

Physicochemical and sensory characterization of vegetable fat pressed cheese

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Abstract

At the basis of this experimental study is the process of obtaining vegetable fat pressed cheese and the physicochemical and sensory characterization of this product. The vegetable fat pressed cheese belongs to the category of scalded cheeses, created by partial or total replacement of animal fats in milk with vegetable fats. Thus, a more affordable product was obtained from a financial point of view, due to the low costs of vegetable fats, compared to animal fats. The non-hydrogenated palm oil used contributes to the texture and stability of the product, ensures the semi-hard consistency and uniform melting of the cheese. The cheese samples were analyzed from a sensorial and physicochemical point of view (determination of moisture, fat content, sodium chloride content and acidity) at different ripening time intervals, following the characteristics and their inclusion in the parameters of standard quality for cheeses.

Key words: pressed cheese, scalded cheese, vegetable fat, palm oil, sensory analysis.

1. Introduction

Pressed cheese is a food rich in vitamins and minerals such as phosphorus, zinc, vitamin A, B2 and B12, but also in protein, having a particularly important role in strengthening the immune system. Daily consumption of pressed cheese contributes to the improvement of brain function and memory due to the high content of vitamin B12. Nutrient substances from pressed cheese contribute to maintaining the health and youthful appearance of the skin, help prevent osteoporosis, being an excellent source of vitamins, minerals and proteins for the whole body.

Palm oil is a type of edible vegetable oil in which all the fats are extracted from the mesocarp or reddish pulp of the palm [1,3]. Palm oil is made up of fatty acids that have been esterified with glycerol. Saturated fatty acids, especially palmitic acid and 16-carbon saturated fatty acid, are particularly abundant in palm oil [2,3]. Palm oil is a prominent source

of tocotrienol, a member of the vitamin E family. Palm oils are often preferred by food manufacturers because they are easier to maintain in terms of flavor and consistency in processed foods. Palm oil is extracted from the mesocarp of the palm (*Elaeis guineensis Jacq.*), which belongs to the Arecaceae family and is native to West Africa.

Malaysia and Indonesia are responsible for 85% of the global production of palm oil, which accounts for 34% of the world's vegetable oil requirement [4,5]. This makes Southeast Asia the most important region responsible for supplying the oils and fats needed by the world's growing population. The oil palm fruit contains two types of oil, palm oil from the fleshy outer layer and palm kernel oil from the seeds. Palm oil contains 44% palmitic acid as the main saturated fatty acid, counterbalanced by unsaturated fatty acids, which include oleic acid (~39%) and linoleic acid (~11%). The composition of palm kernel

oil is almost 80% saturated [4,6,7]. The different fatty acid profiles of palm oil and palm kernel oil allow for their varied applications in industry.

Food industries consume 80% of palm oil, and the remaining 20% is used for industrial (non-food) applications, such as in the biodiesel industry [4,8]. Its diverse food and non-food applications, including biofuels, and its competitive price compared to other vegetable oils make palm oil an attractive and attractive commodity [4,9,10,11,12]. The growth of the world population, estimated to reach 9.15 billion by 2050 [4,13], will also increase the requirement of vegetable oils, estimated to 240 million tons during the same period [4,14]. As the most productive oil crop, providing three to eight times more oil per unit area of cultivated land compared to other temperate or tropical oil crops, oil palm is well positioned to meet the growing demand for oils and fats in a sustainable way.

2. Materials and method

Pressed cheese is a food product obtained from whole milk, curdle and lactic cultures, processed by scalding the curd until the specific texture of pressed cheese is formed. When normalizing milk, animal fats were partially replaced by vegetable fats (palm oil). For inoculation, starter culture was used with a leaven concentration of 1-2%. At this stage of the manufacturing process, CaCl_2 solution is added to give firmness to the curdle and to reduce the coagulation time. The inoculation was done at 40°C, followed by the addition of the coagulant, in the form of a curdle extract solution and the homogenization of the mixture for a better distribution of the curdle in the milk and the formation of a consistent curdle. The addition of curdle was done at a pH of 6.1 in the proportion of 0.30 ml of solution per liter of milk, and the coagulation time was 45 minutes. The acidification process was considered complete at a pH of 5.2. The formed curdle was processed by slow cutting and shredding, followed by heating for dehydration, with the formation of a curdle in the form of a 3 mm grain of rice, after which the curd was processed into "başchiu" curd by heating the whole mass to 70-75°C, until obtained a homogeneous paste, which is easily spun into threads. The drying time was 16-18 hours at a temperature of 22°C.

