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Sugar and polyalcohol based NADES: Stability of Ascorbic acid during storage at 25ºC and 4ºC.

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PURPOSE OF THE ABSTRACT

Introduction: Ascorbic acid (AA) is an indicator of quality and stability of food extracts due to its quick and easy degradation. Natural Deep eutectic solvents have interesting and important properties that make them a suitable alternative to organic solvents, they are eutectic mixtures of two or more components, one acts as hydrogen bond donor (HBD) and the other as hydrogen bond acceptor (HBA) [1]. Objective: The aim of this study is to analyze the stability of AA in four NADES and their antioxidant capacity. Materials and methods: AA standard (0.2mg/ml) was added to four different combinations of NADES, all of them sugar-based (choline chloride:glucose (ChChl:Glu), choline chloride:fructose (ChChl:Fruc), choline chloride:xylose (ChChl:Xyl)) o polialcohol-based NADES (choline chloride:glycerol (ChChl:Gly)) and in all cases with choline chloride (ChChl) as HBD following a molar ratio, to reduce their viscosity was added distilled water 40% (v/v). Two forms of storage were taken into account, at 25ºC and at 4ºC. The concentration of AA was measured with 2,6-dichlorophenolindophenol [2], was taken for point 0 the day of preparation and the degradation of AA was analyzed for thirty days, likewise it was stored in the same conditions NADES without addition of AA as a target, to observe the degradation of the solvent itself. Antioxidant capacity (AC) of NADES and NADES added with AA was measured by fluorometric method ORAC [3] (Wallac 1420 VICTOR multilabel counter (Perkin-Elmer, USA)). Data was analyzed using Statgraphics Plus 5.1 software (Statpoint Technologies Inc. Warrenton, VA, USA), a simple regression was done, and p-value in the ANOVA test was less than 0.05 in every NADES, there are statistically significant relationship between the concentration and day at the 95,0% confidence level. Results: The results show that the NADES added at 4ºC (figure 1) preserve the AA practically in its entirety initial concentration, following a different degradation kinetics in each case (table 1), being ChChl:Xyl and ChChl:Gly the ones that remains more stable, this may be due to different factors such as the antioxidant capacity that each solvent presents, being ChChl:Xyl the sugar-based one that presents the higher AC (2.03 mM TE) and the polyalchol-based ChChl:Gly (4.57 mM TE). Samples stored at 25ºC (Figure 1) underwent AA degradation following a linear and exponential model, with similar degradation kinetics for the four combinations of NADES. Conclusions: Antioxidant capacity is related to the stability of AA in the NADES studied in this case the concentration of AA remained stable at 4ºC storage.

FIGURES

NADES	Storage	Equation	Model	R-squared	Mean absolute error
ChChl.Glu	25ºC	Y = 0.938 – 0.027 x	Linear	98.129	0.024
ChChl.Glu	4ºC	Y = exp (-0.057 – 0.008 x)	Exponential	81.935	0.027
ChChl.Fruc	25ºC	Y = exp (0.117 – 0.101 x)	Exponencial	89.277	0.217
ChChl.Fruc	4ºC	Y = exp (-0.226 – 0.005 x)	Exponential	18.298	0.074
ChChl:Xyl	25ºC	Y= exp (0.012 – 0.063 x)	Exponential	97.672	0.062
ChChl:Xyl	4ºC	Y = 0.951 – 0.002 x	Linear	21.433	0.034
ChChl:Gly	25ºC	Y = 0.965 – 0.030 x	Linear	97.679	0.029
ChChl:Gly	4ºC	Y = 0.993 – 0.004 x	Linear	79.314	0.015

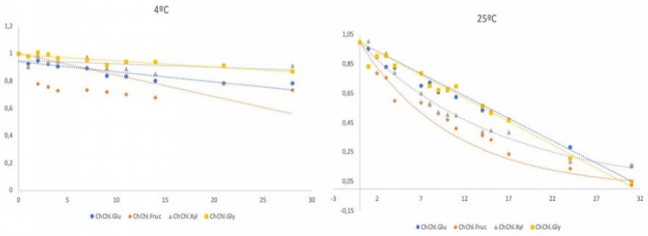

FIGURE 1

Table 1: Degradation kinetics of NADES studied

ChChl: Choline chloride, Glu: glucose, Fruc: fructose, Xyl: xylose Gly: glycerol

FIGURE 2

Figure 1: NADES added with AA stored at 4?C and 25?C

ChChl: Choline chloride, Glu: glucose, Fruc: fructose, Xyl: xylose Gly: glycerol

KEYWORDS

Natural deep eutectic solvents | ORAC | ascorbic acid | stability

BIBLIOGRAPHY