

**PENGARUH PELAPISAN NANO-KITOSAN - *CROSSLINKER* ASAM
SITRAT TERHADAP *DYE ABILITY* ZAT WARNA ALAM INDIGO DAN
AKTIVITAS ANTIBAKTERI PADA KAIN KATUN**

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INTISARI

Kitosan merupakan biopolimer yang telah digunakan sebagai *functional finish* pada material tekstil yang dapat meningkatkan *dye ability* pada kain dan memberikan sifat antibakteri. Pada penelitian ini, telah dilakukan kajian pengaruh pelapisan nanokitosan-*crosslinker* asam sitrat untuk meningkatkan pewarnaan zat warna alam indigo dan aktivitas antibakteri *Staphylococcus aureus* pada kain katun.

Sintesis nanokitosan dilakukan melalui kompleksasi kitosan 0,2% (g/l) dan sodium tripolifosfat 0,84 g/l, kemudian dikarakterisasi menggunakan *particle size analyzer* (PSA). Agen *crosslinker* disiapkan dengan larutan asam sitrat pada berbagai konsentrasi yaitu 2%; 5% dan 8%. Pelapisan kain katun dilakukan dengan mencampurkan larutan dispersi nanokitosan dan *crosslinker* asam sitrat pada berbagai rasio volume nanokitosan: asam sitrat yaitu 1:1, 2:1 dan 3:1. Pelapisan kain katun dilakukan bertahap dengan teknik *pad-dry-cure*. Kain yang telah dilapisi kemudian dilakukan pencelupan dengan zat warna alam indigo. Karakterisasi terhadap kain yang dilapisi nanokitosan-*crosslinker* asam sitrat dilakukan menggunakan FT-IR. Pengaruh pelapisan nanokitosan-*crosslinker* asam sitrat terhadap pewarnaan zat warna alam indigo dilakukan dengan uji ketuaan warna yang dinyatakan dengan nilai K/S dan daya tahan luntur warna terhadap pencucian. Pengaruh pelapisan nanokitosan-*crosslinker* asam sitrat terhadap aktivitas antibakteri *Staphylococcus aureus* dilakukan dengan metode *shake flask turbidimetry* dan *total viable count*.

Hasil penelitian menunjukkan bahwa pelapisan nanokitosan-asam sitrat pada kain katun dapat meningkatkan *dye ability* dari zat warna alam indigo. Hasil terbaik yang didapatkan untuk memperoleh ketuaan warna indigo adalah kain yang dilapisi nanokitosan dengan konsentrasi asam sitrat sebesar 5% dan rasio volume nanokitosan: asam sitrat dengan perbandingan 3:1 yang menunjukkan nilai K/S pada kisaran 2,28-3,31. Kain yang dilapisi nanokitosan/asam sitrat menunjukkan aktivitas antibakteri dan mengalami penurunan aktivitas antibakteri setelah pewarnaan dengan zat warna alam indigo.

Kata kunci: nanokitosan, pelapisan, *crosslinker*, asam sitrat, indigo, antibakteri

EFFECTS OF - CITRIC ACID CROSSLINKED-NANOCHITOSAN ON DYE ABILITY OF NATURAL INDIGO DYE AND ANTIBACTERIAL ACTIVITY ON COTTON FABRIC

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Abstract

Chitosan is a biopolymer that has been used as a functional finish on textile materials to increase dye ability of fabrics and impart antibacterial properties. The effect of coating nanochitosan-citric acid on cotton fabrics as dye fixing agent of natural indigo dye and antibacterial agent of *Staphylococcus aureus* has been investigated. Cotton fabrics were treated with two different particle size of chitosan solution (bulk chitosan and nano-chitosan), various concentration of crosslinker agent, volume ratio of nanochitosan: citric acid and antibacterial activity when applied independently and collectively on cotton fabrics were assessed.

Nano-chitosan was synthesized by complexation of chitosan and sodium tripolyphosphate, and then characterized by particle size analyzer (PSA). Crosslinker agent is prepared by citric acid solution with various concentration 2%, 5% and 8% respectively. The cotton fabrics were coated by pad-dry-cure technique with various volume ratio between nanochitosan and citric acid 1:1, 2:1 and 3:1 respectively. Intermolecular interactions of cellulose and nano-chitosan/citric acid, were analyzed by FT-IR. Effect of particle size of chitosan and crosslinker agent concentration on cotton fabrics were examined through dye ability using natural indigo in terms of color strength (K/S) and color fastness. The antibacterial activity of nano-chitosan and natural indigo dye both when applied independently and collectively on cotton fabrics were assessed by *shake flask turbidimetry* and *total viable count* methods.

The experimental results showed that the coating of nano-chitosan and citric acid on cotton fabrics tend to increase dye ability of natural indigo. The highest color strength value was achieved by nano-chitosan/citric acid with 5% citric acid concentration with volume ratio of nano-chitosan: citric acid is 3:1. The treated cotton fabrics were found to be antibacterial and the indigo dyeing reducing the antibacterial activity. Those results revealed that the particle size of chitosan and the addition of citric acid as crosslinker agent might enhanced dye ability of natural indigo dye and antibacterial activity of *Staphylococcus aureus*.

Keywords: nano-chitosan, coating, crosslinker, citric acid, natural indigo, antibacterial