

**STUDY OF THE INFLUENCE OF THE PREPARATION METHOD AND THE SEASONING INGREDIENTS ON THE SENSORY CHARACTERISTICS OF PORK HAMBURGER**

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***Abstract:** The hamburger, known also as "burger" appeared in the early twentieth century and it is usually prepared from beef. In recent years due to the fact that it has been consumed more and more by children, the assortments of chicken meat have appeared. The present paper presents a novelty regarding the burger assortments, namely the use of pork in its preparation. Also, the study shows the influence of the used spices and the way of cooking on the preferences of consumers. In order to carry out the research, for samples of hamburger, using four different seasoning mixes were prepared. The samples were analyzed from the sensory point of view after their preparation on the grill and in the oven using the same technicological conditions. These were evaluated against a reference, prepared with the classic hamburger spice and cooked in the same conditions as the samples. The experimental results showed that grilled hamburgers were more appreciated by tasters than baked goods. Only one hamburger sample was rated tastier than the reference.*

**Key words:** hamburger, ingredients, sensory, consumers, pork

## **INTRODUCTION**

The Hamburger (often times simply called "burger") is dated since the end of 19<sup>th</sup> – early 20<sup>th</sup> century [9]. In its modern form, the hamburger has rather developed as a response to the modern society needs. The appearance of the working class, the spike in industrialised food processing as well as the need for over all accessible food have all contributed to the development of the modern day burger [1,12]. Most of the information around the Hamburger, is backing off the idea that USA is the first country to have ever commercialized a meat patty stuck between two buns of bread as "Hamburger". There are, however many controversies around the country who actually invented the burger, that because many other countries apart from US have ate beef patty and bread, just not combined in a sandwich. A short time after its creation people have added several types of toppings such as onion, salad or pickels [1, 10]. As a consequence of many debates that have taken place during the 20<sup>th</sup> century, the burger is associated with United States of America and with a junk food diet. [13, 18]. Also together with chicken nuggets and apple pie, this food is considered a culinary symbol in USA [4]. The world fame of burgers relieve the globalization of food system[8], that includes and various national dishes as pizza (from Italy) or sushi (from Japan). The hamburger has penetrated many countries on all continents, most likely due to its pleasant taste and ease of preparation [14]. It came in the form of a ready-made food concept, first served in the 1920s in White Castle restaurant chain according to a recipe created by Edgar Waldo "Billy" Ingram, which was then redefined by McDonald's in the mid 40's [15]. This worldwide recognition of the burger has led to the formulation of an economic indicator, Big Mac Index, whose value gives indications on the degree of sale of this food in the countries where it is marketed. [3]. Minced meat was considered a luxury dish of medieval cuisine, accessible only to the noble class [2]. In the late 2000s, the hamburger became a customary meal in the several

New York Harbor restaurants. This type of patty was hand-minced beef, slightly salty and sometimes smoked, which often is served raw on a plate alongside onions and bread [5,11]. The hamburger origin is not known exactly until today. Much information over time describes the burger as being as a piece of meat between two slices of bread, named "Hamburg steak", or "Hamburger sandwich." But information from that time is scarce [9]. One of the inventors is considered Charlie Nagreen (1871-1951), who in the 1915s, sold "Hamburg steaks" in small market on busy boulevards. In 1885 Nagreen started to sale hamburger at festivals, thus giving people the opportunity to move freely while eating [7]. Because of this, the burger was named "Hamburger Charlie. Another creator of the hamburger is considered chef Fletcher Davis ("Old Dave"), who stated that the idea of putting a piece of steak between two slices of bread belongs entirely to him. Thus, even those in a hurry could satisfy their hunger quickly and comfortably. This story is also found in Ronald L. McDonald's book [14]. The emergence of modern methods of food preservation, and the improvement of agricultural production and transport, have made burgers a comfortable food alternative for for the population of the city from the inception [17]. At the end of the 20<sup>th</sup> century, the burger has become a very controversial food from a nutritional point of view. Take into consideration the world population growth, increasing the incidence of obesity and people's orientation to healthy foods, the appearance of "XXL burgers" has generated many debates and polemics [6]. Consequently, most of restaurant chains began to create low-calorie burgers from the early twentieth century [19].

## MATERIALS AND METHODS

### *Sample preparation*

4 samples of minced pork hamburger were prepared, using 4 different spice mixtures. Spice mixtures were provided by manufacturers of ingredients for the food industry.

