

Study on the Consumer Profile of Aged Beef in Cluj County

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Abstract. The purpose of the study was to identify the consumer profile and preferred characteristics of aged beef in order to assess the marketing mix of new aged beef products. The study was designed to identify the consumer profile of aged beef available in specialized stores or supermarkets. The study was carried out in ten grocery stores in Cluj county. Participating panelists received questionnaires that collected data on age, gender, aged beef preferences and income. In addition, they took part in a sensory analysis assay of meat aged by wet and dry method, for 21 and 35 days, respectively. At the end of the study, the consumer profile of aged beef was created: a person with above than average income and higher education graduate that prefers Black Angus beef aged by the dry.

Keywords: beef aging, dry aging, wet aging, consumer profile

INTRODUCTION

Meat is the most important source of protein and it is included almost daily in the menu of Romanians. Although pork and poultry are the most consumed in Romania, but lately, beef has started to be more and more appreciated, especially by experienced consumers. Aged beef entered the diet of an increasing number of consumers because of its low fat content compared to pork, but also because its sensory characteristics.

Meat is the main food with a plastic and energetic role in the human body. The plastic role of meat is due to its quality and amino acids content, especially essential amino acids. Meat proteins have a high biological value, because they contain all the essential amino acids necessary for the metabolic processes that take place in the body. The proteins in meat compared to those in milk contain high amounts of methionine and lysine but are poorer in isoleucine, leucine and valine (Iurca, 1998).

Beef is a meat with hard fiber, without flavor and with little juiciness if it is consumed immediately after slaughter. That is why meat aging is used worldwide to allow the natural enzymatic proteolysis to take place. Aging improves the tenderness, flavor, and juiciness of the beef (Ballico, S., et al., 2010 and Troy, D.J.J.; Kerry, J.P., 2010). Two main beef aging methods are used in the industry to improve the characteristics of beef: dry aging and wet aging.

Chronologically, dry aging was the first to be used, having a market niche in almost world-wide, the demand having especially increased in the restaurants with pretensions, traditional or gourmet customers and some retailers (Berger, J. et al., 2018 and Smith, R.D. et al., 2008).

Dry aging consists of placing unpacked whole carcasses, primal cuts, or pieces of meat under low temperatures within a controlled environment (relative humidity and airflow) for a defined time. In these conditions the aroma of the product becomes more intense due to the evaporation of water and the concentration of the flavor compounds (Campbell, R.E. et. all., 2001)

The wet aging of beef is a method that involves placing the pieces of meat in a special bag, under vacuum, at a temperature of 1 - 4° C for a determined period of time. Under these conditions, the liquid released is absorbed by the meat and its flavor is concentrated (Campbell, R.E. et. all., 2001).

Although aging leads to the improvement of the organoleptic characteristics of beef, it is still used on a rather reduced scale because to the high cost derived from the losses that appear when cutting and finishing the anatomical parts, the risk of contamination, and the space required to use this technology (Dashdorj, D. et. all., 2016).

Tenderness and flavor increase in aged beef, which results from calpain activity myofibrillar and cytoskeletal proteolysis in sarcomeres, more specifically, lysis of bonds during the first 14 to 21 days post-mortem (Bhat, Z.F. et. all., 2018).

Muscle biochemistry (calpain-calpastatin activity), mastication resistance and juiciness are significantly influenced by the breed of cattle that provides the meat for the aging process. For some breeds characterized by high calpastatin activity, the functionality of calpain is reduced and the resulting beef, although aged will be tougher and less juicy (O'Connor, S.F. et. all - 1997 and Wheeler, T.L. et. all - 1990).

The beef market has evolved and is under pressure from the consumer who is influenced by flavor, consistency, and, more recently, healthier food options (Font-i-Furnols, M.; Guerrero, L., 2014, Henchion, M. et. all, 2014 and D.J.J.; Kerry, J.P., 2010). Consumers have different life-styles and this influences the purchase decision as well, something that has long known by industry and food product marketers (Chong, F.S., 2019 and Menkhaus, D.J., 1993)

The increased demand for beef has led to a change in the beef market, with new opportunities arising for beef producers, processors, and marketers of food products. In addition, this change also allows shifted the place of aged beef from a homogenous product to a niche product with specific characteristics depending on the duration and aging technology (Lusk, L.L.; Fox, J.A, 2000).

At the market level, palyers who deal with the production and marketing of aged beef, try to adapt to the ever changing environment, both in terms of aging technology, packaging methods, and consumption, which are evolving. This influences the price structure of the various types of aged beef, however, the price alone does not explain all the changes in the demand for beef.

The superior organoleptic characteristics aged beef have led to an increase in the demand for these products by consumers. As a result, in many cases, the studies and research carried out are oriented towards the influence of the degree of tenderness of the commercialized beef. (Lusk, L.L.; Fox, J.A., 2000, Lusk, J.L. et all, 2001, Lusk, J.L.; Schroeder, T.C., 2004 and Miller, M.F. et. all., 2001)

The retail market of aged beef is commonly considered to be the final market; therefore, researchers typically focus their efforts on understanding the consumer's purchase decision at a retail level. The retail market for aged beef is usually considered the end market; therefore, researchers typically focus their efforts on understanding the consumer's purchase decision at the retail level and identifying the external factors that influence the consumer's perception of beef quality. (McIlveen, H.; Buchanan, J., 2001)

In order to avoid the influence of external factors and to have an image as close as possible to reality, we chose to use for this study ordinary, non-specialized consumers that buy aged beef in grocery stores. The aim of this study was to create the profile of the aged beef consumer and identify the main preferences when choosing aged beef products.

The consumer profile will allow the identification of the main characteristics that influence consumer's decision when buying aged beef. In addition to the demographic data on the panel, we want to identify which of the organoleptic characteristics: appearance, aroma, taste, or juiciness are more important for the consumer and to estimate the quality attributes that correspond with various levels of satisfaction.

MATERIALS AND METHODS

Sampling Methodology

In order to have an image as close as possible to reality, we chose 10 grocery stores and bistro-type of retail stores that were also equipped with a grill so that the heat treatment of the aged beef could be performed according to the established protocol. Sample preparation is described below at product and preparation.

Starting from the average number of consumers per retail store, we established the frequency with which to ask customers to participate in the tasting so that the waiting time was kept at minimum and the participants were representative. In the end, the number of participants was 340 people coming from different backgrounds, representatives of both sexes to cover the diversity of the population of Cluj county.

At the end of the study we had two parts in the data collecting: a survey on the profile of the consumer of aged beef and a sensory analysis questionnaire for untrained consumer preference assay.

