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ANALYSIS OF THE PERCEPTION OF CONSUMERS IN ROMANIA TOWARDS THE USE OF INSECTS AND ARTIFICIAL MEAT IN PUBLIC FOOD

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Abstract

Recently, the European Commission approved mealworms as a food product in the European Union. Following this authorisation, mealworms are considered 'novel foods'. Lab-grown meat is regulated in the EU as "novel food", a legal definition that includes products not significantly present in Europeans' diets before May 1997. In this context, the paper aimed to analyze the perception of the Romanian consumers towards the use of insects and artificial meat in public food. For this purpose, it was applied a questionnaire with 6 questions to a number of 1,200 people over 16 years old. The results pointed out that of the 1,200 questioned individuals, only 30% would consume edible insects. This aspect is due to the fact that in Romania the consumption of insects is not a habit as in other countries, where insects are consumed almost daily. Also, artificial meat is not highly rated by consumers. A very small proportion of those who took part in the survey agree with the production and consumption of artificial meat.

Key words: *public food, edible insects, food, artificial meat, consumers, mealworms*

INTRODUCTION

Recently, the European Commission approved mealworms as a food product in the European Union - a first decision in the field.
Why are insects authorized as food products?
Following a recent authorisation, mealworms are considered 'novel foods' - this designation refers to any food that was not widely consumed by EU citizens before 15 May 1997, when the first food regulation came into force us [25].
In 2023, the EU also developed a strategy on food sustainability, entitled the Farm to Consumer Strategy, which aims to create a sustainable food system that ensures food security, protecting nature and individuals [11] [21]). The UN appreciates that, in principle, sustainable consumption depends on sustainable production, aiming to facilitate the satisfaction of basic needs and ensure a high quality of life [13] [22]. Minimizing the use of natural resources and toxic materials, reducing emissions of pollutants and reducing the amount of waste in order not to endanger society as a whole [3] [6]. According to the OECD, sustainable consumption is achieved by making the consumption of energy and other resources more efficient, minimizing food waste and developing among consumers a mindset and behavior responsible for nature [16] [20] [29].
Of course, it is up to consumers to decide whether they want to eat insects or not, but eating insects is nothing new, as they are already part of the diet in many parts of the world [2].
The draft legislation establishes labeling requirements for food products that will contain novel foods. This requirement is in addition to the provisions of the labeling regulation.

The EU is strongly committed to transparency [7] [18].

According to the FAO, insects as food will play a major role in addressing the many problems we face today and will face in the future [14] [24]. These include the rising cost of animal protein.[4] [23].

Insects are found in abundance all over the world. They are high in protein and account for less than 1% of the animal's carbon footprint [30]. They are the ideal food alternative that facilitates the transition to a healthy and sustainable diet and contributes positively not only to our health, but also to that of the environment and therefore our future [10]. According to FAO, more than 1,900 species of insects are used as food in the world [26][27].

In Romania, Law 411/2023, which applies from January 18, 2024, regulates the use of insects (insect flour) in the preparation of food products, as well as the way in which these products can be labeled and sold.

Economic operators are prohibited from including new foods in the preparation of the products provided for in the National Register of Traditional Products and the National Register of Sacred Recipes.

The reporting committees (agricultural and economic) in the Senate replaced the phrase "insect meal" with new authorized foods in the project.

According to an amendment introduced by the reporting committees and appropriated by the plenary, the European Regulations are listed in whose annexes the forms of use (frozen, paste, dry, powder, partially defatted), the conditions under which new foods can be used in food products, the specific categories of food in which they can be used and the maximum proportions allowed.

On the label of the food products, the name of the newly authorized food will be found as follows: dried, frozen or powdered yellow mealworm, depending on the form used; flour beetle larvae in frozen or paste form; partially defatted homemade cricket powder; frozen/dried/powdered/whole locusts.

