

Agrio et Emulsio

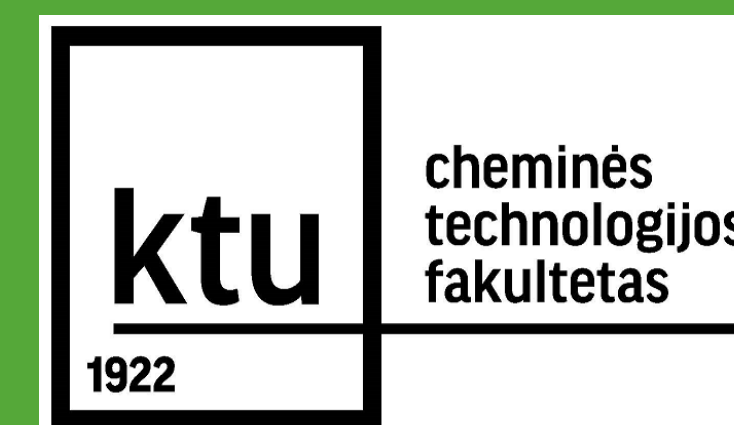
Development of new products with vinegar and sweet potatoes

Cristina Laranjeira¹, Ruben Ribeiro¹, Maria Lima¹, Marília Henriques¹

cristina.laranjeira@esa.ipsantarem.pt



FOODBALT-2018



¹ Polytechnic Institute of Santarém-ESAS (leader).

Other consortium entities: Superior School of Hospitality and Tourism of Estoril-ESHTE; Polytechnic Institute of Beja-ESAB; INIAV-Dois Portos Pole; TagusValley.

Partners



Introduction

- The project **Agrio et Emulsio** (POCI-01-0145-FEDER-023583) develops in vinegar and food emulsions areas. In line **Agrio**, vinegar technological ability (solvent, acidifying, extractive, preservative, fermentative, etc.) enables the development of multiple products, by fermentative and non-fermentative prototyping.
- Vinegar is a product whose history is lost in time. The most remote evidence comes from Egyptian (10,000 BC) and Babylonian (5,000 BC) civilizations. Although its definition is not yet consensual at international level, in the EU "**vinegar**" is obtained exclusively by double alcoholic and acetic fermentation of substances of agricultural origin (EN 13188: 2000).
- Its production process is a classic example of flexibility and versatility in the use of underutilized agricultural resources, as well as applying the principle of integrated technologies, positioning itself at the end of the transformation line of the agri-food sector.
- Portugal is a small producer with about 2% of the EU vinegar production and no noble vinegar manufacturing traditions, but the upward trend in demand and the dietary value of this **low-calorie** and **functional** food, creates opportunities for **innovation** and growth.
- In this project, started with line **Agrio** in **2009**, in **ESAS**, with students' participation, were developed **unusual non-fermentative techniques** in vinegar industry, such as multiple flavoring (vinegars and vinaigrettes, marinades), acid preserving of sweet fruits in vinegar (pickles), development of fruity cream mustards, vinegar glaze jams, etc.
- Prototypes are designed to provide **innovation and convenience** - long shelf-life and multiple food applications in industry/restoration - aiming the preservation of expensive/seasonal/surplus regional raw materials and valorization of byproducts, ensuring, simultaneously, good practices and food safety.

Objectives

- The **objective** of this study was to start the development of a **new line of vegan/veggie marinades** in aromatized vinegar, and to continue the line of development of **fresh pack pickles**, using **sweet potato** as main ingredient, introducing innovation and value. New products - where the acidic or bittersweet characteristics and new functionalities are requirements - are primarily intended for Mediterranean gastronomy and **Gourmet** cuisine.

Assays, Results and Discussion

- Articulating **technological, laboratory and sensory tests** and inspired both by the **marinades** in wine or vinegar of the **Mediterranean gastronomy** and in the traditional Portuguese recipe of "**drunk**" **pear in red wine**, two prototypes are undergoing final development, using sweet potato cultivars (*Ipomoea batatas*) as main common ingredient.



