

색상과 톤, 염료가 천연염색 색채 감성에 미치는 영향

Effects of Hue, Tone, and Dyes on Color Sensibility of Natural Dyeing

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ABSTRACT

This study was aimed to determine color sensibility factors for naturally dyed fabrics and to investigate their relationship with color variables such as hue and tone and dyes. Two hundreds different fabric colors prepared by a variety of natural dyeing were subjectively evaluated by color experts, which resulted in three color sensibility factors including 'Pleasant', 'Comfort', and 'Modern'. Among hues, Yellowish shade by natural dyeing was found as more pleasant and more comfort than any others. Among main tones for natural dyeing, g(grayish) and ltg(light grayish) were more felt in 'Comfort' whereas d(dull) more in 'Pleasant'. As for dyes, Gardenia Blue, Gardenia Yellow, and Anato tended to give feelings of 'Pleasant' whereas Raw Indigo and Loess did 'Comfort'.

Keyword: color sensibility factor, natural dyes, hue, tone

1. Introduction

There has been a growing interest in eco-friendly products with natural feeling to humans. Because colors of naturally dyed fabrics can meet the current global trend, the color of natural dyed fabrics could be effective ways to improve the additive values of textile products. Color shades by natural dyeing were reported as being limited and the intensity of natural dyes as on the lower side [1], [2]. Mordants and some auxiliaries have been used in natural dyeing to give a little limited variety to shades [3]. Therefore, color sensibility for natural dyeing needs to be newly identified based on its relation to objective color variables and dyes in order to help

natural dyeing workers choose influential colors on consumers. The overall goal of this study was to clarify the relationship between color sensibility and objective color variables and dyes. To determine this, a number of color sensibilities were classified by factor analysis and the determined color sensibility factors were investigated according to physical color variables such as hue and tone as well as natural dyes.

2. Methods

2.1. Preparation of Stimuli

In order to select representative colors by natural dyeing on textiles, in a preliminary work [4], a set of numerous colors was

constructed by nominating 500 differently dyed silk fabrics with several natural dye powders commercially available (Madder, Gardenia yellow and blue, Gromwell, Lac, Anato, Pomegranate, Betel Nut, Loess, and Raw Indigo) under varied conditions of bath solutions, mordanting, and dyeing sequences (singular and sequential). For this study, final 200 different colors among them were selected by considering their characteristics of Munsell's hue and PCCS (Practical Color Coordinate System) tones. Figure 1 shows the distribution of tones according to hue of the final stimuli. As seen in Figure 1, all of 10 hue families and 12 tones for chromatic and 3 neutral tones like W(White), ltGy(light Gray), and mGy(media Gray) were prepared. Their characteristics agree well with previous works [1], [2] dealing with color analysis of naturally dyed fabrics in that YR (Yellow Red) was the largest portioned hue in natural dye color followed by Y(Yellow) and R(Red) and tones such as d(dull), ltg(light grayish), g(grayish), and sf(soft) were the main tones for natural dyeing.

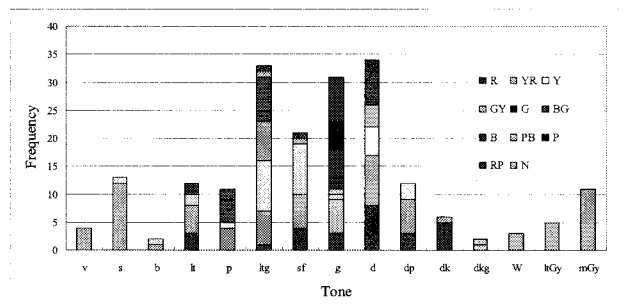


Figure 1 Hue/tone distributions of naturally dyed fabrics.

2.2. Sensibility Evaluation

For sensibility evaluation, the stimuli were prepared by respectively framed with neutral gray mat board in size of 9cm×9cm. A total of 56 experts working for fashion companies or color-related research institutes participated in subjective evaluation. Each stimulus was presented to each participant in random orders. A total of seventeen sensibility adjectives which were chosen among ones determined as main sensory terms in I.R.I color image scales [5] were evaluated on 7-point scales.

2.3. Statistical Data Analysis

To figure out color sensibility factors for natural dyeing factor analysis was employed. The extraction method applied was the principal component analysis, together with a varimax rotation technique. Analysis of variance was adopted to test the differences among hues, tones, and singular dyes of naturally dyed fabrics in the extracted color sensibility factors.