The law also states that the labels of food products containing novel foods must state that this ingredient may cause allergic reactions to consumers with known allergies to mites and/or crustaceans and products derived from them. The mention must appear in close proximity to the list of ingredients. An article, kept in the form proposed by the initiators, provides that the food products that are/contain insect species authorized to be introduced on the market as new foods, coming from the European Union area, will be presented in the classic direct sales areas, in a stand separately, delimited by the stands containing consecrated products that do not contain insects.

The topic of lab-grown meat has sparked controversy over the past five years, as promises have been made to lessen the environmental impact of conventionally produced meat. On the other hand, this industry is facing problems due to diminishing investments, difficulties in reaching a high level of production, as well as hostile reactions in some countries [17].

Review of the scientific literature

The research methodology on the systematic analysis of specialized literature, includes specific tools for bibliometric studies considered popular and rigorous methods for exploring and analyzing large volumes of data [8] [12]. The data collection stage is very important for the relevance of the research results, and that is why it was paid more attention to it [9] [19]. The Web of Science (WoS) was used as an academic database because it is considered one of the most important scientific information source in the world [15]. To emphasize the relevance of the final database, we also used VOSviewer, as an IT tool, this being a software product made by Van Eck and Waltman, which allowed us to develop some suggestive bibliometric maps [28].

In order to create the bibliometric maps with the help of VOSviewer, it was necessary to export the WoS database in tab delimited file format [1] [5].

Through this software we were able to perform an analysis of the relevance of the keywords used in the WoS query process, as can be seen in Figure 1.

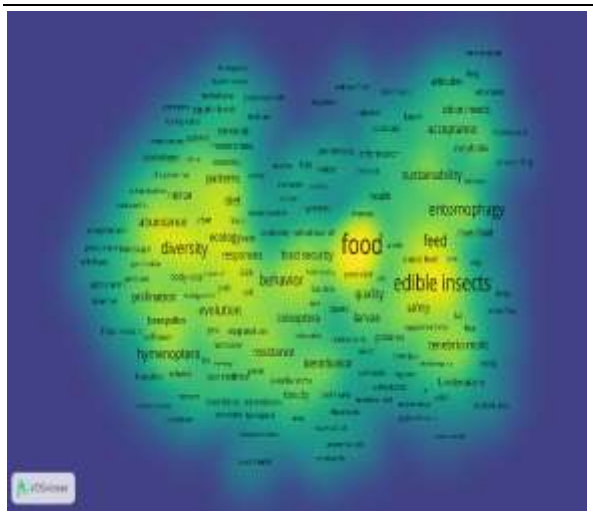

Fig. 1. The relevance of keywords used in the WoS query process.
Source: VOSviewer.

The map generated by VOSviewer highlights the frequency of use of keywords by the authors and, from its analysis, it can be seen that among the most used keywords are those used by us in the query process.
Using the same scientific method, there were also identified university networks, clusters, that study issues related to the use of insects and artificial meat in human nutrition (Figure 2).
A very important element of our research concerned the identification of the most cited authors who addressed these topics and the collaboration between them (Figure 3).

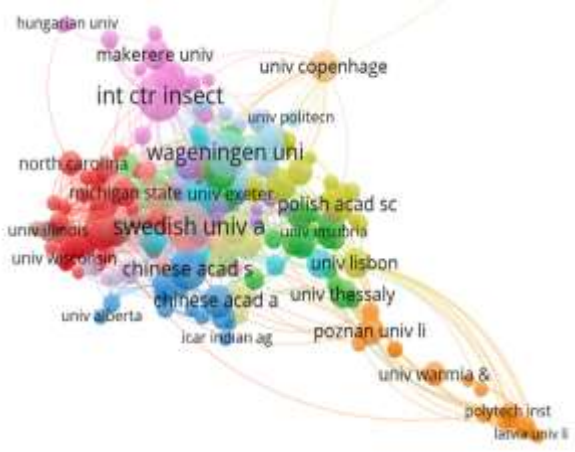

Fig. 2. University networks.
Source: VOSviewer.

