

# Newsletter

## July 2022



## INFORMATION

### Newsletter CIEQV

July 2022

Number 22 | volume 3

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ISSN: 2184-8637

Frequency: Monthly

Support: Digital

[www.cieqv.pt/newsletter/](http://www.cieqv.pt/newsletter/)

### Graphic Design:

CloudByte

### Property:

Life Quality Research Centre (CIEQV)

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*This work is financed by national funds through FCT – Fundação para a Ciência e a Tecnologia, I.P., under the project nº UID/CED/04748/2020.*

## INDEX

<b>01 EDITORIAL</b> .....	<b>4</b>
<b>02 INTERVIEWS</b> .....	<b>6</b>
<b>03 NEWS – PROJECTS UNDER DEVELOPMENT</b> .....	<b>13</b>
<b>04 ARTICLE</b> .....	<b>20</b>
<b>05 PUBLICATIONS</b> .....	<b>34</b>
<b>06 LQRC-CIEV ACTIVITIES</b> .....	<b>37</b>
<b>07 CALLS AND FUNDING</b> .....	<b>39</b>
<b>08 CONFERENCES AGENDA</b> .....	<b>43</b>

01

## EDITORIAL

July 2022, issue number... 22!

Before a period of (certainly deserved but undoubtedly necessary) rest, we deliver another number of this our vehicle that, as in the late sixties of the last century was advertised, came to stay... and have stayed!

Obtaining academic titles, in particular the PhD degree, is something that is relevant to those who obtain it but that, also, undoubtedly contributes to a greater recognition of the institutions that benefit from it. It is, therefore, a pleasure and a satisfaction to announce the obtaining of the PhD degree at the Lusophone University of Humanities and Technologies by our integrated member, José Amoroso, professor at the School of Education and Social Sciences of the Polytechnic Institute of Leiria, with a thesis centred on one of the passions of his life, the Frisbee. Congratulations!

It was with surprise that we received the news from FCT that the external evaluation process to which the LQRC-CIEQV intends to undergo would be postponed for one year. Thus, only in October 2023 will the procedure for which we were already preparing be launched. In fact, we keep preparing. Indeed, such postponement will not entail any slowdown in our activity, so we call on all members to continue with the energy and scientific productivity they have been revealing!

Speaking of energy, preparations are in full development of what we hope will be an excellent International Congress, the II of LQRC-CIEQV on 23 and 24 February 2023! The panel of invited speakers is now closed and at any time calls will be launched, on the LQRC-CIEQV website, for authors to send communication proposals: be aware!

This 22nd edition of the LQRC-CIEQV newsletter has the seal of the scientific area of Food Production and Technology/Food behaviour and we present in it two interviews. Maria Paula Pinto is a Coordinator Professor at the Polytechnic Institute of Santarém. The Mediterranean Diet and Well-Being (MeDiWeB) is the main Project where she has been working, since 2019. Maria do Céu Godinho is an Adjunct Professor at the Polytechnic Institute of Santarém. She has elected MaisSolo as the main Project where she has been involved, as many others under the theme of the development of alternative control methods to protect crops against pests, avoiding pesticides.

Furthermore, several projects of this scientific area of LQRC-CIEQV (Food Production and Technology/Food behaviour) are presented in a News section, followed by an article entitled “Introduction of pea protein in fish hams with microbial transglutaminase and chicory fiber”. This article, written by Ana Teresa Ribeiro with colleagues from other institutions, had the purpose of reveal the development of fish hams, a healthy ready-to-eat seafood product with characteristics like those of a pork ham, including the texture.

At last, LQRC-CIEQV’s publications and activities are presented, as well as information about calls and funds.

Have a nice vacation!



Rui Matos <sup>1,2</sup>

<sup>1</sup> School of Education and Social Sciences – Polytechnic Institute of Leiria

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02

## INTERVIEWS

### — Interview with Paula Pinto



Paula Pinto <sup>1,2</sup>

<sup>1</sup> Santarém Agriculture School – Polytechnic Institute of Santarém

<sup>2</sup> Life Quality Research Centre

#### **Brief curricular presentation**

Maria Paula Pinto has a PhD in Biochemistry (University of Lisbon) and is a Coordinator Professor in Instituto Politécnico de Santarém (IPSantarém), and the Santarém Subdirector of the Research Unit (UI\_IPSantarém). She is responsible for Curricular Units in the areas of Biochemistry and Nutrition in first and second cycle courses (Higher School of Agriculture in IPSantarém). She is a member of the Life Quality Research Centre (CIEQV), where her main research areas are Mediterranean Diet and Food Behaviors. She has collaborated with the Molecular Nutrition and Health Laboratory in iNOVA4Health Research Centre, where she investigated (poly)phenol consumption from diet and its effects in health. She has been a member of several projects and has been the institutional PI of one international ERASMUS + project. She was a Member of the Management Committee of the COST Action FA1403 – Interindividual variation in response to consumption of plant food bioactives and determinants involved and coordinator of meta-analysis on flavonols. For the past four years she has been coordinating a consortium of seven countries to study the impact of Mediterranean Diet in well-being. She published more than 30 scientific papers and book chapters, and several oral and poster communications in scientific conferences. ORCID ID: <https://orcid.org/0000-0001-6379-1768>; Ciência Vitae ID: 011F-62A8-AE04

### **What are your goals as a member of the LQRC-CIEQV?**

My main goal is to contribute to filling the gap related to health and lifestyle behaviors. Huge scientific evidence has been accumulating on the benefits of healthy food choices and other healthy lifestyle factors on the prevention of non-transmissible diseases and promotion of mental health. Several policies have been implemented all over Europe to promote healthy lifestyles, but they seem to have low impact on people. What is missing here? Why are there so many people not adopting healthier lifestyles? I am interested in understanding what motivates people to adopt healthy food habits and other healthy lifestyle habits, in particular, those characteristic of the Mediterranean Diet. This food pattern is considered one of the most healthy and sustainable; it goes beyond healthy food choices, as it includes important factors associated with physical and mental health, such as physical activity, adequate rest, and socialization. Also, the updated Mediterranean pyramid includes the dimension of sustainability. Thus, I am interested in finding new strategies to promote the adherence to the different dimensions of the Mediterranean Diet and study its impact in subjective well-being.

### **Which are your main research projects?**

The main project I have been working on is The Mediterranean Diet and Well-Being (MeDiWeB). This project has been developed since 2019, and includes a consortium of seven Southern European countries, five Mediterranean countries: Portugal (PT), Spain (SP), Italy (IT), Greece (GR) and Cyprus (CY), and two non-Mediterranean countries: Bulgaria (BG) and the Republic of North Macedonia (NMK). The objectives of this project were: i) simultaneously validate in the seven countries a common instrument for monitoring Mediterranean Diet (MD) adherence (MEDAS, Mediterranean Diet Adherence Score) and compare adherence to MD; ii) validate a common index for monitoring subjective well-being (SWB) that includes the hedonic and eudemonic dimensions; iii) study the association between MD and other lifestyle factors, and subjective well-being.

The validation of MEDAS was based on the comparison between a food frequency questionnaire, containing the 14 questions needed to calculate the MEDAS, and the participants' three-day food diaries. The same methodology was used for the simultaneous validation of MEDAS in different countries. The results indicated an adequate validation of this instrument to monitor and compare the adherence to DM of the adult population in these countries<sup>1</sup>. After completing the validation phase, an online questionnaire was designed to explore the association between adherence to DM, other lifestyle factors, subjective well-being parameters and sociodemographic factors. The questionnaire was translated into each of the national languages and distributed online for data collection, before the confinement imposed by the COVID-19 pandemic. A total of 3145 participants, aged over 18 years, were eligible for analysis (with 300 to 500 participants per country). Most

participants from Mediterranean countries showed moderate adherence to MD (68%, MEDAS between 6 to 9), while in non-Mediterranean countries, most participants had low adherence to MD (51%, MEDAS  $\leq 5$ ). It is worrying to note that even in Mediterranean countries only a small percentage of participants showed high adherence to MD (11%, MEDAS  $\geq 10$ ). Regarding the food habits that could explain these results, it was observed that most participants did not consume the recommended amounts of fruits, vegetables, legumes, oleaginous fruits, and fish<sup>2</sup>. The results point to the need of reinforcing policies and programs that encourage citizens to adhere to healthy eating habits, characteristic of the MD.

Another goal was to design an instrument that included the hedonic and eudemonic dimensions of SWB, and thus allowed for a more comprehensive monitoring of subjective well-being in different countries. This monitoring is increasingly important in a society constantly facing economic, social and environmental challenges, and where mental illness has been on the rise. Factorial analysis performed on the collected SWB variables allowed the validation of a 9-item construct in five of the seven countries of the consortium<sup>3</sup>. The 9-item SWB index included two components: C1, related to positive perceptions of life (global life satisfaction, meaning of life, feeling happy) and positive functioning (feeling energetic and being efficient), and C2, related to the negative perceptions and functioning (feeling stressed, depressed, worried, and not being able to cope with everything in hands). Mean values of SWB ranged from 6.0 to 6.6 (in a scale of 0 to 9) with higher values observed in Mediterranean countries. Analysis of the association between SWB and lifestyle factors showed that a higher adherence to MD, more time spent with family and friends, more time in contact with nature and an active lifestyle, and adequate sleeping at night were positively associated with SWB<sup>3,4</sup>. As observed in this study, our well-being perceptions are the result of a multiple factorial influence of healthy lifestyle factors.

