DOI: 10.61458/jepm2301009p
UDC: 582.28:637.1

Journal of
Engineering & Processing Management

ORIGINAL SCIENTIFIC PAPER

Practical results regarding the use of mushrooms in dairy products

Oana-Maria Popa[1] | Ovidiu Tița[2]

[1]Doctoral School of "Lucian Blaga", University of Sibiu 550024 Sibiu Romania

[2]Faculty of Agriculture Science, Food Industry and Environmental Protection "Lucian Blaga ", university of Sibiu 550012 Sibiu Romania

Correspondence
Oana-Maria Popa, Doctoral School of "Lucian Blaga", University of Sibiu 550024 Sibiu Romania
Email: oanamaria.popa@ulbsibiu.ro

Abstract

The purpose of the study is to present the practical results regarding the introduction of different types of mushrooms in the process of obtaining dairy products. Edible mushrooms have a multitude of health benefits. They contain a series of nutrients, ensure efficient digestion and they are very good for increasing immunity. Also, according to some laboratory studies, certain mushroom compounds have the ability to annihilate the development of tumor cells. The proposed research focuses on the development of several acidic dairy products with the addition of edible mushrooms such as Cantharellus cibarius, Boletus edulis, Pleurotus and Champignon. The developed assortments were compared from a sensorial and physico-chemical point of view with a regular product represented by a dairy assortment in order to note all the aspects that the edible mushrooms bring. In order to obtain the new assortments, we started with the technology of obtaining acid dairy products with usual additions, and after the seeding process, before the product was packaged, the mushrooms were added in powder form. Following the determinations made, the obtained results showed that the dairy products enrichment with mushrooms had a positive impact among consumers and the organoleptic analysis showed that consumers are willing to accept the new varieties developed. From a physico-chemical point of view, in addition to the intake of nutrients and vitamins that mushrooms provide, the developed products performed very well in the laboratory tests, which means that the intake of mushrooms does not change the properties of ordinary dairy products, but, on the contrary, they improve them.

Keywords: dairy products, edible mushrooms, nutrients, health benefits, organoleptic analysis

1. INTRODUCTION

Fermented milk is an acidic dairy product that is obtained by heat treatments at high temperatures followed by fermentation and then by seeding with a starter culture consisting of acidifying and flavoring lactic streptococci. There are many reasons to choose the milk fermentation process, the main function being to increase the shelf life. Other advantages include improving the taste, improving the digestibility of the product and manufacturing a diversified range of products from plain yogurts or with different additions to cheeses (Chintescu & Pătrașcu 1988). In the 5th century BC, even the historian Herodotus mentioned the benefits of fermented milk and claimed that the favorite drink of high society people was mare's milk that was prepared in a special way, this drink being called kumis nowadays. Also, kumis and yogurt were mentioned in the 17th century in specialized medical books as remedies against various diseases such as tuberculosis and fever (Portal diletant culinar 2021). A wide range of fermented dairy products are manufactured worldwide and around 400 generic names are applied to traditional and industrialized products. In Romania, four types of fermented milk are processed, respectively:

- fat (type II), with at least 2% fat;
- light (type III), with a maximum of 0.1% fat;
- Sana type (type I), with 3.6% fat;
- extra, with 4% fat.

Apart from the presented assortments, there are many other types whose spread is limited to certain countries, their preparation depending on the raw material (cow's

