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Research Article

ASSESSMENT OF COTTON FLOW COLOUR IN USTER HVI SYSTEM

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ABSTRACT

The Uster HVI system reflects the assessment of the colour of cotton fibre on the basis of international universal standards and the replacement of the subjective visual assessment of the colour of cotton fibre in Uzbekistan by objective instrumental measurement.

KEYWORDS

Cotton fibre colour, quality, international universal standard, HVI system, yellowing, brightness level, reflection coefficient, USDA, integration, organoleptic, classifiers, standards - a set of appearance samples.

INTRODUCTION

Cotton is the main textile raw material processed all over the world. Despite strong competition for growing man-made fibres, the share of cotton in total fibre consumption remains high. Quality classification of cotton fibre plays a very important role in the world cotton trade. Traditionally, cotton fibre is evaluated by cotton classifiers in an organoleptic-visual manner [1-5]. However, human pricing is subjective and may not be tailored to consumer needs.

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THE MAIN PARTS

Today, it is planned to replace the subjective visual assessment determined by the class with the objective instrumental measurement. There are many methods, techniques and devices available today to measure the quality of cotton fibre. Some of them are designed to measure certain parameters of cotton fibre [6-9].

Examples: Microner, Pressley, Stelometer, Fibrograph, Thermodetector and others. There are also measurement systems that allow a comprehensive assessment of cotton fibre quality, such as Uster HVI (High Volume Instrument), Premier ART, AFIS (Advanced Fibre Information System), IsoTester, FibroLab and UAK. These devices and systems provide cotton fibre producers, traders, and spinners with valuable information that can be used not only to classify cotton fibre but also to predict fibre performance. Measuring the colour of cotton fibre. The colour of cotton fibre is one of the most important properties that determine the quality classification. The colour of cotton fibre can be affected by many factors related to its cultivation: rainfall, changing climatic conditions, insects, fungi, soil, grass and cotton leaf staining, and humidity and temperature during storage of cotton. Thus, the deterioration of the colour affects the efficiency of cotton processing and, at the same time, its cost. Deterioration also affects the fibre's ability to dye, absorb and retain dyes. Evaluation of cotton fibre colour is usually performed by classes by the organoleptic method [10-17]. Specially trained classmates classify a cotton fibre sample by visual comparison with a set of standard specimens in a room with 1,200 lux of light, muffled grey walls, and a black desk. In the 1930s, the USDA began developing an instrumental colour scale. Then two parameters were included in the classification of cotton fibre varieties: brightness reflection rate (Rd) and yellowing (+ b). The brightness level (Rd) indicates how bright or dull the sample is, and the yellowness (+ b) indicates the degree of colour pigmentation. The colour of the cotton fibre was determined instrumentally using a two-filter colourimeter. This objective method was developed by Nickerson and Hunter in the early 1940s to examine USDA cotton grade standards [18-22].

In the 1970s, colourimeter technology was integrated into HVI. The HVI used 2.8-inch and 3.6-inch sample mirrors and double-sided Xenon light bulbs for lighting to create a 10.1-square-inch colour sample area. The two light bulbs are positioned at 45 ° from the viewing angle to comply with ASTM D 1729.

During the colour measurement process, the cotton fibre is placed on a sample glass and the two components of the cotton fibre are measured: brightness-reflection coefficient (Rd,%) and yellowing rate (+ b) when the light from the lamps is compressed to a predetermined pressure and returned through filters and photodiodes. . The reflection coefficient describes how bright, white or dull, grey the fibre is. The colour grade of the cotton fibre is determined by the location of the intersection points in the Nickerson and Hunter diagrams of the Rd and + b values measured in HVI, as shown in Figure 1. The light is measured by two separate detectors. The signals from these detectors are used to calculate the sample to the nearest tenth of a unit of colour (Rd) and (+ b). The fixation level (Rd) determined by HVI indicates the brightness of the sample, which corresponds to that shown in the Nickerson-Hunter colour chart (Rd). Yellowing on HVI (+ b) is determined using a yellow filter that shows the degree of cotton pigmentation. The yellowness in HVI (+ b) corresponds to the value (+ b) shown in the Nickerson Hunter colour chart. Yellowing (+ b) is used in conjunction with the value of

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the reflector (Rd) to determine the colour level of the cotton measured on the instrument.

Other devices can measure the colour of cotton fibre, such as FQT / FibroLab (Lintronics) and IsoTester (Schaffner Technologies, Inc.), but they are not widely used in industry. HVI is now considered worldwide as a universal method for measuring the colour of cotton fibre. In the HVI system, the colour of the fibre is determined by the three-digit code "Upland" in accordance with the International American Universal Standard for colour scheme Nickerson-Hunter Figure 1. The first two digits of the colour code in accordance with the International American Universal Standard describe the colour variety. For more accurate measurement, each value of the variety is divided into squares that indicate the colour difference within the variety. The third number of the colour code identifies the square code [23-27]. As shown in Figure 1.

