

SOYBEAN SEEDS FERMENTATION: THE EVOLUTION OF SENSORIAL CHARACTERISTICS WITH TIME, TEMPERATURE AND COMPOSITION OF FERMENTATIVE MEDIUM

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Abstract

Lactic fermentation is a traditional process used for increasing food stability and sensorial characteristics, mainly for legumes. The present work was focused on the evaluation of the influence of fermentation on the sensorial characteristics of soybean seeds, which can improve the acceptability of this bean in human diet. Thus, the soybeans were immersed into a lactic bacteria medium (a traditional lactic product obtained from wheat husks) with different quantities of sucrose or salt added. The soybean seeds were maintained at 20, 25 °C for different time period (12, 24 or 36 hours) in order to develop the fermentative process and changes in sensorial characteristics. Each sample was analyzed by sensorial analysis method and there were evaluated the color, aroma, taste and general acceptability. The results shown that the fermentative process improved the sensorial characteristics of soybean seeds and the most appreciated samples were those fermented at 20 and 25 °C for 24 hours with 1% salt added and also those fermented at 25 °C for 24 hours into a medium with 3% sucrose addition.

Keywords: soybean, fermentation, sensorial characteristics, taste, color, aroma, acceptability, profile analysis.

1. INTRODUCTION

The fermentation process represents the oldest used biotechnological technique, which have as the main advantages:

- development of an improved flavor, texture and taste (special for different food products) which conduces to an increasing of its acceptability and popularity;
- reducing the product volume, which conduces to reduce the heat treatment parameters and the energetic consumption (if apply to the technological process). A lot of fermented products are ready-to-eat products: cheese, sufu, tofu, wine, vinegar e.a;
- increasing the products stability and safe life due to the synthesis of lactic or acetic acid during the fermentation (Bahaciu, 2008).

2. MATERIAL AND METHOD

Fermentation medium (traditional product)

Soybean seeds fermentation was done by immersion of the seeds into a lactic fermented medium. This was obtained by a traditional method: the wheat husks were immersed in warm water (30-35 °C) with 1:20 (mass ratio) and there were left for 2-3 hours for bacterial

growth and multiplication (production leaven was obtaining); after this period, there are added to this leaven, fresh wheat husks and warm water up to 10 liter. The mix is left for the night to fermentation and after that is filtered. The filtrate represents a Romanian traditional product used in soup. The investigations were conducted in order to determine the sensorial characteristics changes in soybean seeds after fermenting (at 20 or 25 °C) in this medium (simple, with sucrose or salt adding) for 12, 24 or 36 hours, accordingly to sample preparations shown in table 1.

Table 1 Sample preparation legend

Fermentation process	Notations		
	% or time	20 °C	25 °C
Sucrose added (%) and fermented for 24 hours	0%	F20-0Z	F25-0Z
	1%	F20-1Z	F25-1Z
	3%	F20-3Z	F25-3Z
	5%	F20-5Z	F25-5Z
Salt adding, 1%	12 hours	F20-S12	F25-S12
	24 hours	F20-S24	F25-S24
	36 hours	F20-S36	F25-S36

Sensorial analysis was determined using the methodology described by SR ISO13299:2003 and SR ISO11035:1994, provided by Romanian Standard Association (ASRO).

3. RESULTS AND DISCUSSION

The data regarding the sensorial evaluation of the fermented soybean seeds (at 20 and 25°C and with sucrose or salt adding accordingly to table 1) are shown in table 2.

From table 2 it can be observed that by fermenting the soybean seeds at 20°C determines the improvement of the sensorial characteristics compared to soybean control sample (unfermented soybean seeds). The scores for color and general acceptability are over 3 (from 5 maximum).

Table 2 Sensorial characteristics of soybean fermented seeds

Sample	Color	Flavor	Taste	Acceptability
<i>Fermentation temperature 20°C</i>				
SM	3	2,5	2	2,5
F20-0Z	3,5	3	3,1	3,2
F20-1Z	3,6	3,3	3,3	3,4
F20-3Z	3,7	3,4	3,5	3,6
F20-5Z	3,7	3,4	3	3,3
SM	3	2,5	2	2,5
F25-S12	4	3,2	3,6	3,6
F25-S24	4,4	4	4,5	4,5
F25-S36	4,1	3,5	3,7	4,3
<i>Fermentation temperature 25°C</i>				
SM	3	2,5	2	2,5
F25-0Z	3,8	3	3,5	3,4
F25-1Z	4,2	4	4	4
F25-3Z	4,4	4	4,5	4,3
F25-5Z	4	4	3,5	4,2
F25-S12	4	3,2	3,6	3,6
F25-S24	4,4	4	4,5	4,5
F25-S36	4,1	3,5	3,7	4,3

The members of the evaluation teams described the fermented samples as products with a slight sourish taste, pale yellow color and crispy consistency which were very appreciated (as taste and general appearance).

The data shown in table 2 were transposed into a radar diagram (figure 1) which represents by the size of the area profile, the most appreciated sample by the evaluation team.

