SINTESIS FILM-BIOPLASTIK KITOSAN/POLIETILEN GLIKOL/PATI KULIT SINGKONG (*Manihot esculenta*) DENGAN NANOPARTIKEL PERAK SEBAGAI AGEN ANTIBAKTERI

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INTISARI

Telah dilakukan penelitian tentang pembuatan bioplastik yang terbuat dari pati (P) kulit singkong (*Manihot esculenta*) dengan penambahan kitosan (Kit) sebagai penguat, polietilen glikol (PEG) sebagai pemlastis dan nanopartikel perak (AgNPs) sebagai antibakteri. Tujuan penelitian ini yaitu melakukan ekstraksi pati dari kulit singkong, mengetahui komposisi konsentrasi kitosan dan polietilen glikol (PEG) yang dapat membentuk bioplastik dengan kuat tarik dan elongasi terbaik serta mempelajari pengaruh penambahan nanopartikel perak terhadap sifat antibakteri yang diuji dengan bakteri *Eschericia coli*. Pati dari kulit singkong diperoleh dengan proses ekstraksi basah. Pada proses sintesis bioplastik dilakukan variasi perbandingan massa P/Kit/PEG: 2/0,5/0,5; 2/0,5/1; 2/0,5/1,5; 2/0,5/2 dan 2/1/0,5; 2/1/1; 2/1/1,5; 2/1/2 untuk menentukan komposisi dengan sifat mekanik terbaik yang dikarakterisasi dengan *Universal Testing Machine* (UTM). Bioplastik (P/Kit/PEG) dengan sifat mekanik terbaik dilakukan penambahan koloid nanopartikel perak sebagai antibakteri kemudian dikarakterisasi gugus fungsi dengan FTIR, morfologi dan komposisi unsur dengan *Scanning Electron Microscope Energy-Dispersive X-rayspectroscopy* (SEM-EDX), uji aktivitas antibakteri terhadap bakteri *Eschericia coli* dan uji biodegradasi.

Hasil penelitian diperoleh kadar pati kulit singkong sebesar 73,02% dengan kandungan amilosa 29,39% dan amilopektin sebesar 43,67%. Film bioplastik yang memiliki nilai kuat tarik tertinggi yaitu 26,74 MPa adalah bioplastik dengan komposisi massa P/Kit/PEG yaitu 2/1/1 sehingga, diperoleh konsentrasi pati/kitosan/PEG dalam film bioplastik adalah 50/25/25% (b/b). Bioplastik dengan penambahan nanopartikel perak mampu memberikan aktivitas antibakteri yang kuat pada bakteri *Escherichia coli*.

Kata kunci: antibakteri, bioplastik, kitosan, nanopartikel perak, polietilen glikol.

SYNTHESIS OF BIOPLASTIC-FILM FROM CHITOSAN/POLYETHYLEN GLYCOL/STARCH FROM CASSAVA PEEL (Manihot esculenta) WITH SILVER NANOPARTICLES AS AN ANTIBACTERIAL AGENT

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ABSTRACT

Synthesis of starch (P) based bioplastic films from cassava peel (*Manihot esculenta*) has been done using chitosan (Kit) as reinforced film, polyethylene glycol (PEG) as plasticizer and silver naoparticles (AgNPs) as antibacterial. The purpose of this study was to extract starch from cassava peels, to determine the composition of chitosan and polyethylene glycol (PEG) which provided the best tensile strength and elongation film, as well as know to know the influence of the addition of silver nanoparticles on antibacterial properties tested with *Eschericia coli* bacteria. The starch from cassava peels was obtained by a wet extraction process. In the bioplastic synthesis process, various mass ratio of P/Kit/PEG was carried out: 2/0.5/0.5; 2/0.5/1; 2/0.5/1.5; 2/0.5/2 and 2/1/0.5; 2/1/1; 2/1/1.5; 2/1/2 to determine the composition with the best mechanical properties characterized by Universal Testing Machine (UTM). Bioplastics (P/Kit/PEG) with the best mechanical properties was added with colloidal silver nanoparticles (AgNPs) prior to being tested for antibacterial activity against bacteria of *Eschericia coli*. The functional groups, the morphology and elemental composition of Bioplastics (AgNPs) was characterized using FTIR spectrophotometer, and Scanning Electron Microscope Energy-dispersive X-rayspectroscopy (SEM-EDX), respectively. The biodegradation test of the synthesized bioplastics was conducted as well.

The results showed that the starch content of cassava peels was 73.02% with 29.39% amylose and 43.67% amylopectin. The bioplastic film that produced the highest tensile strength was bioplastic with a mass composition of P/Kit/PEG of 2/1/1 so that the starch/chitosan/PEG concentration in the bioplastic film was 50/25/25% (w/w). Bioplastics with the addition of silver nanoparticles are able to provide strong antibacterial activity against *Escherichia coli*.

Keywords: antibacterial, bioplastic, chitosan, polyethylene glycol, silver nanoparticles.