

HYDROTHERMAL DEHYDRATION OF D-GLUCOSE AND D-XYLOSE IN DEIONIZED WATER

M.Kammoun^{1,2}, T.Istasse¹, N.Rassaa³, T.Bettaieb², A.Richel¹

1 Laboratory of Biomass and Green Technologies. ULg - GxABT. Passage des Déportés, 2, 5030 - Gembloux, Belgium

2 Laboratory of Horticultural Sciences. UC- INAT. Avenue Charles Nicole, 43, 1082 – Tunis, Tunisie.

3 Laboratory of Agricultural Production Systems Sustainability in the Northe Region of Tunisia. UJ - ESAK. Boulifa, 7119 – Le Kef, Tunisie.

ABSTRACT

The industrial trend is moving toward biobased platform molecule preparation using biobased-processes integrating into green chemistry discipline. These “building blocks” molecules are intermediate for the synthesis of value-added chemicals. 5-hydroxymethylfurfural (5-HMF) and 2-furfural are two platform molecules derived from monosaccharides.

In order to produce these furanic compounds, xylose and glucose conversion were conducted in hot deionized water, which represent the greenest solvent, at 211°C, 20 bars by means of batch-type reactor. A selected rang of times $T_1=1$ min, $T_2=15$ min, $T_3=30$ min, $T_4=45$ min and $T_5=60$ min were investigated.

Results shows that at 15 min, the best 5-hydroxymethyl furfural (5-HMF) yield is 18,52%, produced by glucose dehydration, then it recorded a stable rate. At the same time 2-furfural was produced from xylose with a yield of 26,71% and didn't vary significantly over time.

A 11,09% and 9,67% yield of Lactic acid (LA) and Formic Acid (FA) were obtained as a co-product from glucose dehydration and 5.53% of LA was generated from xylose decomposition.

MATERIALS

-Hydrothermal decomposition was performed in a 5500 Parr reactor (600ml) equipped with a temperature probe connected to a 4848 Parr reactor controller.

-Decomposition products were analyzed using conventional analytical protocols, respectively gas chromatography quantification on the basis of the alditol acetates protocol and high performance liquid chromatography coupled with UV detection at 210 nm for organic acids and 248 nm for furanic compounds (with 5mM H₂SO₄ as the elution solvent at 0.6 ml/min and a Aminex HPX-87H column, 45 °C).