milk, sheep's milk, buffalo's milk, mare's milk, camel's milk, etc.), climatic conditions, the nature of agricultural exploitations, etc. This category includes Kefir, Cumîs, Cheran, Saia, Dahi, Taette, Cial, etc. They are consumed more in Asia, with the exception of Taette and Kefir products, which are consumed in Europe (Banu 2009). The purpose of the work is the valorization of buttermilk by using four different additions of mushrooms found on the territory of Romania and widely consumed and known by consumers, such as*Cantharellus cibarius*,*Boletus edulis*,*Pleurotus*and*Champignon*. The research carried out consisted of sensory and physico-chemical analysis methods. Through the proposed work, we want to investigate the benefits that the intake of mushrooms can bring to some often consumed products, but also the possibility of developing the acidic dairy products. *Cantharellus cibarius*is the most frequently harvested mushroom in Polish forests because it is a very tasty, well known edible mushroom. It is a firm and durable mushroom, resistant to bacteria and worms, due to the dense structure and high concentration of the ergocalciferol and hydrophobic compounds. Its chemical composition depends on the place of origin, conservation procedures and environmental conditions (Muszyńska, Kała, Firlej, & Sułkowska-Ziaja 2016). *Boletus edulis* is a genus of fungi of the phylum Basidiomycota in the *Boletaceae* family, which includes well over 100 species and coexists as a mycorrhizal symbiont. The generic name is derived from the Latin word *boletus*, which, in turn, derives from the ancient Greek word bolitos which means "mushrooms from the ground" and is popularly known as hribi (Simpson 1979). *Pleurotus*mushrooms, like other tree-growing varieties, are popularly called tree mushrooms and are one of the most commonly cultivated edible mushrooms in the world. The wild variety grows in natural deciduous and coniferous forests on tree trunks or dead wood. The appearance depends on the species, so it tends to be from May (April) to December, but some varieties also grow in winter, if the weather is not too frosty (Bon 2012). The interest in this*Agaricus*species has become more and more evident all over the world due to its nutritional and medical properties. The mushroom also has a high protein and polysaccharide content and a low fat content (Atila, Nadhim Owaid, & Ali Shariati 2017). The mushrooms chosen are edible mushrooms with commercial importance. They are available on the market in a wide variety and can be consumed fresh or in various combinations. Since the shelf life in fresh form is very short, it was used in this direction as an addition to the whipped milk component (Singh, Langowski, Wani, & Saengerlaub 2010).

Materials and Methods

2. MATERIALS

The materials used were: Raw milk, purchased from Horticola Seviş farm from Sibiu Romania. The raw milk was subjected to sensory analysis, as well as physico-chemical analysis by the manufacturing plant before being purchased to obtain the product. Blank sample was represented by a fermented milk assortment purchased from the supermarket. Cultures DVS purchased from a natural pharmacy. Mesophilic and aromatic lactic bacteria culturefor milk fermentation we used fermentation cultures represented by lactic bacteria and mushroom powder from*Cantharellus cibarius*, *Boletus edulis, Pleurotus* and *Agaricus* species purchased from a naturist pharmacy

3. METHODS

3.1. Fermented milk

The raw milk was pasteurized at 85-95 °C for 20 minutes, cooled to 30-32 °C and then seeded. The cultures were introduced into the milk, then the milk was thermostated at 30-32 °C for 7 hours, and finally the obtained dairy product was cooled to 6-8°C. After that, the milk was enriched with the mushroom powder of the chosen species.

3.2. Sensory analysis

The proposed method was the low point score method, the order-by-order method, and the sensory characteristics appreciated were consistency, taste and smell.

3.3. Acidity determination

Acidity determination was performed by titration with sodium hydroxide, 0.1 n solution, in the presence of phenolphthalein as an indicator, expressed in °T.

3.4. Lactose content

The lactose content was analyzed by the polarimetric method II. The method consists in determining the percentage of lactose by calculating the filtrate resulting from the samples.

4. RESULTS AND DISCUSSION

4.1. Sensory analysis

A questionnaire with a small number of points as a method of determination was used for the consistency analysis. All samples were analyzed by 10 tasters and the results obtained from each of the tasters are shown in Figure 1. In Figure 1, which presents the results obtained for

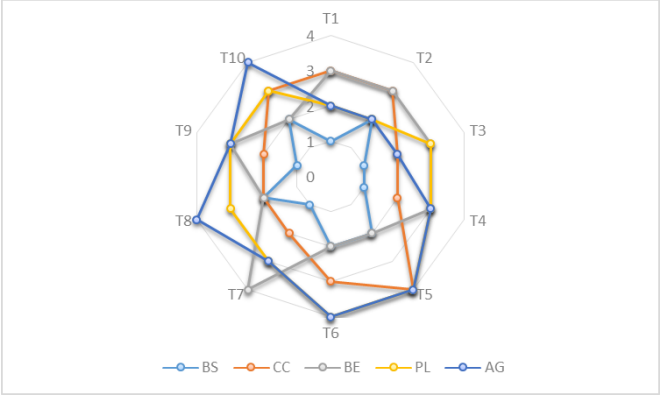

Figure 1. Evolution of consistency characteristics of the 5 samples. BS - blank sample; CC - buttermilk with*Cantharellus cibarius*; BE - buttermilk with*Boletus eduli*; PL - buttermilk with*Pleurotus*; AG - buttermilk with*Agaricus*. T1, T2, T3, T4, T5, T6, T7, T8, T9, T10 – taster.

