

## ABSTRAK

Inovasi kemasan pangan saat ini telah berfokus pada pengembangan kemasan plastik yang ramah lingkungan sekaligus memiliki kemampuan dalam memperpanjang umur simpan pangan. Minyak atsiri mendapat perhatian dari industri pangan karena terbukti mampu mempertahankan kualitas makanan secara alami. Minyak atsiri dari hasil ekstraksi kayu manis (*Cinnamomum cassia*) digunakan pada penelitian ini sebagai bahan aktif karena kandungan senyawa utama, *cinnamaldehyde* diketahui efektif sebagai antimikroba. Minyak atsiri kayu manis ditambahkan ke dalam film berbahan baku nasi aking dengan bahan campuran kitosan dan gliserol. Tujuan penelitian ini untuk mengetahui kombinasi faktor optimal dari minyak atsiri kayu manis, kitosan, dan gliserol terhadap parameter (respon) performansi film bioplastik aktif meliputi sifat mekanik (*tensile strength*, elongasi, dan modulus elastisitas), permeabilitas uap air, aktivitas antimikroba yang dilakukan secara *in vitro*, serta biodegradasi. Desain eksperimen penelitian ini menggunakan metode Taguchi dengan matriks ortogonal  $L_9 (3^3)$ . Pada penelitian ini, permasalahan optimasi multirespon dianalisis dengan menggunakan metode penggabungan antara *Grey Relational Analysis* (GRA) dan *Principal Component Analysis* (PCA). Berdasarkan hasil optimasi menggunakan gabungan GRA dan PCA didapatkan hasil optimal untuk tujuh parameter (respon) yaitu melalui kombinasi faktor 1,5% minyak atsiri kayu manis, 2 g kitosan, dan 4 mL gliserol atau kombinasi level (3-2-2) faktor minyak atsiri kayu manis, kitosan, dan gliserol. Faktor yang paling berpengaruh signifikan terhadap performansi film bioplastik aktif adalah konsentrasi minyak atsiri kayu manis. Kombinasi level faktor optimal tersebut menghasilkan nilai *tensile strength* 4,686 MPa, elongasi 11,518%, modulus elastisitas 40,9473 MPa, permeabilitas uap air  $8,427 \times 10^{-11}$  g/Pa.s.m, aktivitas antimikroba terhadap *Staphylococcus aureus* 3,65 mm, aktivitas antimikroba terhadap mikroba *swab type* 3,63 mm, dan biodegradasi 80%.

Kata kunci: minyak atsiri kayu manis, nasi aking, optimasi multirespon, Taguchi

## ABSTRACT

Contemporary food packaging innovations have now been focused on development of eco-friendly plastics with longer food shelf life. Many kinds of essential oil have been in the center of gravity in food industry due to its proven benefits as natural preservatives. In this research, the essential oil extracted from cinnamon (*Cinnamomum cassia*) was used as an active ingredient because its main compound, cinnamaldehyde, is known for its effective antimicrobial advantage. Cinnamon essential oil, combined with chitosan and glycerol, was added into some dried-rice-based films to find out the optimum combined factors of cinnamon essential oil, chitosan, and glycerol on performance parameters (responses) of the active bio-plastics films, which includes mechanical properties (tensile strength, elongation, and elasticity module), water vapor permeability, in vitro antimicrobial activity, and bio-degradation. This research's experimental design is Taguchi method with L9 orthogonal matrix (33). In this research, the multi-response optimization was analyzed by means of combined Grey Relational Analysis (GRA) and Principal Component Analysis (PCA). This combined use of GRA and PCA has lead to the optimum results of the seven parameters (responses). These results are gained by means of combined factors 1,5% cinnamon essential oil, 2 grams chitosan, and 4 mililiters of glycerol, or the combined factor levels (3-2-2) of cinnamon essential oil, chitosan, and glycerol. The most significantly influential factor on the active bio-plastic film performance was the cinnamon essential oil concentration. The optimum factor level combination resulted in the following values: 4.686 MPa tensile strength, 11.518% elongation, 40.9473 MPa elasticity module,  $8.427 \times 10^{-11}$  g/Pa.s.m water vapor permeability, 3.65 mm antimicrobial activity against *Staphylococcus aureus*, 3.63 mm antimicrobial activity against swab type, 80% biodegradation.

Keywords: cinnamon essential oil, dried-rice (*nasi aking*), multi-response optimization, Taguchi