In previous consumer studies, the cut (muscle), beef aging technology, animal breed and origin (country and/or feeding system) were made known to the panelist (Jingjing Liu, et. all, 2022, Lusk, J.L.; et. all, 2001, Felderhoff, C, 2020 and Boleman, S.J. et. all, 1997). This procedure can be problematic because consumers could be influenced by the anatomical portion of the beef, which they consider to influence the quality (Asem-Hiablie, S., et all, 2016). Moreover, it was found that the disclosure of the breed influenced the consumer perception of the quality of a product, especially when it comes from good production practices (Ron, O.S., et. all, 2019). Due to these reasons, we decided to use "blind" sensory tests to control for these the influences.

Product and preparation

For the sensory analysis, we used strip loin, *longissimus lumborum*, that was aged by the dry method or the wet method in whole pieces. The aging of the anatomical portions was achieved by both methods of meat aging, dry and wet method at a temperature of 0 – 4°C and a relative humidity of 75 – 80%, the aging period was 21 - 35 days (Dashdorj, D, et all 2016).

After the aging period, the product was prepared as follows:

- wet aged beef was taken out of the packaging, sliced into pieces approximately 2.5 cm thick and left at room temperature for 30 minutes, then the heat treatment was done on the grill for approx. 5 minutes. After the heat treatment, the roasted product was left at room temperature to rest for 3 minutes and then sliced and placed for tasting, on white plates, two samples per plate.

- dry aged beef was finished by removing the crust formed due to dehydration, cut into slices approximately 2.5 cm thick and then heat-treated on the grill for 5 minutes. After the heat treatment, the roasted product was left to rest at room temperature for 3 minutes and then sliced and placed for tasting, on white plates, two samples per plate..

Regardless of the method used, aging was carried out for 21 days and 35 days, respectively, in conditions of temperature of 0 – 4°C and a relative humidity of 75 – 80% to the two beef aging methods.

Consumer Panels

For the tasting, the panel was selected in 10 grocery stores in Cluj county. Each person who agreed to participate in the tasting participated only once. The stages of the assay were explained and after providing their consent, they each received a questionnaire in which they filled in information related to age, gender, income, education, frequency of beef consumption, the price they would be willing to pay for the purchase of aged beef. In the second part, the actual tasting took place where they had to score the characteristics of the tasted product with scores between 1 and 9 (Apostu,S., Al. Naghiu, 2008). Each panelist received a disposable plate, a glass, plastic utensils, napkin, and palate cleansers to use between samples (unsalted crackers and a 10% apple juice, 90% water solution). The panelists were given verbal instructions about the assay and the procedure for the testing of samples. Panelists were instructed to cut each sample using their utensils to a size representative of beef consumed in the home or restaurant.

All consumers received a training sample as a test for the sample format and evaluation procedures. The data obtained from training samples was excluded from the analysis, as they were not related to the trial. The training samples were always served in the first position, followed by the 6 samples. This design provided a balance for frequency, order, and carryover (Watson, R. et. all, 2008).

Data processing

A scaling is used to grade the intensity of each perceived attribute either in terms of numbers or attributes. The effectiveness of scaling, however, is highly dependent on the training of the panel. In addition, the evaluator must be aware of how much the intensity of a given attribute varies within a selected product. If a numerical scale is used, scales of 9, 10 or 15 points are considered to be wide enough to account for both drastic and relatively small changes in intensities. (Apostu,S., Al. Naghiu, 2008).

If attributes are used, the following indicators may be used: "perceived sensation", "mild sensation", "moderate sensation", "intense sensation", "very intense sensation". The reference materials used in the terminology generation process can be used additionally to assist the evaluator and ensure consistency of results. Appropriate reference material for an attribute is assigned a value on the scale based on the decision of the consensus panel. The samples are then assigned intensity values relative to the reference material (Rainey, B.A., 1997).

The method was used in conjunction with the continuum satisfaction measurement. The random utility model provided a direct relationship between the satisfaction and the attributes. It was applied to the general model to determine the impact of tenderness, juiciness, and flavor on overall satisfaction.

RESULTS AND DISCUSSIONS

The results obtained after applying the questionnaire and carrying out the tasting in 10 grocery stores were applied to a number of 340 customers of these establishments from Cluj County.

According to the results of the study, as can be seen in fig. 1, the respondents of the questionnaire were 38% male and 62% female

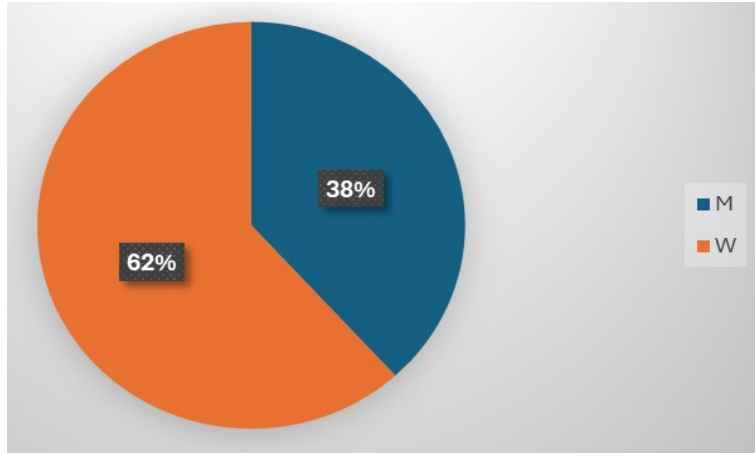


Fig. 1 Gender distribution of panel respondents

The age of the panelists (fig. 2) varied between 14 and 72 years. The distribution being 14 – 25 years 20.58%, 25 – 35 years 29.41%, 35 – 65% 38.24% and over 65 only 11.76%.

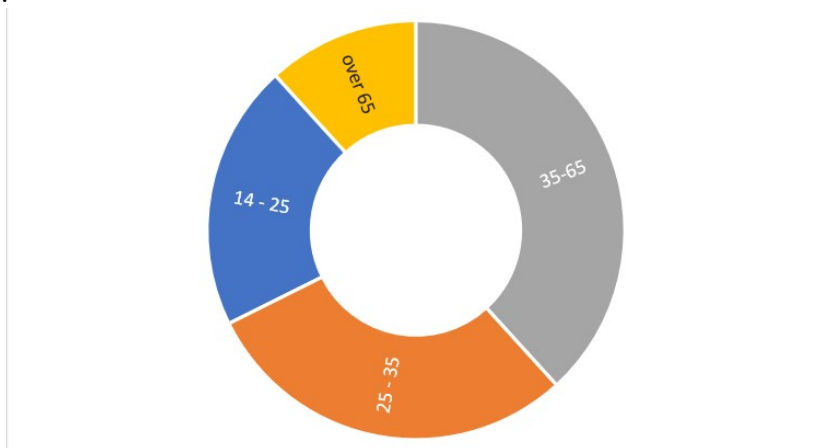


Fig. 2 Age distribution of panel respondents

The education of the panelists (fig. 3) was 15% high school graduates, 67% university graduates, and 18% had acquired a form of postuniversity degree.