### **Knowing that knowledge should be transferred to society, how can the area of scientific research and professional intervention in which you are involved contribute to the union of theory and practice?**

Increasing the population well-being is one of the main goals of World Health Organization. To reach this goal, a greater emphasis should be placed on the empowerment of the individual. This line of research aims to understand the determinants and motivations of the individuals to adopt healthier behaviors and attain emotional balance. This will undoubtedly contribute to the design of tailored education programs in the domains of SWB and healthy lifestyles, which may be used as driving forces towards a better global well-being.

**Considering that the CIEQV promotes research on quality of life, what are the practical implications of its research?**

To assure the transference of the scientific evidence to the global community, an online workshop has taken place on last May, within the framework of Sapiienta Sports Education Platform: Mediterranean Lifestyle Pattern and its impact on Subjective Well-being. I'm sure other workshops will be made available to the community as new results come along.

## — Interview with Céu Godinho



Céu Godinho <sup>1,2</sup>

<sup>1</sup> Santarém Agriculture School – Polytechnic Institute of Santarém

<sup>2</sup> Life Quality Research Centre

### **Brief curricular presentation**

My degree was agronomy and the Master`s thesis was about biological control of pests on crops, applied to greenhouse crops, particularly fresh vegetables. The main research area during the past 20 years has been the development of alternative control methods to protect crops against pests, avoiding pesticides. The approach has been holistic, considering crop systems and technical profiles, highlighting the preventive methods and the system resilience to withstand impacts and avoid outbreaks. More recently since we joined the Agrarian School of Santarém (ESAS), we began working with horticultural crops. The ESAS team has been included in several program-funded project consortia. In the past 10 years the most relevant projects were PROTOMATE, SAFEBROCOLO, MAISOLO, AGROINOV between others, and already finished. More recently, the most important project, financially approved, must take place from 2022 to the end of 2025: SOILIFE1st. The most of the publications are mainly of a technical nature because the scientific objectives are much more directed towards the application of knowledge by the end user.

### **What are your goals as a member of the LQRC-CIEQV?**

In a simple and direct way, I believe, more and more, in multidisciplinary teams. At the Research Center, it will be easier to integrate other fields of knowledge, especially the social sciences, which are very relevant to our success in applying the knowledge created and validated. In short, my objective is to extend the lines of action of research projects to other members of CIEQV.

### **Which are your main research projects?**

I would like to highlight MaisSolo [Maissolo \(webnode.pt\)](http://Maissolo.webnode.pt). Monoculture agricultural systems with production for industrial purposes have high yields and are highly relevant in the national economy. In technical terms, these systems have important phytosanitary problems due to the pests, but also due to the lack of solutions to control. Furthermore, the successive withdrawal of active substances (pesticides) from the market, such as metam-sodium, has worsened the situation.

In view of the situation, it was intended to develop and apply alternative technologies to chemical control, namely, a new product that will be used in cover crops or in Rotation/crop succession, consisting of seeds inoculated with beneficial microorganisms. The work program also included the introduction of other improving solutions such as biofumigation, "developer" plants and biological control. These techniques will make it possible to remove very toxic treatments for an establishment of species of microorganisms that, when present in the rhizospheric environment, protect plants from pathogens.

The main goals:

- 1 - Improve crop protection by reducing dependence on pesticides, given the phytosanitary problems that result from the attack of organisms present in the soil.
- 2 - Increase the efficiency of resource use in agricultural production, contributing to the maintenance of biodiversity and soil and water conservation.
- 3 - Provide growers with greater capacity in decision-making.

New products to use as cover crops or in succession, consisting of biodiverse mixtures of legumes and grasses, inoculated with beneficial microorganisms (previously selected bacteria), more suited to the ecology of the horticultural agricultural systems of Ribatejo will be available. Furthermore, technologies such as biofumigation, "developer" plants and the application of biological control using entomopathogenic nematodes was evaluated and information is now available.

### **Knowing that knowledge should be transferred to society, how can the area of scientific research and professional intervention in which you are involved contribute to the union of theory and practice?**

The direct results that are expected to be achieved with this research group are organised to solve problems. The technologies or combination of the most appropriate technologies, under the standard conditions tested to integrate in the technical itinerary of horticultural crops are validated under tailored conditions.

The projects and the solutions developed are mainly to reduce the damage caused by the pests and diseases and to make available alternative techniques, avoiding pesticides. These direct results

make it possible to provide a list of alternatives that producers can and should resort to. An important issue is the empowerment of the farmers and the challenge of integrating in practice the new solutions. To address this issue better successfully, we have included stakeholders in the teams.

**Considering that the CIEQV promotes research on quality of life, what are the practical implications of its research?**

Quality of life is also about promoting better food and a better environment. This is where I stand.

This is the first issue, in a new model, resulting from a collaborative work of the integrated and collaborating members of the scientific area of Food Production and Technology/Food Behaviour and other colleagues (potential future members!) from ESAS, namely: M<sup>a</sup> Adelaide Oliveira, M<sup>a</sup> Gabriela Lima, M<sup>a</sup> do Céu Godinho, Paula Pinto, Paula Ruivo, Vanda Andrade and Nair Cunha.

03

## NEWS – PROJECTS UNDER DEVELOPMENT

### — Project 1 – FOOD PRODUCTION AND TECHNOLOGY/FOOD BEHAVIOUR SCIENTIFIC AREA

#### 1.1 Contract signing and presentation of the SoILife1st Project

The presentation and contract signing of SoILife1st Project occurred, last June at the Feira Nacional da Agricultura, in Santarém. ESAS is the leader of the consortium, which is constituted by partners of different typologies with the participation of a high number of SMEs. The Responsible Researcher, Professor Maria do Céu Godinho, lecturer at the School of Agriculture of the Polytechnic of Santarém (ESAS), and member of the LQRC-CIEQV highlighted the importance of working in living laboratories to improve more sustainable production systems.

The objectives of SoILife1st are:

- Promotion of soil conservation and fertility improvement techniques, adjusted to intensive agricultural systems - horticultural and horticultural industries;
- Promotion of water retention in the soil, before, during and after the implementation of soil conservation practices;
- Promotion of practices for greater resilience of the systems;
- Production, based on selection, of species/varieties more adapted for intercropping and/or cover crops;
- Sharing of knowledge and co-creation of improving solutions, directed at potential beneficiaries.



## 1.2 Projects presented in 3rd LQRC-CIEQV Multidisciplinary Scientific Journeys (30th June, Santarém Education School)

At the Multidisciplinary Scientific Journeys projects, at various levels of development, and for which the collaboration of members of other scientific areas of the Centre is very important, were presented and discussed. In addition to the participation in the Perceived Sustainability project, other projects in progress were presented, namely:

### – Enrichment of flour for bakery and other products with insects' s proteins

Maria Gabriela Lima presented a new research line of scientific area of Food Production and Technology/Food Behaviour.

The food industry is considering new alternative protein sources for human nutrition consumption. Edible insects are particularly interesting because of their high protein content and lower environmental impact compared to conventional animal production.

The high nutritional value of edible insects has caught the attention of researchers and food industry for their potential use in foods with improved nutritional characteristics. One of the possible uses of this protein is the incorporation of cricket powder in flours of various cereals to obtain bread or other bakery products, such as energy bars, etc., with higher nutritional value. If it is interesting in nutritional terms, there could be the possibility that edible insect powder could be successfully

included in various processed food products, thus increasing their protein content, which is very important for those who practice physical exercise intensively.

The removal of gluten in bakery products due to celiac disease is a technological challenge, since the absence of gluten generates breads with poor gas retention capacity during fermentation, which can be minimized with the use of gluten-free proteins in combination with hydrocolloids and/or enzymes, which is the case of insect powders that could be incorporated into these mixtures enriching them with gluten-free protein.

The aim of this study is to explore the potential use of insect powders as a protein-rich ingredient for bakery products, to characterise it technologically and to carry out the evaluation of its nutritional and health effects in certain

#### **– Solilife1st / SUSTerra / Accept**

Rosa Coelho, Céu Godinho and Paula Ruivo, presented projects, which may benefit from multidisciplinary research. In common, the theme of Agroecology and Transition to Sustainable Food Systems. The development of these projects may be anchored in other larger projects, in application or already approved, namely:

- SoilLife1st – Adaptation of production systems in the context of climate change
- RedeSusTERRA – Network to promote sustainable practices in agricultural systems with an impact on territories
- Accept – Affirmation of the AgroecologiC Model in PorTugal

The aim of these presentations was to create multidisciplinary teams that participate at different levels:

- co-construct and disseminate agroecological knowledge, based on collaborative and shared processes at local/regional scale;
- building capacity actions to be promoted among farmers and consumers;
- promotion of agro-ecological literacy as a vector for communicating the agro-ecological model and the contribution it can make to the development strategy of the territories.

