PROBIOLIVES: Table olive fermentation with selected strains of probiotic lactic acid bacteria. Towards a new functional food (FP7-SME-2008- 2 project)

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ABSTRACT

The current project is a collaborative action of 14 participants. There are 4 SME-AGs (PEMETE -Greece, ASEMESA - Spain, APABI - Portugal, AIFO - Italy) comprising of table olive producing SMEs and 4 industries producing fermented olives from the main olive producing countries (OLYMP-Greece, JOLCA- Spain, AZAGAP-Italy and PROBEIRA-Portugal), 3 Research Institutions from Greece (NAGREF), Spain (IG-CSIC) and Portugal (INRB); and 3 Universities from Greece (AUA), Italy (UNITO) and Tunisia (INSAT), all of which are selected for their multidisciplinary individual expertise in the proposed research as well as for their ability to provide expert facilities to perform the various tasks.

The concept of this project is to provide to the SME Associations and their members SMEs with tools to increase their technological level, competitiveness and profits by the production of olives, fermented with probiotic bacteria, preferably isolated among the lactic acid bacteria colonizing the olives. Lactic acid bacteria from the olive microbiota are the dominant microorganisms in natural fermentations and there will be studied if some of them possess probiotic properties. The selected probiotic bacteria will be introduced into the brines at the onset of fermentation, to act as starters, to be able to dominate and ensure a proper fermentation inhibiting the growth and survival of undesirable microorganisms.

The goal is the production of a functional product, containing probiotic bacteria in adequate amounts to improve consumer’s health, without altering the quality characteristics of fermented olives. Consumer acceptance studies will be essential for the exploitation and the introduction of the new food into the EU and international market. At the same time a better control of the fermentation process, early detection of faulty fermentation and spoilage and assessment of the time needed for fermentation completion will be achieved by monitoring the quality indices (e.g. volatiles) throughout the process with the use of advanced and emerging instruments and tools (mathematical models).

Keywords: probiotic; table olives; lactic acid bacteria; fermentation; functional food

INTRODUCTION

Table olives are one of the most important traditional fermented vegetable in Southern European countries. The production of fermented olives is more or less a craft that remains empirical for all those countries with a tradition in this type of food preservation. The proposal intends to provide solutions of this situation for the European SME-AGs throughout their SMEs table olive industries by carrying out basic, pre-competitive (because it involves research into new areas for the SME's concerned) and applied research tasks that permit a more scientific insight in the fermentation process and the processing and packaging procedure in order to improve the quality, safety and consumer acceptability of the final product. Moreover it intends to help the SME-AGs and their members involved to standardize and predict the fermentation process using starter cultures that not only ensure proper fermentation but also offer beneficial health results to consumers as probiotics.

There is also a need for SME-AGs in the table olive sector for adapting their offer to the consumers. This may be achieved (solution) by introducing into the market new added value products as the consumers are seeking for new preparations based on olives. There is also a major concern by the consumers to buy
naturally processed foods with great impact on their health. It should therefore be advantageous to provide food products that allow to administer probiotic bacteria without causing allergies or intolerances and that can be stored for a long time after opening. Also, it will be of great importance to identify new probiotic bacteria belonging to the natural microflora of a food product.