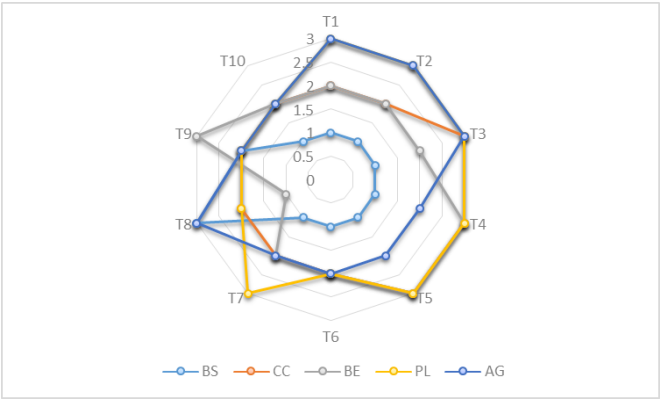

Figure 2. Taste evolution for the 5 samples. BS - blank sample; CC - buttermilk with*Cantharellus cibarius*; BE - buttermilk with*Boletus eduli*; PL - buttermilk with*Pleurotus*; AG - buttermilk with*Agaricus*. T1, T2, T3, T4, T5, T6, T7, T8, T9, T10 – taster.

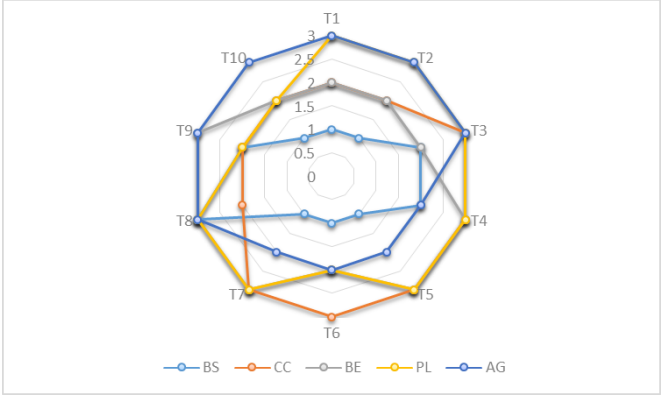

Figure 3. Evolution of odor for the 5 samples. BS - blank sample; CC - buttermilk with*Cantharellus cibarius*; BE - buttermilk with*Boletus eduli*; PL - buttermilk with*Pleurotus*; AG - buttermilk with*Agaricus*. T1, T2, T3, T4, T5, T6, T7, T8, T9, T10 – taster.

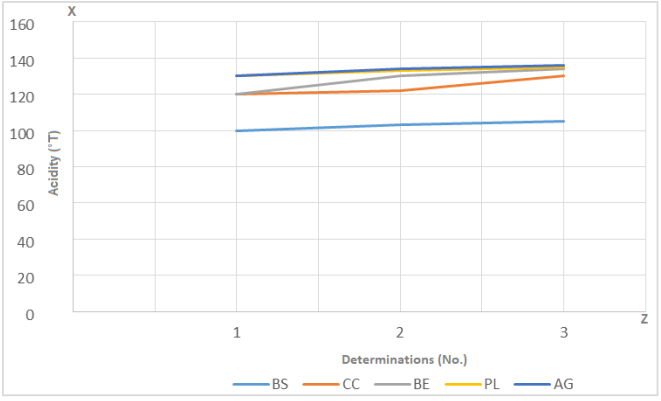

Figure 4. Evolution of acidity for the 5 samples. BS - blank sample; CC - buttermilk with*Cantharellus cibarius*; BE - buttermilk with*Boletus eduli*; PL - buttermilk with*Pleurotus*; AG - buttermilk with*Agaricus*.

the consistency parameter, it was found that the most appreciated sample was the one obtained with the addition of mushrooms from the *Agaricus* species, and the lowest score was obtained by the blank sample.

For the taste analysis, a scale of intensity was used as follows: 0 - not taken into account, 1 - weak, 2 - moderate, 3 - strong. The ten tasters tasted successively the samples and scored for each sample the sensation by the intensity value using the scoring scale from 0 to 3. The results of the analysis are shown in Figure 2. Regarding the taste parameter, the tasters gave the highest score to the sample that was enriched with*Pleurotus*mushroom. Also in this situation, the samples with the addition were appreciated and marked with a higher score compared to the blank sample. For the evaluation of the smell, we used the ordering method by ordering the samples according to the intensity of the sensory characteristics. All samples were analyzed successively by each taster and the results are presented in Figure 3. From the results obtained in the graph, it was found that in the case of the smell, the samples with the addition of mushroom were appreciated, the highest score being obtained, as in the case of the taste of the sample with*Pleurotus*.