The milk for the pressed cheese was purchased from local producers, and the curdle and lactic cultures from local naturist stores.

For the comparative study, two types of vegetable fats pressed cheese were made, one natural and one smoked, for which sensory and physicochemical determinations were made.

From sensory point of view, the cheese has the following characteristics:

- the shell is whole, smooth, clean, without spots, wrinkles or cracks,
- the core is compact, homogeneous, uniform,
- the consistency is semi-hard, slightly elastic,
- the color is light yellow for the natural product and dark yellow for the smoked product,
- the smell and taste are specific, pleasant, of a slightly acidic product, of smoke for the smoked product.

For the sensory analysis, samples were taken from the two types of pressed cheese, natural and smoked.

Both types of pressed cheese were evaluated by 12 people aged between 19 and 48 years.

The people selected for the evaluation were people without allergies or intolerance to the cheese ingredients.

The samples subject to evaluation were presented to each evaluator in turn, on disposable plates, separately for the natural product and the smoked one.

The sensory characteristics analyzed by each individual evaluator are: appearance, color, consistency, smell and taste, using the consumer acceptability score, on a 5-point hedonic scale, as follows:

- 5 - extremely pleasant;
- 4 - slightly pleasant;
- 3 - regardless, neither pleasant nor unpleasant;
- 2 - slightly unpleasant;
- 1 - extremely unpleasant.

Regarding the physicochemical analysis, determinations were made of:

- dry matter content (according to SR EN ISO 5534:2004),
- fat content (according to SR EN ISO 23319:2022),
- sodium chloride (NaCl) content (according to SR EN ISO 5943:2007),
- acidity (by direct reading with a pH-meter for cheeses).

3. Results and Discussion

The data obtained during the sensory analysis for the two types of pressed cheese, natural and smoked, are presented in tables 1, 2 and fig. 1, 2. Analyzing the results, for the natural pressed cheese assortment the most appreciated sensory characteristics are smell, appearance and color, with an average score of 3.75 points, respectively 3.67 points and 3.42 points. Consistency and taste with 3.33 points and 3.08

points respectively, were the least appreciated sensory characteristics for natural pressed cheese. For the smoked pressed cheese assortment, the most appreciated sensory characteristics are appearance and smell with an average equal score to 4.67 points, followed by taste with 4.58 points. Color and consistency, with 4.50 points and 4.08 points, respectively, were sensory characteristics appreciated to a lower extent for smoked pressed cheese.

Table 1. Centralized sensory characteristics of natural vegetable fats pressed cheese

Evaluator	Appearance	Color	Consistency	Smell	Taste
E1	2	4	2	3	2
E2	4	3	3	4	4
E3	3	4	3	4	3
E4	5	4	4	4	4
E5	3	2	4	4	3
E6	4	3	3	3	4
E7	4	3	4	4	3
E8	5	4	4	3	2
E9	3	3	4	3	4
E10	3	4	3	4	3
E11	4	3	2	5	3
E12	4	4	4	4	2