The conclusions can be watched on the CIEQV YouTube channel: <https://youtu.be/-As5fWbvVolg>

## — 2 — COMMUNICATIONS IN CONGRESSES / CONFERENCES / SEMINARS

### **2<sup>nd</sup> International Congress on 21<sup>st</sup> Centuries Literacies**

The 2<sup>nd</sup> International Congress on 21<sup>st</sup> Centuries Literacies occurred July, 7-8, 2022 at the Higher School of Education of Santarém, Santarém with support of the Life Quality Research Centre (LQRC-CIEQV). Department of Food Technology, Biotechnology and Nutrition was invited to organize a symposium and proposed the subject “Food & nutritional literacy”. Three integrated (i) and three collaborators (c) members of the area of “Food production and technology / Food behavior” of the CIEQV participated in the Symposium, moderated by Adelaide Oliveira (i).

Under the theme “Ingredients of food literacy”, Rui Jorge (c) introduced the concepts of food literacy, nutrition literacy and health literacy, described some of the main components of food literacy, since the planning of the meals till the act of heating, and addressed some topics affecting them. In “Literacia alimentar – componentes Food safety e Food security”, Igor Dias (c) highlighted the importance of food safety and food security in food literacy. The loss of skills in storage and preparation of food, with a huge impact on the choice and hygiene of food, is critical for food safety. The food supply chain is now global (and less sustainable) and local and global events can easily and quickly evolve to food emergency. Food literacy is an essential tool to deal with all these issues. “A Literacia do Vinho” presented by Helena Mira (i) explained the role of the wine in the Portuguese culture and unveiled the content and meaning of the various items presents in the label and back label of a bottle of wine. Margarida Oliveira (c) and Miguel Macário contributed with “Do prato ao prado” – A compostagem e a literacia como uma estratégia de bioeconomia. Miguel Macário addressed the concerns with food waste and the need to reduce and incorporate it in the concept of food literacy. Composting was presented as an alternative solution to landfills, to deal with food wastes. The compost could then be used in agriculture production, as an alternative to chemical products, and the cycle is closed: “farm-to-table-to-farm”. Paula Ruivo (i) with “Agrifood systems and Food Literacy” introduced the dimensions of diversity and sustainability of agri-food systems and short food circuits in food literacy and presented some of the results of food literacy-related programs in national and international schools, emphasising the importance of promoting studies with higher education students and other young adults.

## 1<sup>st</sup> Workshop of BIOMA

Gabriela Basto de Lima and Sara Sousa presented the communication "Development of new products-fruit and vegetable sector", under the BIOMA project, PPS 3 Activity 1, in the session Solutions for valorization of waste and food sub-products, in the 1st Workshop of BIOMA project entitled "Bioeconomics for mobilization of the agrifood chain: BIOSave, BIOValue", which was held at the National Agriculture Fair of Santarém, June 6, 2022.

## — 3 — CONCLUSION OF THE CONTEST FOR THE ATTRIBUTION OF A RESEARCH SCHOLARSHIP FOR MASTER'S DEGREE STUDENT

The jury's deliberation, homologated last July 12<sup>th</sup>, allowed to know the name of the candidate that fulfilled the conditions for the attribution of the Master's scholarship.



Brief presentation of Nair Cunha:

- Master's student in Food Technology at Escola Superior Agrária de Santarém (ESAS), Polytechnic Institute of Santarém, and Degree in Animal Production Engineering at ESAS.
- Worked for 4 years in the animal production sector but wanted to do more, especially in the food sector.
- Co-Developed an innovative project, EASYPROTEIN, that promotes the production of an alternative source of animal protein with high nutritional value which is more sustainable and

offers a solution to several current problems like the demand for more sustainable and healthy foods. With this project, based on the production of a cricket specie known as domestic cricket (*Acheta domestica*) for human consumption, she participated in entrepreneurship competitions.

With the will to do more and better, through her entrepreneurial spirit, she wants to help in the investigation of topics that improve the quality of human life.

## – 4 – INVOLVING STUDENTS IN RESEARCH ACTIVITIES – CO-CONSTRUCTION OF SOLUTIONS

### **Improvements in pesticides application aiming to reduce their doses**

This project was developed under the scope of the 3rd edition of “DEMOLA- Learning based on co-creation processes”. The process engaged a team which included a facilitator – Vanda Andrade – and a co-facilitator – Maria do Céu Godinho, both teaching in the Agrarian School of Santarém (ESAS), and respectively, with formation in the fields of Toxicology and Sustainable Farming. Their shared interests – responsible use of pesticides and impacts in the environment and human health – quickly allowed to define the theme of the project. The choice of a partner to include in this team, Syngenta Portugal, was based on the company business area, dedicated to pesticide commercialization and simultaneously with a great commitment in searching solutions to promote safe foods and protect the environment. The other team members, the talents, were three students finishing the graduation in Agronomy in ESAS. A current global problem is the alarming augment of pesticides use, as concerns to their doses and frequency of the treatments, due to the need of intensify food production and due to resistance phenomena. In this view, Syngenta identified as a specific problem the difficulty in guarantee a uniform pulverization of the pesticides; namely, being the main target the inferior page of the plants leaf's, the foliage dimension interferes with this process. In truth, it is estimated that in most pesticide pulverizations 80% of the product does not reach the target, with ensuing waste, and soil and water pollution. Seeking to obtain a contribution to minimize this problem, Syngenta proposed as a challenge the searching of a solution which could improve the application of the pesticides in the field. At the end of the project, the talents had created a prototype

of a portable system capable to measure in real time the efficiency of pulverization in the field and could be integrated in pulverization devices. The possibility of connecting several sensors in the same device allow to monitor: i) the spatial distribution of the pesticide; ii) the exact amount reaching the target; iii) and how much is being wasted. Such interesting solution, obtained through a novel pedagogical method, come undoubtedly to contribute to improve the efficiency of pesticides application in the field, reduce waste and the vicious cycle dose/frequency vs resistance, and diminish the environmental pollution and risks for human health.

04

## ARTICLE

### — Introduction of pea protein in fish hams with microbial transglutaminase and chicory fiber. Comparison of physical characteristics with pork ham.



Ana Teresa Ribeiro<sup>1,2,3</sup>; Miguel Elias<sup>1,4</sup>; Bárbara Teixeira<sup>5</sup>; Carla Pires<sup>5</sup>; Rogério Mendes<sup>5</sup>

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<sup>4</sup> Science and Technology School – University of Évora

<sup>5</sup> Portuguese Institute for the Sea and Atmosphere

#### Abstract

The increasing consumer demand for healthier products is driving the development of novel fish-based products, due to the well-known benefits of its consumption.

With the purpose of developing a healthy ready-to-eat seafood product with characteristics like those of a pork ham, including the texture, fish hams were prepared with farmed meagre (*Argyrosomus regius*), 0.5 % of microbial transglutaminase, 1 % of chicory fibre and different contents of pea protein isolate (0, 0.5 and 1.0 %). From the different experiments, it was concluded that the ham prepared with farmed meagre with 0.5% MTGase, 1% chicory fibre and 1% pea protein isolate, presented the characteristics that most closely resembled those of extra pork ham.

**Keywords:** ham, meagre, texture, color, water holding capacity, pea protein, gel products.

#### 1. Introduction

Meagre (*Argyrosomus regius*) is a marine fish species common to the Mediterranean area where farming has gained economic importance, especially for specimens that attained at least 1 kg.

According to Monfort (2010), portion-sized meagre are not considered suited for marketing as this fish size have a large head, large bones, little flesh, and are not very tasty, and thus few farmed fish are sold at size below 1 kg. A solution to overcome the marketing problems of small-sized fish could be the development of innovative functional foods. The potential of small-sized meagre for the preparation of gel products was demonstrated by Cardoso *et al.* (2014). Small-sized meagre was also combined with dietary fibers to produce heat-induced gels (Cardoso *et al.*, 2015) and fish sausages (Ribeiro, 2001). Furthermore, fish hams were prepared with other fish species (hake or gilthead sea bream) incorporating dietary fibers and showed potential as new healthier products (Cardoso *et al.*, 2013). However, the industrial development of fish hams prepared with meagre is not yet a reality.

Among food additives, microbial transglutaminase (MTGase) has been widely used in the food industry for cross-linking of proteins (Téllez-Luis *et al.*, 2002). Previous studies on cold gelation showed that MTGase was able to generate gels, prepared with trout and hake mince, with good properties (Moreno *et al.*, 2010). Also, dietary fibers like chicory root fiber and inner pea fiber, and carrageenan have been identified as promising ingredients for the formulation of restructured fish products. Chicory root fiber is a low caloric additive and can be used as a fat mimetic additive, as in fish sausages, ensuring smoothness, creaminess, and an oily mouth feel (Cardoso *et al.*, 2008; Ribeiro *et al.*, 2013).

Vegetable proteins are an attractive ingredient for the preparation of seafood products due to their high protein content and low cost. However, their use will depend on their functional properties, rheological and sensory behaviour during processing, storage and consumption. Due to its amino acid composition and acceptable functional properties, pea protein isolate is a potential protein source for the enrichment of some food products (Tömösközi *et al.*, 2001). Pea protein isolate has also been shown to perform other desirable functions as an ingredient in processed foods, such as water absorption, emulsification and foam formation (Hsu *et al.*, 1982; Sumner, Nielsen & Youngs, 1981).

