# Using the dye extracted from *Gardenia carinata* Wall. for the coloring of cotton yarn, by comparison, the binding of dye with chemical and natural mordants

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Natural dyes are easily degraded by microbial action thus its safety to humans and environment. Natural dyes are preferred by environmentally conscious wearers. In this study, the yellow dye was extracted from 1 g of dried *Gardenia carinata* Wall. per 100 mL of water by boiling them for 5 minutes. The UV-vis absorption spectroscopy of the extracts was analyzed by measurement at the wavelength of maximum absorbance at 493 nm. It was shown that the microwave oven had more efficient extraction within a short time than the hot plate. The colorimetric parameters such as lightness (L*), reddish-yellowness (a*), blueness-greenness (b*) and color strength (K/S) of cotton yarn subjected were measured to select the optimal dyeing conditions. The highest color strength (K/S) as 5.041 was obtained from the optimum dyeing conditions included dyeing temperature of 85 °C and dyeing time of 30 min for dyeing of clean cotton yarn its color included L* equal to 63.810, a* equal to 11.956, and b* equal to 46.920. The natural mordants such as condensed tannin obtained from the Bitter gourd and chemical mordant as a 10 ppm of $CuSO_4$ were employed to study the ability of binding between the cotton yarn and dye. The alkaline pretreatment of cotton yarn with 1 M of NaOH also confirm using the natural mordant to substituted for $CuSO_4$ when dyeing processes combine with pre- mordanting. The color fastness properties after one time washing in the basic standard detergent solution that reported the K/S value of natural pre-mordanting higher than chemical pre-mordanting as 0.328. The CIELAB L*, a*, and b* values of NaOH pretreatment for natural and chemical pre-mordanting that included L* 73.756, a* 7.756, and b* 47.636 and L* 72.520, a* 8.303, and b* 43.086, respectively. Moreover, adding 1 g of salt to 100 mL of dye extract features the increased binding of dye approximately 64%.

**Keywords:** Natural dye; Dyeing; Mordanting methods