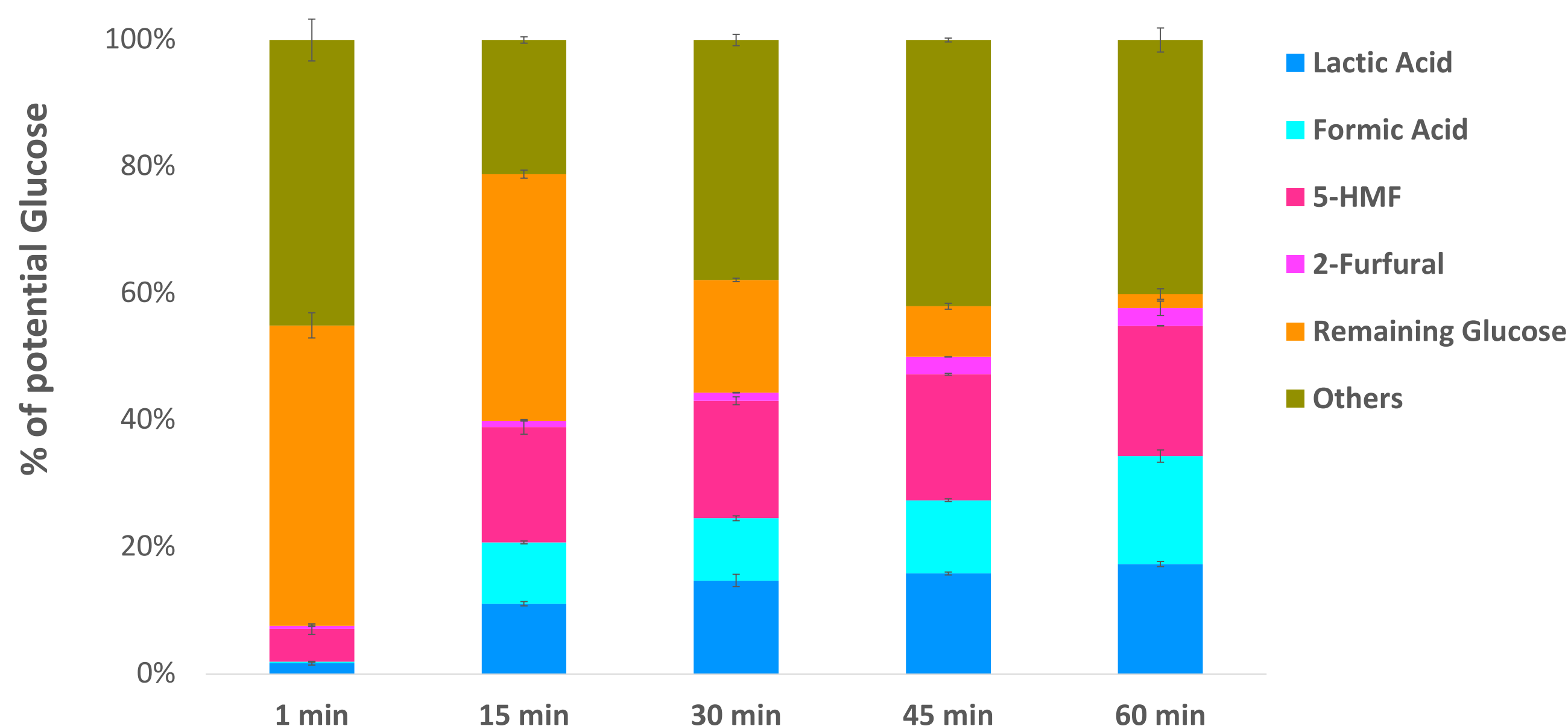


Parr reactor

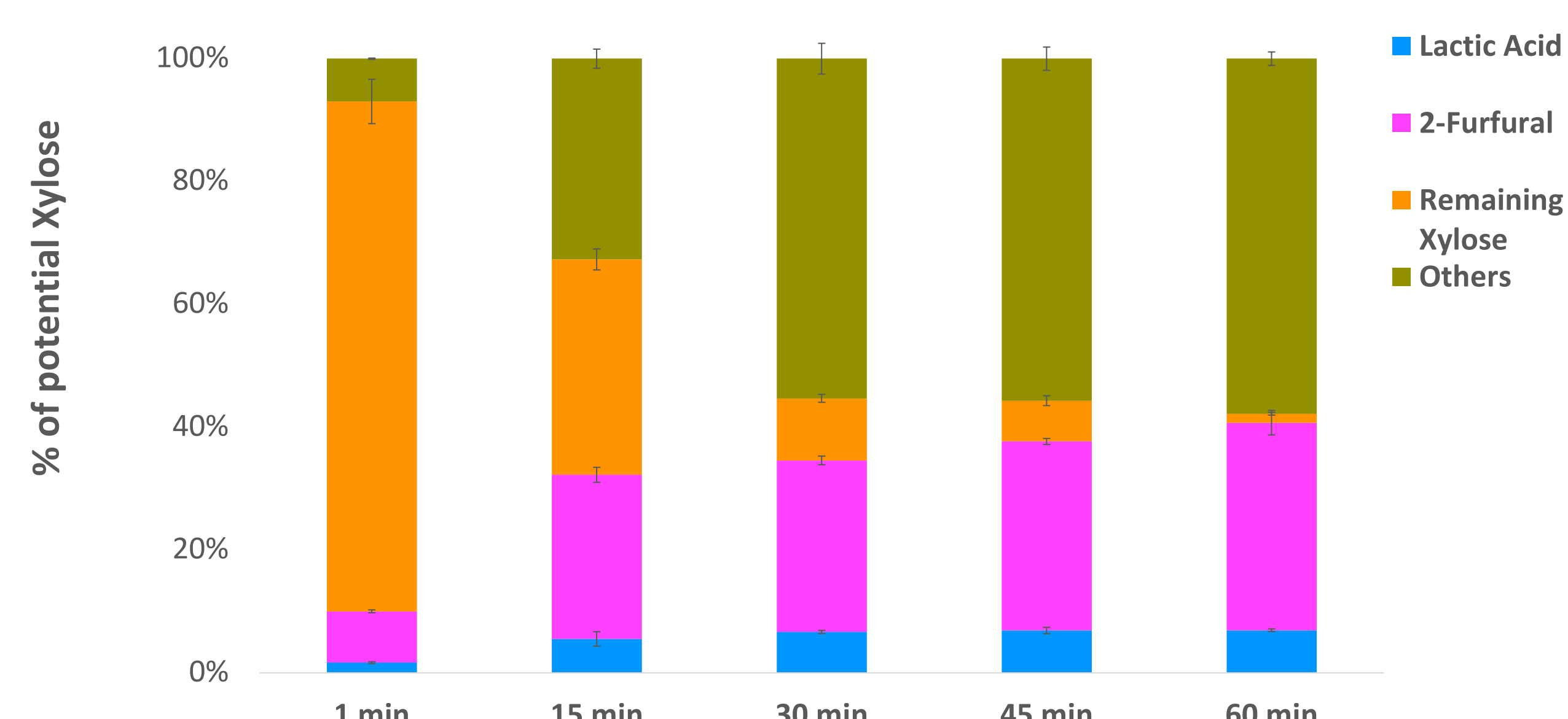


HPLC-UV detection

RESULTS



Conversion of D-glucose in deionized water after 15 min at 211°C into furanic compounds and organic acids



Conversion of D-xylose in deionized water after 15 min at 211°C into furanic compounds and organic acids

Conclusion

