

ORGANOLEPTIC EVALUATION OF SLAVONIAN HOME - MADE KULEN FROM BLACK SLAVONIAN OR WHITE PIGS

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SUMMARY

Black Slavonian pig used to be the most widespread breed in Slavonia, and it was mainly used for the production of fat and authentic meat products such as kulen – a slowly fermented and dry- cured spicy sausage stuffed in pork blind gut. Nowadays, this breed is rare, and kulen and other meat products are mostly produced from the meat of more productive white pig breeds. Still, the products of local breeds and sustainable production systems of breeding have been raising again an increased interest of the European public and consumers, and here as well have been reviving the breeding of Black Slavonian pig for the production of autochthonous meat products. In this work, organoleptic traits of Slavonian home-made kulen produced from the meat of Black Slavonian breed and its crossbreeds or modern white breeds and pig crossbreeds were evaluated. The evaluation was performed by assessors with previous experience in assessing kulen. Surface appearance, surface smell, texture, inner smell, cross section form, palatability, taste and aroma, and after- taste, were evaluated on the scale from 1- 5. Based on mean score of individual traits and the coefficients of importance of certain trait, the total quality score of kulen was calculated. The comparison of results of organoleptic trait score was tested by nonparametric statistic and the total score was tested by Student t- test. Slavonian kulen made from Black Slavonian or modern white breeds and pig crossbreeds was similarly scored for most organoleptic traits, as well as for the total quality. In conditions of performed testing there hasn't been determined the influence of genotype of pigs on organoleptic traits of Slavonian kulen. However, for acquiring better understandings of organoleptic quality and other traits of meat and products from

Black Slavonian pigs, further researches are needed, and the breed itself and its products should have an additional market promotion, development and preservation. This could be, by itself, the best way for long- term preservation and survival of Black Slavonian breed.

Key words: Black Slavonian pig, Slavonian kulen, organoleptic traits

INTRODUCTION

Traditional Slavonian meat products have their origin in the time of family cooperatives and existence of homes (granges) located on pastures near the woods, on which pigs and other cattle were bred (Petričević et al., 2002). The early beginnings of development of such farming agricultural system on Slavonian- Srijem area are connected to formation of the Military Border in the 17th century, when the pigs, except for subsistent needs, started to be bred on a large scale for the needs of the army and larger consumer centers of Austrian- Hungarian Monarchy (Benčević and Petričević, 1999). The purpose of pig breeding was for a long time intended primary for the production of bacon and fat, which were, at the time, the most wanted products. Later, with improvement of breeding and feeding of pigs, especially on latifundia, and with growing development of butcher's trade, some other autochthonous products such as Slavonian kulen, ham and sausages were developed, whose tradition of production in Slavonian area has been preserved to these days (Benčević and Petričević, 1999). Of the breeds bred at that time in Slavonia, Benčević and Čakalić (2001) mention Croatian Šiška as the oldest breed, then Bagun and Mangalitsa, and finally, Black Slavonian breed of pigs, which was around the middle of the 20th century the

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▼ **Figure 1.** Slavonian kulen (Photo: D. Karolyi)

most numerous breed in Slavonian breeding and fattening sites, and it was greatly used for the production of fat and traditional meat products. Nowadays, the Black Slavonian breed is rare in Slavonia, and meat products are mostly produced from the meat of significantly more productive white breeds and crossbreeds.

But, within the current trends of promotion and support of sustainable traditional systems of food production, it is becoming more important to preserve traditional production systems of local breeds and their products. In that sense, renewed breeding of Black Slavonian pigs for the production of traditional meat products of added value becomes justified (Ekert Kabalin et al., 2007; Karolyi et al., 2007).

Among autochthonous Slavonian meat products, the most prominent position as before so now belongs

to Slavonian home- made kulen (Figure 1), which has remained a constituent part of the tradition, food culture and the way of living in Slavonia (Kovačić, 2005). Technologically, it is a dry- cured sausage produced of mixture of pork meat and back fat of the best quality, which is minced and mixed with the addition of table salt and natural spices (hot and sweet pepper and garlic), and stuffed in pork blind gut (caecum). Slavonian kulen is then cold smoked, and it naturally ferments, dries and ripens during several months. Ripe kulen can be characterized as a long- life sausage of low acidity (high pH), whose microbiological stability and sustainability is conditioned by low activity of water (*aw*) in a finished product (Karolyi et al., 2005).

