Improvement of Upland Cotton through Interspecific Hybridization: Analyze of the Fibre Fineness of Bi- and Trispecific Hybrids Involving *G. longicalyx*

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Introduction

The cotton fiber is the major commercial product from cotton and the most widely used natural fiber in the world. Faced with the existing demand of the textile industry the perpetual need of improved fiber quality is one of the main challenge of the cotton breeders. Besides the length and the strength, the fineness is one of the most important criteria associated to cotton fiber quality. The wild species *G. longicalyx* Hutch. and Lee (F1) seems be a good donor for the increase of fibre fineness (Ndungo *et al.*, 1988). A breeding program was developed at the Gembloux Agricultural University (Gembloux Agro-Bio Tech) to transfer this useful trait from *G. longicalyx* to upland cotton varieties. We present here the first results obtained in the framework of this breeding program.

Materials and Methods

Eleven (11) diploid species (Table 1), their bi-species hexaploid hybrid with *G. hirsutum* (Table 2), the tri-species hybrid (*G. hirsutum* x *G. thurberi*)² x *G. longicalyx* (Konan et al, 2007) and its BC1 and BC2 progenies were analyzed for the fiber fineness. For these analyses, the fibers were combed and a tuft of parallel fibers was cut. Their free points were also cut and the median region was placed on a slide and covered with a cover glass. A drop of 18% NaOH solution was applied on each fiber sample in order to swell them (figure 1).The diameter of at least 100 fibres was then measured with the software NIS-Elements BR 2.30 using the Nikon Eclipse E800 microscope equipped with a digital Nikon camera. The ribbon width was determined by dividing the mean of the measured diameters with the 1.3 Summers coefficient (Roehrich, 1947).

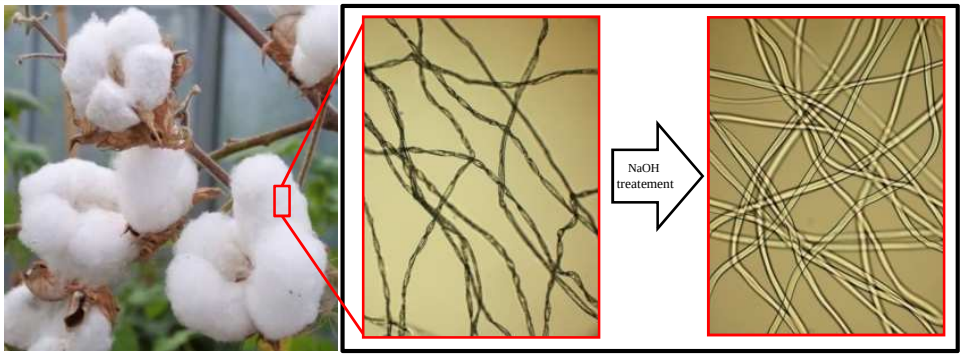


Figure 1. Swelling of cotton fibres after treatment with 18% NaOH solution

Results and discussion

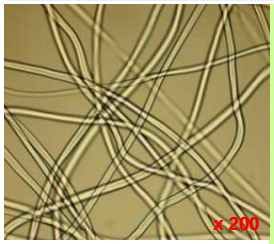
On the 11 diploid species analyzed *G. longicalyx* had the most fine fibers (Table 1): 5.94µm ribbon width for *G. longicalyx* against 6,13 - 24.37µm for the others species. The same trend was observed with the bi-species hexaploid hybrids: 12.53µm for (*G. hirsutum* x *G. longiclayx*)² and 15.83 to 22.94µm for the others. The tri-species hybrid (*G. hirsutum* x *G. thurberi*)² x *G.longicalyx* with a 12,65µm ribbon width exhibited the same fiber fineness as the (*G. hirsutum* x *G. longiclayx*)² hexaploid hybrid and so do some BC1 and BC2 plants (figure 2). These results prove that *G. longicalyx* is a valuable genetic stock for the improvement of upland cotton fiber fineness.

