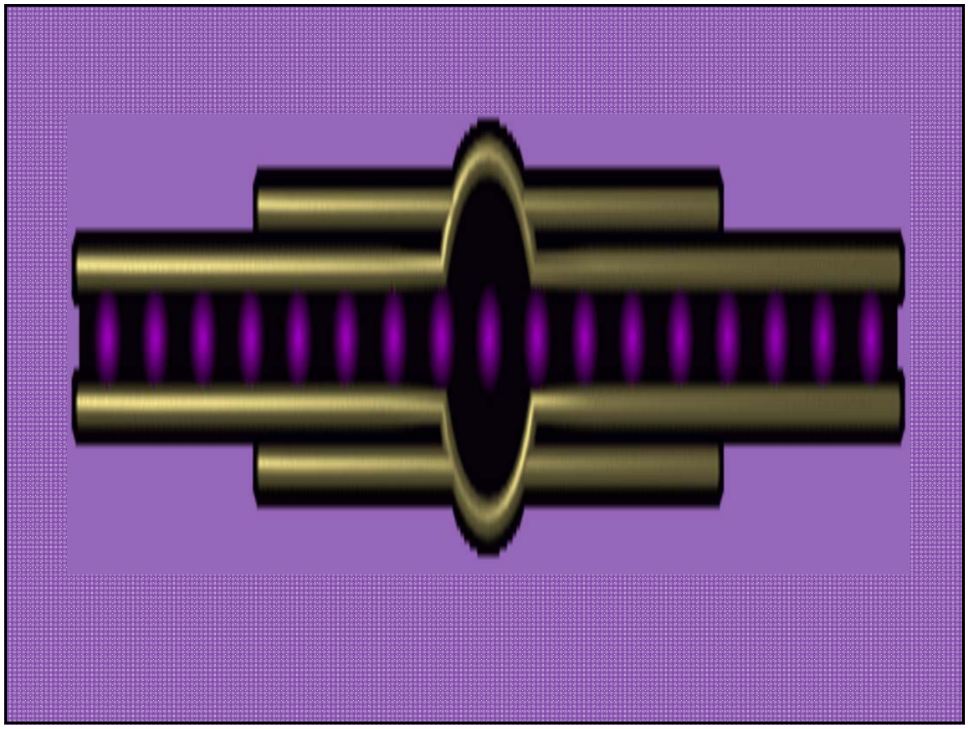

Develop and compare new software based on Ramey and Lord Equations to calculate fineness and maturity parameters using HVI instrument

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Introduction

The fineness of cotton is important because yarn made from fine fiber is generally stronger and more uniform than yarn from coarse fibers. Fiber maturity is important because mature fibers, those with well developed cell walls, absorb dye better and are less prone to cause defects of various sorts in the finished product. Fineness and maturity can be measured in accurate way using microscope or image analyzer , but it is time consuming .Thus, there is a need for an accurate and rapid method for measuring cotton fiber fineness and maturity characters.

Materials and methods

15 Egyptian genotypes produced by cotton research institute. As well as two upland cotton samples from Sudan were used in theses study during 2012 season. The sample tested using the HVI m, Micromat and the Image Analyzer instruments. Images for the same samples were processed to calculate fiber perimeter with [μ], area of secondary cell wall (ASCW) with $[\mu]^2$and degree of thickening (θ).

The results of HVI micronaire and maturity were averaged and used to calculate the PL and Ph values from Lord's FMT models.

Results and discussion

It's familiar that Micromat instrument software based on the Lord's formula to calculate micronaire, fineness and maturity readings as follows:

Mic= (850/PL+40) +0.6

MR=0.247*PL0.125 (PL/Ph) 2

Fin= (60000/ PL)*(Ph / PL) 1.75

During the pervious study(Arafa and Arafa 2012) used the micronaire readings and maturity ratio measured by HVI instrument to calculate back the PL and Ph values which used principally to calibrate the Micromat instrument as follows:

PL =(1)/(mic-0.6)*(850/1)-(40)

Ph=SQRT (0.247*PL0.125/MR)

Thus it could be easy to calculate fineness when the third formula is applied .The pervious study proceed by(Arafa and Arafa 2012)indicated the congruency of the micromat fineness and calculated fineness using HVI Instrument .