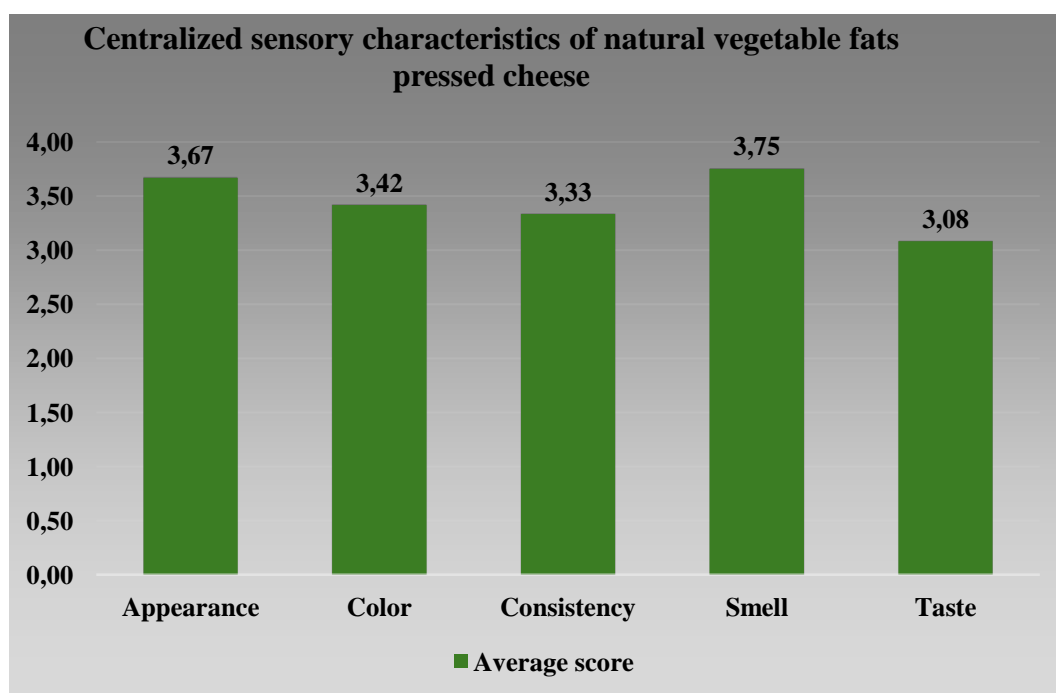


Figure 1. Graphic representation of centralized sensory characteristics of natural vegetable fats pressed cheese

Table 2. Centralized sensory characteristics of smoked vegetable fats pressed cheese

Evaluator	Appearance	Color	Consistency	Smell	Taste
E1	4	5	3	5	5
E2	5	4	4	5	5
E3	5	5	4	5	4
E4	5	4	4	4	5
E5	4	3	5	5	5
E6	5	5	4	5	5
E7	5	5	5	4	4
E8	5	5	4	4	4
E9	4	4	5	5	5
E10	5	4	4	4	4
E11	4	5	3	5	5
E12	5	5	4	5	4