After obtaining the composition, it was portioned into portions of 80g each, then it was shaped round and then pressed by hand until obtaining the elliptical shape, flattened characteristic of the hamburger. The 4 hamburger variants (P1, P2, P3, P4) were evaluated compared to a reference sample, PR, prepared with the classic hamburger spice also provided by a manufacturer of ingredients for the food industry. The stoves were thermally prepared in two variants: grilling and baking in the oven. We also opted for the baking option, as an alternative when the consumer wants to prepare the product at home and does not have a stove grill. The specific spices of each type of hamburger sort, which is not found in the other samples is:

- P1 = smoked paprika, brown sugar
- P2 = dried basil, red pepper
- P3 = soy sauce, worcestershire sauce
- P4 = old bay, cumin powder, dried thyme, rosemary

### *Analysis of sensory characteristics*

The evaluation of the sensory attributes of the hamburger samples was performed by the descriptive method, respectively the shared evaluation. These are the analysis of the properties of food using the sense organs: odor, taste, sight, hearing, temperature, touch, irritation. Sensory properties radically determine customers' purchasing options. The sensory analysis was performed by 15 tasters. They scored with marks from 1 to 5 each sensory attribute mentioned in the tasting sheet (1-minimum, 5-maximum), respectively from -1 to -5, interval in which 0 represents the reference against which the comparative analysis is made. (-1 - much less pleasant than the reference, 5 - much more pleasant as the reference). The sensory attributes analyzed were: appearance, odor, taste, texture,

persistence of taste after swallowing. Before tasting, the samples were divided into pieces of about 2x2 cm. After each tasting, the tasters ate a piece of bread and drank water [16].

### RESEARCH RESULTS

The results obtained from the evaluation of the sensory attributes of the hamburger samples prepared on the grill are presented in tables 1-5.

**Table 1.**

**The results of the evaluation of the sensory attributes of the PR sample**

SAMPLE	TESTER	OVERALL APPEARANCE	CRUST APPEARANCE	SECTION APPEARANCE	GENERAL ODOR	SPECIFIC ODOR	GENERAL TASTE	SPICY TASTE	SALTINESS	SWEETNESS	(STRONGLY SPICED)	TEXTURE / FIRMNESS	PERSISTENCE OF THE TASTE AFTER SWALLOWING
PR	1.	3	2	4	3	2	4	1	1	3	0	3	4
	2.	3	3	3	3	2	4	3	2	3	0	4	4
	3.	4	3	3	5	5	4	3	4	4	0	4	4
	4.	4	3	3	4	3	4	3	3	2	0	4	4
	5.	4	3	3	3	4	3	1	1	0	0	3	4
	6.	4	1	2	4	5	3	1	1	-1	0	3	5
	7.	3	1	2	5	5	3	1	1	0	0	2	3
	8.	4	1	2	5	5	4	0	1	0	0	2	4
	9.	4	2	2	4	4	3	2	1	0	0	3	3
	10.	4	3	3	5	5	3	2	3	3	0	3	3
	11.	4	3	3	5	4	4	2	1	1	0	3	4
	12.	4	4	4	4	4	5	3	3	2	0	3	4
	13.	4	3	3	5	5	4	3	4	4	0	4	4
	14.	4	4	4	4	4	5	3	3	2	0	3	4
	15.	4	3	3	5	4	4	2	1	1	0	3	4
Confidence Interval > 95%													
	Average	3,8	2,4	2,8	4,2	4,0	3,7	1,8	1,8	1,4	0,0	3,1	3,8
	Standard deviation	0,7	1,0	0,7	0,8	1,1	0,7	1,0	1,1	1,6	0,0	0,7	0,6
	C. I.	0,4	0,6	0,4	0,5	0,6	0,4	0,6	0,6	0,9	0,0	0,4	0,3
		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig

The most appreciated sensory attributes in the case of PR were the general, respectively specific smell, the overall appearance, respectively the persistence of the taste after swallowing (Table1).

Table 2.

