

## INTISARI

Serbuk kayu mahoni adalah hasil samping dari industri furnitur. Senyawa kimia zat warna dalam kayu mahoni adalah tanin, flavonoid dan quinon. Zat warna dari ekstrak kayu mahoni dapat dimanfaatkan sebagai bahan pewarna alam untuk kulit namun membutuhkan bahan pengikat (mordan) agar warna dapat terikat dengan baik. Daun loba adalah salah satu bahan yang dapat digunakan sebagai mordan alami (biomordan) karena kandungan tannin dan logam aluminium. Daun loba yang dimanfaatkan adalah guguran daun keringnya karena kandungan aluminiumnya lebih tinggi dibanding bagian ranting dan kulit kayunya, selain itu juga tidak mengganggu kelangsungan hidup tanaman. Daun loba biasa digunakan sebagai penguat warna merah pada pewarna alam akar mengkudu yang diaplikasikan pada benang tenun Lombok. Daun loba belum pernah diaplikasikan sebagai bahan penguat warna pada pewarnaan alami kulit kambing kras dengan metode pewarnaan menggunakan drum berputar. Tujuan dari penelitian ini adalah mengetahui kinerja serbuk kayu mahoni sebagai pewarna alami pada kulit kambing kras dengan biomordan daun loba; menentukan hubungan antara konsentrasi biomordan, waktu pewarnaan dan rasio pewarna terhadap parameter mutu produk kulit dan limbah cair; menentukan kombinasi faktor dan level konsentrasi biomordan, waktu pewarnaan dan rasio larutan pewarna terbaik dalam menghasilkan produk kulit warna dan limbah cair. Desain eksperimen ditentukan menggunakan metode Taguchi L25 ( $5^3$ ) dan analisis multirespon dilakukan dengan pendekatan *Grey Relational Analysis*. Faktor kendali yang digunakan yaitu konsentrasi biomordan (0%, 20%, 40%, 60%, 80%), waktu pewarnaan (30, 60, 90, 120, 150 menit), rasio larutan pewarna (75%, 100%, 125%, 150%, 175% berat kulit basah). Percobaan dijalankan 25 perlakuan, masing-masing 2 kali ulangan. Respon pada penelitian ini adalah kualitas limbah cair (COD, TSS), kualitas produk kulit warna (ketahanan luntur warna meliputi skala penodaan kain basah dan kering dan skala ketahanan warna kulit basah dan kering, kelemasan kulit, prosentase reflektansi (ketahanan warna), nilai beda warna). Analisis data dilakukan dengan menggunakan S/N rasio, *mean*, *grey relational analysis*, dan analisis korelasi. Serbuk kayu mahoni dengan biomordan daun loba dapat dimanfaatkan sebagai bahan pewarna alam kulit kambing kras. Nilai COD rata-rata 6275,20 mg/L dan nilai TSS 599,52 mg/L. Ketahanan luntur warna (kering) skala 4,5-5, ketahanan luntur warna (basah) skala 3-5. Reflektansi rata-rata 43,79, kelemasan 4,72 dan nilai beda warna ( $\Delta E$ ) 20,36. Faktor konsentrasi biomordan berkontribusi secara signifikan terhadap nilai COD, nilai TSS, nilai reflektansi, kelemasan dan beda warna ( $\Delta E$ ). Rasio larutan pewarna berkontribusi secara signifikan terhadap nilai COD dan TSS; waktu pewarnaan berkontribusi secara signifikan terhadap nilai TSS; ketahanan luntur warna (skala penodaan dan ketahanan warna kulit); nilai reflektansi, kelemasan dan beda warna ( $\Delta E$ ). Makin tinggi konsentrasi biomordan maka nilai COD dan TSS makin tinggi, nilai beda warna makin rendah. Rasio larutan pewarna makin tinggi maka nilai COD makin tinggi. Semakin lama waktu pewarnaan menurunkan nilai TSS, kelemasan, % reflektansi, beda warna ( $\Delta E$ ), dan skala ketahanan luntur warna makin baik. Kombinasi faktor dan level terbaik adalah konsentrasi biomordan 60%, waktu pewarnaan 30 menit dan rasio larutan pewarna 150%. Hasil karakterisasi produk kulit warna dari percobaan konfirmasi diperoleh nilai penodaan kain (kering) 4,5, nilai penodaan kain (basah) 4, nilai ketahanan warna (kering) 5, ketahanan warna (basah) 4,5, nilai kelemasan kulit 5,33, % Reflektansi 48,5 dan beda warna ( $\Delta E$ ) 15,51.

