

RESEARCH ARTICLE

Performance Evaluation of Trash Analyzer and Opener Blender for Preparing Cotton Lint Samples for Fibre Quality Testing

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Abstract

Cotton lint samples drawn from densely packed bales are required to be well opened and cleaned before being used for fibre quality assessment using modern testing equipment. Importance of proper opening of lint samples introduced into the porosity chamber for measurement of fibre fineness (micronaire) is well recognised to ensure not only correct micronaire but also strength values. If lint samples are tested as such without any opening and cleaning, there is every possibility of variations in the micronaire reading from the actual value. In this paper, performance of the two equipments namely trash analyzer and opener blender has been analysed for opening of cotton lint samples to ensure accurate and precise measurement of fibre fineness using High Volume Instrument. It was observed that while both equipments gave similar quality of opening, the capacity of trash analyser was nearly double due to its larger size when compared to opener blender.

Keywords : Cotton, Fibre, Fineness, Lint, Micronaire, Opener, Testing

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Introduction

Major quality factors that are important in determining the market value of cotton are its grade and staple length. The grade depends upon various quality parameters namely, fibre length, strength, fineness (micronaire), non-lint content, moisture content etc. However, in recent years, the micronaire has gained greater importance in spot cotton market pricing. Premium or discount is offered based on the micronaire value of cotton lint. This has led to the increased interest of farmers, ginners, merchants and spinners in producing and trading better micronaire producing cotton varieties. Other factors that affect the micronaire value are location, environment and harvesting conditions. Besides these, mechanical processing machines, non-lint content in the test specimen and sample preparation before testing also affect the micronaire values.

Micronaire (Mic) reading indicates the resistance to passage of air through lint specimen compressed to a given volume. If cotton lint samples are tested on modern High Volume Instrument (HVI) as such in the condition in which received without any opening and cleaning, possibility of variations in micronaire reading from the actual value cannot be denied. However, for increasing the speed of testing, the tendency among machine operators is to use samples as received without any further opening. The Mic value can be considerably higher if samples are tested without opening

which incidentally removes some of the bigger trash particles also. While opening allows proper air flow and accurate surface area measurement, unopened sample reduces the actual surface exposed to air and offers less resistance to air flow thereby increasing the Mic reading, which further lead to lower tenacity values. Hence, proper opening of sample introduced into the porosity chamber for micronaire measurement is very important. Otherwise not only erratic Mic but also erratic strength values can result. In the process of opening, fibres are individualised, parallelised and short fibre and non-lint contents are removed, which improves the Mic value. Presently, opening of lint samples for Mic testing is achieved either manually by hand or by using equipment like trash analyzer and opener blender. The extent of lint opening and the capacity of these methods is discussed in this paper.

Materials and Methods

The experiments were carried out at Ginning Training Centre, Nagpur, which is a regional unit of ICAR-CIRCOT, Mumbai. Cotton lint samples were obtained from the ICAR-CICR, Nagpur. Women labourers were employed for opening the lint samples manually by hand (Figure 1) and by using the MAG Sitra make trash analyser (Figure 2) and SDL fibre opener blender (Fig.3). Specific volume (cc/g) of lint samples before and after fibre opening was determined using the beaker method, in which a known weight of lint sample

was loosely placed in a beaker and its height measured. The capacity was calculated as number of samples opened per hour by recording the time required for opening cotton samples weighing 12-15g. Fibre fineness or Micronaire was measured using the High Volume Instrument (HVI).



Figure 1: Opening of cotton lint samples manually by hand



Figure 2: Opening of cotton lint samples using MAG Sitra Trash Analyzer



Figure 3: Opening of cotton lint samples using SDL Fibre Opener Blender

Results and Discussion

Opening of cotton lint samples manually by hand is the simplest method of lint opening in which cotton lint bundles are simply pulled apart by hands to separate out the entangled fibres and to remove any non-lint impurities. However, in case of hand opening, the desired optimum extent of lint opening is not achieved and the amount of non-lint content seen is also more as compared to the opening by trash analyser and opener blender. The presence of non-lint content adversely affects the micronaire value of cotton fibres. Besides this opening of samples by hand is very tedious and laborious job that leads to testing of samples without proper opening.

