A fruit snack including grape and tomato pomaces – assessment of the effect of temperature on drying characteristics and quality during storage

Rocio Santiago R., Inês N. Ramos, Cristina L.M. Silva*

Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado
Escola Superior de Biotecnologia, Rua Diogo Botelho, 1327, 4169-005 Porto, Portugal
*clsilva@porto.ucp.pt

Introduction

- On average, each person in Europe wastes 173 ± 37 kg of food per year (Stenmarck et al., 2016). Food waste generates energy and human resources waste, affects climate change, and has a very negative economic impact. Food waste was considered a priority in the EU Circular Economy Action Plan.
- Both grape and tomato pomaces are very nutritious, and therefore it is interesting to include them in the manufacture of a product for human consumption. New trends in the reuse of pomace suggest implementing it into snack manufacturing (Orrego et al., 2014).

Objectives

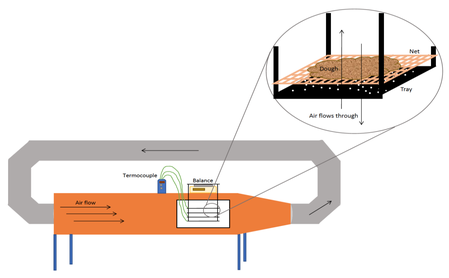
- To develop a fruit bar recipe which is appealing for the consumer while being healthy, with a focus group. To include grape and tomato pomace by-products, avoiding waste and promoting a circular economy.
- To study the impact of different drying temperatures in the convective air dryer, on the final product's physico-chemical properties.
- To adjust the experimental drying curves to different thin-layer drying models and find the one that adjusts best.
- To assess whether the product is stable over storage for the different processing temperatures.

Methodology

List of the ingredients used in the final recipe.

Ingredient	Weight (g)	% of the total
Oat flocks	300	27.3
Quinoa seeds	50	4.6
Chia seeds	25	2.3
Honey	100	9.1
Peanut butter	100	9.1
Grape pomace	200	18.2
Tomato pomace	200	18.2
Water	125	11.4

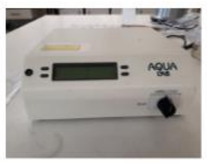
Convective drying
temperature: 50 °C, 60 °C, and 70 °C
air velocity: 0.54 m/s



Quality Analysis

- ✓ Water activity (aw)
- ✓ Water content
- ✓ Colour – CVS (Computer Vision System)
- ✓ Texture

aw-meter Aqualab



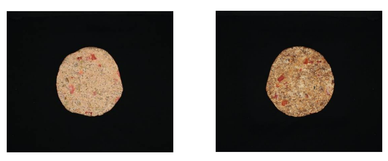
CVS - photo studio box with camera

Texturometer

Results & Discussion

Colour

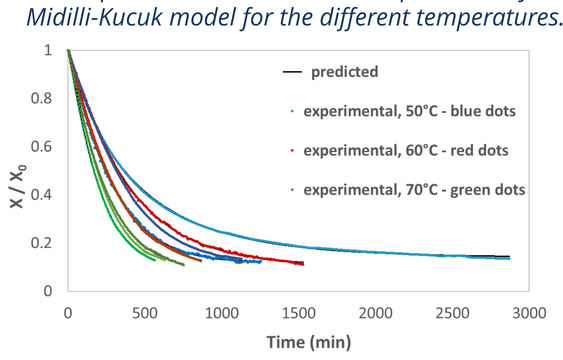
Samples before (left) and after drying (right).



✓ There was a great difference in the color of the samples before and after drying, and no significant difference between different processing temperatures.

Drying Kinetics

Experimental data and values predicted by Midilli-Kucuk model for the different temperatures.



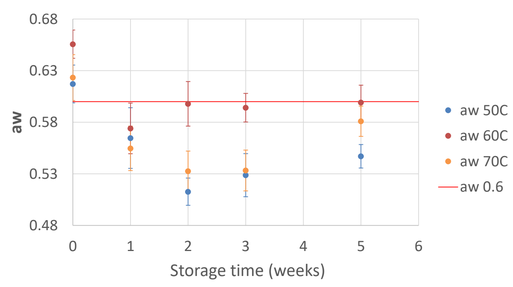
✓ The thin layer drying model that adjusted best to the experimental curves was the Midilli-Kucuk model:

$$\frac{X_i - X_e}{X_0 - X_e} = a \cdot \exp(-k \cdot t^N) + b \cdot t$$

Storage study

Water activity

Water activity along storage time (weeks) for the different replicates, and produced at 50 °C, 60 °C, and 70 °C .



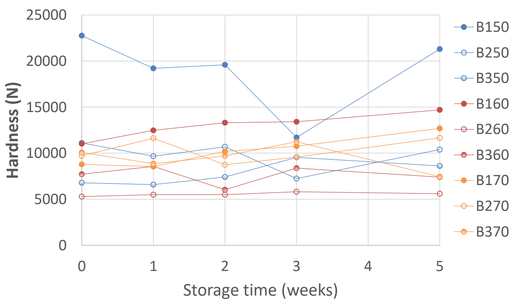
The red line at aw = 0.6 represents the limit value for safety from a microbiological point of view.

✓ The water activity tended to a similar value for all drying temperatures along storage time, from week 3 onwards.

Texture

- Hardness
- Springiness
- Cohesiveness
- Resilience
- Chewiness

Hardness (N) along storage time (weeks) for the different replicates, and produced at 50 °C, 60 °C, and 70 °C .



✓ All the texture attributes remained without significant differences for the different weeks of storage. As well, the tested processing temperatures were not a determining factor for texture.

Conclusions

- ✓ Overall, the fruit snack was perceived as tasty and healthy by the focus group. According to FAO's claim guidelines it is a source of protein, dietary fiber and zinc, low in saturated fats and high in iron.
- ✓ For the 5 weeks of storage, the fruit snack was stable regarding texture and water activity. Additionally, no significant differences in the quality of the product were observed between the different processing temperatures.

References

- Stenmarck, Å., Jensen, C., Quested, T., Moates, G., Cseh, B., Juul, S., Parry, A., Politano, A., Redlingshofer, B., Scherhaufer, S., Silvennoinen, K., Soethoudt, H., Zübert, C., & Östergren, K. (2016). FUSIONS - Estimates of European food waste levels. In *Fusions*. https://www.eu-fusions.org/
- Orrego, C. E., Salgado, N., & Botero, C. A. (2014). Developments and Trends in Fruit Bar Production and Characterization. *Critical Reviews in Food Science and Nutrition*, *54*(1), 84–97. https://doi.org/10.1080/10408398.2011.571798.

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