The results of the evaluation of the sensory attributes of the P1 sample

SAMPLE	TESTER	OVERALL APPEARANCE	CRUST APPEARANCE	SECTION APPEARANCE	GENERAL ODOR	SPECIFIC ODOR	GENERAL TASTE	SPICY TASTE	SALTINESS	SWEETNESS	OTHER (STRONGLY SPICED)	TEXTURE / FIRMNESS	PERSISTENCE OF THE TASTE AFTER SWALLOWING
P 1	1.	4	4	5	3	3	3	4	4	3	4	4	3
	2.	4	4	4	3	3	2	4	3	3	2	3	3
	3.	3	3	4	2	2	3	1	3	3	3	3	3
	4.	4	3	4	3	1	2	2	3	4	2	1	3
	5.	3	3	4	3	2	2	1	3	2	3	2	2
	6.	3	3	4	2	3	3	2	1	3	1	2	2
	7.	3	4	4	2	3	2	1	1	2	1	3	3
	8.	5	4	4	3	3	4	2	2	2	2	2	2
	9.	4	3	3	3	2	2	2	2	2	1	1	1
	10.	4	3	3	3	2	2	2	3	3	1	1	1
	11.	3	3	2	3	3	2	1	1	2	1	1	1
	12.	2	3	3	2	4	2	2	1	2	1	0	3
	13.	4	4	3	3	3	5	5	5	5	0	4	4
	14.	4	4	4	3	3	3	4	4	4	4	4	4
	15.	3	3	3	4	3	3	2	3	1	0	3	3
Confidence interval > 95%													
	Average	3,5	3,4	3,6	2,8	2,7	2,7	2,3	2,6	2,7	1,7	2,3	2,5
	Standard deviation	0,7	0,5	0,7	0,6	0,7	0,9	1,3	1,2	1,0	1,3	1,3	1,0
	C. I.	0,4	0,3	0,4	0,3	0,4	0,5	0,7	0,6	0,5	0,6	0,6	0,5
		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig

Table 3.

The results of the evaluation of the sensory attributes of the P2 sample

SAMPLE	TESTER	OVERALL APPEARANCE	CRUST APPEARANCE	SECTION APPEARANCE	GENERAL ODOR	SPECIFIC ODOR	GENERAL TASTE	SPICY TASTE	SALTINESS	SWEETNESS	OTHER (STRONGLY SPICED)	TEXTURE / FIRMNESS	PERSISTENCE OF THE TASTE AFTER SWALLOWING
P2	1.	5	5	5	5	4	5	4	4	4	4	5	4
	2.	5	5	4	4	4	5	3	3	4	4	5	3
	3.	5	5	5	4	4	3	3	2	4	3	5	3
	4.	5	5	3	4	4	3	3	4	5	3	4	2
	5.	4	4	4	5	5	4	2	3	3	0	4	4
	6.	5	5	4	4	5	4	3	2	1	1	3	4
	7.	5	5	4	5	5	4	1	1	4	0	4	2
	8.	5	5	4	5	5	4	1	1	2	0	3	4
	9.	4	3	4	4	5	3	1	0	0	0	4	2
	10.	3	3	4	5	5	5	1	3	3	0	4	4
	11.	4	4	3	4	4	3	3	3	2	2	4	4
	12.	3	3	2	2	3	2	1	1	1	0	2	2
	13.	3	3	2	2	2	2	1	2	2	0	3	2
	14.	2	3	1	2	4	1	2	3	1	2	3	4
	15.	3	3	2	2	2	3	1	2	2	0	2	3
Confidence Interval > 95%													
	Average	4,0	4,1	3,4	3,8	4,0	3,3	2,0	2,2	2,6	1,3	3,6	3,1
	Standard deviation	1,0	0,9	1,1	1,2	1,0	1,2	1,0	1,2	1,4	1,5	1,0	0,9
	C. I.	0,5	0,5	0,6	0,6	0,5	0,6	0,5	0,6	0,7	0,8	0,5	0,5
		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig

Analysis of the data presented in table 3 reveals that the attributes related to taste were appreciated with the lowest grades, these being the least pleasant by tasters.

Table 4.

