L.) Gaud) and Precipitated Calcium Carbonate (PCC) has become a field of increasing interest. In this study, the effect of CNF ramie-PCC on the physical, mechanical, thermal and biodegradabilty properties of a cassava starch matrix composite was examined. The samples were characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), particle size analysis (PSA), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) analysis, thermogravimetric analysis (TGA), moisture absorbtion test, and biodegradability test.

The novelty of this work lies in isolating CNF from ramie using chemical-ultrasonication treatment. The cellulose nanofibers were successfully isolated from ramie with a diameter 34,2 ±7,07 nm. Indeed, there is a decrease in the hemicellulose and lignin content while the cellulose content increases due to the pulping and bleaching processes. After that, the synthesis and characterization of CNF from ramie fibers reinforced by PCC hibrids nanocomposite with tapioca starch matrix. Nanocomposites are made by using casting solution and glycerol as plasticizers.

The optimum tensile strength was obtained upon the addition of 4 % PCC. The addition of PCC improved the thermal stability of bioplastic/PCC composites. The results of X-ray Diffraction testing showed an increase in the crystallinity of the bioplastic/PCC composites with increase in PCC content but there is a decrease in the moisture absorption.

The results show that the CS4CNF6PCC sample has the highest crystallinity index and tensile strength of 30,76% and 12,84 Mpa respectively. The addition of CNF ramie and PCC in nanocomposites leads to moisture absorption, crystallinity and thermal stability have increased. The SEM image shows that the CNF ramie is bound in a matrix and the PCC is weakly bound in the tapioca starch matrix because of the calcium clumps in the matrix. In general, FTIR indicated that the nanocomposites hibrid were hydrophilic, and the addition of PCC reduced the hydrophilic properties by damaging the hydrogen bonding between starch molecules and water. In the soil burial test, the lowest mass loss was in CS10CNF (70,2%) after 6 days. Meanwhile, the smallest fungus growth rate was CS2CNF8PCC and CS4CNF6PCC.

***Keywords**: CNF ramie, hybrid nanocomposites, PCC, cassava starch*