During the process of kulen production under certain conditions of temperature, moisture and circulation of air, the stuffing undergoes complex physical- chemical and enzymatic changes of carbohydrates, proteins and fats, loss of water and increase in concentration of dry matter. These changes are very significant for final quality, nutritional and organoleptic traits of ripe kulen.

The goal of this work was to evaluate organoleptic traits of Slavonian home- made kulen, produced from the meat of Black Slavonian breed and its crossbreeds, and modern white breeds and pig crossbreeds.

MATERIAL AND METHODS

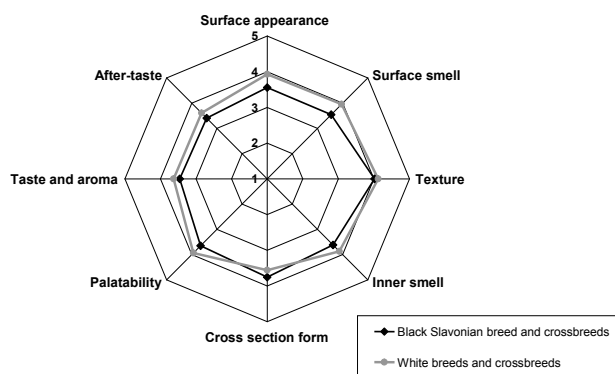
Organoleptic evaluation was carried out on samples of kulen produced from the meat of Black Slavonian breed and its crossbreeds ($n=8$) and samples of kulen produced from the meat of white breeds and pig crossbreeds ($n=5$). Samples of kulen came from a few family farms in Slavo-

▼ **Table 1.** Descriptive statistics of organoleptic evaluation of Slavonian kulen from Black Slavonian or white pigs

Sensory trait	Black Slavonian breed and crossbreeds			White breeds and		
	Mean	SD	CV %	Mean	SD	CV %
Surface appearance	3,56	0,87	24,47	3,93	0,83	21,12
Surface smell	3,54	0,93	26,20	3,96	0,94	23,74
Texture	4,02	0,84	20,89	4,12	0,56	13,32
Inner smell	3,62	0,82	22,80	3,87	0,80	20,78
Cross section form	3,75	0,77	20,67	3,56	0,85	23,83
Palatability	3,65	0,74	20,15	3,93	0,73	18,59
Taste and aroma	3,46	0,87	25,18	3,63	0,93	25,51
After-taste	3,40	0,94	27,57	3,61	0,68	18,94
Total score	3,58	0,68	18,93	3,79	0,62	16,42

SD – standard deviation; CV – coefficient of variation

▼ **Graph 1.** Sensory evaluation of Slavonian kulen from Black Slavonian or White pigs



nia which are engaged in breeding of pigs and producing home- made kulen, and at the time of evaluation, they were about 6 months old. Evaluation was conducted by a commission of 5 or 7 assessors with previous experience in evaluation of kulen on Faculty of Agriculture in Zagreb. Each sample of kulen was cut in half by a knife, and immediately after cutting each assessor got one half on a white plastic plate (thick about 0,5cm), whereas the other half was available for visual inspection and touch.

The assessors were asked to evaluate surface appearance, surface smell, texture, inner smell, cross section form, palatability, taste and aroma, and after - taste on

a scale from 1 (minimum grade) to 5 (maximum grade). Totally, there were 42 evaluations of samples of kulen of Black Slavonian pig and its breeds and 27 evaluations of samples of kulen of white breeds and pig crossbreeds. Based on mean score of individual trait and coefficient of importance of that trait, the total grade of quality of kulen was calculated. During the evaluation of the samples, the assessors were offered water and apple slices.

Descriptive statistics of the evaluation of organoleptic traits of kulen (average, standard deviation and coefficient of variability) were calculated by PROC UNIVARIATE method of the SAS Statistic program (SAS 1999). The comparison of average grades for surface appearance, surface smell, texture, inner smell, cross section form, palatability, taste and aroma, and after- taste between samples of kulen of Black Slavonian and white pigs was performed by nonparametric Wilcoxon Mann- Whitney test, by using PROC NPAR1WAY procedure and WILCOXON option, whereas testing of differences in the total grade of quality was performed by Student t- test by using PROC TTEST procedure (SAS 1999).