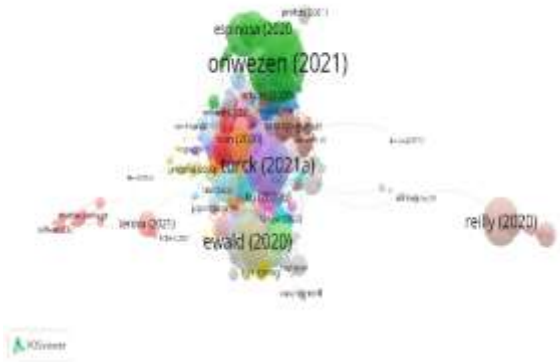

Fig. 3. The most cited authors
Source: VOSviewer.

Also very interesting is the map showing the main publications that dealt with these topics and the collaboration between them (Figure 4).

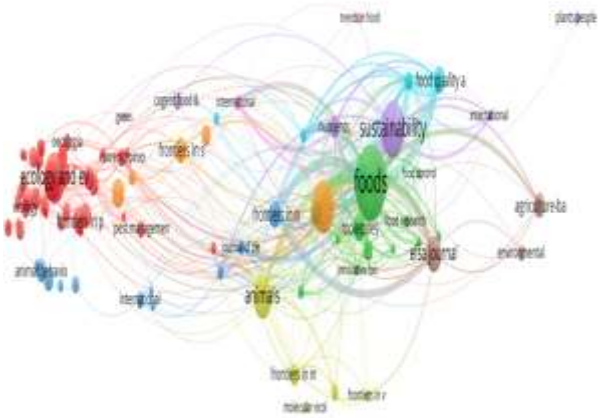

Fig. 4. Main publications
Source: VOSviewer.

MATERIALS AND METHODS

In this paper it was analyzed the perception of Romanian consumers towards the use of insects and artificial meat in public food.
For the study, a questionnaire with 6 questions was applied to a number of 1,200 people over 16 years old.
When applying the questionnaires, the research team was helped by 2 students from the master's degree in Quality and Innovation Management from our faculty.
The questions are presented in Table 1.

Table 1. The questions in the questionnaire

1	**Would you eat edible insects?**
2	Would you be willing to eat meal or other insect products?
3	Can eating insects become dangerous to health?
4	What would make you eat edible insects?
5	Can insect flour replace regular flour?
6	Do you agree with the production of artificial meat?

Source: Own contribution.

RESULTS AND DISCUSSIONS

According to our analysis, it turned out that out of a sample of 1,200 people, only 30% of them would consume edible insects. This aspect is due to the fact that in our country the consumption of insects is not a habit as in other countries, where insects are consumed almost daily (Figure 5).

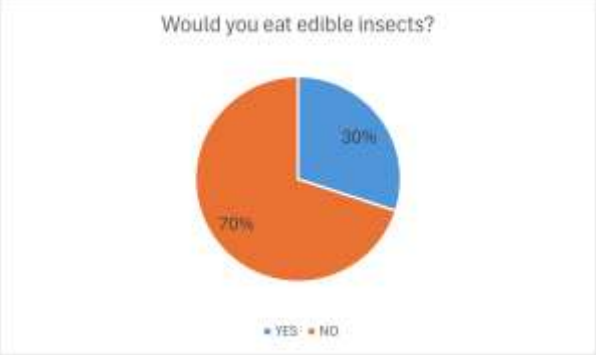

Fig. 5. People willing to eat edible insects
Source: Own contribution.

According to the survey, the consumption of flour or other products resulting from insects, such as powder, has a rather large weight, almost 40% of people answered the question affirmatively.
This result is due to the fact that the insects in the form of flour or powder are subjected to a process that gives a different appearance and taste to the final product compared to the actual eating of the insect (Figure 6).
Referring to the survey, the consumption of insects can become dangerous to health if we do not pay more attention to how they are prepared or the species of insects consumed (Figure 7).