Results of the evaluation of the sensory attributes of the P3 sample

SAMPLE	TESTER	OVERALL APPEARANCE	CRUST APPEARANCE	SECTION APPEARANCE	GENERAL ODOR	SPECIFIC ODOR	GENERAL TASTE	SPICY TASTE	SALTINESS	SWEETNESS	OTHER (STRONGLY SPICED)	TEXTURE / FIRMNESS	PERSISTENCE OF THE TASTE AFTER SWALLOWING	
P3	1	4	3	5	4	4	3	2	1	2	0	4	3	
	2	4	4	5	4	4	4	3	3	4	0	4	4	
	3	3	4	5	5	5	5	4	4	4	0	4	5	
	4	4	3	5	5	4	5	4	4	4	0	5	5	
	5	4	0	0	4	4	4	4	3	3	0	4	5	
	6	4	4	5	3	3	3	3	2	2	0	4	3	
	7	4	3	3	3	4	3	4	3	2	0	4	3	
	8	4	2	3	4	4	4	2	2	1	2	0	4	4
	9	4	2	2	4	4	4	3	3	2	3	0	4	4
	10	3	1	3	3	3	4	4	2	1	3	1	4	4
	11	3	2	2	4	5	3	3	3	2	1	0	4	3
	12	3	2	2	3	2	3	2	2	2	3	2	3	5
	13	4	3	1	4	4	5	2	3	2	0	4	4	
	14	4	3	3	3	3	4	4	2	3	2	1	3	3
	15	3	3	2	3	3	4	3	2	2	2	0	3	3
Confidence Interval >95%														
Average		3,7	2,6	3,1	3,7	3,9	3,6	2,7	2,3	2,5	0,3	3,8	3,8	
Standard deviation		0,5	1,1	1,6	0,7	0,7	0,9	0,9	1,0	1,0	0,6	0,7	0,8	
C. I.		0,2	0,5	0,8	0,3	0,4	0,4	0,5	0,5	0,5	0,3	0,3	0,4	
		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	

In the case of P3, similar to P2, the taste of the hamburger samples were evaluated with the lowest scores, according to the data presented in Table 4.

Table 5.

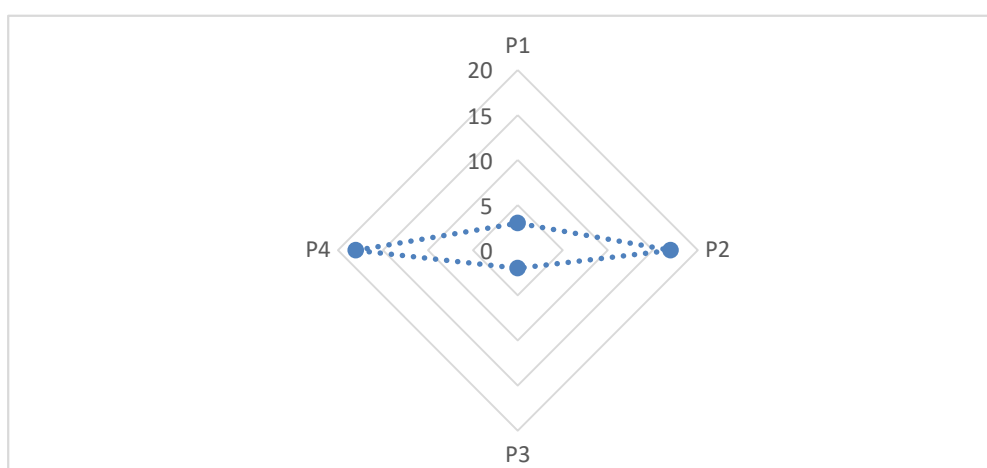
Results of the evaluation of the sensory attributes of the P4 sample

SAMPLE	TESTER	OVERALL APPEARANCE	CRUST APPEARANCE	SECTION APPEARANCE	GENERAL ODOR	SPECIFIC ODOR	GENERAL TASTE	SPICY TASTE	SALTINESS	SWEETNESS	OTHER (STRONGLY SPICED)	TEXTURE / FIRMNESS	PERSISTENCE OF THE TASTE AFTER SWALLOWING	
P4	1.	5	5	4	2	2	1	2	1	1	0	3	1	
	2.	4	4	3	2	2	1	2	3	3	0	3	2	
	3.	4	4	4	4	4	4	1	1	1	0	2	2	
	4.	5	4	4	4	4	4	2	2	3	2	0	3	3
	5.	5	4	4	4	4	4	3	3	2	2	0	2	2
	6.	5	4	4	5	4	4	4	4	4	4	0	3	4
	7.	5	4	3	4	4	4	4	3	4	3	0	3	3
	8.	5	4	3	4	4	4	4	4	4	4	0	3	3
	9.	5	5	4	5	5	5	5	3	2	1	0	4	4
	10.	4	3	0	4	4	4	3	3	2	1	0	0	3
	11.	4	3	4	3	2	2	3	2	2	1	0	2	3
	12.	4	4	3	2	2	2	4	2	4	2	0	3	3
	13.	4	4	3	4	3	4	4	3	3	1	1	4	2
	14.	5	5	4	4	4	3	3	2	3	3	3	4	2
	15.	3	3	3	3	3	4	4	4	4	3	2	3	4
Confidence Interval > 95%														
Average		4,3	3,9	3,4	3,5	3,4	3,2	2,7	2,7	2,1	0,4	2,8	2,8	
Standard deviation		0,8	0,7	1,0	0,9	0,9	1,1	0,9	1,1	1,1	0,9	1,0	0,8	
C. I.		0,4	0,3	0,5	0,4	0,4	0,5	0,4	0,5	0,5	0,4	0,5	0,4	
		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	