RESULTS AND DISCUSSION

Descriptive statistic of the evaluation of organoleptic traits of kulen from Black Slavonian and white modern breeds and pig crossbreeds is shown in Table 1, and graphic outline (Spider's web) of the results is shown in Graph 1.

From the shown results, with both groups of samples

▼ **Table 2.** Comparison of evaluation of sensory traits of Slavonian kulen from black Slavonian and white pigs

Variable	Black slavonian breed and crossbreeds			White breeds and			Test statistika	
	median	min	max	median	min	max	Z	p
Surface appearance	4,0	1,0	5,0	4,0	2,0	5,0	1,602	0,109
Surface smell	3,0	2,0	5,0	4,0	1,0	5,0	2,030	0,042
Texture	4,0	2,0	5,0	4,0	3,0	5,0	0,675	0,500
Inner smell	4,0	2,0	5,0	4,0	2,0	5,0	1,396	0,163
Cross section form	4,0	2,0	5,0	4,0	1,0	5,0	-0,528	0,598
Palatability	4,0	2,0	5,0	4,0	3,0	5,0	1,418	0,156
Taste and aroma	3,0	2,0	5,0	4,0	2,0	5,0	0,678	0,498
After-taste	3,0	1,0	5,0	4,0	2,0	5,0	1,100	0,272
<i>Quantitative</i>	<i>mean</i>	<i>min</i>	<i>max</i>	<i>mean</i>	<i>min</i>	<i>max</i>	<i>t</i>	<i>p</i>
Total score	3,58	2,24	4,76	3,79	2,47	4,76	1,28	0,205

Z - Wilcoxon test, t - Student t-test, p - level of significance, two - sided test

a high variability of the grade of taste and aroma is visible (CV around 25%), as of surface smell (CV 23,7 and 26,2%), whereas the grades which varied the least were of texture by touch (CV 13,2 and 20,9%) and texture by consummation (CV 18,6 and 20,2%). The grade of an after- taste of kulen from Black Slavonian pigs and cross-breeds was highly variable (CV 27,6%), whereas the same trait was more homogenously evaluated on the sample of kulen from white breeds and pig crossbreeds (CV 18,9%). High variability of organoleptic grade of aroma was also noted with other traditional sausages, e.g. Greek (Ambrosiadis et al., 2004).

Comparison of the grade of organoleptic traits between the samples of kulen from Black Slavonian and white pigs is shown in Table 2.

According to results of comparison of organoleptic grade of kulen from Black Slavonian breed with kulen from modern white pig breeds, it is noticeable that in both cases the assessors evaluated surface appearance, texture, inner smell, cross section appearance, palatability, taste and aroma, and after- taste similarly. Kulen from Black Slavonian pig breed and its crossbreeds was graded somewhat lower only for the trait of surface smell ($p=0,042$), whereas the total grade of kulen quality in both cases was also equal.

In Europe, especially in Mediterranean countries, there is a growing interest for autochthonous meat products from local pig breeds from extensive, sustainable breeding. Particularity and quality of products from local pig breeds, bred in their natural environment, like the Iberian breed in Spain or Alentejano in Portugal, is clearly recognized and through European Protected designation of origin – PDO, and similar projects of protection of products are taking place in Italy as well with Nero Siciliano and Cinta Sense breeds, and in France with Corsica, Basque and Gascon breeds (Lebert, 2007). Meat and meat products of traditional breeds have a generally good image in public and media, and they are often considered to be better and of better quality than the meat and meat products of modern breeds and crossbreeds. The listed above is also confirmed by researches, for example the local breed Nero Siciliano whose meat has a quality of traditional Sicilian salami, which is better at reflecting the typical organoleptic and other traits of products than when the production of salami uses the meat of white pigs (Madonia et al., 2004).