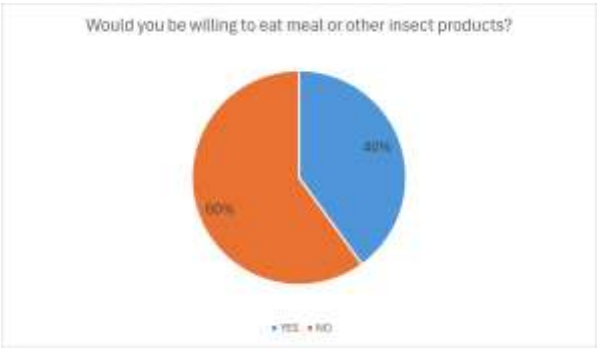

Fig. 6. People willing to consume insect meal.
Source: Own contribution.

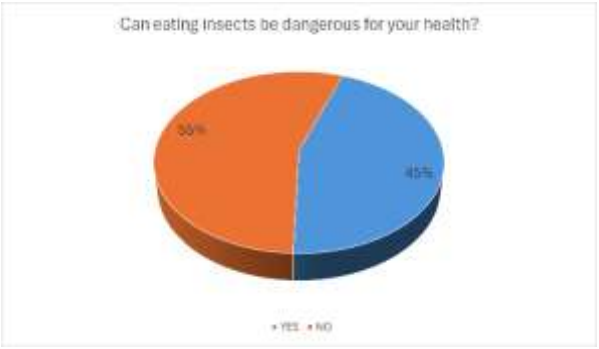

Fig. 7. Can eating insects become dangerous to health?
Source: Own contribution.

Among the Romanians, insects whether edible are looked down upon and not regarded as a source of food or protein. The result shows that only 30% of those surveyed would eat insects at least once out of curiosity.
Most of them wouldn't be driven by anything to even try insects (Figure 8).
Insects as a whole or in the form of flour or powder are not valued so much in Romania.

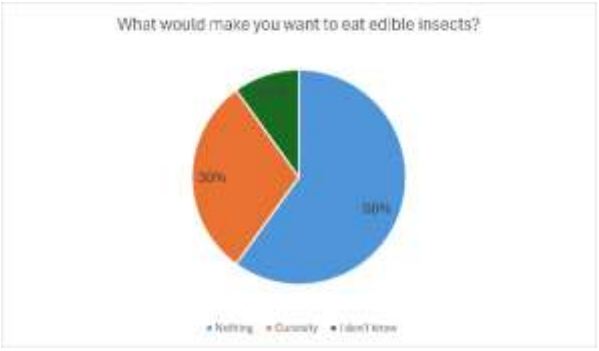

Fig. 8. The reason why people would be willing to consume insects.
Source: Own contribution.

The survey shows that even insect meal is not valued and cannot replace the flour we normally use. 75% of people who participated

in the survey do not agree that insect flour can replace normal flour (Figure 9).

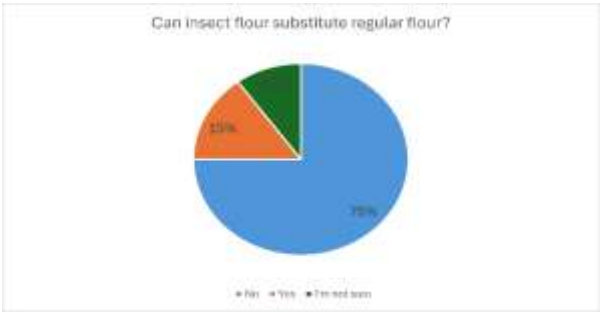

Fig. 9. The consumption of meal from insects.
Source: Own contribution.

Artificial meat is not highly rated by the Romanian consumers. A very small share of those who participated in the survey agree with the production of artificial meat (Figure 10).