The sensory characteristics best noted by tasters in the case of P4 were those related to appearance, smell, taste, texture and persistence of taste after swallowing being less pleasant by the participants in the tasting test (Table 5). Other tastes, related to PR were recorded in the case of all other P1-P4 samples and these are due to the specific spices used in their manufacturing recipe (smoked paprika – P1; basil and red pepper- P2; soy and worcestershire sauce - P3; mix of old bay, cumin, thyme and rosemary - P4). The most appreciated and balanced in terms of sensory characteristics, according to the evaluation made by tasters, was P4, which was more attractive to them than the reference (PR).

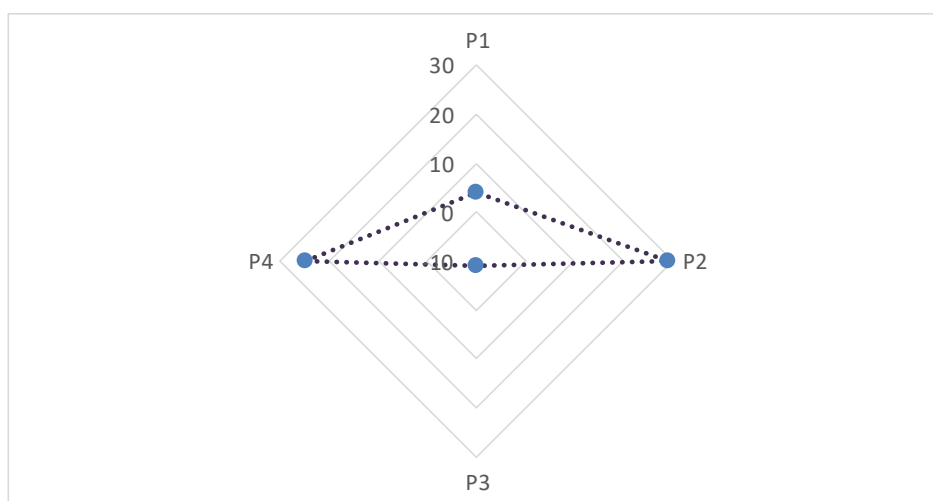
Regarding the preparation method, all the samples cooked on the grill, regardless of the nature of the spices, were more appreciated than those cooked in the oven.

The comparative analysis of each sensory attribute corresponding to the 4 hamburger samples, reported for reference are presented in figures 1-5 is related to PR.



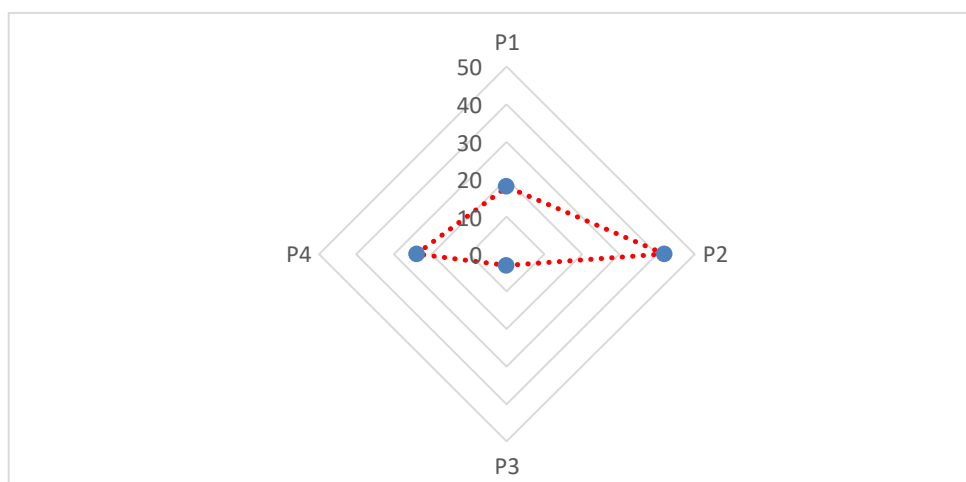
**Figure 1. Comparative analysis of the overall appearance of the samples**