Maturity ratio (M %) fineness (H) were calculated from the following equation **.**

Maturity ratio (M %) = $\frac{\theta}{0.577}$

according to (Peirce. and Lord 1939)

Θ= Maturity ratio x 0.577 it could be calculated directly using HVI data

Fineness (H) = ASCW X ŋ

according to (Ramy1982)

Where as ŋ= cell wall density=1.52

ASCW = Fineness (H)/ ŋ

However; standard fineness (Hs) was calculated from equation as follows:

Standard fineness (Hs) = $\frac{H}{\sqrt{M}}$

according to (Lord. 1956).

P =$\sqrt{}$ **3.7853 Hs** according to (Hequet and wyatt 2001)

Where as p= perimeter

...P=$\sqrt{}$**3.7853 Hs** with P= 2r π, and 2r=Diameter (D)

$\frac{perimeter}{3.14}$

π X D=$\sqrt{}$ 3.7853 Hs

D=$\sqrt{}$ 3.7853 Hs / π or **D=P/π**

Where as, π=3.14

... Diameter (D) = $\sqrt{}$1.2055 Hs or = $\frac{perimeter}{3.14}$

Arafa et al., 2009).

Data of degree of thickening, area of secondary cell wall and perimeter showed no significant difference, excellent correlation and determining factor between both of the Image analysis data and the data extracted from the equation used for HVI software.

Fig.1 comparison between degree of thickness obtained from image analyzer instrument and their corresponding reading calculated using HVI instrument

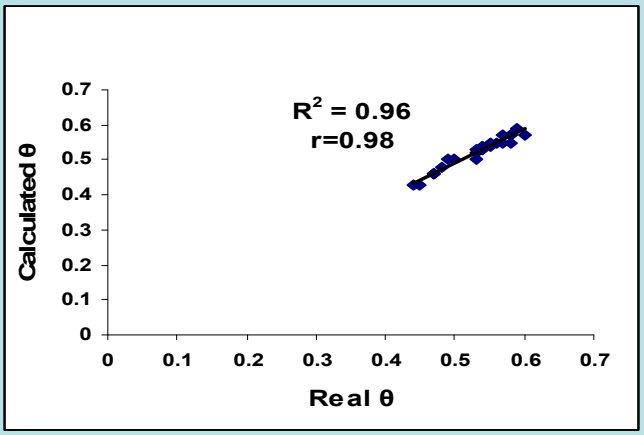


Fig.2 comparison between area of secondary cell wall obtained from image analyzer instrument and their corresponding reading calculated using HVI instrument .

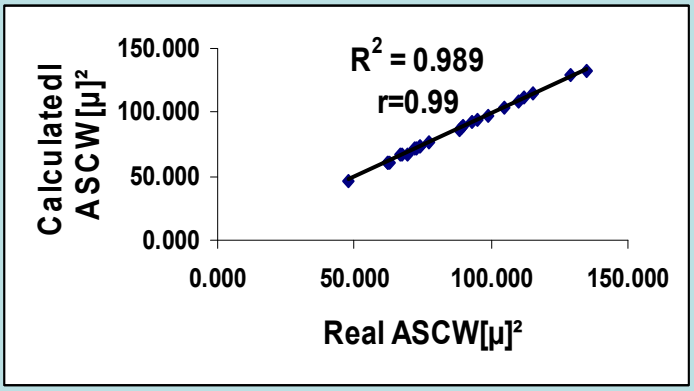


Fig.3 comparison between perimeter obtained from image analyzer instrument and their corresponding reading calculated using HVI instrument

