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## Relative saccharification and initial degradation rates of different waste paper materials by cellulase from *Trichoderma viride*

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## ABSTRACT

*Objectives:* Solid waste accumulation, renewable and sustainable energy development are topical issues concerning many populations around the globe. Used paper is defined as part of organic solid waste, which besides recycling is eventually dumped, incinerated or landfilled. A structural analysis revealed that cellulose, a major component of waste paper, is a biopolymer composed of glucose units and when treated with cellulase enzymes, cellulose can be degraded into glucose a fermentable sugar. The aim of this investigation was to determine the relative saccharification of various waste paper materials when treated with cellulase from *Trichoderma viride* as well as the initial rate at which each material was degraded. It was also at aim to determine the amount of sugar produced when each paper material was maximally degraded and the time taken for maximum cellulase catalysed hydrolyses.

*Methodology and Results:* Various waste paper materials such as office paper, foolscap paper, filter paper, Woolworths paper (a local retailer) and cardboard were saccharified with *T. viride* cellulase during different incubation periods producing different amounts of sugar concentrations. The different initial saccharification rates of the paper materials were calculated by determining the amount of sugar produced during the initial period of incubation and it was concluded that different maximum sugar concentrations were obtained during saccharification of these used paper materials. Filter paper took the longest time of 100 minutes to obtain maximum saccharification. The shortest period of 40 minutes to reach maximum saccharification was obtained during the degradation of newspaper. The fastest rate of degradation was obtained from newspaper at 0.028 mg.min<sup>-1</sup> and the lowest rate was calculated for filter paper at 0.0045 mg.min<sup>-1</sup>. Cardboard produced the highest concentration of sugar at 8.0 mg.ml<sup>-1</sup> while filter paper produced the lowest at 1.4 mg.ml<sup>-1</sup>.

Conclusions and applications of findings: Different waste paper materials exhibit different susceptibilities for degradation by *T.viride* cellulase into glucose a fermentable sugar and as a result, different maximum amounts of sugars were obtained during bioconversion of the papers. The time needed for maximum degradation differs for the different paper products, which indicates that each paper material should be exposed to an unique bioconversion procedure ensuring a maximum sugar yield. Waste paper exhibits the ability to be bioconverted into fermentable sugars thus could be applied as a renewable resource for bioproduct development.

Keywords: Cellulase, Trichoderma viride, Waste paper, Saccharification, Bioenergy