Trash separator or analyser is used to determine the percentage of lint, trash, dust and microdots in a sample, which may be raw cotton, blow room lap or card sliver. The machine weighs about 100 kg and has overall dimensions of 1000 × 750 × 600 mm. It uses 50-100 g samples at the lint opening rate of 16 g/min. It is based on the carding principle with separate suction system for efficient separation of lint and non-lint contents. In case of trash analyser, the more aggressive and excessive opening is achieved by saw band cylinder that may adversely affect the micronaire and other fibre quality parameters. The speed of opening of samples by trash analyser machines was found to be 30-35 samples per hour which does not match with the higher handling capacity of the HVI leading to a tendency of testing samples without opening.

SDL Fibre Opener Blender, which weighs 43kg and has overall dimensions of 640 × 470 × 300 mm, is only about half the size of the trash analyser and therefore also has half its capacity at only about 15-20 samples per hour. However, its performance was found to be at par with that of the trash analyser in terms of specific volume of around 100-120 cc/g after opening. Hand opening could achieve only up to 60-80 cc/g, which was only marginally higher than that of 40-60 cc/g in case of unopened samples. The results of the experiment are graphically presented in the Figure 4.

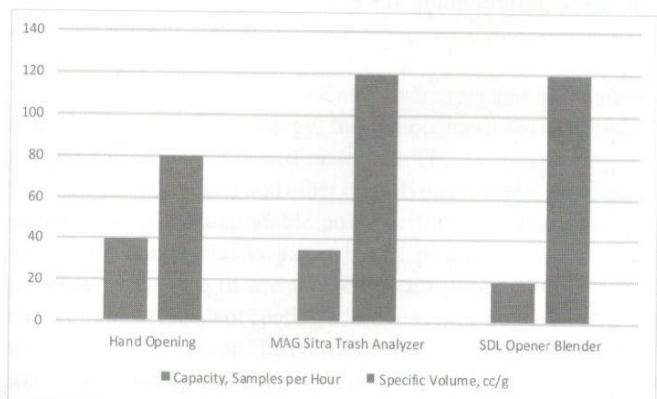


Figure 4: Performance evaluation of trash analyser and opener blender vis-à-vis manual method of cotton lint sample opening for micronaire testing

Influence of Cotton Lint Sample Opening on Fibre Fineness

Cotton is classified as very fine (<3), fine (3-4), average (4-5), coarse (5-6) and very coarse (>6) depending upon its Micronaire values. Influence of lint opening on Micronaire value of cotton samples for five different varieties can be seen from results given in Table 1. It can be observed that cotton varieties having 'fine' fibres, if tested unopened, are often shown under 'average' fibre category with as much as 20% deviation in the readings. Thus, opening of cotton lint samples is very important to get correct fineness readings and higher market price to farmers.

Table 1: Influence of Lint Opening on Micronaire Value of Cotton Samples

Cotton Variety	Micronaire Value		Deviation	Deviation %
	Opened	Unopened		
H6	3.0	3.4	0.4	13
Lra 5166	3.3	3.7	0.4	12
H6	3.5	4.2	0.7	20
H4	3.6	4.0	0.4	11
GCot 16	3.6	4.3	0.7	19

Conclusions

Cotton lint samples used for testing fibre quality parameters must be clean and free from any non-lint content. Generally, lint samples received for testing are drawn from densely packed bales and contain some non-lint portions too. Hence, they require cleaning and opening up to ensure accurate measurement of micronaire

values. Presently, HVI testing laboratories open cotton lint samples either manually by hand or by using trash analyser and opener blender. While both these methods have been found to meet the requirement for giving accurate micronaire readings, yet there are some disadvantages of these methods, especially the low capacity, which need to be looked into while attempting development of new methods of lint opening.

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