The overall aspect was well appreciated by the evaluators in the case of all the tests, the highest scores being registered in the P2 and P4 tests, the most appreciated being P4, similar to the reference.



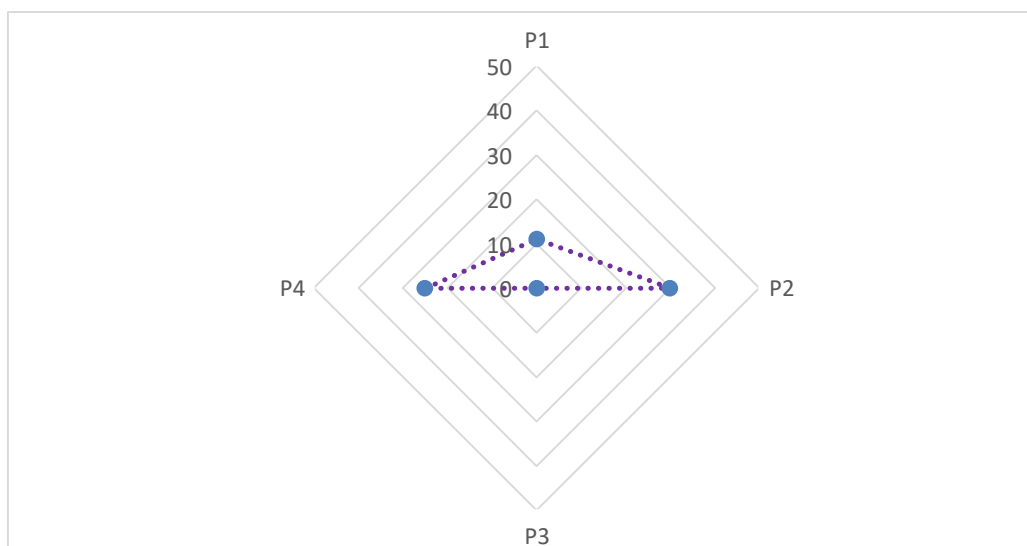
**Figure 2. Comparative analysis of the crust after preparation**

The appearance of the crust after preparation was better assessed in samples P1, P2 and P4 similar to the reference sample. In the case of sample P3, a major deviation from the reference was reported.



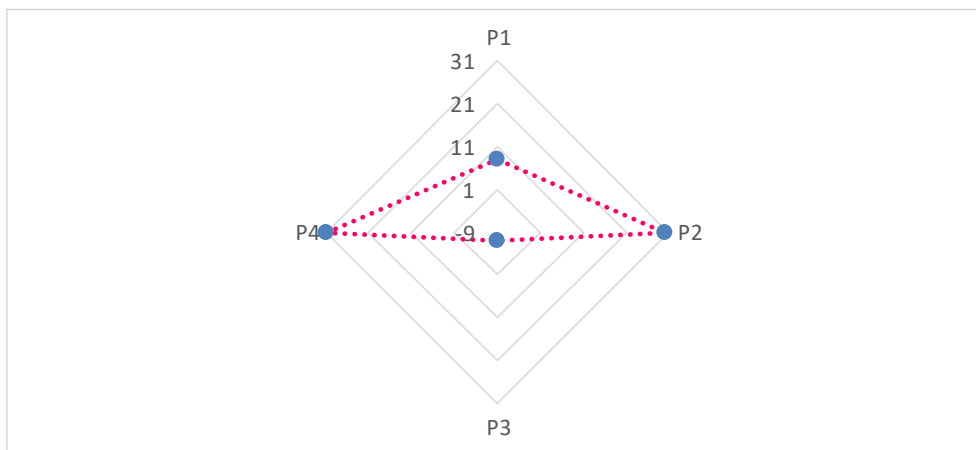
**Figure 3. Comparative analysis of the general odor of the samples**

For the general odor attribute, samples P1, P2 and P4 are preferred PR, except for P3.



