

## The application of Chinese herbal extracts on hair dye formulations

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### Objects

Hair dyeing is a kind of cultural art that crosses international boundaries. For thousands of years, hair has been dyed first with natural dyes and then with synthetic organic dyes. At present, organic coloration is mainly used to cover the gray hair of women and men. In such cases, permanent coloration is commonly sought-after with the common treatment being oxidation dyeing. Hair color is produced inside the hair fiber through hydrogen peroxide-induced oxidation and commonly combined with coupling reactions of aromatic amines and phenols. In this study, neutral hair dyeing formulas containing Chinese herbal extracts, which are rich in polyphenols were developed. Moreover, the tensile strength of the colorized hairs were also examined and deemed superior to commercially available dyes.

### Materials and methods

*Sanguisorba officinalis* L. *Perilla frutescens* L. Britt. and *Casesalpinia sappan* L. were purchased from Tainan local medicinal markets in 2007. Dried extracts were prepared with 10-fold aqueous solution at room temperature for 24 hours and then filtered. The procedure was repeated two times. The filtrates were combined and were concentrated under reduced pressure, freeze-dried, and stored in a closed container until use. Samples of gray hair were obtained from sixty-five year old women and were colorized by a standard oxidation hair dye procedure. Tensile tests were conducted to study the tensile strength of the colorized hair after UV irradiations.

### Results

Results obtained from the hairs dyed from dyes containing Chinese herbal extracts showed similar color changes with those of commercial hair dyes. As shown in figure 1, the tensile strengths of Chinese herbal dyed hairs shown that the tensile strengths were higher than that observed in commercial dyed hairs (max tensile load, 54.60 gf) in the UV irradiation experiments. Extracts of *Sanguisorba officinalis* L. (max tensile load, 83.77 gf) exhibited the higher protection activity than the extracts of *Perilla frutescens* L. Britt. (max tensile load, 64.67 gf) and *Casesalpinia sappan* L. (max tensile load, 63.53 gf). The results indicated that Chinese herbal extracts perform better protection than their commercial counterparts in regard to hair strength.