Table 1. Ribbon width of 11 diploid cotton species and some tetraploid species

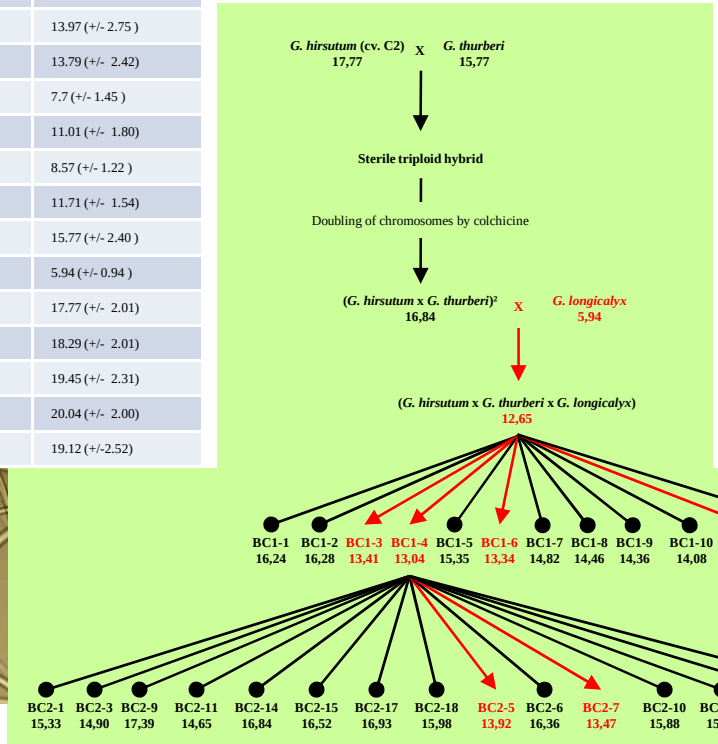
Genotypes	Ribbon width (µm)
G. Arboreum	24.37 (+/-3.58)
G. Anomalum	6.13 (+/-1.03)
G. Sturtianum	10.91 (+/- 2.75)
G. Armourianum	13.97 (+/- 2.75)
G. Areysianum	13.79 (+/- 2.42)
G. Harknessii	7.7 (+/- 1.45)
G. Aridum	11.01 (+/- 1.80)
G. Raimondii	8.57 (+/- 1.22)
G. Stocksii	11.71 (+/- 1.54)
G. Thurberi	15.77 (+/- 2.40)
G. Longicalyx	5.94 (+/- 0.94)
G. hirsutum (cv. C2)	17.77 (+/- 2.01)
G. hirsutum (cv. NC8)	18.29 (+/- 2.01)
G. hirsutum (cv. 98M-2983)	19.45 (+/- 2.31)
G. hirsutum (cv. 11240-RNR)	20.04 (+/- 2.00)
G. barbadense (cv. 353)	19.12 (+/-2.52)

Table 2. Ribbon width of 11 bi-species hexaploid cotton hybrids and a tri-species hybrid

Genotypes	Ribbon width (µm)
(*G. hirsutum* cv. C2 x *G. arboreum*)²	22.31 (+/-2.45)
(*G. hirsutum* cv. C2 x *G. anomalum*)²	15.83 (+/- 1.64)
(*G. hirsutum* cv. C2 x *G. sturtianum*)²	19.50 (+/- 2.47)
(*G. hirsutum* cv. NC8 x *G. australe*)²	20.07 (+/- 2.91)
(*G. hirsutum* cv. NC8 x *G. harknessii*)²	20.20 (+/- 1.94)
(*G. hirsutum* cv. NC8 x *G. aridum*)²	18.18 (+/- 1.60)
(*G. hirsutum* cv. NC8 x *G. raimondii*)²	18.85 (+/- 1.54)
(*G. hirsutum* cv. NC8 x *G. stocksii*)²	16.85 (+/- 1.80)
(*G. hirsutum* cv. NC8 x *G. areysianum*)²	22.94 (+/- 2.19)
(*G. hirsutum* cv. C2 x *G. thurberi*)²	16.83 (+/- 1.91)
(*G. hirsutum* cv. C2 x *G. longicalyx*)²	12.53 (+/- 1.69)
(*G. hirsutum* x *G. thurberi*)² x *G. longicalyx*	12.65 (+/-1.67)



Fibres of *G. hirsutum* after NaOH treatement



Fibres of *G. longicalyx* after NaOH treatement

Figure 2. Ribbon width (µm) of parental species and the BC progenies of the HTL tri-species hybrid

References

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