In this context, the aim of this work was the preparation of fish ham with different amounts (0, 0.5, and 1.0 g/kg) of pea protein isolate (PPI) to obtain the best fish ham formulation with characteristics like those of pork ham. This will contribute to the improvement of this type of seafood product.

## **2. Material and methods**

### **2.1. Experimental treatments**

Meagre fish hams were prepared with 0.50 % of microbial transglutaminase (MTGase), 1.0 % of chicory fiber and different amounts (0, 0.5 and 1.0 %) of pea protein isolate (PPI).

### **2.1.1. Raw material and ingredients**

Farmed meagre (*Argyrosomus regius*) was captured from the Aquaculture Research Station at Olhão (EPPO) from the Portuguese Institute for the Sea and Atmosphere and slaughtered by immersion in an ice and sea water (1:1) bath. The fish were kept in ice and transported to the laboratory within 24 h. The average individual fish weight was 380 g. Fish was processed (headed, tailed, gutted, and filleted) at low temperature (below 10°C), and after filleting, meagre was minced in a 694 BAADER meat deboner (BAADER, Lübeck, Germany) equipped with a 3 mm diameter hole rotating cylinder. The moisture of the raw material was determined, in view of controlling the moisture content of the final fish ham.

The remaining ingredients used for the preparation of fish hams were all of food grade materials manufactured by different companies. Sodium triphosphate was of analytical grade and from Merck (Darmstadt, Germany). Casings and packages used were of food grade.

### **2.1.2. Preparation of meagre hams**

The preparation of meagre hams was done according to the procedure described by Cardoso *et al.* (2013). The mixture of meagre mince and the remaining ingredients was done in a refrigerated vacuum homogenizer (UM12, Stephan and Söhne, Hameln, Germany), being the whole mixing process performed under vacuum at refrigerated temperatures (below 7 °C). Water was added in the form of ice to adjust the moisture content to 80% in the final fish ham. In a first step, meagre mince was mixed (1420 rpm, 1 min) with sodium triphosphate, salt (NaCl), and nitrified salt. Then, ice (70 % of the total amount of added water, considering the final moisture level of 80 %), MTGase, and sucrose were added and the same mixing conditions were applied. Finally, the carrageenan, chicory fibre (hydrated with 30 % of the total amount of added water considering the final moisture level of 80 %), pea protein isolate, and the ham flavour were added and mixed (2800 rpm, 2 min). The final mixture was packed in 25 mm diameter cellulose casings with a hydraulic filler (EB-12, Mainca Equipamientos Carnicos, S.L., Granollers, Spain), followed by manual twisting and knotting. The setting of fish hams was performed by immersion in water at 30 °C for 30 min (setting). A total of 3 batches were prepared, each with about 4 kg. Three fish hams with about 25 cm were used for each treatment condition. After the setting, fish hams were subjected to the traditional cooking treatment for pasteurization. Pasteurization was performed in a water bath at 82 °C for 1 h 50 min, to achieve an internal temperature of 72 °C, followed by a rapid cooling in water and ice bath and then kept in refrigerated conditions (5 °C) overnight.

## **2.2. Physical properties**

### 2.2.1. Water holding capacity (WHC)

The water holding capacity (WHC) was measured with the modified method of Sánchez-González and co-authors (2008). A cubic piece of fish ham (ca. 2 g; ca. 1.7 cm<sup>3</sup>;  $W_s$ ) with two folded filter papers (also weighted,  $W_i$ ) in the bottom of a centrifuge tube were submitted to 3000 xg for 10 min at room temperature (3K30, Sigma, Osterode, Germany). After centrifugation, the sample was removed and the filter papers were weighed ( $W_f$ ). WHC was expressed as g of water in sample after centrifugation per 100 g of water initially present in sample:

$$WHC = \frac{W_s \times \frac{H}{100} - (W_f - W_i)}{W_s \times \frac{H}{100}} \times 100$$

where H is the moisture (%). All determinations were performed in triplicate.

### 2.2.2. Color

Color measurements of fish ham mince were assessed with a colorimeter (CR-410, Konica Minolta Camera, Co, Japan). The colorimeter was calibrated against a white standard plate (Yxy system) and the illuminant setting D65 was used. Lightness ( $L^*$ ), red-green value ( $a^*$ ), and yellow-blue value ( $b^*$ ) were measured. For the assessment of color, chroma ( $C^*$ ), hue ( $h^*$ ) and whiteness ( $W$ ) were estimated accordingly to the following equations (Sahin & Sumnu, 2006).

$$C^* = \sqrt{(a^*)^2 + (b^*)^2} \quad W = 100 - \sqrt{(100 - L^*)^2 + (a^*)^2 + (b^*)^2}$$

$$H^\circ = \arctan\left(\frac{b^*}{a^*}\right) \quad , \text{ between } 0^\circ \text{ and } 90^\circ$$

### 2.2.3. Texture

Prior to texture measurements, meagre ham samples were taken out from casings and tempered to room temperature.

#### 2.2.3.1. Folding test

Folding test was done according to a previous work (Mendes *et al.*, 1997). Fish ham samples were cut into 2 mm slices with 25 mm diameter. The evaluation was performed manually in accordance with a five-point grade system as follows: Grade 5, no crack when folded into quadrants; Grade 4, no cracks when folded in half; Grade 3, crack develops gradually when folded in half; Grade 2, crack

develops immediately when folded in half; and Grade 1, crumbles when pressed by finger. All determinations were performed in triplicate.

### 2.2.3.2. Instrumental texture measurements

Instrumental texture measurements were evaluated using a model Instron 4301 texturometer (Instron Engineering Corp., Canton, EUA) following the procedures described in Cardoso *et al.* (2008). Fish ham samples were cut into pieces of 25 mm height and 25 mm diameter.

For the puncture test, each sample was penetrated to the breaking point using a metal probe with a 5 mm diameter spherical head. The cross-speed head was 10 mm/min and the load cell was 1000 N. The breaking force (N) and breaking deformation (mm) were measured, while the gel strength (N.mm) was determined by multiplying these two parameters. Rupture work (J), the area below the force-deformation curve until the maximum breaking force is reached, was determined and it also reflects the strength of the gel.

For the texture profile analysis (TPA), each sample was compressed twice, by means of a 50 % compression level test, with a cylindrical plunger (50 mm diameter) adapted to a 1000 N load cell at a deformation rate of 50 mm/min. The following parameters were determined: hardness (N), maximum height of first peak on first compression; cohesiveness, ratio of second compression to first-compression positive areas; gumminess (N), product of hardness and cohesiveness.

For the compression-relaxation test, the procedure was as for the texture profile analysis, except that the sample was compressed only once for 1 min. Elasticity was calculated as:

$$\text{Elasticity (\%)} = 100 - \frac{F_0 - F_1}{F_0} \times 100$$

where  $F_0$  is the force registered at the onset of relaxation immediately after sample compression and  $F_1$  is the force registered after 1 min of relaxation. Chewiness (N), product of elasticity and gumminess, was calculated. All determinations were performed in quadruplicate.

## 2.3 Sensorial analysis

The fish hams were sensory evaluated according to ISO 6658 (2017). The sensory evaluation was carried out on average by 8 trained tasters from IPMA. Before analysis, the hams were removed from the packaging and stabilized at room temperature (around 20 °C). Thin slices about 2 mm thick were cut. These slices were distributed on white plates, duly coded and presented to the taster. The evaluation was carried out in the IPMA sensory analysis laboratory, in room with the specifications required by EN ISO 8589:2010/A1 (2014). The tasting sheet used was analytical descriptive, more specifically, attribute classification with category scale and with structure.

## 2.4. Statistical analysis

For each experiment, the effects of treatments were tested with a one-way analysis of variance, followed by a multiple comparisons test (Tukey's honestly significant difference, HSD) to identify the differences between treatments. The differences in fish ham and pork ham were evaluated by a t-test for independent samples to identify differences between fish or pork hams.

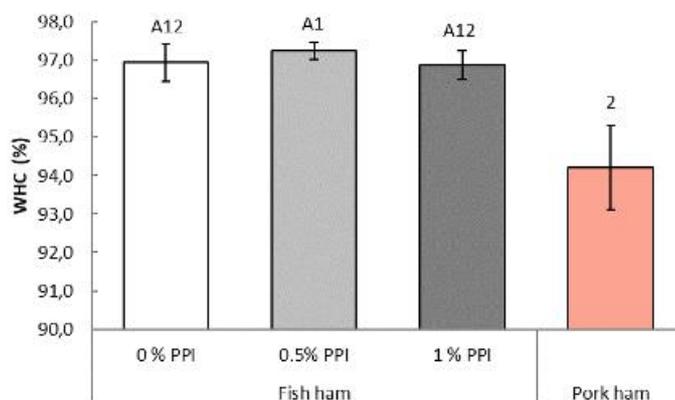
All statistical analyses were tested at a 0.05 level of probability with the software STATISTICA™ 6.1 (Statsoft, Inc., Tulsa, OK, USA).