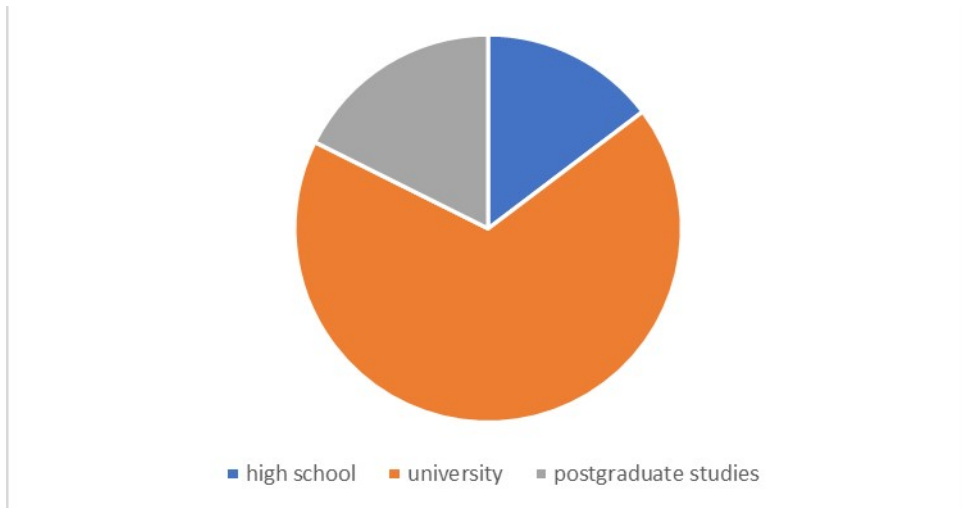


Fig. 3 Level of education of the respondents

When asked if they consumed beef, the respondents who said they did not usually consume beef were excluded from the study because their answers related to the quality of the beef or the price would not have been relevant. As it can be seen in fig. 4, about 6% of the surveyed consumers who entered a store specializing in the sale of meat and meat preparations declared that they do not consume aged beef.



Fig. 4 Consumers of aged beef

When asked about the aged beef they prefer and buy, the answers were as expected. About 60% of the respondents preferred aged Black Angus beef (fig.5), in second place was Argentinian beef and only 6% of respondents declared they bought aged beef from mixed breeds, specifically from Romanian Spotted.

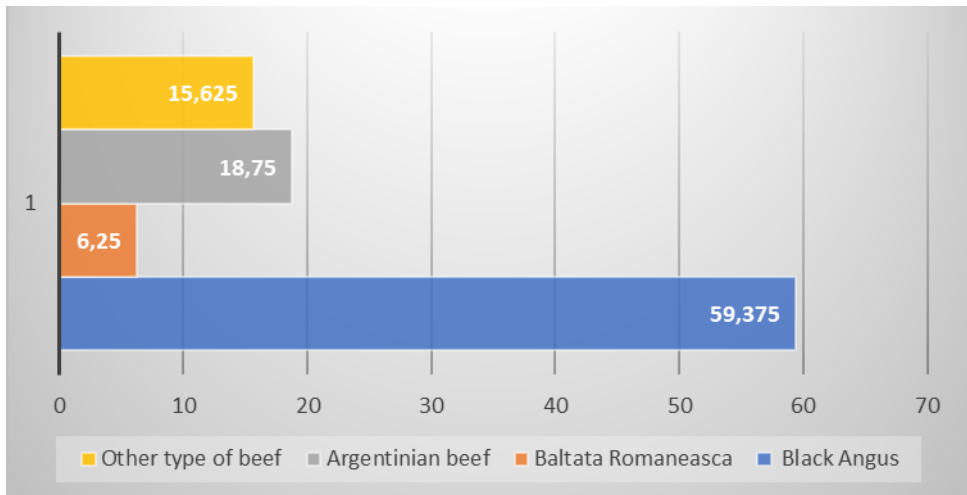


Fig. 5. The preferences of aged beef consumers related to the breed from which the meat comes

The frequency of consumption of aged beef (fig. 6) of the respondents varied from 1-2 times per month approximately 47%, 1-2 times/week, 34% and 3% of the respondents declared they consumed aged meat less often than once a month and only 15% of respondents declared they consumed beef more than 3 times a week.

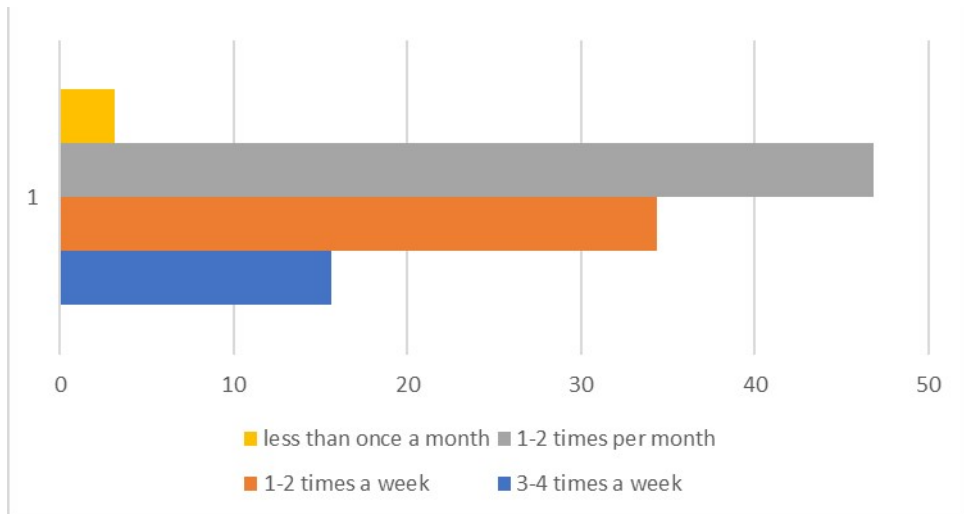


Fig. 6 Frequency of consumption of aged beef

To the question „What is the characteristic that you appreciate the most in aged beef” 37.5% of respondents said that they appreciated tenderness, about 28% flavor and almost 22% juiciness (fig. 7).



Fig. 7. The characteristic most appreciated by the consumer of aged beef

The price that consumers of aged beef declared they would be willing to pay for 100g of aged beef varies. As it can be seen in fig. 8, approximately 41% of respondents declared to be willing to pay approximately 10 lei/100 g (100 lei/kg), 34% only 7.5 lei/100g (75 lei /kg) and only 18.75% of respondents declared to be willing to pay 15 lei/100 g (150 lei/kg).