3. Results and Discussion

3.1. Color Sensibility Factors for Naturally Dyed Fabrics

Three factors were extracted from the collected data, as summarized in Table 1, and the ability to classify the three factors was shown to be 84.35%. The first factor was named as 'Pleasant', since the terms depicting positive and delightful feelings composed this category such as cheerful, clear, and cute. The second factor was 'Comfort' in which 'soft', 'faint', and 'comfort' existed. The third factor was labeled as 'Modern' since 'urban' and 'modern' defined it.

Table 1 Color sensibility factors for natural dyeing.

Sensibility terms	Factor 1 Pleasant	Factor 2 Comfort	Factor 3 Modern
Cheerful	0.953	0.004	-0.164
Clear	0.903	0.183	0.032
Cute	0.902	0.188	-0.246
Sporty	0.857	-0.380	-0.102
Splendid	0.846	-0.265	-0.239
Dynamic	0.842	-0.399	-0.169
Fragrant	0.838	0.136	-0.325
classical	-0.805	0.310	0.205
Soft	0.240	0.911	0.061
Strong	0.250	-0.866	-0.154
Faint	-0.269	0.854	0.269
Comfort	-0.384	0.827	0.010
Hard	-0.323	-0.775	0.273
Calm	0.188	0.764	-0.296
Natural	-0.241	0.759	-0.216
Urban	-0.211	-0.163	0.909
Modern	-0.355	0.101	0.856
Eigen value	6.794	5.339	2.206
% variance	39.966	31.406	12.978
% accumulative variance	39.966	71.372	84.351

3.2. The Relationship between Color Variables/Dyes and Color Sensibility Factors for Naturally Dyed Fabrics

Figure 2 gives the mean values for each color sensibility factor according to hues. R and YR as principal shades of natural dyeing had negative scores for both 'Comfort' and 'Modern'. Another main hue, Y was given the highest factor scores for both 'Pleasant' and 'Comfort'. Neutral shade (N) was the most modern followed by B and BG among hues. By using ANOVA, factor 'Comfort' and 'Modern' showed significant differences among hues. Precisely, GY(Green Yellow), Y, and N evoked the feeling of 'Comfort' more than P(Purple) did($F=3.22, p<.01$). As for 'Modern', N showed higher score than P and BG(Blue Green) which did even higher ones than R and YR($F=11.98, p<.01$).

There were also significant differences in all of color sensibility factors among tones for naturally dyed fabrics. Human subjects felt bright and soft tones as positively for 'Pleasant' such as v(vivid), s(strong), and b(bright) whereas they evaluated main tones like g and ltg as negatively($F=22.59, p<.01$). In the other hands, 'Comfort' was significantly more strongly felt in p(pale), ltg, and lt than in dkg(dark grayish), s, and dp(deep)($F=13.98, p<.01$). The third factor 'Modern' was also differently perceived among tones in that ltGy and W had significantly higher positive factor scores than ltg and p did ($F=10.31, p<.01$).

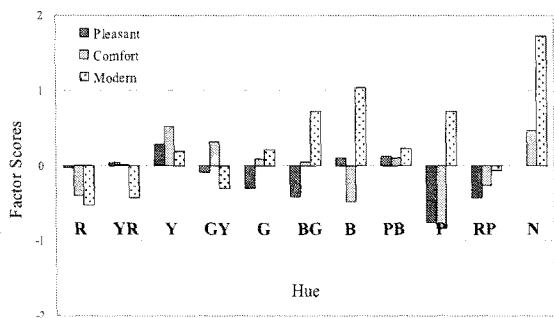
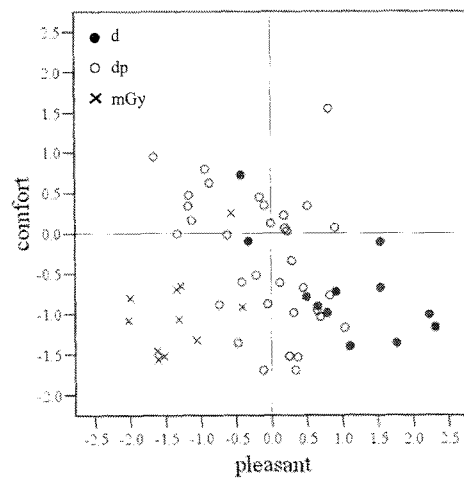
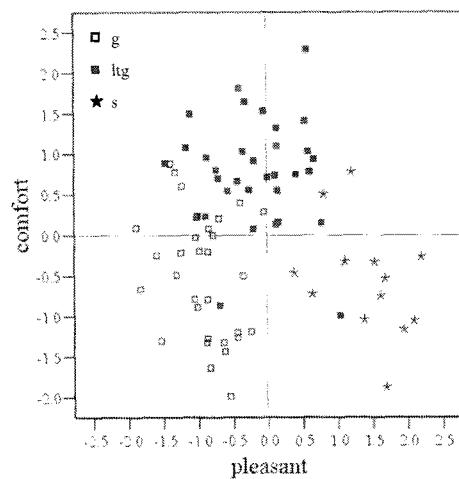