## 3. Results and Discussion

### 3.1. Water holding capacity (WHC)

The addition of different amounts of PPI in the fish hams did not induce any change in the WHC of the hams (Figure 1.). Comparing all the hams, the ham with 0.5 % PPI was found to have the highest WHC value in contrast to the extra pork ham which had the lowest value.

Since the addition of PPI resulted in highest WHC values compared to pork hams, it seems an interesting ingredient for fish hams.



**Figure 1.** Average values of WHC (%) of fish hams with different amounts of PPI and of the extra pork leg ham. Error bars represent standard deviation (n=3). Upper case letters indicate significant differences ( $p < 0.05$ ) between hams with different PPI concentrations (0 %; 0.5 % and 1 %). Numbers indicate significant differences among all hams. PPI (Pea Protein Isolate).

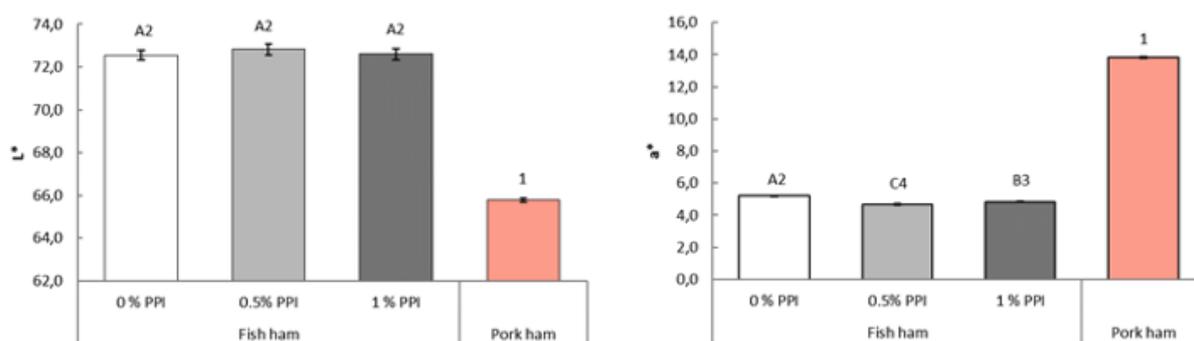
Pea protein isolate is considered a promising substitute for commonly used animal protein ingredients (Bogahawaththa *et al.*, 2019). Its use in the food industry is still not very common due to the lack of scientific knowledge about its functional properties, particularly solubility (Bogahawaththa *et al.*, 2019). However, the pH of the medium is known to have a considerable influence on pea

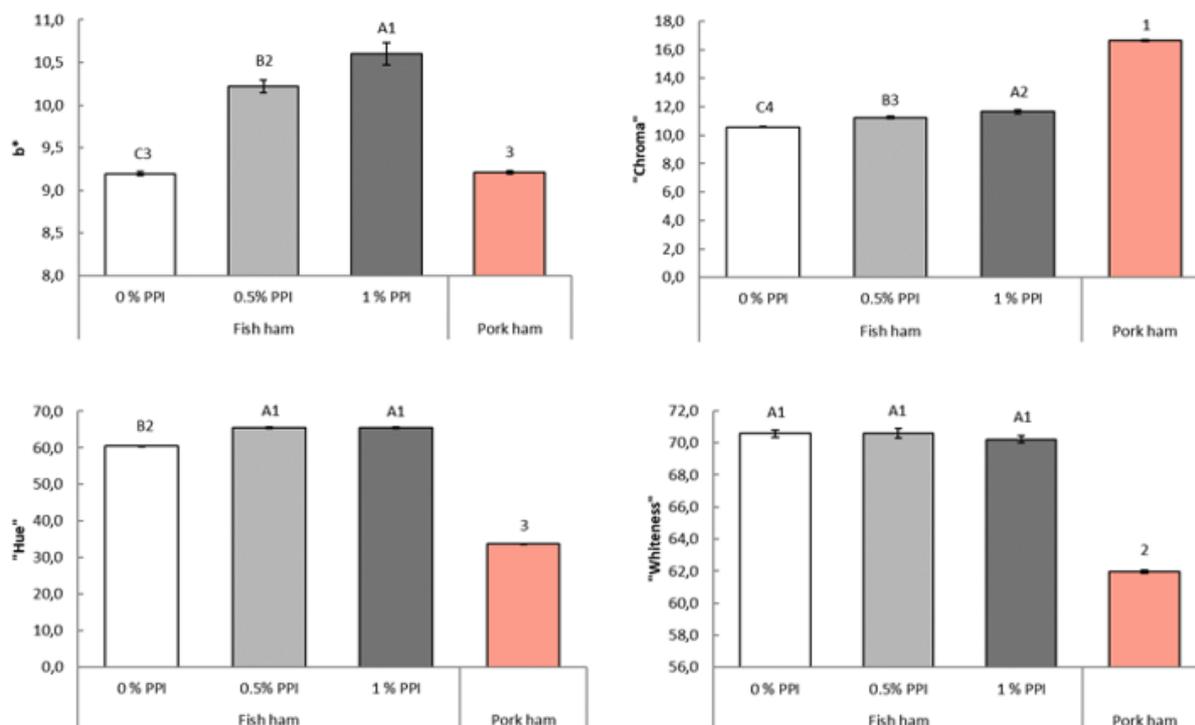
protein solubility, surface charge (zeta potential) and surface hydrophobicity (Burger & Zhang, 2019). Further studies are needed to understand which conditions are respectively suitable for its solubility and thermal stability of the final product.

### 3.2 Color

To evaluate if PPI affects color, fish hams were prepared without adding any food colorants, being only added nitrified salt for color fixation. The addition of PPI did not significantly change the lightness ( $L^*$ ) and “whiteness” of the hams but led to a decrease in the red color ( $a^*$ ) and a significant increase in the yellow color ( $b^*$ ), reaching the highest value with the addition of 1%. Comparing all the hams, it is the one from the extra pork ham that shows a lower lightness and “whiteness” with a more red and less yellow color.

Pork ham showed a redder color probably because it has more myoglobin which, although it is not the only muscle pigment, is the one found in greater quantity in meat, being responsible for the red color of mammalian muscles (Fennema, 1992). Pigments other than myoglobin, are more relevant in the meat color of poultry, fish and game meat than in livestock species (Suman & Joseph, 2013). In fish, hemoglobin is the predominant pigment in dark muscle (Belitz *et al.*, 2009) and, with heat treatment of the pulps, myoglobin denatures (Suman *et al.*, 2016). Perhaps due to these pigment characteristics of fish meat, fish hams have a less reddish color.





**Figure 2.** Average values of the parameters L\*, a\*, b\*, "chroma", "whiteness" and "hue" of the color of fish hams with different amounts of PPI and of the extra pork leg ham. Error bars represent standard deviation (n=3). Upper case letters indicate significant differences ( $p < 0.05$ ) between fish hams with different PPI concentrations (0 %; 0.5 % and 1 %). Numbers indicate significant differences among all hams. PPI (Pea Protein Isolate).

The addition of PPI induced significant increase in saturation color ("chroma") in fish hams which was beneficial in bringing the values of this parameter closer to the values obtained in pork ham.

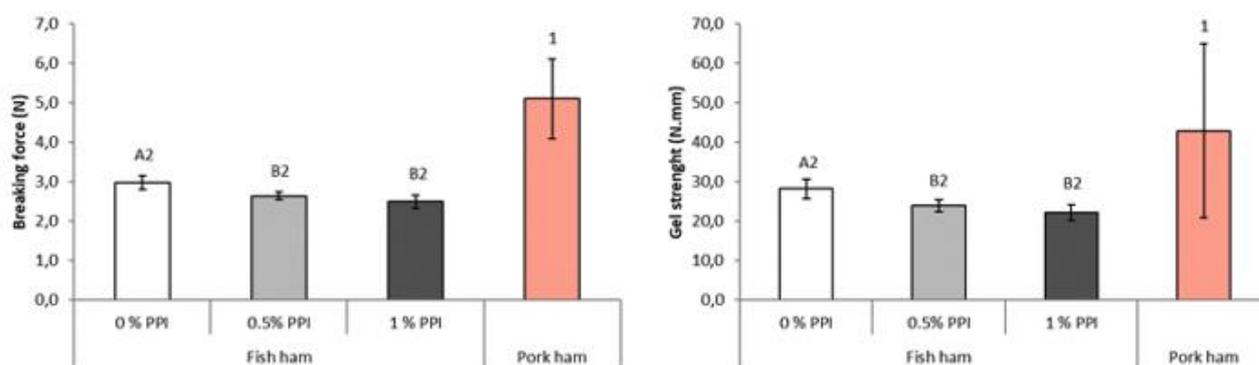
The "Hue" of hams increased significantly with the addition of PPI, whether 0.5% or 1%. Among all, the extra pork ham registered the lowest hue value. According to Sahin & Sumnu (2006), the lower tonality values, represented in degrees, are those located on the red-green positive axis. This was found to be the case with the extra pork ham, compared to the meagre hams.

