Development of natural salivary substitutes and evaluation of their rheological properties using an in vitro model

Yurixy Bugarin-Castillo, Alejandro Avila-Sierra, Vincent Mathieu, Marco Ramaioli

To cite this version:
Yurixy Bugarin-Castillo, Alejandro Avila-Sierra, Vincent Mathieu, Marco Ramaioli. Development of natural salivary substitutes and evaluation of their rheological properties using an in vitro model. 12th Congress of European Society of Swallowing Disorders 2022, Sep 2022, Leuven, Belgium. 2022. hal-03780659

HAL Id: hal-03780659
https://hal.science/hal-03780659
Submitted on 19 Sep 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
DEVELOPMENT OF NATURAL SALIVARY SUBSTITUTES AND EVALUATION OF THEIR RHEOLOGICAL PROPERTIES USING AN IN VITRO MODEL

Y. Bugarin Castillo(*) , A. Avila Sierra , V. Mathieu, M. Ramaioli (**)
Université Paris-Saclay, INRAE, AgroParisTech, UMR SayFood, 91120, Palaiseau, France

CONTEXT
• Xerostomia is usually described as a decrease in salivary flow caused by specific diseases, drugs, or therapies associated. 1,2
• The prevalence of xerostomia varies from 13 to 28% in the older population and increases up to 60% in patients living in long-term care facilities. 2
• It can seriously impact the quality of life, altering speech, oral environment, and swallowing. 1,2

OBJECTIVE
To develop artificial saliva to be used in swallowing in vitro models in order to design tailored food textures for xerostomic patients.

MATERIALS & METHODS
Artificial Saliva
Flaxseed extracts at 0.25% and 0.7% dry matter were mixed with deionized water.

Apple Puree
Commercial apple puree was used as a model food (Andros, France).

RESULTS

Shear Viscosity [Pa s]

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Relaxation time [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.118</td>
</tr>
<tr>
<td>0.1</td>
<td>0.444</td>
</tr>
<tr>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>

In Vitro Swallowing

Lubricated* VS Unlubricated In Vitro Swallow

Residue Mass [g]

<table>
<thead>
<tr>
<th>Shear Stress [Pa]</th>
<th>Swallow 1</th>
<th>Swallow 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power Law fitting model. Values for 1st swallow: Consistency Index "k*

29.91 21.56 9.10

Lubricated Flaxseed Extracts

CONCLUSIONS
• The flaxseed extracts at 0.25% and 0.70% DM show shear-thinning behavior, with the 0.25% closer to human saliva.
• The relaxation time of both concentrations (0.25% and 0.7%) are in agreement with those obtained from human saliva.
• Residues decreased when flaxseed extracts are used suggesting a lubrication effect.
• The shear viscosity of in vitro bolus decreased using flaxseed extracts simulating human saliva behavior.
• Flaxseed extracts showed bolus’ cohesiveness during the swallowing sequence.

CONTACT
(*) Yurixy BUGARIN CASTILLO yurixy.bugarin-castillo@inrae.fr
(**) Marco RAMAIOLI marco.ramaioli@inrae.fr

REFERENCES