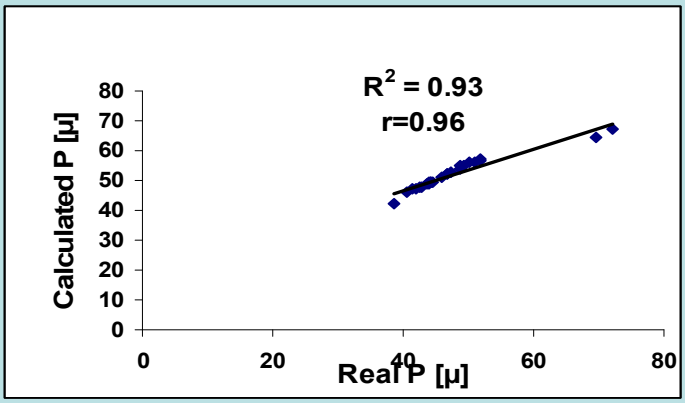


Fig. 4, the software flow chart

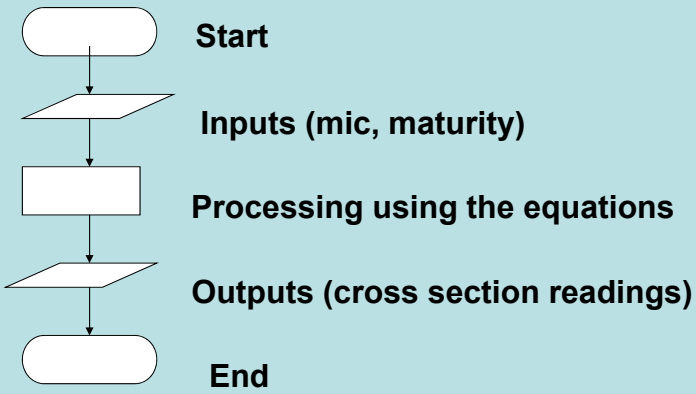
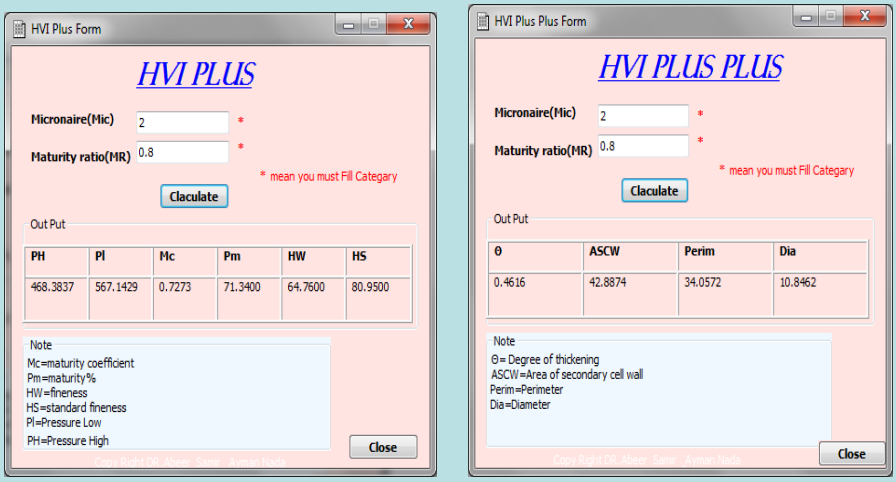


Fig .5, the software screens



References

1. Arafa A.S.; A.E. Ibrahim and Mostafa M.K. (2009). Extent of accord Between Egyptian cotton fiber fineness and maturity parameters measured by the image analyzer and their corresponding parameters estimated from the micromat data J. Adv. Agric. Res. ,14:(2) (Fac. Agric. saba.bashs. Alex.

2. Hequet, E. F.; Wyatt B.; Abidi N. and Thibodeaux D.P. (2006). Creation of a set of reference material for cotton fiber maturity measurements. Text. Res. J. 76:576-586.

3. Lord.E.(1956).J.text.inst.,4747.T 16.

4. Peirce, F.T. and Lord E. (1939). The fineness and maturity of cotton. J. Text. Inst. 30:T173-T210.

5. Ramey, H.H., Jr. 1982. The meaning and assessment of cotton fibre fineness. Int. Institute for Cotton, Technical Research Division, Manchester, England.