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# Characterization of a novel strain from *Aspergillus aculeatinus*: from rhamnogalacturonan I-type pectin degradation to the application for juice clarification



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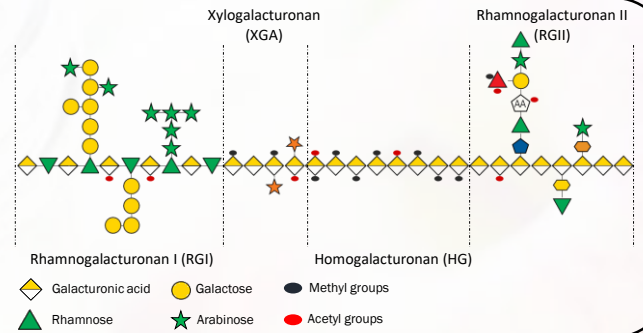
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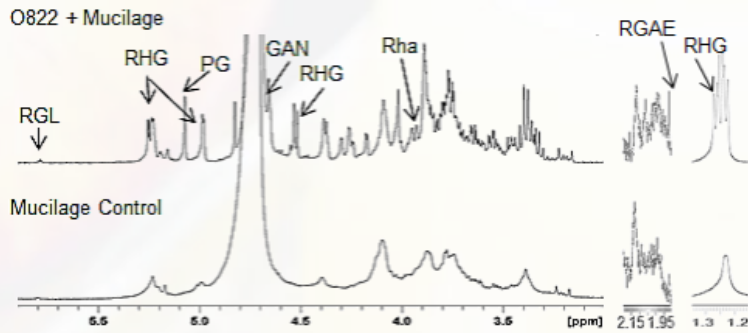
3 : Centre Technique de la Conservation des Produits Agricoles, 41 avenue Paul Claudel, 80480 Dury-Amiens, France

## Introduction

In fruit juice industry, the high concentration of pectins can lead to colloids formation, which can induce filter clogging during the process (Cameron et al., 2017), with consequent effect on the yields of juice production. Four pectic domains can be described: Homogalacturonan (60%), Xylogalacturonan (XGA), Rhamnogalacturonan II (RGII) and Rhamnogalacturonan I (30%) (Mohnen, 2008; Silva et al., 2016). Classical enzymatic cocktails used in industry are composed of pectin methyl-esterase and polygalacturonase, both involved in HG degradation. These cocktails are lacking enzymatic activities that can effectively degrade RGI-type pectins (RGI-ases). The aim of this study was to assess the potential of one *Aspergillus aculeatinus* strain, O822, in secreting RGI-degrading enzyme and its application potential for fruit processing industry.

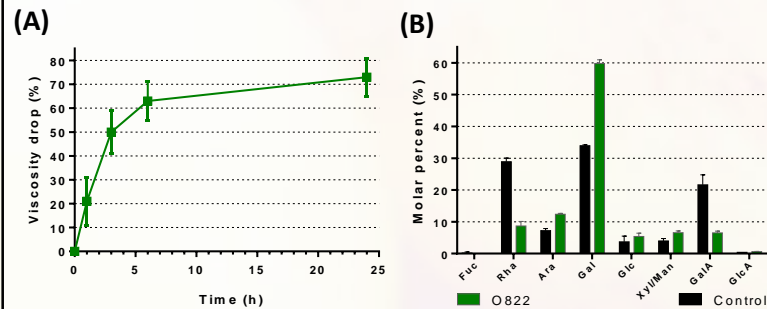


## (I) Identification of O822 aqueous extract activities by NMR analysis on *Camelina sativa* mucilage



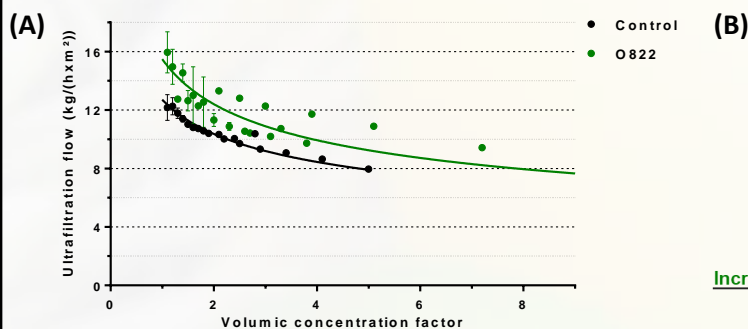
1H proton NMR spectra of mucilage following treatment with O822. RGL: rhamnogalacturonan lyase; RHG: endo-rhamnogalacturonase; PG: polygalacturonase; GAN: Endo-β-1,4-galactanase; Rha: α-L-rhamnosidase; RGAE: Rhamnogalacturonase acetyl esterase.

## (II) O822 aqueous extract decrease *Camelina sativa* mucilage viscosity by modifying monosaccharides composition



(A) Effects of O822 aqueous extract on *Camelina sativa* mucilage viscosity by sine-wave vibro viscosimeter. (B) Monosaccharide composition of mucilage measured by HPAEC-PAD. Fuc: fucose; Rha: rhamnose; Ara: arabinose; Gal: galactose; Glc: glucose; Xyl/Man: xylose and mannose; GalA: galacturonic acid; GlcA: glucuronic acid

## (III) O822 aqueous extract increase apple juice filtration capacity at laboratory and pilot scale



	Experiment I		Experiment II	
	Control	AE O822	Control	AE O822
Juice Density	1.05	1.06	1.06	1.07
Brix degree	13.40	15.60	15.00	15.90
Volume filtered (L)	60.00	60.00	26.00	25.70
Average filtration rate (L/h)	104.40	139.40	70.90	87.70
Average filtration rate (kg sugar/h)	14.75	23.13	11.29	14.85
Increase in filtration rate vs control (% L/h)	-	34%	-	24%
Increase in filtration rate vs control (% kg sugar/h)	-	57%	-	32%

\*AE O822 in juice 155 mL/hL

(A) Effects of O822 strain on concentrated liquefied apple fruit juice filtration capacity at laboratory scale. Results show a significant increase in the ultrafiltration flow when the juice is treated with 10% w/w AE O822 during 2h incubation. (B) Filtration assays at pilot scale involves a standard apple juice process with cold-stored apples and front filtration as final step. Juice was treated with 0.15% v/v of AE O822 resulted in an increase in the average filtration flow of 34% and 24%.

## Conclusion

As NMR analysis shows, aqueous extract recover from O822 *Aspergillus aculeatinus* strain has all activities needed to a complete RGI degradation (i.e. endo-rhamnogalacturonase, endo-β-1,4-galactanase, α-L-rhamnosidase and rhamnogalacturonase acetyl esterase). Due to these activities, the viscosity of the substrate is drastically reduced, showing the application potential of the aqueous extract. Potential evaluations at laboratory and pilot scale shows an increase in ultrafiltration flow and in average filtration rate of apple juice after an incubation with a RGI-ase rich aqueous extract recover from a novel *Aspergillus aculeatinus* strain.

## References

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 Silva, I. et al. (2016) New biotechnology. 33(1):41-54.