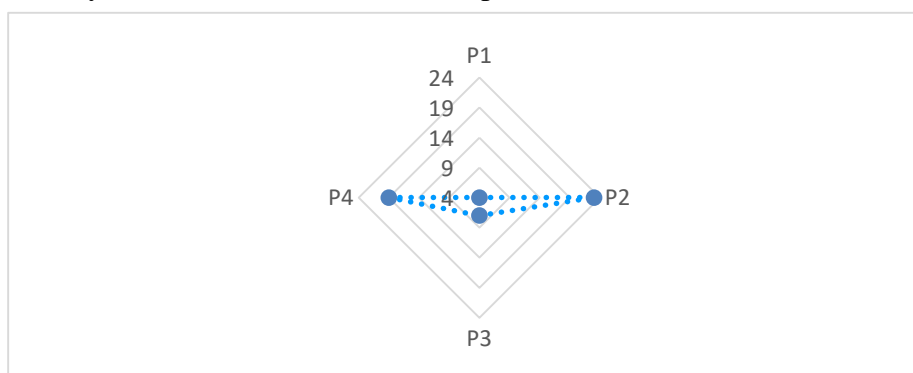
**Figure 4. Comparative analysis of the specific odor of the samples**

In assessing the specific odor, the evaluators perceived it to be more pronounced in samples P1, P2 and P4, while in sample P3 no difference was observed compared to the reference sample.



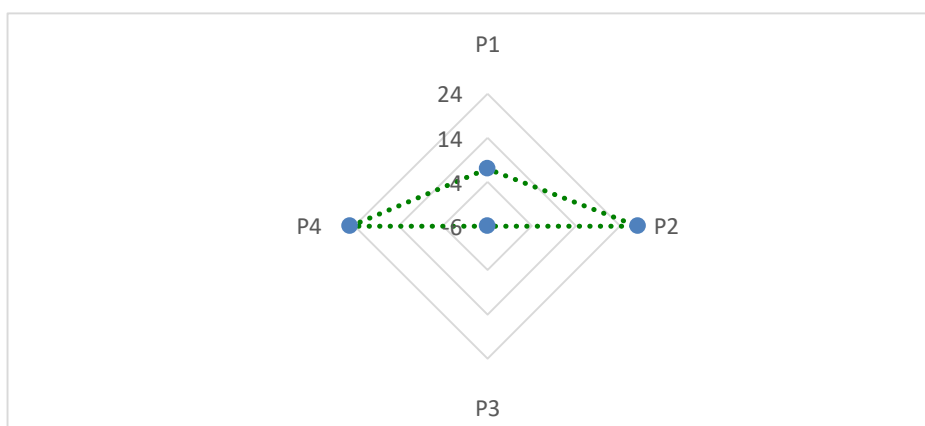
**Figure 5. Comparative analysis of the general taste of the samples**

The P3 test received the lowest general taste assessment score. The other samples were significantly better than the reference sample.



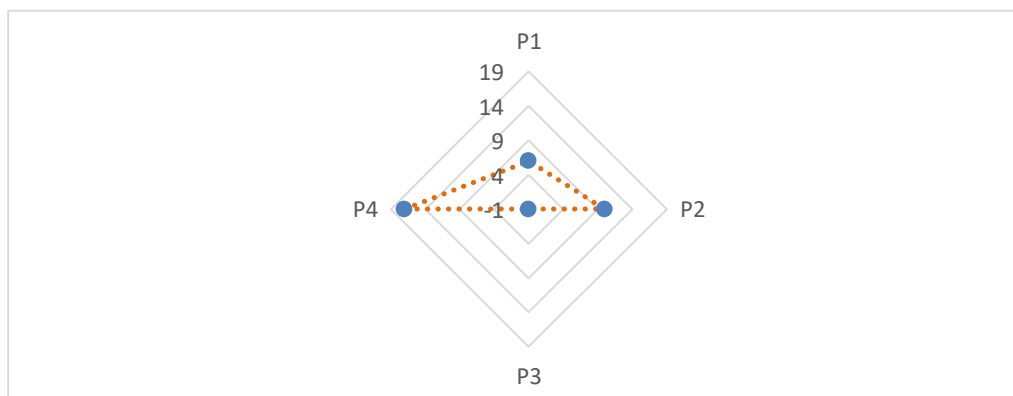
**Figura 6. Comparative analysis of the saltiness of the samples**

All samples evaluated were perceived as properly salted, noting that P2 and P4 were slightly more spicy.