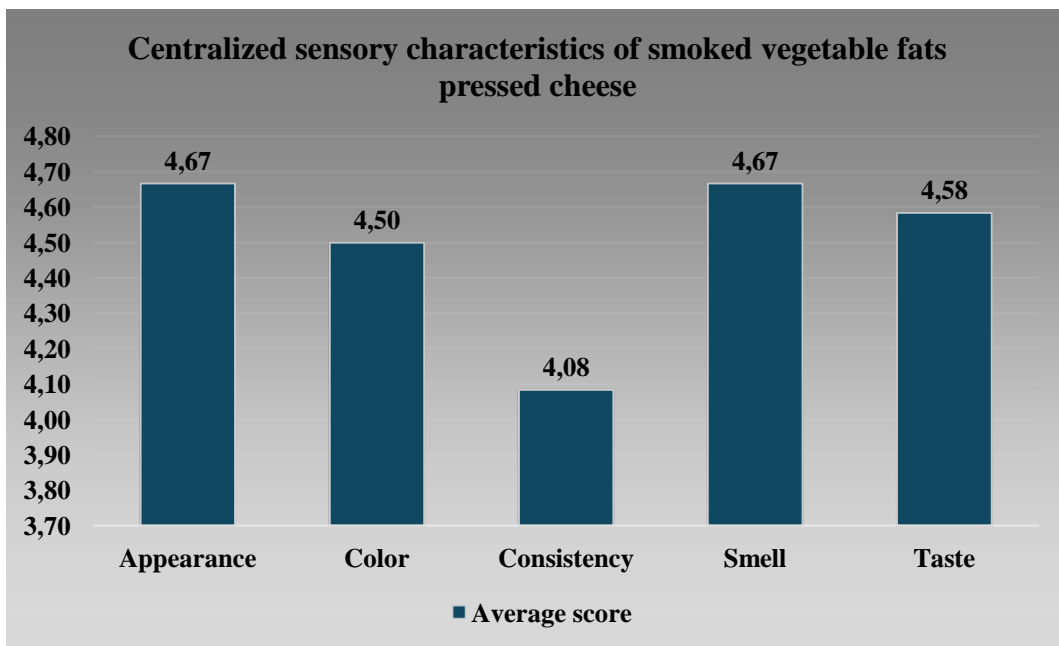


Figure 2. Graphic representation of centralized sensory characteristics of smoked vegetable fats pressed cheese

Regarding the physicochemical characteristics of vegetable fats pressed cheese, they are presented in terms of values in table 3.

The data presented show that the average moisture values of the analyzed samples are 43,8% for natural pressed cheese, respectively 42,30% for smoked pressed cheese.

Table 3. Physicochemical average characteristics score of vegetable fats pressed cheese

Pressed cheese assortment	Moisture (%)	Fat (%)	NaCl (%)	pH
Natural vegetable fats pressed cheese	43,80±3,4	22,49±1,2	2,31±0,48	5,05±0,07
Smoked vegetable fats pressed cheese	42,30±0,66	20,70±0,7	2,19±0,19	5,95±0,09

The data presented show that the average moisture values of the analyzed samples are 43,8% for natural pressed cheese, respectively 42,30% for smoked pressed cheese. The average values of the fat content in the samples

analyzed is 22,49% for the natural pressed cheese, respectively 20,70% for the smoked one. The average values of the sodium chloride content obtained indicate values of 2,31% for the natural pressed cheese, respectively 2,19%

for the smoked one.

The pH values of the analyzed pressed cheese samples are 5,05 for natural pressed cheese and 5,95 for smoked pressed cheese.

4. Conclusion

Experimental findings show that this product can meet the requirements of the modern consumer. It has a pleasant taste, the texture of traditional pressed cheese and additional nutritional benefits. Non-hydrogenated palm oil contributes to the texture and stability of the product.

From the two assortments of pressed cheese analyzed, from a sensory point of view the most appreciated was the smoked one.

For the natural pressed cheese assortment, the most appreciated sensory characteristics are smell, appearance and color, with an average score of 3.75 points, respectively 3.67 points and 3.42 points. Consistency with 3.33 points and taste with 3.08 points were the least valued sensory characteristics for this variety.

For the smoked pressed cheese assortment, the most valued sensory characteristics are appearance and smell with an average score of 4.67 points, followed by taste with 4.58 points. Color and texture, with 4.50 points and 4.08 points, respectively, were the least valued sensory characteristics for the smoked cheese variety.

The physicochemical characteristics analyzed for the two assortments of pressed cheese show a firmer consistency and texture for the smoked pressed cheese, compared to the natural one. The average moisture values of the analyzed samples obtained is 43.8% for the natural pressed cheese, respectively 42.30% for the smoked pressed cheese.

The average values of the fat content in the samples analyzed is 22.49% for the natural pressed cheese, respectively 20.70% for the smoked one.

The average values of the sodium chloride content obtained indicate values of 2.31% for the natural pressed cheese, respectively 2.19% for the smoked one.

The pH values of the analyzed pressed cheese samples are 5.05 for natural pressed cheese and 5.95 for smoked pressed cheese.

Thus, following the bibliographic data, we can conclude that this product can be a qualitative product, obtained at lower costs, which makes it more accessible to a wider segment of the population, a particularly

important aspect in the current economic context.

Conflict of Interest. Authors has declared that no competing interests exist.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human /or animal subjects (if exist) respect the specific regulation and standards.

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