In general, the addition of PPI to hams had no influence on luminosity or whiteness, but led to a slight decrease in red color, an increase in yellow color and hue, moving away from the values obtained for pork hams. The increase of the saturation allowed obtaining, in this parameter, values closer to those of pork hams.

### 3.3 Texture

Proteins and polysaccharides play a key role in the formation of characteristic textures due to their ability to form gels (Zhuang *et al.*, 2018). The interactions between proteins and polysaccharides determine the textural properties of the final product, which is one of the main attributes that consumers evaluate in the overall quality of food.

Regarding the texture evaluation of fish hams, no cracks were observed when folded into quadrants, presenting the maximum point grade in the folding test, independently of the amount of PPI.



**Figure 3.** Average values of the breaking force and gel strength (puncture test) of fish hams with different amounts of PPI and of the extra pork leg ham. Error bars represent standard deviation (n=3). Upper case letters indicate significant differences ( $p < 0.05$ ) between fish hams with different PPI concentrations (0 %; 0.5 % and 1 %). Numbers indicate significant differences among all hams. PPI (Pea Protein Isolate).

From the results obtained in the puncture test, it was found that the addition of pea protein isolate impairs the quality of the gels obtained, moving the breaking force and gel strength values away from those obtained in pork ham (Figure 3.).

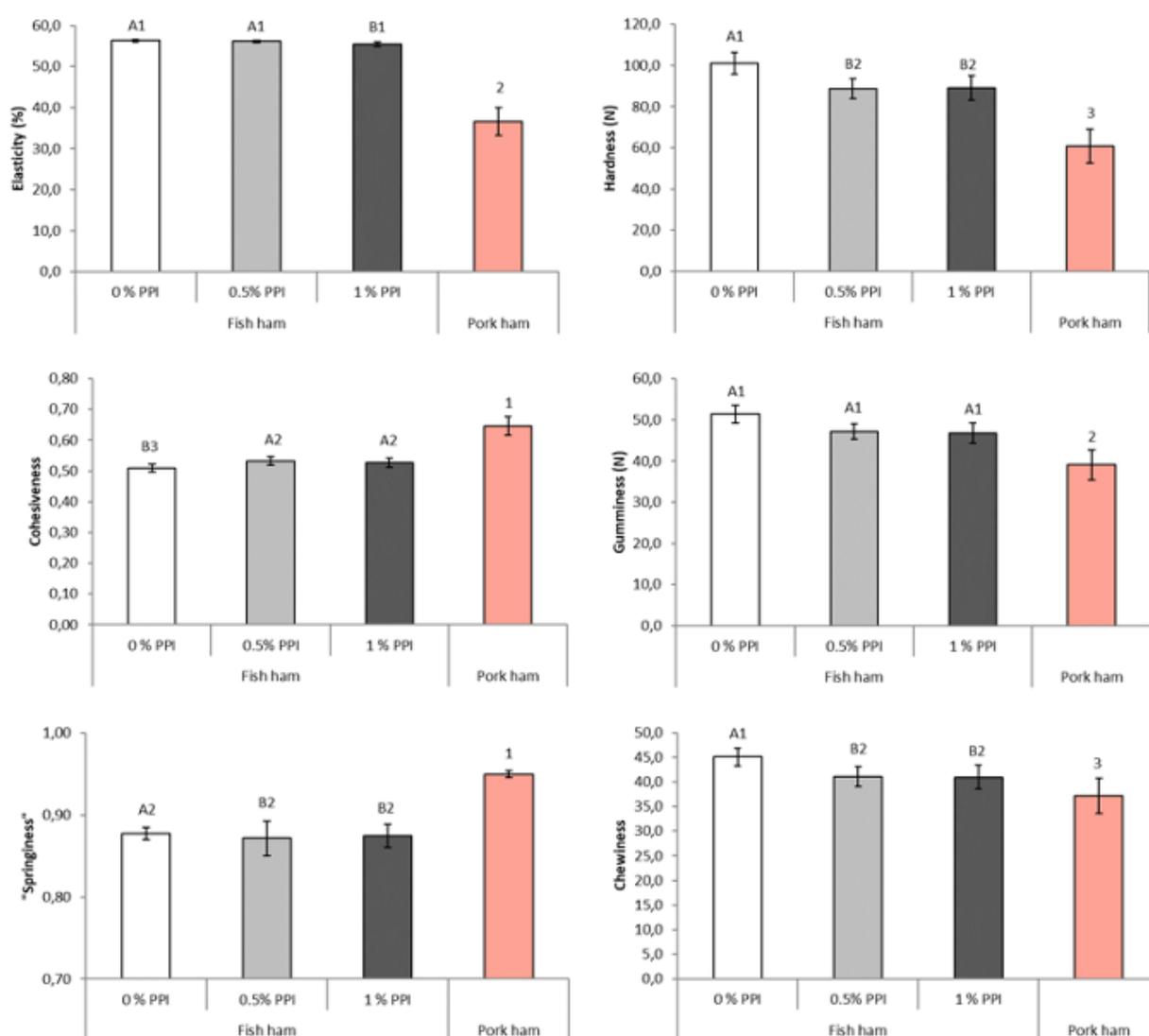
The fish hams presented elasticity values higher than those obtained in the pork ham (Figure 4.). The addition of 1% PPI significantly reduced the elasticity in the hams approaching this parameter to the values obtained in the pork ham. The same effect is observed for hardness, but it is enough to add 0.5% PPI to decrease this parameter in fish hams.

In relation to cohesiveness, the addition of 0.5% or 1% (indifferent) of PPI in fish ham, improved this parameter allowing it to approach the values obtained in pork ham.

The fish hams had a higher gumminess than the pork ham. Although there were no significant differences between hams, only hams with added PPI showed gumminess values closer to those of pork ham.

The pork ham was the one that showed the highest ability to recover after the first bite ("springiness"). Significantly lower values were obtained in fish hams and the addition of PPI further accentuated this trend.

The highest chewiness values were recorded in fish hams, but it was found that the addition of PPI produced hams with values of this parameter significantly closer to those of pork ham.



**Figure 4.** Average values of the elasticity (compression-relaxation test) and hardness, cohesiveness, gumminess, springiness and chewiness (TPA) of fish

hams with different amounts of PPI and of the extra pork leg ham. Error bars represent standard deviation (n=3). Upper case letters indicate significant differences ( $p < 0.05$ ) between fish hams with different PPI concentrations (0 %; 0.5 % and 1 %). Numbers indicate significant differences among all hams. PPI (Pea Protein Isolate).

In the development of new restructured fish products, studies have been conducted on the use of dietary fibres such as carrageenan, chicory root inulin, garrophin, guar and xanthan (Cardoso *et al.*, 2012; Cardoso, 2011; Cardoso *et al.*, 2009; 2007a, b; Sánchez-Alonso, Haji-Maleki & Borderías, 2007). The common objective of these studies is to improve the gelling, textural and nutritional quality and to develop products that are attractive to the consumer. Some additives interact with proteins to form a more structured system, while others act as fillers, binding water and modifying the viscosity of the system (Lee, Wu & Okada, 1992). The different interactions between fibers and proteins can lead to different results.

The addition of isolate pea protein in fish hams contributed to a decrease in breaking strength, gel strength, elasticity, hardness, springiness and chewiness. Also, Tome *et al.* (2015), when studying the effect of adding different proportions of commercial pea proteins, on the physical properties of gels and emulsions of protein obtained from Cape hake (*Merluccius capensis*) by-products found that the addition of pea proteins induced a decrease in gel firmness.

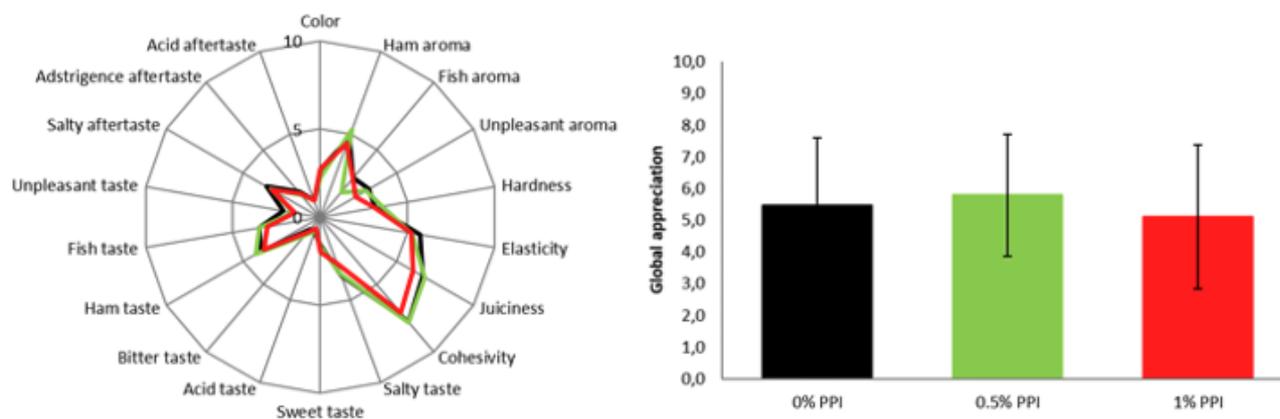
According to Ziegler & Foegeding (1990), mixtures of proteins can create compatible, semi-compatible or incompatible systems, depending on the interaction between the two different types of protein. The type of interaction between the proteins will affect the gel properties.