The current project is a collaborative action of 14 participants. There are 4 SME-AGs comprising of table olive producing SMEs and 4 industries producing fermented olives from the main olive producing countries (Greece, Spain, Italy and Portugal), 3 Research Institutions from Greece, Spain and Portugal; and 3 Universities from Greece, Italy and Tunisia, all of which are selected for their multidisciplinary individual expertise in the proposed research as well as for their ability to provide expert facilities to perform the various tasks. **PEMETE** is the Greek association of table olive processors, packers and exporters representing 60 members, **ASEMESA** is the Spanish association of table olive producers and exporters representing more than 85% of the total Spanish exportations, **APABI** is the Portuguese association of 100 members table olive producers and **AIFO** is Italian association with many table olive producers. All of them have a common interest in the innovation and development of the table olive sector as a tool for their business improvement. These interests move them to promote this project within the EU 7th Framework Programme. Table olive producing SMEs, all members of the local SME-AGs in the major Mediterranean countries (*OLYMP* in Greece, *JOLCA* in Spain, *PROBEIRA* in Portugal and *AZAGAP* in Italy) will contribute to the exploitation of project’s results as end users. They were selected for their high innovative attitude. The **NAGREF-ITAP** and **AUA** in Greece, **IG-CSIC** in Spain and **INRB** in collaboration with ITQB in Portugal are leaders in research on olive fermentation for many years with several related implemented projects and numerous scientific publications. They are willing to collaborate and assist the SME-AGs and their members in each country to develop the new functional product according to their needs, techniques and practices (e.g. variations in olive microbial system, cultivars, conditions and time of fermentation, types of packaging). They will have the collaboration and assistance of **UNITTO** a leading University from Italy in microbial identification and molecular typing techniques to assist in probiotic bacteria selection and strain identification. The **AUA** and **INRB** have also significant background on probiotics research while **AUA**, **NAGREF-ITAP** and **IG-CSIC** will contribute to the integration and modelling of the data generated by the project. There will be also a University from a third country belonging to the ICPC-Tunisia (**INSAT**), which has also a reasonable research activity on food microbiology in general and on olive fermentation. Their participation will be valuable to the project as they will work on the isolation and testing of different possible starters as it is expected to promote variations in olive microflora attributed to different climatic conditions of North Africa.

Specifically, lactic acid bacteria from the olive microbiota [1] are the dominant microorganisms in natural fermentations and there will be studied if some of them possess probiotic properties [2]. The selected probiotic bacteria will be introduced into the brines at the onset of fermentation, to act as starters [3,4,5], to be able to dominate and ensure a proper fermentation inhibiting the growth and survival of undesirable microorganisms.

The goal is the production of a functional product, containing probiotic bacteria in adequate amounts to improve consumer’s health, without altering the quality characteristics of fermented olives. Consumer acceptance studies will be essential for the exploitation and the introduction of the new food into the EU and international market. At the same time a better control of the fermentation process, [6,7] early detection of faulty fermentation and spoilage and assessment of the time needed for fermentation completion will be achieved by monitoring the quality indices (e.g. volatiles) [8] throughout the process with the use of advanced and emerging instruments and tools (mathematical models) [9].

**MATERIALS & METHODS**

The project will be implemented through the achievement of the following targets:

- Isolation and characterization of probiotic lactic acid bacteria as starter cultures in green olive fermentation
- Application of the selected probiotic lactic acid bacteria as starter cultures in small-scale controlled fermentations
- Evaluation of shelf life of the probiotic fermented olives under different storage conditions [10]
- Modelling the fermentation kinetics and survival during storage of the selected probiotic lactic acid bacteria
- Risk assessment studies to ensure the safety of the final product
- Consumer acceptance studies to assess the acceptability of the probiotic olives
- Application of the selected probiotic lactic acid bacteria as starter cultures in medium or large-scale controlled fermentations.
- Exploitation, dissemination and training will be carried out to disseminate the results both to the members of the SME-AGs of the consortium and beyond to a wider audience and to train the SME-AGs and their SMEs to facilitate the take-up of the project results.

RESULTS & DISCUSSION

The PROBIOLIVES project is in progress, running its second year. The results so far are very promising. A great number of lactic acid bacteria has been isolated from different cultivars in Greece, Spain, Portugal, Italy and Tunisia. The tests that have been performed in vitro for their probiotic potential have indicated that certain lactic acid bacteria have shown probiotic properties. The most promising ones have been used as starters in olive fermentations in each participating country. The fermentations have been monitored with microbiological and physicochemical analyses performed at regular intervals and data analysis is in progress. Molecular techniques have also been used to detect the survival rate of the potential probiotic strains in the final fermented product. Packaging and safety studies are also in progress.

CONCLUSION

There are very promising results regarding the isolation of new probiotic strains of lactic acid bacteria from olives that are suitable to be used as starter cultures in olive fermentation.

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