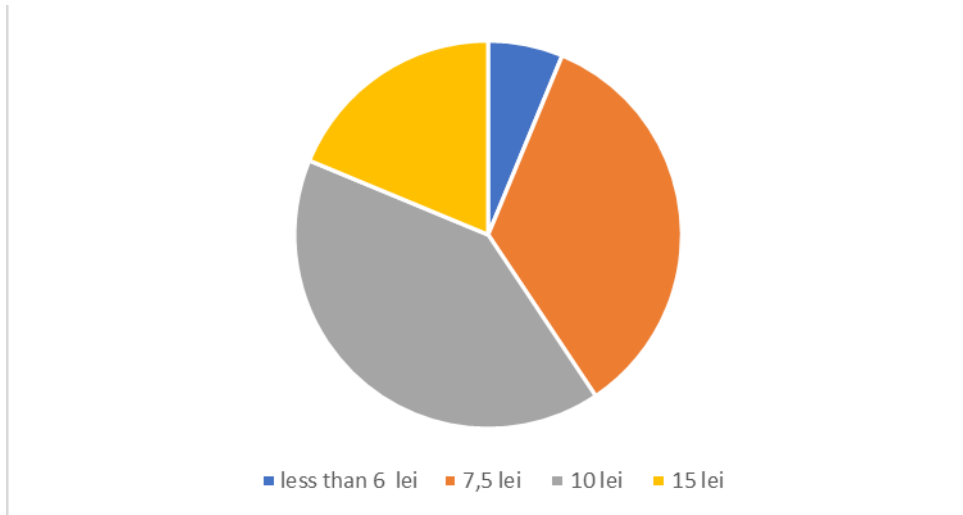


Fig. 7 The price the panelists declared they would be willing to pay for 100 g of the product

The tasting was done after 21 and 35 days of beef aging for each variety. The product characteristics were: appearance, color, taste, smell, tenderness/texture, juiciness and overall appearance of the tasted sample.

The results of the sensory analysis of the 21-day aged beef are presented in fig.8 . The representation for each characteristic of each assortment was made using the average values of the scores given by the panel.

As it can be seen in the figure below, the highest score was obtained by the beef obtained by wet aging followed by the dry aging.

In the case of beef aged by the wet procedure, it can be stated that the aging intensified the maturation process and added additional flavor to the product. In addition, muscle fiber breakdown was enhanced due to cell juice that was partially resorbed in the matured beef pieces (Ji-Han K., 2017 and Muhammad I K., 2016). As can be seen in fig. 8 almost all the sensory characteristics after 21 days were better appreciated by the consumers for the meat matured by the wet maturation method. The highest score of 6.82 was obtained by wet-aged meat after 21 days of aging compared to 6.41 for dry-aged meat.

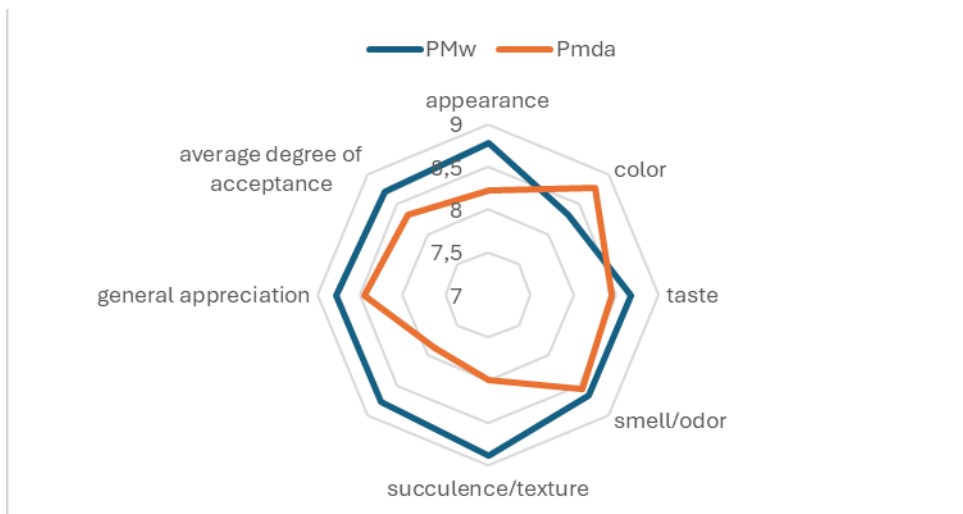


Fig. 8 Results of the sensory analysis of the beef obtained after 21 days of aging

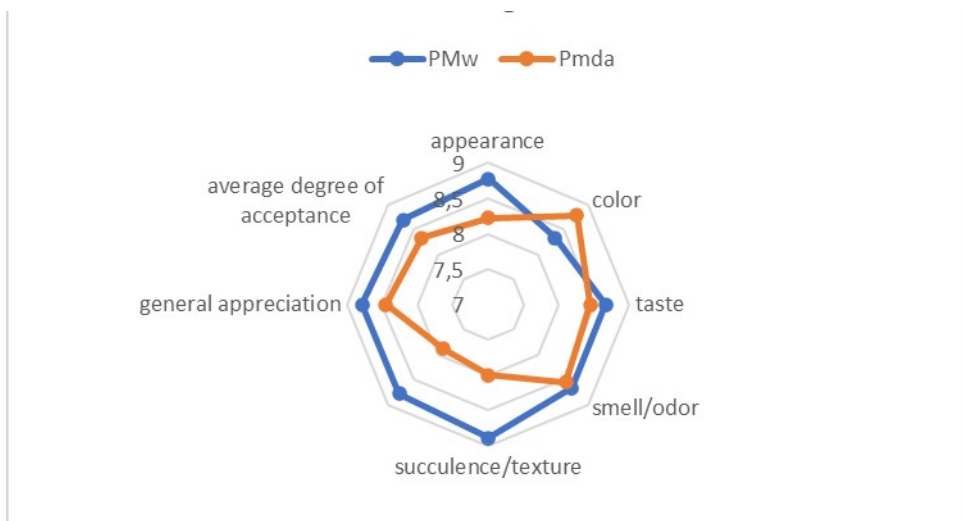


Fig. 9 Results of the sensory analysis of the product obtained after 35 days of beef aged

The sample that received the highest score after 35 day of aging was the sample obtained by the classic dry aging. As can be seen in fig. 9 after 35 days of beef maturation things change and the highest overall score is obtained by the meat matured by the dry aging method where consumers gave the highest average score of 8.69. Meat obtained by the dry aging method scored higher in all characteristics: appearance - 8.77, taste - 8.66, texture - 8.77. .

The samples obtained by wet aging was less appreciated by the panel of this study, which is explained by the action of cell juice and humidity that had the effect of intensifying some hydrolysis processes (Terjung, N., et all, 2021 and SolJi K., et all, 2022).