In this study, although the addition of pea protein isolate to hams has affected some texture parameters, namely breaking force, gel strength and springiness, its addition has brought the values of elasticity, hardness, cohesiveness and chewiness, closer to those of pork ham.

However, these results are insufficient to draw more concrete conclusions and therefore further studies on this effect should be carried out.

### **3.4 Sensorial analysis**

The fish hams were sensorially tested and no significant differences were found between the parameters evaluated. However, the ham aroma and taste were evaluated as more intense but without being considered unpleasant (Figure 5).



**Figure 5.** Results obtained from the sensory analysis of fish hams with different formulations. PPI (Pea Protein Isolate).

Ham with 0.5% PPI, overall, it was the most appreciated and was evaluated as having the most intense ham aroma, the hardest and most cohesive, the juiciest and the most intense bitter taste. The results obtained in the sensory evaluation allowed us to check whether the hams had evident characteristics of rejection or acceptance and, among the formulations used, which was the most accepted. The results obtained in the sensory analysis reinforce the potential that these hams may have in the market. However, it is known that consumer opinion is affected by the context in which the food is tasted and by the expectations that some external factors, such as brand or price, will exert (Lawless, 1995; Moskowitz, 1995).

#### 4. Conclusions

In conclusion, the addition of PPI can have a favorable effect in obtaining fish ham with good sensory acceptance and with textural characteristics similar to those of extra pork ham. The fish ham with added PPI also has the advantage of having ingredients in its composition that improve it in nutritional aspects.

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## 06 LQRC-CIEQV ACTIVITIES

- **Book:**

LQRC-CIEQV edited a book coordinated by José Amendoeira, with the following reference: Amendoeira, J. (2022). *Saúde Individual e Comunitária*. Centro de Investigação em Qualidade de Vida.

- **Invitation for publication in Healthcare journal:**

The researcher Prof. Dr. João Brito with researcher Prof. Dr. Rafael Oliveira are the guest editors of a special issue with the topic: *Improve Athletes' Performance and Avoid Health Issues*. Deadline for manuscript submissions: 31 August, 2022. More information [\*\*SEE MORE\*\*](#).

- **Invitation for publication in Symmetry journal:**

The researcher Prof. Dr. Mário Espanha with researcher Prof. Dr. Fernando Santos are the guest editors of a special issue with the topic: *Symmetry and Asymmetry in Biomechanics and Human Physiology*. Deadline for manuscript submissions: 31 December, 2022. More information [\*\*SEE MORE\*\*](#).

- **Invitation for publication in International Journal of Environmental Research and Public Health (IJERPH):**

The researcher Prof. Dr. Nuno Loureiro, prof. Dr. Rafael Oliveira and prof. Dr. Fernando Santos are the guest editors of a special issue with the topic: *"Football Related Injury and Health Problems"*. Deadline for manuscript submissions: 20 April, 2023. More information [\*\*SEE MORE\*\*](#).

- **Invitation for publication in International Journal of Environmental Research and Public Health (IJERPH):**

The researcher Prof. Dr. João Brito with researcher Prof. Dr. Rafael Oliveira are the guest editors of a special issue with the topic: *"Exercise Monitoring, Testing and Prescription Strategies to Improve Quality of Life in Athletes and Non-athletes"*. Deadline for manuscript submissions: 31 May, 2022. More information [\*\*SEE MORE\*\*](#).

- **FCT funding the program *Verão com Ciência***

The researchers Raul Antunes and Roberta Frontini are the coordinators of the project “Sintomatologia depressiva e ansiosa, qualidade de vida e bem-estar subjetivo em praticantes de exercício e desporto”.

- **Grupo Projeto Creche**

The report presented aims to show the work developed within the scope of the Grupo Projeto Creche (GPC) from the 2008/2009 to the present. The first point presents the Projeto Creche Group, showing its elements, its dynamics and the main results of its operation. Next, the partnerships/collaborations and final considerations are identified.

- ***Física(Mente)* – Physical exercise, Quality of Life and Mental Health** – Isabel Simões Dias, Marta Fonseca and Maria Odília Abreu

This research project was carried out in the academic year 2013/2014, at ESECS/PL, from the convergence of interests of two colleagues from the Department of Communication, Education and Psychology, Isabel Simões Dias and Maria Odília Abreu, members of the CIEQV. Considering the data from the World Health Organization on the importance of the practice of Physical Exercise in the perception of Quality of Life and Mental Health, this project aims to study the relationship between these three variables in order to proposed intervention to promote health and well-being.

- **I&D projects in the scientific areas of CIEQV:**

More information [SEE MORE](#).

07

## CALLS AND FUNDING

- Calls for support to *Turismo*. Status: open. More information [\*\*SEE MORE\*\*](#).
- Calls for support to *Programa de Desenvolvimento Rural*. Status: open. More information [\*\*SEE MORE\*\*](#).
- Calls for support to *Plano de Recuperação e Resiliência*. Status: open. More information [\*\*SEE MORE\*\*](#).
- Calls for support to *Programa ATIVAR.PT*. Status: open. More information [\*\*SEE MORE\*\*](#).
- Calls for support to *Apoio à Produção Nacional*. Status: open. Deadline: to be defined. More information [\*\*SEE MORE\*\*](#).
- Calls for support to *Programa de Incentivo para os Açores*. Status: open. More information [\*\*SEE MORE\*\*](#).
- Calls for support to *Apoios à contratação – IEFP*. Status: open. More information [\*\*SEE MORE\*\*](#).
- FCT contest schedule 2021-2023. FCT provides the calendar of competitions scheduled for the years 2021 to 2023. More information [\*\*SEE MORE\*\*](#).
- Founders Program Indico. Call continuously open. More information [\*\*SEE MORE\*\*](#).
- Work programs 2021-2022, Destinations Fight Against Crime and Terrorism (FCT) & Effective management of EU external borders (BM) & Resilient Infrastructure (INFRA) & Disaster-Resilient Society for Europe (DRS) & Strengthened Security Research and Innovation (SSRI):
  - Call 2022 opening on 30 June, 2022 and deadline 23 November, 2022  
More information [\*\*SEE MORE\*\*](#).  
Financing opportunities for *PMEs na área do Digital*. Calls opening on 28 June, 2022 and deadline on 9 December, 2022. More information [\*\*SEE MORE\*\*](#).
- Work programs 2021-2022, Destination Increased Cybersecurity (CS)
  - Call 2022 opening on 30 June, 2022 and deadline on 16 November, 2022  
More information [\*\*SEE MORE\*\*](#).
- IDB Lab – International – *Tokens e Biodiversidade*. Deadline: 12 August, 2022. More information [\*\*SEE MORE\*\*](#).
- EU Prize for Women Innovators. Deadline: 18 August, 2022. More information [\*\*SEE MORE\*\*](#).
- *Projeto de Regulamento de Concessão de Apoios a Projetos Internacionais de Mobilidade de Investigadores*. Deadline: 19 August, 2022. More information [\*\*SEE MORE\*\*](#).
- *Prémio Economia Circular*. Deadline: 31 August, 2022. More information [\*\*SEE MORE\*\*](#).

- *Fundação Oceano Azul & Fundação Calouste Gulbenkian* – BlueBioValue Acceleration. Deadline: September, 2022. More information [\*\*SEE MORE\*\*](#).
- EIT Food's TeamUp: find the right co-founder for your agrifood star-up. Deadline: 3 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Portal Funding & Tenders, for the following areas of Cluster 5 – *Clima, Energia e Mobilidade*: “Batteries”. Deadline: 6 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Portal Funding & Tenders, for the following areas of Cluster 5 – *Clima, Energia e Mobilidade*: “Energy systems, grids, storage”, “CCUS”, “Waterborne”, “2ZERO” e “Aviation”. Deadline: 6 de setembro de 2022. More information [\*\*SEE MORE\*\*](#).
- Portal Funding & Tenders, for the following areas of Cluster 5 – *Clima, Energia e Mobilidade*: “Multimodal transport, logistics, infrastructure”. Deadline: 6 September, 2022. More information [\*\*SEE MORE\*\*](#).
- EDA Defence Innovation Prize 2022. Deadline: 9 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Submission of manuscript for publication in the *Revista Científica da FPDD – Desporto e Atividade Física para Todos*. Incentive award for best article. Deadline: 15 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Eurostars joint transnational call for proposals SEP 2022. Deadline: 15 September, 2022. More information [\*\*SEE MORE\*\*](#).
- L'Oréal Portugal Medals of Honor for Women in Science 2022. Deadline: 16 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Portal Funding & Tenders, for the following areas of Cluster 5 – *Clima, Energia e Mobilidade*: “Buildings”. Deadline: 6 September, 2022 and 24 January, 2023. More information [\*\*SEE MORE\*\*](#).
- Challenge lab 2022 – Southern Europe. Deadline: 16 September, 2022. More information [\*\*SEE MORE\*\*](#).
- FCT with Deutscher Akademischer Austauschdienst open calls for Programme for Cooperation in Science between Portugal and Germany. Deadline: 19 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Prize *Desporto + Acessível*. Deadline: 19 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Call for expression of interest for experts participating in Focus Groups of the European Innovation. Deadline: 19 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Opportunities in Cluster 2 of Horizon Europe. Deadline: 21 September, 2022. More information [\*\*SEE MORE\*\*](#).

