EVALUATION OF COTTONISED HEMP FIBRE PRODUCED USING A NEW CATALYTIC DEGUMMING SYSTEM

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ABSTRACT

Hemp (Cannabis sativa L) fibres in their individualised form are a viable alternative to cotton fibres for textile manufacture. These fibres have similar diameter, length and properties to cotton however obtaining individual fibres from the fibre rich hemp bark is not a simple process. This work analyses a cottonised hemp fibre produced by a new rapid catalytic degumming technique developed by Deakin University and Logistik Unicorp.

INTRODUCTION

Hemp (Cannabis sativa L) is a high yield, short growth cycle plant that contains fibre within its bark (bast). The fibre needs to be extracted from the plant before it may be used and this is normally done in a two-step process; decortication and retting. The fibres within the bark are held in a composite structure with lignin's, waxes, hemicellulose and pentosans acting as the binding agents. Retting is the process of separating these fibres and can be undertaken in a number of ways including water retting (Scott 1962) dew retting, enzymatic (Akin 2000) chemical/physical (Hurren 2002) methods, combined chemical and enzymatic retting (Ramaswamy 1994), ultrasonic(Wang 2001) and steam explosion(Vignon 1996).

The majority of current hemp production utilises bark that has been field retted and is spun on traditional bast fibre spinning equipment. The field retting process is slow, land use restricting, climate specific and hard to control and traditional bast fibre spinning equipment labour intensive with low levels of modernisation (Ditchfield 1998). Research and industrial process has been conducted on separating fibre so that it can be ran a blends on cotton and wool spinning equipment but most of this fibre is tow or waste from the traditional system (Cierpucha 2004). A simplified method for separating decorticated hemp bark into a fibre that can be used on the cotton system is required to make hemp a viable player in the textile fibre market.

This work investigates the quality and repeatability of process of fibre produced using a newly developed two step fibre separation called "catalytic degumming". Fibre quality has been expressed by fibre fineness (OFDA2000), fibre length and colour whiteness index (CIE/E313) on 31 individual batches processed. Fibre compatibility on the cotton spinning system was determined using a digital spinning system (Tianjin Polytechnic, China)

RESULTS AND CONCLUSIONS

The mean fibre whiteness of the separated fibre was -14.4 (3.7 SD). The mean fibre diameter of the separated fibre was 18.2μm (0.8 SD). There was no relationship between colour and diameter observed for the trial with colour and diameter variation observed assumed to be in the starting material (Fig. 1). Yield of the process was 55.6% (4.1 SD) of the initial dry decorticated bark. Fibre length was 16mm. 60/40wt% blends of cotton/hemp were spun to

85tex and 4.5 twist factor and exhibited a tenacity of 14.8g/tex (3.6SD) and an elongation to break 10.2% (2.3SD). The fibre diameter achieved was appropriate for spinning however the length was shorter than would normally be desired. This gave problems with drafting in spinning and reduced the strength of the resultant yarn. The shortness of fibre length was directly attributed to the decortication method which had impacted on fibre quality before catalytic degumming. Future work will focus on starting material decorticated by a different method.

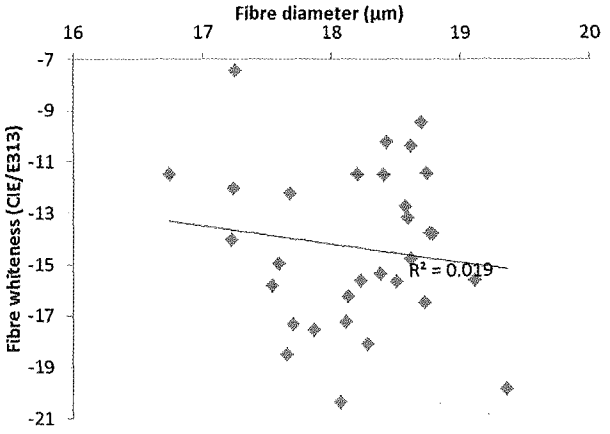

Fig.1 Fibre colour versus diameter

This study shows that hemp fibre can be rapidly separated to form a fibre capable of being spun on a cotton ring spinning system.

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