As a result, we recommend using the wet aging method only when a reduction in the aging time is needed. In the case of using this aging option, we propose commercializing the aged beef within 14-28 days from the beginning of the aging.

CONCLUSIONS

Based on the responses received in this study, the aged beef consumer is: a person with higher education, between 35 and 65 years old, who consumes aged beef 1-2 times a month, sometimes 1-2 times a week, and who prefers an aged beef that is tender, flavourful and with a price of about 100 lei/kg. If we consider the fact that the study was carried out in late 2022 early 2023, the current price that they would be willing to pay could be higher (at least taking into account the inflation index).

In the partial analysis of the results obtained from the sensory analysis on day 21 and day 35, the values of the sensory characteristics for all samples are lower on day 21 compared to day 35.

Although on the 21st day, the sample that received the highest score was the sample obtained by wet aging, on the 35th day the highest score was obtained by samples obtained by dry aging.

As a result, we recommend the use of the wet method of aging of when a short aging period is aimed and a quick commercialization, while the dry aging of beef is the method by which a finished product with superior characteristics can be obtained, but the aging time it will be longer.

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INTRODUCTION

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Dry aging consists of placing unpacked whole carcasses, primal cuts, or pieces of meat under low temperatures within a controlled environment (relative humidity and airflow) for a defined time. In these conditions the aroma of the product becomes more intense due to the evaporation of water and the concentration of the flavor compounds (Campbell, R.E. et. all., 2001)

The wet aging of beef is a method that involves placing the pieces of meat in a special bag, under vacuum, at a temperature of 1 - 4° C for a determined period of time. Under these conditions, the liquid released is absorbed by the meat and its flavor is concentrated (Campbell, R.E. et. all., 2001).

Although aging leads to the improvement of the organoleptic characteristics of beef, it is still used on a rather reduced scale because to the high cost derived from the losses that appear when cutting and finishing the anatomical parts, the risk of contamination, and the space required to use this technology (Dashdorj, D. et. all., 2016).

Tenderness and flavor increase in aged beef, which results from calpain activity myofibrillar and cytoskeletal proteolysis in sarcomeres, more specifically, lysis of bonds during the first 14 to 21 days post-mortem (Bhat, Z.F. et. all., 2018).

Muscle biochemistry (calpain-calpastatin activity), mastication resistance and juiciness are significantly influenced by the breed of cattle that provides the meat for the aging process. For some breeds characterized by high calpastatin activity, the functionality of calpain is reduced and the resulting beef, although aged will be tougher and less juicy (O'Connor, S.F. et. all - 1997 and Wheeler, T.L. et. all - 1990).

The beef market has evolved and is under pressure from the consumer who is influenced by flavor, consistency, and, more recently, healthier food options (Font-i-Furnols, M.; Guerrero, L., 2014, Henchion, M. et. all, 2014 and D.J.J.; Kerry, J.P., 2010). Consumers have different life-styles and this influences the purchase decision as well, something that has long known by industry and food product marketers (Chong, F.S., 2019 and Menkhaus, D.J., 1993)

The increased demand for beef has led to a change in the beef market, with new opportunities arising for beef producers, processors, and marketers of food products. In addition, this change also allows shifted the place of aged beef from a homogenous product to a niche product with specific characteristics depending on the duration and aging technology (Lusk, L.L.; Fox, J.A, 2000).

At the market level, palyers who deal with the production and marketing of aged beef, try to adapt to the ever changing environment, both in terms of aging technology, packaging methods, and consumption, which are evolving. This influences the price structure of the various types of aged beef, however, the price alone does not explain all the changes in the demand for beef.

The superior organoleptic characteristics aged beef have led to an increase in the demand for these products by consumers. As a result, in many cases, the studies and research carried out are oriented towards the influence of the degree of tenderness of the commercialized beef. (Lusk, L.L.; Fox, J.A., 2000, Lusk, J.L. et all, 2001, Lusk, J.L.; Schroeder, T.C., 2004 and Miller, M.F. et. all., 2001)

The retail market of aged beef is commonly considered to be the final market; therefore, researchers typically focus their efforts on understanding the consumer's purchase decision at a retail level. The retail market for aged beef is usually considered the end market; therefore, researchers typically focus their efforts on understanding the consumer's purchase decision at the retail level and identifying the external factors that influence the consumer's perception of beef quality. (McIlveen, H.; Buchanan, J., 2001)

In order to avoid the influence of external factors and to have an image as close as possible to reality, we chose to use for this study ordinary, non-specialized consumers that buy aged beef in grocery stores. The aim of this study was to create the profile of the aged beef consumer and identify the main preferences when choosing aged beef products.

The consumer profile will allow the identification of the main characteristics that influence consumer's decision when buying aged beef. In addition to the demographic data on the panel, we want to identify which of the organoleptic characteristics: appearance, aroma, taste, or juiciness are more important for the consumer and to estimate the quality attributes that correspond with various levels of satisfaction.

MATERIALS AND METHODS

Sampling Methodology

In order to have an image as close as possible to reality, we chose 10 grocery stores and bistro-type of retail stores that were also equipped with a grill so that the heat treatment of the aged beef could be performed according to the established protocol. Sample preparation is described below at product and preparation.

Starting from the average number of consumers per retail store, we established the frequency with which to ask customers to participate in the tasting so that the waiting time was kept at minimum and the participants were representative. In the end, the number of participants was 340 people coming from different backgrounds, representatives of both sexes to cover the diversity of the population of Cluj county.

At the end of the study we had two parts in the data collecting: a survey on the profile of the consumer of aged beef and a sensory analysis questionnaire for untrained consumer preference assay.

In previous consumer studies, the cut (muscle), beef aging technology, animal breed and origin (country and/or feeding system) were made known to the panelist (Jingjing Liu, et. all, 2022, Lusk, J.L.; et. all, 2001, Felderhoff, C, 2020 and Boleman, S.J. et. all, 1997). This procedure can be problematic because consumers could be influenced by the anatomical portion of the beef, which they consider to influence the quality (Asem-Hiablie, S., et all, 2016). Moreover, it was found that the disclosure of the breed influenced the consumer perception of the quality of a product, especially when it comes from good production practices (Ron, O.S., et. all, 2019). Due to these reasons, we decided to use "blind" sensory tests to control for these the influences.

Product and preparation

For the sensory analysis, we used strip loin, *longissimus lumborum*, that was aged by the dry method or the wet method in whole pieces. The aging of the anatomical portions was achieved by both methods of meat aging, dry and wet method at a temperature of 0 – 4°C and a relative humidity of 75 – 80%, the aging period was 21 - 35 days (Dashdorj, D, et all 2016).

After the aging period, the product was prepared as follows:

- wet aged beef was taken out of the packaging, sliced into pieces approximately 2.5 cm thick and left at room temperature for 30 minutes, then the heat treatment was done on the grill for approx. 5 minutes. After the heat treatment, the roasted product was left at room temperature to rest for 3 minutes and then sliced and placed for tasting, on white plates, two samples per plate.