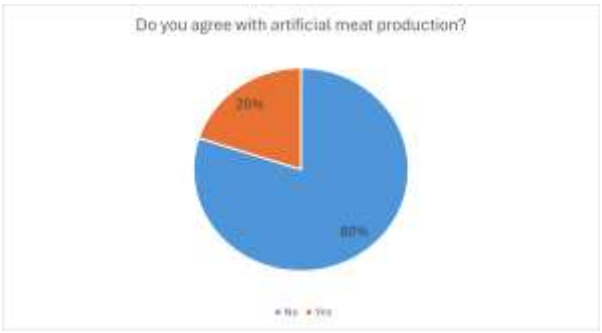

Fig. 10. The opinion of consumers towards the production of artificial meat.
Source: Own contribution.

In a year and a half we could eat laboratory-produced meat in restaurants in Romania. A company in France has already submitted an application to the European Union's regulatory authorities for authorization to sell cultured meat in all 27 states of the Union.
French company Gourmey has applied for the first EU pre-market authorization for lab-grown foie gras amid a heated debate between European governments over food innovation.
On July 26, Gourmey, a Paris-based cultured food company, announced that it has submitted an application for its cell-based duck product to food safety authorities in the EU, Switzerland, the UK, Singapore and the US United. The sale of mealworms in the EU has to meet a number of requirements imposed by EFSA - European Food Safety Authority, so an economic process model for the production of this type of material - mealworms flour, incorporated in an ERP - SAP system using smart technologies as presented in Figure 11.
Mainly the adaptation of the ERP system for this particular type of production is aimed to go through some steps that will be related to the following modules of the integrated ERP SAP system - PP - production planning, MM - material management, CO - controlling, EWM - extended warehouse management, QM - quality management.
The model proposed in this paper will use AI - artificial intelligence, through iRPA - intelligent Robotic Process Automation, to solve the repetitive tasks (tasks).
Sensors and video cameras can also be used to monitor the stages of evolution existing in the growth of these worms (raw material) used for the type of edible flour discussed - these transmit data in SAP for decision making regarding - worm growth (selection of controlled growth environments, control of environmental conditions, etc.), harvesting (and here we can have a range of data that the ERP system can store for various analyses), worm pre-processing, dehydration (the ERP system can monitor and transmit the necessary information for the respective process - drying methods, temperature control, etc.), milling, packaging (airtight packaging, labeling) and storage (controlled storage) and QM - quality management (various analyzes performed and which are attached in the SAP system for use in the economic production process).

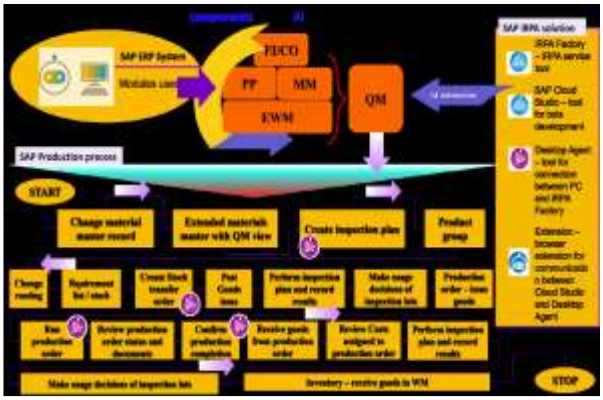

Fig. 11. ERP SAP system.
Source: Own contribution.

CONCLUSIONS

The conclusions regarding the desire of Romanians to consume insects or insect flour

are very interesting and differ from other countries.

In Romania, according to the analysis above, it turned out that out of a sample of 1,200 people, only 30% of them would consume edible insects.

This aspect is due to the fact that in Romania the consumption of insects is not a habit as in other countries, where insects are consumed almost daily. Many, 55%, believe this is dangerous to health.

These consumer perceptions are not based on data from specialized studies, but rather from the mass media and social networks.

According to the survey, the consumption of flour or other products resulting from insects, such as powder, has a greater weight, 40% of the 1,200 people surveyed answered the question affirmatively.

Regarding the consumption of artificial meat, Romanian consumers are very conservative and traditional, compared to those from other countries. It is very difficult to change some 2000-year-old gastronomic habits.

In Romania, artificial meat is not highly rated by consumers. A very small share – 20% of those who participated in the survey agree with the production of artificial meat.

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