According to the International American Universal Standard, Upland medium-fibre cotton fibre should be white in colour. Cotton fibre is divided into groups depending on the colour, depending on the yellow saturation: White-white, Light Spotted-weak spot, Spotted-spot, Tinged-yellow, Yellow Stained-yellow. Varieties in each colour group differ in the degree of darkening due to increased pollution and adverse weather conditions, which is reflected in a decrease in the reflection coefficient and are divided into the following classifiers: Good Middling (GM) - good medium; Strict Middling (SM) - solid medium; Middling -middle; Strict Low Middling (SLM) - strictly low to medium; Low Middling (LM) - low to medium; Strict Good Ordinary (SGO); Good Ordinary (GO) - good simple; Below Grades (BG) -standard.

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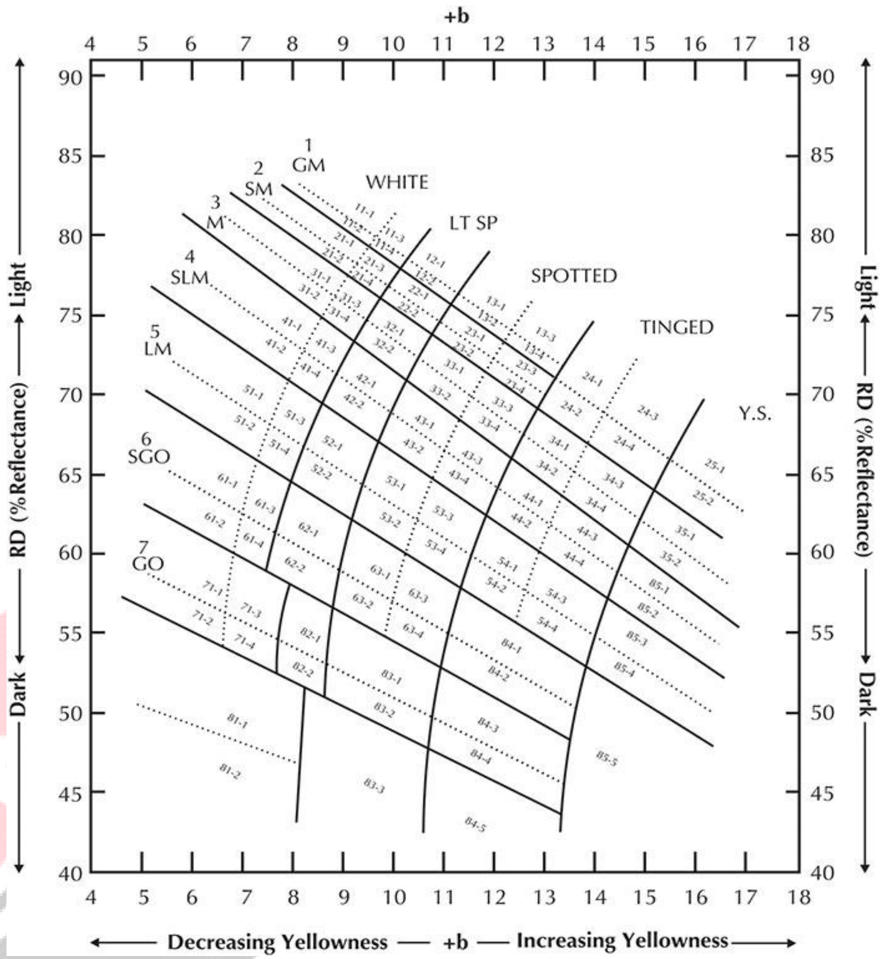

Figure 1. Nickerson-Hunter colour chart.

Uzbek cotton fibre UzDSt 604: 2016 Cotton fibre. According to the specifications, the quality of cotton fibre is determined by three different classification methods [26-29]. They are STIC (HVI) method; klassyor method; special methods. The SITC (HVI) method is used to certify and determine the quality of cotton fibre in Uzbekistan. The quality indicators of cotton fibre determined in the Uster HVI system are accepted as mandatory indicators and reference indicators according to the state standards UzDSt 604: 2016 and UzDSt 3295: 2018. However, the Colour Grade, which is determined by the HVI system's colour and impurity modulus, is not applicable to Uzbek cotton fibre. This is because only the Rd and + b values of the USDA standard mountain cotton are integrated into the HVI, according to the Nickerson and Hunter diagrams of the Colour Grade cotton fibre colour, which is determined in the colour and impurity module of the HVI system. Due to the unfavourable weather conditions in the United States, the colours of cotton fibre are very different from the climatic conditions of Uzbekistan.

CONCLUSION

When testing Uzbek cotton fibre in the HVI system, the results are inconsistent with the requirements for the colour and appearance of industrial varieties of cotton

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fibre, given in Chapter 5.2.1 of the standard UzDSt 604: 2016. This is due to the fact that the long-term research of Uzbek scientists on the brightness and reflection coefficient (Rd,%) and yellowing rate (+ b) of Uzbek fibre is higher than the Rd and + b values of USDA standard mountain cotton. Today, HVI is considered worldwide as a universal method of measuring the colour of cotton fibre, and it is planned to replace the subjective visual assessment determined by the class with the objective instrumental measurement. Therefore, in order to further improve the quality of Uzbek fibre in the world market, it is necessary to use world experience and new modern technologies.

To address this, the above shortcomings can be addressed by adopting the nomenclature of colour codes in the Nickerson-Hunter colour chart defined in the colour and pollution module of the HVI system, changing some state standards and appearance samples of Uzbek cotton fibre.

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