- dry aged beef was finished by removing the crust formed due to dehydration, cut into slices approximately 2.5 cm thick and then heat-treated on the grill for 5 minutes. After the heat treatment, the roasted product was left to rest at room temperature for 3 minutes and then sliced and placed for tasting, on white plates, two samples per plate..

Regardless of the method used, aging was carried out for 21 days and 35 days, respectively, in conditions of temperature of 0 – 4°C and a relative humidity of 75 – 80% to the two beef aging methods.

Consumer Panels

For the tasting, the panel was selected in 10 grocery stores in Cluj county. Each person who agreed to participate in the tasting participated only once. The stages of the assay were explained and after providing their consent, they each received a questionnaire in which they filled in information related to age, gender, income, education, frequency of beef consumption, the price they would be willing to pay for the purchase of aged beef. In the second part, the actual tasting took place where they had to score the characteristics of the tasted product with scores between 1 and 9 (Apostu,S., Al. Naghiu, 2008). Each panelist received a disposable plate, a glass, plastic utensils, napkin, and palate cleansers to use between samples (unsalted crackers and a 10% apple juice, 90% water solution). The panelists were given verbal instructions about the assay and the procedure for the testing of samples. Panelists were instructed to cut each sample using their utensils to a size representative of beef consumed in the home or restaurant.

All consumers received a training sample as a test for the sample format and evaluation procedures. The data obtained from training samples was excluded from the analysis, as they were not related to the trial. The training samples were always served in the first position, followed by the 6 samples. This design provided a balance for frequency, order, and carryover (Watson, R. et. all, 2008).

Data processing

A scaling is used to grade the intensity of each perceived attribute either in terms of numbers or attributes. The effectiveness of scaling, however, is highly dependent on the training of the panel. In addition, the evaluator must be aware of how much the intensity of a given attribute varies within a selected product. If a numerical scale is used, scales of 9, 10 or 15 points are considered to be wide enough to account for both drastic and relatively small changes in intensities. (Apostu,S., Al. Naghiu, 2008).

If attributes are used, the following indicators may be used: "perceived sensation", "mild sensation", "moderate sensation", "intense sensation", "very intense sensation". The reference materials used in the terminology generation process can be used additionally to assist the evaluator and ensure consistency of results. Appropriate reference material for an attribute is assigned a value on the scale based on the decision of the consensus panel. The samples are then assigned intensity values relative to the reference material (Rainey, B.A., 1997).

The method was used in conjunction with the continuum satisfaction measurement. The random utility model provided a direct relationship between the satisfaction and the attributes. It was applied to the general model to determine the impact of tenderness, juiciness, and flavor on overall satisfaction.

RESULTS AND DISCUSSIONS

The results obtained after applying the questionnaire and carrying out the tasting in 10 grocery stores were applied to a number of 340 customers of these establishments from Cluj County.

According to the results of the study, as can be seen in fig. 1, the respondents of the questionnaire were 38% male and 62% female

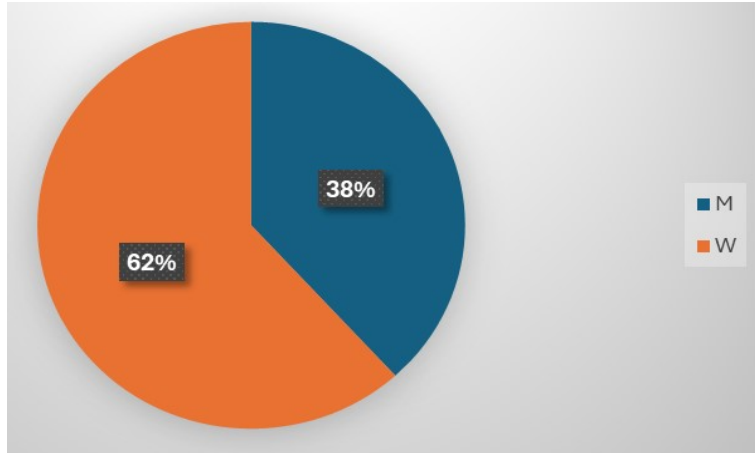


Fig. 1 Gender distribution of panel respondents

The age of the panelists (fig. 2) varied between 14 and 72 years. The distribution being 14 – 25 years 20.58%, 25 – 35 years 29.41%, 35 – 65% 38.24% and over 65 only 11.76%.

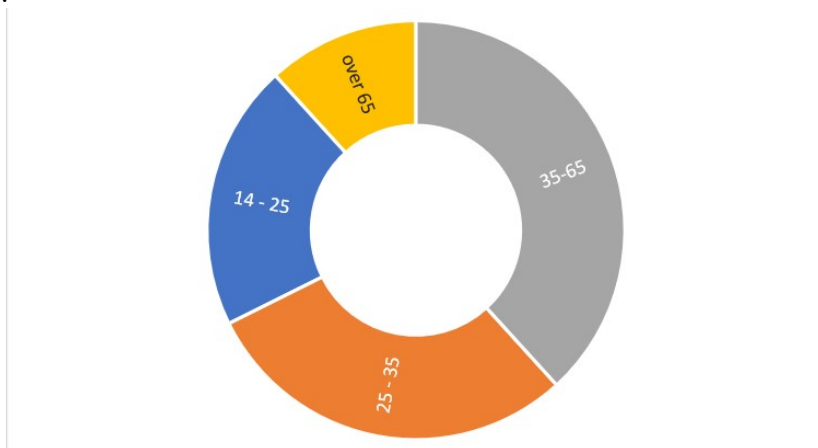


Fig. 2 Age distribution of panel respondents

The education of the panelists (fig. 3) was 15% high school graduates, 67% university graduates, and 18% had acquired a form of postuniversity degree.

