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ABSTRACTS

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Elucidating the impact of N-glycosylation on the ability of recombinant CBM3 from *Clostridium thermocellum* to modify pulp and paper properties

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The hydrolytic activity of the enzymes traditionally used in paper industry to modify pulp and paper properties often leads to the reduction of fiber strength [1]. Thus, the use of the carbohydrate-binding modules (CBMs) of these enzymes has emerged as an interesting alternative, as CBMs have been shown to enhance the surface/interface properties of cellulose fibers independently from the catalytic domain [2].

The CBM3 from the *Clostridium thermocellum* CipA scaffolding protein was previously reported to improve pulp drainability when conjugated with polyethyleneglycol (PEG), which was used to mimetize glycosylation [3]. Otherwise, it didn't affect any of the pulp and paper properties studied [3]. Although not glycosylated in nature, this CBM3 has three potential N-glycosylation sites. Therefore, to elucidate the impact of N-glycosylation on its ability to modify the properties of cellulose fibers, we assessed the effect of two versions of this CBM3 recombinantly produced in *Pichia pastoris*, one non-glycosylated and other glycosylated, on the properties of *Eucalyptus globulus* pulps and handsheets.

Although glycosylation reduced the CBM3 adsorption (16%) and affinity (35%) to Avicel (microcrystalline cellulose), as well as the CBM3 ability to promote the hydrophobization of Whatman's paper surface, the two CBM3 versions affected the *E. globulus* pulp and paper properties in a similar way. None of the CBM3s altered the drainability of *E. globulus* pulps, but both improved significantly the burst and tensile strength indexes of *E. globulus* handsheets, by up to 12% and 10%, respectively. This yet unknown capacity of CBM3 to improve paper strength-related properties was dependent on the amount of CBM3 used, but not on its glycosylation. Therefore, our results show that the N-glycans attached to CBM3 did not significantly change its effects over pulp and paper properties.

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Literature

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