Kata kunci : biomordan, kayu mahoni, kulit kambing kras, daun loba, Taguchi

## ABSTRACT

Mahogany sawdust is a by-product of the furniture industry. Chemical compounds of dyes in mahogany are tannins, flavonoids and quinones. The dye from mahogany wood extract can be used as a natural dye for the skin but requires a binder (mordant) to bind the color. Loba leaf is one of the ingredients that can be used as a natural mordant (biomordant) because of the tannin and aluminum metal content. Loba leaves used are dried leaves because the aluminum content is higher than the roots and bark, but it also does not interfere with plant survival. Loba leaves are commonly used as a red color enhancer in the natural dye of morinda root which is applied to Lombok woven threads. Loba leaf has never been applied as a color enhancer in the natural coloring of crust goat leather by the coloring method using a rotating drum. The purpose of this study was to determine the performance of mahogany sawdust as a natural dye on the crust goat leather with loba leaf biomordant; determine the correlation between the concentration of biomordant, dyeing time and ratio of dye solution to quality parameters of leather products and liquid waste; determine the best of combination factors and levels of concentration of biomordant, dyeing time and ratio of dye solution in producing colored leather products and liquid waste. The experimental design was determined using the Taguchi  $L_{25}(5^3)$  method and multiresponse analysis was performed using the Grey Relational Analysis approach. Control factors used were concentration of biomordant (0%, 20%, 40%, 60%, 80%), dyeing time (30, 60, 90, 120, 150 minutes), ratio of dye solution (75%, 100%, 125 %, 150%, 175% by weight of wet skin). The experiment was carried out with 25 treatments, each with 2 replications. The responses in this study were the quality of liquid waste (COD, TSS), the quality of color leather products (color fastness including the staining scale and grey scale (wet and dry); softness; reflectance; different values color ( $\Delta E$ )). Data analysis was performed using S/N ratio, mean, gray relational analysis, and correlation analysis. Mahogany wood powder with biomordant loba leaves can be used as a natural dye for crust goat leather. The average COD value is 6275.20 mg/L and the TSS value is 599.52 mg/L. Color fastness (dry) on a 4.5-5 scale, color fastness (wet) on a 3-5 scale; reflectance is 43.79, softness is 4.72 and the color difference value ( $\Delta E$ ) is 20.36. The biomordant concentration factor contributed significantly to the COD value, TSS value, reflectance value, softness and color difference ( $\Delta E$ ). The dye solution ratio contributed significantly to the COD and TSS values; dyeing time contributed significantly to the TSS value; color fastness (staining scale and grey scale); the value of reflectance, softness and color difference ( $\Delta E$ ). The higher the concentration of biomordant, the higher the COD and TSS values, the lower the color difference. The higher the ratio of the dye solution, the higher the COD value. The longer the dyeing time, the lower the TSS value, softness, reflectance, color difference ( $\Delta E$ ), and the color fastness scale much better. The best combination of factors and levels was 60% biomordant concentration, 30 minutes dyeing time and 150% dye solution ratio. The results of the characterization of color leather products from the confirmation experiment obtained that the color fastness of staining scale (dry) was 4.5, the staining scale (wet) was 4, the grey scale (dry) was 5, the grey scale (wet) was 4.5, the softness value was 5.33, reflectance 48.5 and color difference ( $\Delta E$ ) 15.51.

**Keywords :** biomordant, mahogany wood, crust goat leather, loba leaf, Taguchi