- Calls 2022 KDT – Key Digital Technologies. Deadline: 21 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Call for proposals “Women in the Blue Economy”. Deadline: 22 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Science meets regions calls for expression of interest. Deadline: 23 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Miion Adaptation to Climate Change. Deadline: 27 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Proof of Concept Grants 2022. Deadline: 29 September, 2022. More information [\*\*SEE MORE\*\*](#).
- I&D+I Projects – *Promoção dos Produtos Agroalimentares Portugueses* (Invitation N.o 15/C05-i03/2021). Deadline: 30 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Anticipating and preventing potential risks from animal, food, antimicrobial resistance and other emerging threats. Deadline: 30 September, 2022. More information [\*\*SEE MORE\*\*](#).
- XI edition of the Cooperation and Solidarity Award Antonio Sergio. Deadline: 30 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Innovation of Portuguese agri-food products. Deadline: 30 September, 2022. More information [\*\*SEE MORE\*\*](#).
- I&D+I Projects – *Uma só Saúde* (N.o 13/C05-i03/2021). Deadline: 30 September, 2022. More information [\*\*SEE MORE\*\*](#).
- Call for contract within the scope of the project PREVENT PCP. Deadline: 30 September, 2022. More information [\*\*SEE MORE\*\*](#).
- FLAD support program for the internationalization of higher education. Deadline: 9 October, 2022. More information [\*\*SEE MORE\*\*](#).
- 70 new COST Actions now online: apply to join. Deadline: 20 October, 2022. More information [\*\*SEE MORE\*\*](#).
- European Cooperation in Science & Technology (Internacional) – COST Action Call. Areas of interest: All scientific and technological areas. Deadline: 20 October, 2022. More information [\*\*SEE MORE\*\*](#).
- Effective fight against trafficking in human beings (HORIZON-CL3-2022-FCT-01-07). Deadline: 23 November, 2022. More information [\*\*SEE MORE\*\*](#).
- Horizon Europe: a new initiative for Young Observer. Deadline: 14 December, 2022. More information [\*\*SEE MORE\*\*](#).
- New European Bauhaus 2022 – Transformation of places of learning. Deadline: 31 December, 2022. More information [\*\*SEE MORE\*\*](#).

- New European Bauhaus 2022 – Transformation of places of learning. Deadline: 31 December, 2022. More information [\*\*SEE MORE\*\*](#).
- Calls for innovative projects in various areas of social and exact sciences, funded by EEA Grants Portugal. Deadline: 4 December, 2020 to 30 June, 2023. More information [\*\*SEE MORE\*\*](#).
- Support Fund for Small and Medium Companies of the European Union. Deadline: 16 December, 2022. More information [\*\*SEE MORE\*\*](#).
- Portal Funding & Tenders, for the following areas of Cluster 5 – *Clima, Energia e Mobilidade*: “Energy supply”. Deadline: 10 January, 2023. More information [\*\*SEE MORE\*\*](#).
- Sustainability 2022 Young Investigator Award. Deadline: 31 January, 2023. More information [\*\*SEE MORE\*\*](#).
- Water4All 2022 Joint Transnational Call. Deadline 20 March, 2023. More information [\*\*SEE MORE\*\*](#).
- BioeconomyVentures – Open calls – Future of Food. Deadline: March, 2023. More information [\*\*SEE MORE\*\*](#).
- *Programa Cidadãos Ativ@s* – Bilateral Cooperation Initiatives of the *Fundação Bissaya Barreta* and *Fundação Calouste Gulbenkian*. Deadline 30 June, 2023. More information [\*\*SEE MORE\*\*](#).
- European Commission – Competitive calls and calls for third parties. Areas of interest: Food; Energy Transition; Climate; Mobility; Digitization. Deadline: 22 July, 2023. More information [\*\*SEE MORE\*\*](#).

08

## CONFERENCES AGENDA

- **European Research and Innovation Days**, 28 and 29 September, 2022, online. More information [SEE MORE](#).
- **Revista Esferas sobre “Comunicação e Estudos Biográficos”**. Deadline: 31 August, 2022. More information [SEE MORE](#).
- **Interaction through Videos for InClass and Out-of-Class Language Learning and Use**, 8-10 September, 2022, in Barcelona, Spain. More information [SEE MORE](#).
- **Interactional Competences and Practices in a Second Language (ICOP-L2)**, 8-10 September, 2022, in Barcelona, Spain. More information [SEE MORE](#).
- **Revista Urban Science sobre “Digital Citizenship Mediating Planning Participation and Space”**
- **XVI Congresso da Sociedade Portuguesa de Ciências da Educação**, 15 to 17 September, 2022, at Higher School of Education of the Polytechnic Institute of Lisbon. More information [SEE MORE](#).
- **II Congresso Internacional sobre Metodologia (Qualis2022)**, 19-21 September, 2022, híbrido and presentiatly event (Coimbra). More information [SEE MORE](#).
- **CE – Annual Research Conference 2022**, 20-21 September, 2022. More information [SEE MORE](#).
- **16th ENSE Forum – Sport Education in a Changing World**, 22 and 23 September, 2022, at Guimarães (Portugal). More information [SEE MORE](#).
- **SmartAgriHubs – SmartAgriHubs Final Event**, 26-29 September, 2022. More information [SEE MORE](#).
- **CONSIPL 2022 – XIII Congresso Internacional da Sociedade Internacional de Português Língua Estrangeira**, 27 and 30 September, 2022. More information [SEE MORE](#).
- **The Business Buster 2022**, 28 and 29 September, 2022, presentiatly (Lisboa). More information [SEE MORE](#).
- **Research and Innovation Days 2022**, 28 and 29 September, 2022. More information [SEE MORE](#).
- **CE – European Research and Innovation Days 2022**, 28 and 29 September, 2022, online. More information [SEE MORE](#).
- **13th Micro Nano Event**, 29-30 September, 2022. More information [SEE MORE](#).
- **SAVE THE DATE**, 6 October, 2022 – Brussels, Belgium. More information [SEE MORE](#).

- **LUSOCONF2022 – IV Encontro Internacional de Língua Portuguesa e Relações Lusófonas**, 13 - 14 October, 2022, at Higher School of Education of the Polytechnic Institute of Bragança. More information [SEE MORE](#).
- **10th ICESD – 10th International Congress of Educational Sciences and Development**, 19-21 October, 2022, online event [SEE MORE](#).
- **Hydrogen Europe’s Flagship Event**, 25-27 October, 2022. More information [SEE MORE](#).
- **17º Seminário de Desenvolvimento Motor da Criança 2022 Faro**, 28 and 29 October, 2022, at the Higher School of Education and Communication of the University of Algarve (Faro). More information [SEE MORE](#).
- **12.ª Edição Congresso Nacional de Educação Física**, 29 and 30 October, 2022, at the José Lúcio Silva Theater. More information [SEE MORE](#).
- **Appropriation**. Deadline: 30 October, 2022. More information [SEE MORE](#).
- **XXIII Jornadas da Sociedade Portuguesa de Psicologia do Desporto**, 2 to 5 November 2022, at the Polytechnic Institute of Maia. More information [SEE MORE](#).
- **IC Congresso Nacional das Escolas Superiores (CNESA)**, 3-4 November, 2022, at the Higher Agricultural School of Santarém. More information [SEE MORE](#).
- **CAPSI2022 – 22a Conferência da Associação Portuguesa de Sistemas de Informação**, 3-5 November, 2022, Assomada, Santiago – Cabo Verde. More information [SEE MORE](#).
- **3º Congresso Internacional de Teoria da Ação Conjunta em Didática (TACD)**, 7-9 November, 2022, at Brest/Rennes. More information [SEE MORE](#).
- **CENTERIS 2022 – International Conference on ENTERprise Information Systems**, 9 – November, 2022, at Lisbon (Portugal). More information [SEE MORE](#).
- **10th International Conference on Project MANagement**, 9-11 November, 2022, at Lisbon (Portugal). More information [SEE MORE](#).
- **Colloque Acedle – Didactique(s), plurilinguisme (s), mondialisation (s)**, 17-18 November, 2022, at University of Aveiro. More information [SEE MORE](#).
- **XXIV Simpósio Internacional de Informática Educativa (SIIE22)**, 17-19 November, 2022, at Coimbra. More information [SEE MORE](#).
- **CZEDU CON 2022 – International Conference on Strategy and Policy in Higher Education**, 21-22 November, 2022. More information [SEE MORE](#).
- **FECSE 2022 – Fórum Europeu de Componentes e Sistemas Eletrónicos**, 24-25 November, 2022. More information [SEE MORE](#).
- **6º Colóquio Internacional de L’ARCD**, 27-30 June 2023, Switzerland. More information [SEE MORE](#).