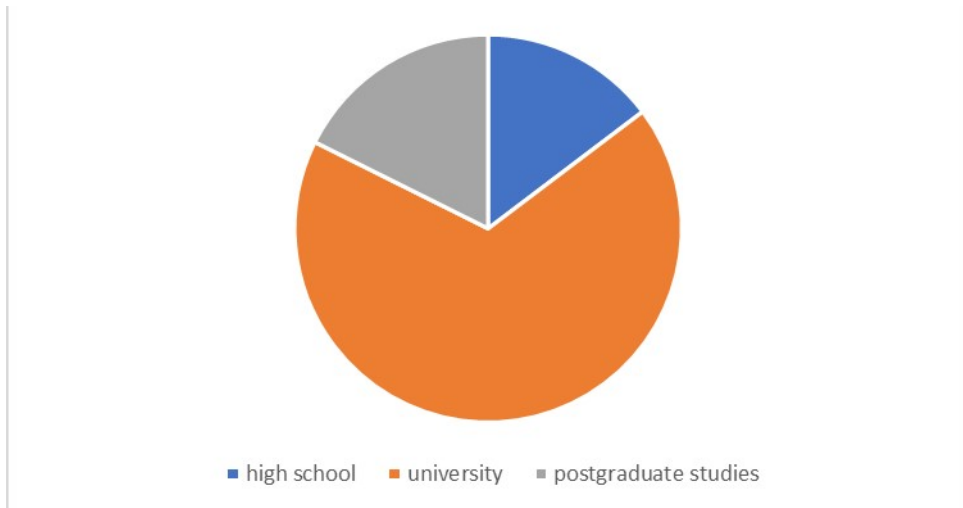


Fig. 3 Level of education of the respondents

When asked if they consumed beef, the respondents who said they did not usually consume beef were excluded from the study because their answers related to the quality of the beef or the price would not have been relevant. As it can be seen in fig. 4, about 6% of the surveyed consumers who entered a store specializing in the sale of meat and meat preparations declared that they do not consume aged beef.



Fig. 4 Consumers of aged beef

When asked about the aged beef they prefer and buy, the answers were as expected. About 60% of the respondents preferred aged Black Angus beef (fig.5), in second place was Argentinian beef and only 6% of respondents declared they bought aged beef from mixed breeds, specifically from Romanian Spotted.

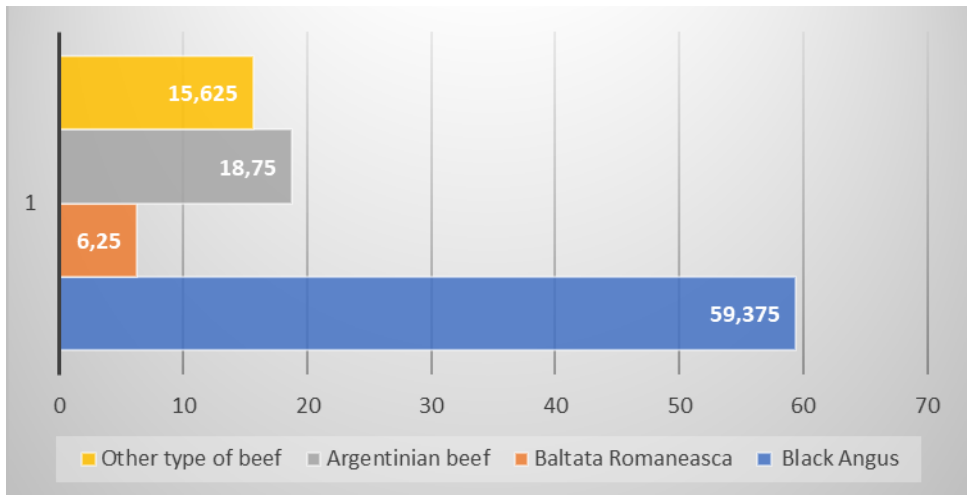


Fig. 5. The preferences of aged beef consumers related to the breed from which the meat comes

The frequency of consumption of aged beef (fig. 6) of the respondents varied from 1-2 times per month approximately 47%, 1-2 times/week, 34% and 3% of the respondents declared they consumed aged meat less often than once a month and only 15% of respondents declared they consumed beef more than 3 times a week.

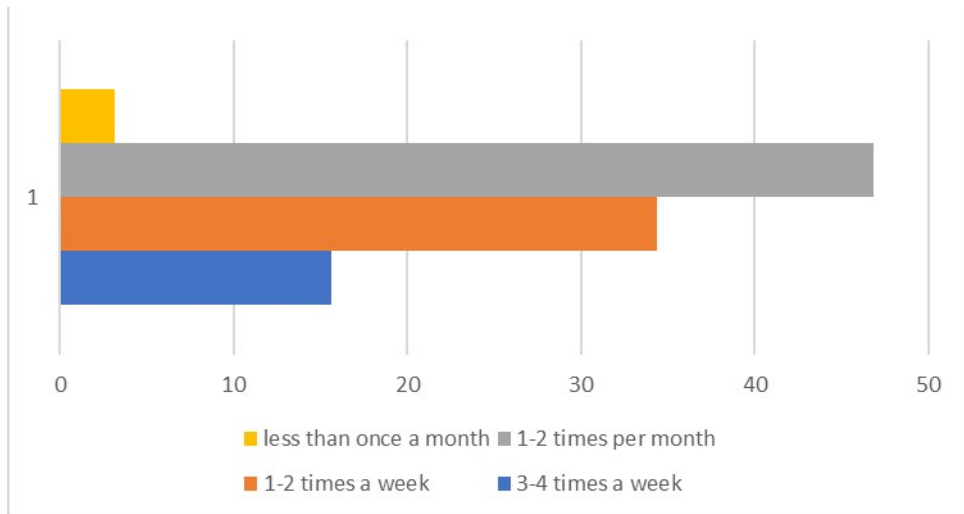


Fig. 6 Frequency of consumption of aged beef

To the question „What is the characteristic that you appreciate the most in aged beef” 37.5% of respondents said that they appreciated tenderness, about 28% flavor and almost 22% juiciness (fig. 7).



Fig. 7. The characteristic most appreciated by the consumer of aged beef

The price that consumers of aged beef declared they would be willing to pay for 100g of aged beef varies. As it can be seen in fig. 8, approximately 41% of respondents declared to be willing to pay approximately 10 lei/100 g (100 lei/kg), 34% only 7.5 lei/100g (75 lei /kg) and only 18.75% of respondents declared to be willing to pay 15 lei/100 g (150 lei/kg).

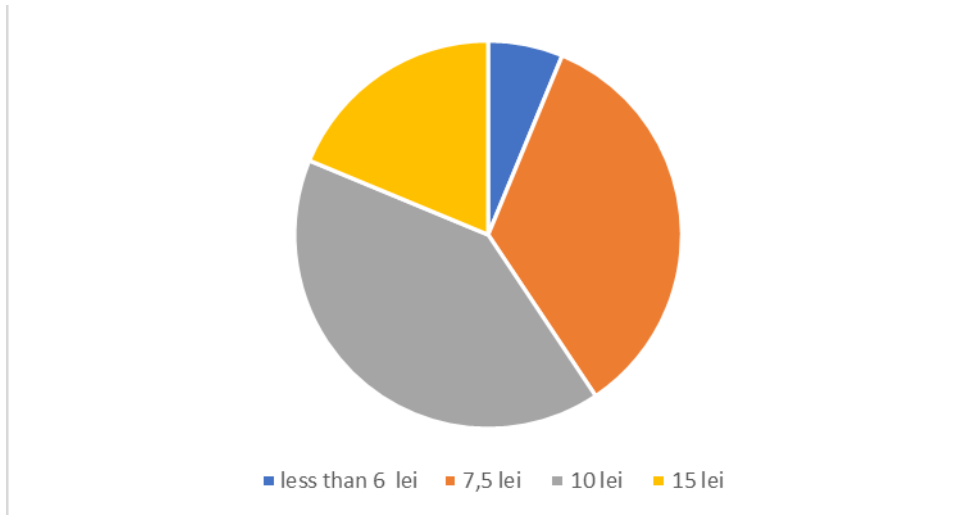


Fig. 7 The price the panelists declared they would be willing to pay for 100 g of the product

The tasting was done after 21 and 35 days of beef aging for each variety. The product characteristics were: appearance, color, taste, smell, tenderness/texture, juiciness and overall appearance of the tasted sample.