4.2. Acidity results

All five samples were subjected three times to analysis regarding the determination of acidity. Following the analysis, an increase in acidity can be seen in the obtained graph, starting from the blank sample and increasing as the mushrooms are added. As can be seen on the graph, the highest acidity is recorded in the sample with *Agaricus*.

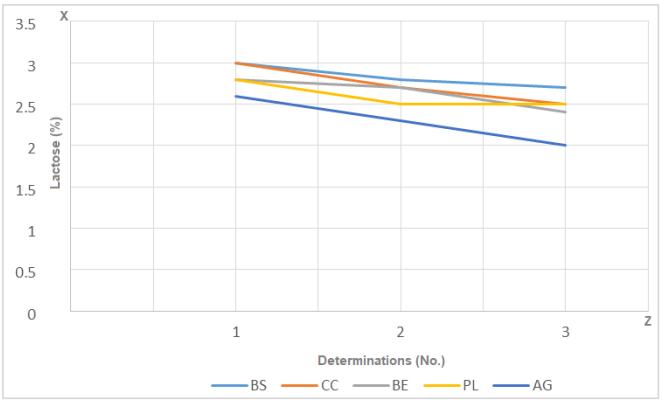

Figure 5. The evolution of lactose for the 5 samples. BS - blank sample; CC - buttermilk with*Cantharellus cibarius*; BE - buttermilk with*Boletus eduli*; PL - buttermilk with*Pleurotus*; AG - buttermilk with*Agaricus*.

4.3. Lactose results

All samples were also subjected to the analysis to determine the lactose content. Three determinations were also made for each sample and the results obtained are in accordance with the determined acidity, so lactose decreased most in the case of the sample with*Agaricus*.

5. CONCLUSIONS

The obtained results showed that the addition of mushrooms to the dairy assortments brings significant modifications both from an organoleptic and physicochemical point of view. From the sensory analysis point of view, the 10 tasters felt and noted significant changes among the 5 samples, and from their results it was observed that they were willing to accept the additives used in comparison with a simple fermented milk assortment. The most obvious changes resulted from the physico-chemical analysis as a result of laboratory determinations on blank samples and samples with the addition of mushroom. The changes were quite significant in the case of acidity where the highest increases were recorded, according to the graphs, for the assortment enriched with*Agaricus*and*Pleurotus*species, which leads to the conclusion that, in the case of the two samples, a greater increase in freshness can be registered. In conclusion, according to the sensory analysis, the products obtained are appreciated and accepted products, whose characteristics are not very different from those of simple dairy products without additives, and their production technology does not bring significant costs or differences in the process.

REFERENCES

Atila, F., Nadhim Owaid, M., & Ali Shariati, M. (2017). The nutritional and medical benefits of agaricus bisporus: A review. *Journal of microbiology, biotechnology and food sciences*, *7*(3), 281–286. http://dx.doi.org/10.15414/jmbfs.2017/18.7.3.281-286

Banu, C. (2009). Tratat de industrie alimentară. *Tehnologii alimentare. Editura ASAB, Bucureşti*, 129–130.

Bon, M. (2012). *Pareys buch der pilze*. Halberstadt: Kosmos.

Chintescu, G., & Pătrașcu, C. (1988). *Agendă pentru industria laptelui*. București: Tehnică.

Muszyńska, B., Kała, K., Firlej, A., & Sułkowska-Ziaja, K. (2016). " cantharellus cibarius": culinary-medicinal mushroom content and biological activity. *Acta Poloniae Pharmaceutica. Drug Research*, *73*(3).

Portal diletant culinar. (2021). *Technology and manufacturing stages of fermented dairy products. general technology of dietary fermented dairy products.* https://glutenfreemama.ru/ro/tehnologiya-i-stadii-izgotovleniya-kislomolochnyh-produktov/

Simpson, D. P. (1979). *Cassell's latin dictionary*. London: Cassell Ltd.

Singh, P., Langowski, H.-C., Wani, A. A., & Saengerlaub, S. (2010). Recent advances in extending the shelf life of fresh agaricus mushrooms: a review. *Journal of the Science of Food and Agriculture*, *90*(9), 1393–1402. http://dx.doi.org/10.1002/jsfa.3971