Figure 2 Scores of color sensibility factors for hues.

Some of tones were positioned in the color sensibility space by 'Pleasant' and 'Comfort' as shown in Figure 3(a) and (b). Most of colors with tone d were plotted in a positive to the axis on 'Pleasant' even though they were not conducive to the color sensibility 'Comfort' as shown in Figure 3(a). The distribution of tone mGy indicated that it was negatively related with both 'Pleasant' and 'Comfort'. In Figure 3(b), tone of g was found as being felt as neither 'Pleasant' nor 'Comfort'. Tone of s could be thought as giving sensibility 'Pleasant' but not as 'Comfort'.

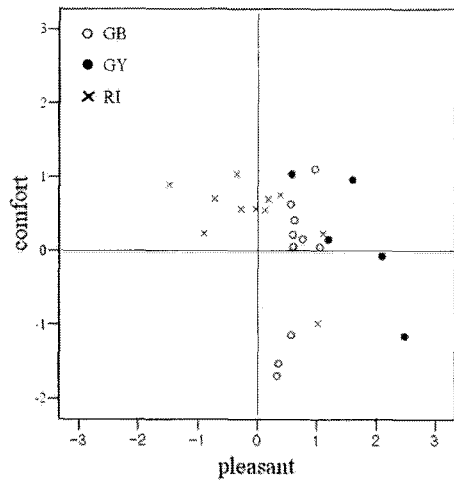


(a) d, dp, and mGy

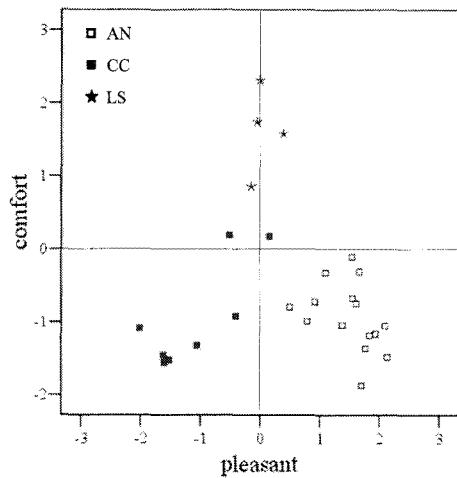


(b) g, ltg, and s

Figure 3 Tone chart for 'Pleasant'-'Comfort' factor.



(a) GB, GY, and RI



(b) AN, CC, and LS

Figure 4 Dye chart for ‘Pleasant’-‘Comfort’ factor.

4. Conclusions

In this study, color sensibility factors of naturally dyed fabrics were purposed to be determined and their relationship with natural dyes and color variables such as hue and tone were investigated. Three sensibility factors including ‘Pleasant’, ‘Comfort’, and ‘Modern’ were extracted for a variety of colors by natural dyeing on fabrics and they were found as being influenced by color hue, tone, and dyes. Among hues, Yellowish shade by natural dyeing was found as more pleasant and more comfort than any others. Among main tones for natural

dyeing, g(grayish) and ltg(light grayish) were more felt in ‘Comfort’ whereas d(dull) more in ‘Pleasant’. As for dyes, Gardenia Blue, Gardenia Yellow, and Anato tended to give feelings of ‘Pleasant’ whereas Raw Indigo and Loess did ‘Comfort’ in their colors on fabrics. Color sensibility ‘Modern’ was found as being more felt by Charcoal when it was dyed on fabrics.

These results may give information to manufacturers who pursue developing color sensible textiles by natural dyeing which could be healthful and safe to humans as well as provide natural feelings to them.

Acknowledgments

This study was supported by Ministry of Knowledge Economy (MKE), a grant funded by Korea Government (H-2007-01-0062).

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