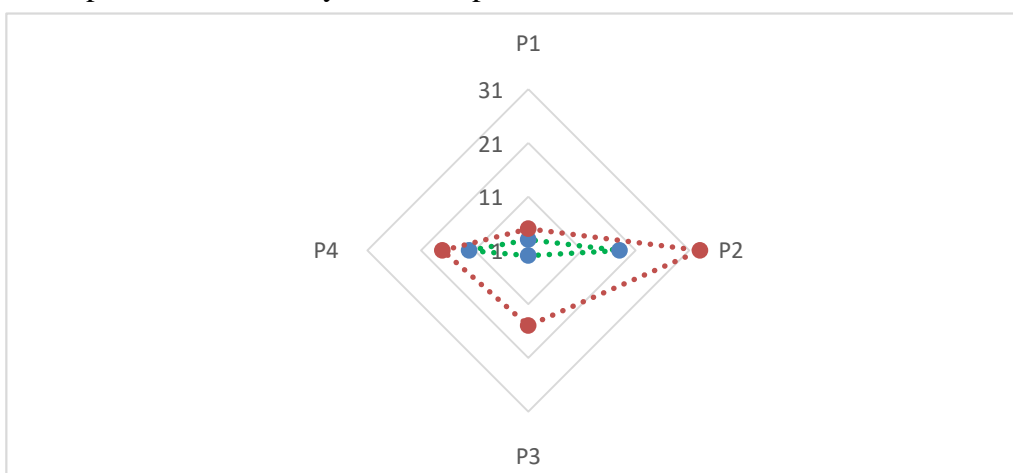
**Figure 7. Comparative analysis of the specific taste of the samples**

Specific tastes were perceived, different from those of the reference to all the samples, those related to P2 and P4 were more appreciated. The specific taste of P3 was less pleasant than PR.



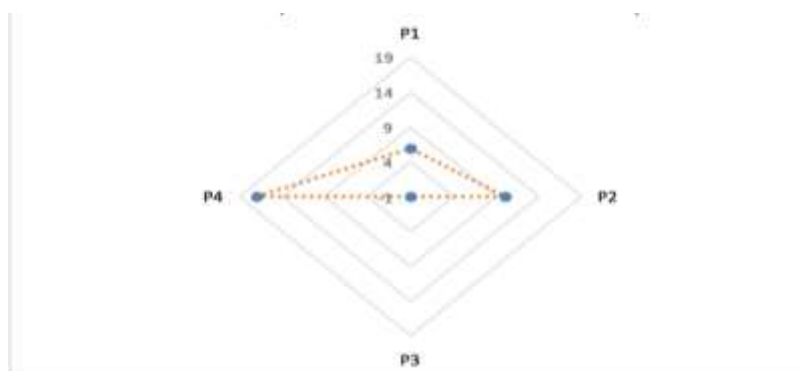
**Figure 8. Comparative analysis of the other taste of the samples characteristic of the spices used in each manufacturing recipe**

In samples P1 and P3 other tastes very different from those of PR were detected, while in samples P2 and P4 they were less pronounced.



**Figure 9. Comparative analysis of sample texture**

The texture of samples P1, P2, P3, P4 was appreciated as being similar to the reference sample, these being tender and juicy, pleasant to chew.



**Figure 10. Analysis of the persistence of taste after swallowing the samples**

In terms of persistence of taste after swallowing, all evaluated samples were positively assessed and similar to PR. P4 scored lower than the other tests.

## CONCLUSIONS

The sensory characteristics of the analyzed samples showed that the P1, P3 and P4 recorded the most pleasant general appearance after preparation. The most appreciated and balanced from a sensory point of view was P4, which denotes that the use of the spice mixture of old bay, cumin powder, dried thyme, rosemary it was best accepted by tasters.

The consistency was tender and juicy in the case of both cooking options, with a slightly dry tint in the case of grilling the reference burger on the grill. The burgers prepared on the grill had more pleasant sensory characteristics than the products prepared in the oven.

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