The results of the sensory analysis of the 21-day aged beef are presented in fig.8 . The representation for each characteristic of each assortment was made using the average values of the scores given by the panel.

As it can be seen in the figure below, the highest score was obtained by the beef obtained by wet aging followed by the dry aging.

In the case of beef aged by the wet procedure, it can be stated that the aging intensified the maturation process and added additional flavor to the product. In addition, muscle fiber breakdown was enhanced due to cell juice that was partially resorbed in the matured beef pieces (Ji-Han K., 2017 and Muhammad I K., 2016). As can be seen in fig. 8 almost all the sensory characteristics after 21 days were better appreciated by the consumers for the meat matured by the wet maturation method. The highest score of 6.82 was obtained by wet-aged meat after 21 days of aging compared to 6.41 for dry-aged meat.

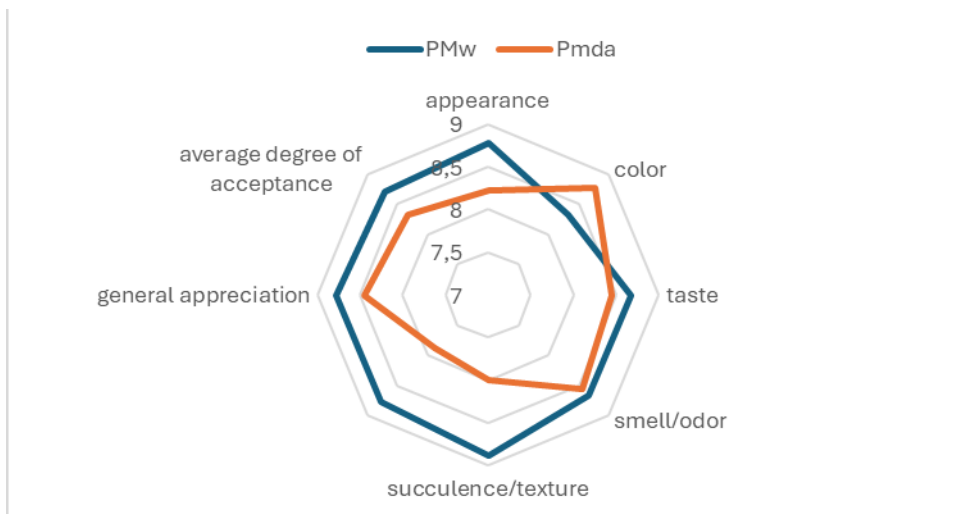


Fig. 8 Results of the sensory analysis of the beef obtained after 21 days of aging

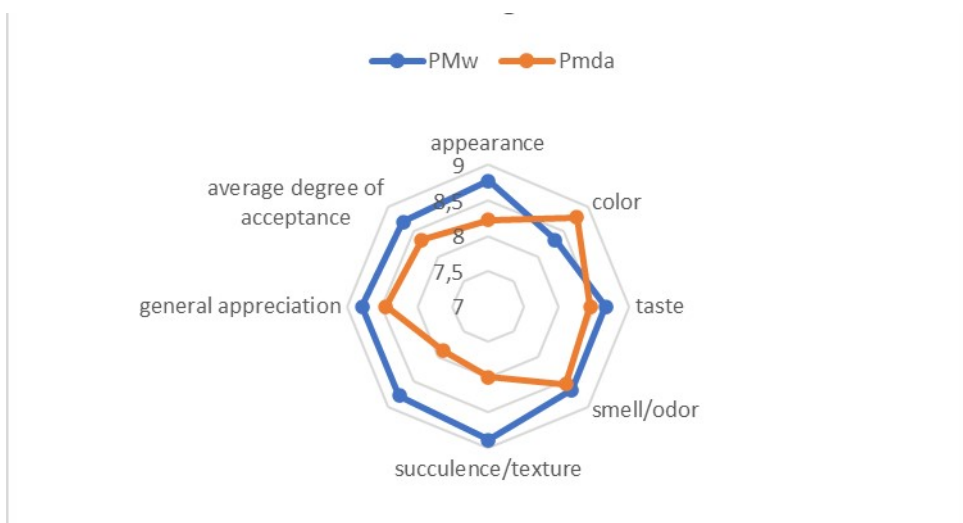


Fig. 9 Results of the sensory analysis of the product obtained after 35 days of beef aged

The sample that received the highest score after 35 day of aging was the sample obtained by the classic dry aging. As can be seen in fig. 9 after 35 days of beef maturation things change and the highest overall score is obtained by the meat matured by the dry aging method where consumers gave the highest average score of 8.69. Meat obtained by the dry aging method scored higher in all characteristics: appearance - 8.77, taste - 8.66, texture - 8.77. .

The samples obtained by wet aging was less appreciated by the panel of this study, which is explained by the action of cell juice and humidity that had the effect of intensifying some hydrolysis processes (Terjung, N., et all, 2021 and SolJi K., et all, 2022).

As a result, we recommend using the wet aging method only when a reduction in the aging time is needed. In the case of using this aging option, we propose commercializing the aged beef within 14-28 days from the beginning of the aging.

CONCLUSIONS

Based on the responses received in this study, the aged beef consumer is: a person with higher education, between 35 and 65 years old, who consumes aged beef 1-2 times a month, sometimes 1-2 times a week, and who prefers an aged beef that is tender, flavourful and with a price of about 100 lei/kg. If we consider the fact that the study was carried out in late 2022 early 2023, the current price that they would be willing to pay could be higher (at least taking into account the inflation index).

In the partial analysis of the results obtained from the sensory analysis on day 21 and day 35, the values of the sensory characteristics for all samples are lower on day 21 compared to day 35.

Although on the 21st day, the sample that received the highest score was the sample obtained by wet aging, on the 35th day the highest score was obtained by samples obtained by dry aging.

As a result, we recommend the use of the wet method of aging of when a short aging period is aimed and a quick commercialization, while the dry aging of beef is the method by which a finished product with superior characteristics can be obtained, but the aging time it will be longer.

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