The most appreciated samples fermented at 20°C were those fermented with 3% sucrose adding (they have the biggest profile area accordingly to figure 1).

The samples fermented at 20°C with 5% sucrose adding were sourly and they were marked less points.

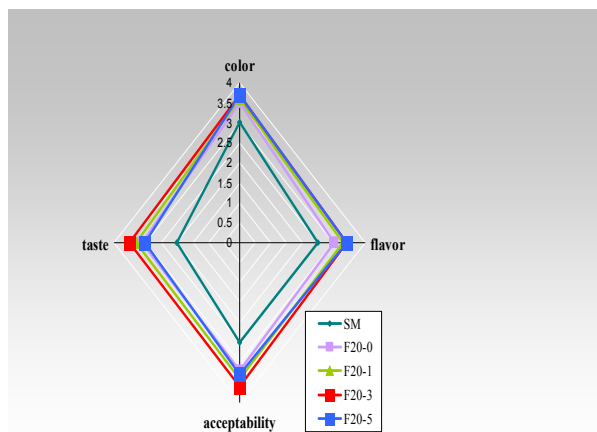


Figure 1 Sensorial analysis profile for fermented soybean seeds at 20°C

In figure 2 are represented the profiles for the fermented soybean seeds at 25°C and it can also be observed that the most appreciated samples were those immersed into a 3% sucrose fermentation medium.

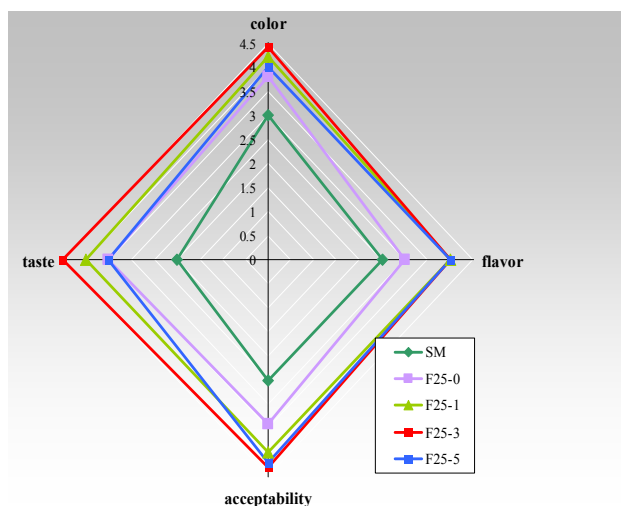


Figure 2 Sensorial analysis profile for fermented soybean seeds at 25°C

In conclusion, the most efficient combination for the improving of the sensorial quality of fermented soybean seeds by adding sucrose is immersing the seeds into a medium with 3% sucrose at 25°C (figure 3).

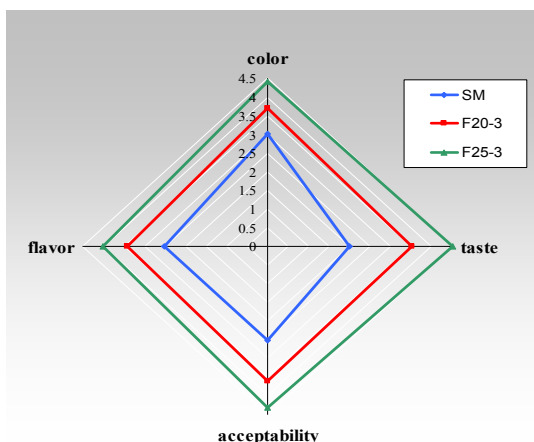


Figure 3 Sensorial analysis profile for fermented soybean seeds at 20 and 25°C

It was also interesting to investigate the evolution of the sensorial characteristics of soybean seeds fermented into a medium with salt adding (1% reported to medium). The characteristics described by the evaluation team were as “pickled legumes as cucumbers or tomatoes”: sourly, tasty and slightly salty. The aroma and general appearance were very appreciated by the team.

The data for the fermented soybean seeds at 20°C with salt added are shown in table 2 and the scores are up to 3,6 (from 5 points maximum). The most appreciated samples are those immersed into a fermentative medium with 1% salt addition and fermented for 24 hours.

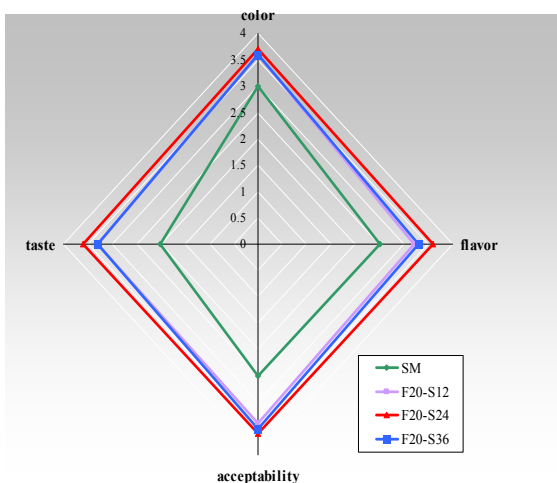


Figure 4 Sensorial analysis profile for fermented soybean seeds at 20°C with 1% salt added

By analyzing the sensorial profile for fermented soybean seeds at 20°C with 1% salt adding (figure 4), it can be observed that the best appreciated sample is that fermented for 24 hours, in these conditions.