- From a basic **formulation or concept**, a series with variable numbers of prototypes were created in parallel and successive process tests, in which matrices and other ingredients and operations were tested.
- The aim was to create products whose acidity is organoleptically compatible with the desired flavour and taste, without losing the **sui generis acetic characteristic** which is common to vinegar products and, at the same time, complying with **good practices** (EN 13188: 2000) and the **technical specifications** necessary for the chemical and microbiological stability of pickled products which are not pasteurized: **pH <3,45 and total acidity, AT > 3.6% (m/v)**, expressed in acetic acid-equivalent.

Assays, Results and Discussion (Cont.)

- A **sweet and sour "drunk" pickle of sweet potato** has been developed by fresh pack pickling technology (without fermentation), using a spicy red wine vinegar with cinnamon and black pepper, sweetened with brown sugar and added Gin.
- In the **development** several ingredients were tested: red and white wine vinegar (sole or blended) 6% total acidity; sweet potato (*Ipomoea batatas*) cut into cubs (1cm³) selecting three cultivars, yellow (*Lira*), orange (*Bauregard*) and purple (*Charleston*), in various proportions; alcoholic beverages; salt (in brine); sugar (brown sugar or fructose) and spices.
- Final prototype met only first stability criteria for unpasteurized vinegar products (pH=3.423±0.002, AT=2.682%±0.009%) but the panel of tasters preferred a prototype with final thermic treatment (95 °C, 12min30s).



Prototypes of the 3rd Assay Procedure for "drunk" pickles of sweet potato



Prototypes of the final Assay. In evidence, the final prototype.

- The **marinade** was designed to be a **ready-to-eat vegan product**, with **tofu** and **sweet potato (Bauregard)** previously salted in brine and then submerged in the marinade liquid. The marinade matrix is a diluted blend of red wine vinegar and regional liqueur wine from Ribatejo, flavored with red pepper, herbs and spices.
- In development of the marinade were tested in successive process assays: **tofu** or **seitan** in mixtures with red bell pepper and sweet potatoes, in various proportions; vinegar (of cider, tomato, pear (*Rocha*) and vinous white and red), total acidity ranging from 6% to 1.5% (m/v); water; liqueur; sugar; salt and spices (garlic, herbs of Provence, coriander, rosemary, oregon, laurel, black pepper, clove of the Indian, paprika, cumin and cinnamon).
- Pre-salting** in brine, **maturation** and **final heat treatment** are fundamental for the quality and safety of the marinade final prototype.



Sweet potato (*Bauregard*) and commercial tofu



Two perspectives of the six prototypes of the 7th Assay Procedure for the tofu and sweet potato Marinade, in aromatized vinegar.

Conclusions

- The composition of the two final prototypes, **pickles and marinade with sweet potato** are defined and are innovative, predicting a future scale-up to industrial production. Both products retain the *sui generis* acetic taste, but with a complex aroma and flavour due to the other ingredients. In addition, they have an **unusual dual use**: either the consumption of sweet potatoes (also tofu and red bell pepper in the marinade), or the flavored liquid such as table vinegar.
- At present time, they are undergoing experimental tests of food pairing and design (ESTHE), and stability tests (ESAS), predicting a long shelf life for these two prototypes.

References

- Laranjeira, C. et al. (2017). Agrio et Emulsio: New products development. In: *XXIII Encontro Galego Português de Química*. Abstracts. April 15-17, Centro de Innovaciones y Servicios C.I.S: Ferrol, Galicia. p. 143. Available: <https://bibliotecadigital.ipb.pt/bitstream/10198/14675/1/Galego-Portugues%20de%20Qu%20C3%ADmica%20Ferrol.pdf>
- Laranjeira C.M., Lima M.G., Henriques M., Ruivo P. et al. (2016). *Agrio et Emulsio: New products development*. Project application to the Aviso Nº2/SAICT/2016, submitted on September 30. Approved July 7, 2017.
- FIC EUROPE (2006). *Code of Practise: Mayonnaise, Mustard, Tomato Ketchup, Fruit and Vegetables in Vinegar*. FIC Europe c/o AGEF s.a., Brussels. p 29-60.

Acknowledgments to the sponsor of the Operational Program Competitiveness and Internationalization and Regional Operational Program of Lisbon, in the ERDF component. Special thanks to all the students and staff involved in the project and to regional industry partners VGT-Portugal and MVPGin, Drink.s and Food, Lda.