Similar researches on meat and meat products from Black Slavonian pig are rare so far. In this research, experienced assessors similarly evaluated organoleptic traits of home- made kulen from Black Slavonian and white pigs. In a previous research, consumers' preference to Slavonian kulen (Radman et al., 2005), the acceptability of

kulen from Black Slavonian pigs among random respondents in one food fair was surprisingly the lowest. Still, such results can partly be a consequence of a variable quality of home- made kulen, whose organoleptic traits can differ, as between individual producers and areas, so between the years. Therefore, the research should be continued with more products from different producers in order to get more reliable information about organoleptic and other traits of products, as about consumers' attitudes toward processed meat products from Black Slavonian pigs. Together with the general need for further promotion of such products on home market (Kovačić et al., 2007), consumers' attitudes should be tested on foreign markets as well, especially on those which have already been proved to be suitable for export of Slavonian kulen in previous market researches (Kovačić et al., 2003).

CONCLUSION

Kulen from Black Slavonian breed and modern white breeds and pig crossbreeds was evaluated similarly for most organoleptic traits as for the total quality, out of which follows the conclusion that in conditions of the conducted research there hasn't been determined the effect of genotype of pigs on organoleptic traits of kulen.

In order to get more reliable information about the organoleptic quality and other traits of meat and meat products from Black Slavonian pigs, the research should be continued, and the breed and its products should be marketing-developed and promoted. That could, by itself, represent the best way for a long- term protection and preservation of Black Slavonian pig breed.

ZUSAMMENFASSUNG

ORGANOLEPTISCHE BEWERTUNG DER SLAWONISCHEN EINHEIMISCHEN SCHWARTENMAGENWURST VON SCHWARZEN UND WEISSEN SCHWEINEN

Das schwarze slawonische Schwein war früher die zahlreichste Rasse auf dem Gebiet Slawoniens. Es wurde zur Erzeugung von Fett und Fleischerzeugnissen, wie z.B. Schwartenmagenwurst „Kulen“, benutzt. Heute ist diese Rasse selten. „Kulen“ und andere Erzeugnisse werden aus Fleisch der produktiveren weißen Schweinerassen hergestellt. Die Erzeugnisse der örtlichen Rassen und der erhaltenen Systeme der Zucht wecken aber in den letzten Jahren wieder das Interesse der europäischen Öffentlichkeit und der Verbraucher und bei uns wird erneut die Zucht des schwarzen slawonischen Schweines zur Erzeugung von ursprünglichen Fleischprodukten ins Leben gerufen. In dieser Arbeit sind organoleptische

Eigenschaften der slawonischen einheimischen Schwartemagenwurst „Kulen“ bewertet, erzeugt aus Fleisch der schwarzen slawonischen Rasse und deren Hybriden sowie der weißen modernen Rassen und deren Hybriden. Die Bewertung führten erfahrene Bewerter für „Kulen“ durch. Auf der Skala von 1 bis 5 wurden bewertet: das äußere Aussehen, der äußere Geruch, die Struktur beim Betasten, der innere Geruch, das Aussehen des Durchschnittes, die Struktur im Mund, der Geschmack, das Aroma und der hinterbliebene Geschmack im Mund. Auf Grund der durchschnittlichen Bewertung der einzelnen Eigenschaft und des Koeffizientes der Eigenschaftswichtigkeit wurde die gesamte Bewertung von „Kulen“ ausgerechnet. Der Vergleich der Bewertungsergebnisse der organoleptischen Eigenschaften wurde unparameter und die gesamten Bewertungen durch Student-t-Test getestet. „Kulen“ aus dem Fleisch des schwarzen und der modernen weißen Rassen sowie deren Hybriden wurde ähnlich für die Mehrheit der organoleptischen Eigenschaften sowie für die gesamte Qualität bewertet. In den Bedingungen des durchgeführten Testens wurde kein Einfluss des Genotypus der Schweine auf organoleptische Eigenschaften von „Kulen“ festgestellt. Zwecks weiterer Erfahrungen über die organoleptische Qualität und anderer Eigenschaften von Fleisch und Erzeugnissen aus dem Fleisch des schwarzen slawonischen Schweines soll die Forschung weiter durchgeführt werden. Die Rasse und die betreffenden Erzeugnisse sollen seitens Marketing geforscht und bearbeitet werden. Die Erzeugnisse sollen promoviert und geschützt werden. Dies sollte der beste Weg für eine langfristige Beschützung und Existenz der Rasse des schwarzen slawonischen Schweines darstellen.

Schlüsselwörter: das schwarze slawonische Schwein, die Schwartenmagenwurst „Kulen“, organoleptische Eigenschaften

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