The fermented soybean seeds at 25°C with 1% salt added registered higher scores for sensorial characteristics compared to those fermented at 20°C (table 2) and the sensorial profile is shown in figure 5.

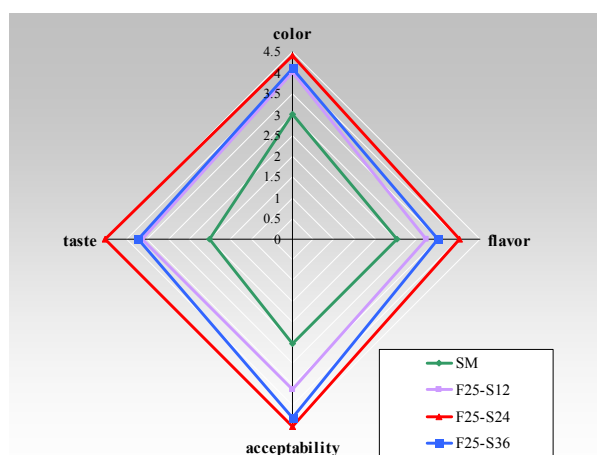


Figure 5 Sensorial analysis profile for fermented soybean at 25°C with 1% salt added

From figure 6 it can be observed that the best samples containing salt in the fermentation medium, from sensorial point of view are those fermented at 25°C for 24 hours.

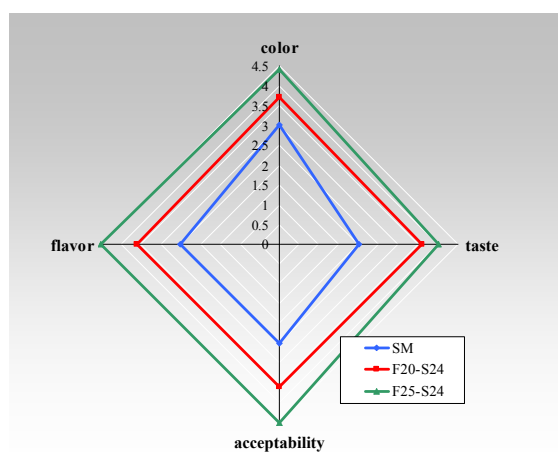


Figure 6 Sensorial analysis profile for fermented soybean seeds with salt added at 20 and 25°C

Finally, it can be observed (figure 3 and 6) that the better scored samples regarding the sensorial characteristics (taste, color, flavor and acceptability) are those fermented for 24 hours with 1% salt addition (at 20 and 25°C) and those fermented in the presence of 3% sucrose (at 20 and 25°C).

In figure 7 we have represented the sensorial analysis profile for those 4 best samples and compared with the control, unfermented soybean seeds.

From the figure 7 can be observed that the best samples were those fermented in the presence of 1% salt for 24 hours at 20 and 25°C.

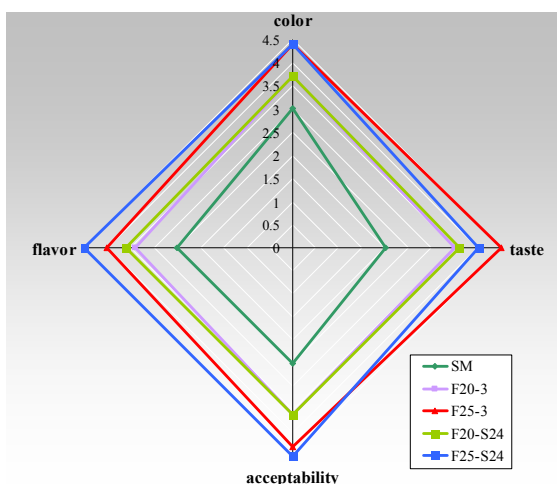


Figure 7 A comparisons of the best appreciated soybean seeds fermented samples

4. CONCLUSIONS

The fermentation of soybean seeds by immersion into a medium containing sucrose conduces to an improvement of the sensorial characteristics and the best combination of the

parameters is fermenting at 25°C with 3% sucrose.

Another way to improve the sensorial characteristics of the soybean seed is by fermenting into a medium with lactic acid bacteria and 1% salt adding. The best combination in this case is by fermenting for 24 hours at 25°C.

Finally, by comparing all the techniques, the experimental data shown that the improvement of the sensorial characteristics of the soybean seeds reach the highest scores for the fermentation in the presence of salt for 24 hours at 20 and 25°C.

It can be concluded that the fermentation represents a good and natural technique for the improvement of sensorial characteristics of this bean and might represent an affordable and near reach method to increase the soybean seeds consumption and to enjoy the taste and the health benefits of it.

5. REFERENCES

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