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TECHNOLOGICAL AND NUTRITIONAL CHARACTERISTICS OF FAT FROM CROSSBRED OF POLISH LARGE WHITE PIG WITH WILD BOAR

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The aim of the study was to evaluate the effect of crossbreeding domestic pig with 25% of wild boars genes on technological and nutritional values of subcutaneous fat. The study was carried out on 20 carcasses of fatteners obtained by crossbreeding of Polish Large White (PLW) sows (50%) with crossbreed of wild boars (WB) (*Sus scrofa ferus*) with PLW. Crossbreed's genotypes contained 75% of PLW and 25% of WB genes. Control group was consisting with 20 fatteners of pure PLW. Each experimental block was formed by 50% of gilts and 50% of young hogs. Analyses were performed on dorsal subcutaneous fat, *m. longissimus thoracis* (LT) and *m. semimembranosus* (SM). Intramuscular fat content in LT and SM muscles was measured, as well as subcutaneous fat thickness, backfat toughness, fat solidifying and melting temperatures, fatty acids profile and sensory analysis of lard. The results of the study showed that subcutaneous fat obtained from crossbred PLW and WB was characterised by higher content of unsaturated and lower content of saturated fatty acids in comparison to fat excised from pure PLW. Moreover, fat from crossbred animals was tougher and had higher temperature of melting and solidifying points. Such quality characteristics connected with high sensory scores proved a high technological usability of analysed fat.

INTRODUCTION

Human diet should be diverse that is why nowadays consumers reach for unconventional meat species such as venison, meat from exotic animals and meat from wild animals kept in captivity, *i.e.* fallow deer, ostrich, deer and antelope [Berge *et al*., 1997; Hoffman *et al*., 2005; Paleari *et al*., 1998]. Probably, more people will be eager to consume venison if it is not characterised by dark colour of meat, as well as specific strong taste and flavour. However, there are many positive aspects of eating venison, such as high nutritive value, high micro- and macro- elements content, especially iron [Paleari *et al*., 1998; Jerez-Timaure *et al*., 2006]. Traditional methods for collection meat from wild animals tend to obtain meat with lower quality, especially from sanitary point of view. Animals live in their natural environment may produce low quality meat, which is connected mainly with the presence of mature males within the population. In some countries wild animals are kept on farms, which cause many controversies [Żmijewski & Korzeniowski, 2001]. That is why crossbreeding of wild animals with domestic ones can be an alternative way of venison production. Crossbreed of domestic sows with wild boars affected in production of good quality meat [Szmańko *et al*., 2007, Walkiewicz *et al*., 1994, 2000, Wielbo *et al*., 2000]. Another positive aspect of crossbreeding is the possibility of intensification of the animal production. Thanks to insemination procedure the number of crossbred getters can be reduced [Kozdrowski & Dubiel, 2004]. Castration eliminated the problem connected with strong and not desired sensory traits of meat. Colour, taste and flavour of meat possessed from crossbreed animals are fully accepted by the consumers. Thus, on the basis of crossbreeding domestic pig with wild boar good quality meat can be produced even on the industrial scale [Szczepański *et al*., 2007]. An important aspect of animal production is also nutritional and technological characteristics of fat. Fatty acid profile has now not only nutritional but also pro health meaning [Chin *et al*., 1992; Pariza *et al*., 2001; Ha *et al*., 1987; MacGandy & Hegsted, 1975].

The objective of the study was to evaluate the effect of crossbreeding of domestic pig with wild boars (25% of WB genes) on technological and nutritional values of subcutaneous fat.

MATERIAL AND METHODS

The study was carried out on 20 carcasses of fatteners obtained by crossbreeding of Polish Large White (PLW) sows (50%) with crossbreed of wild boars (WB) (*Sus scrofa ferus*) with PLW. Crossbreed's genotypes contained 75% of PLW and 25% of WB genes. Control group was consisting with 20 fatteners of pure PLW. Each experimental block was formed by 50% of gilts and 50% of young hogs. Boars were castrated at the age of 28 days. Animals were kept in commercial farm and fed *ad libitum*. Hogs were slaughtered after 180 days of

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fattening in case of PLW and after 240 days in case of crossbreed animals, when their body mass equalled 103±2 kg. Leaf fat weight and backfat thickness (above 1, 3, 14 of breast vertebrae, above 3 lumbar vertebrae and above epiphysis of femur bone) were measured 45 min after slaughter. Then carcasses were chilled for 24 h at 4±1°C. Total fat content was analysed in *m. longissimus thoracis* (LT) and *m. semimembranosus* (SM) according to Soxhlet method [PN-73/A-83111]. Marbling was measured in LT muscle using 5-grade model scale, where 1 represented meat without marbling and 5 meat with intensive marbling [Romans *et al*., 1994]. Fatty acids composition was analysed in lard excised from the carcass at 1 cm from skin base. Analysis was performed on gas chromatograph (Philips) equipped with flame-ionizing detector. Chromatographic columns types Rtx-2330 105 m long was used; the injector chamber temperature was 220°C and detector temperature was 230°C. Helium (70 psi) was used as a carrier gas. Backfat toughness was measured with Stevens apparatus equipped with rounding edges mandrel of 4 mm diameter moving 50 mm/min until 5 mm sample depth. Measurements were taken parallel to skin surface at 10 mm distance from the skin base. Temperature of fat solidification was analysed according to PN-61/A-86927 and temperature of fat melting according to PN-ISO 6321:2000. Sensory analysis of lard melted from backfat was carried out according to PN-ISO 6658 with 5 points scale of intensity and desirability, where 1 represented very slight or undesirable and 5 very strong or very much desirable scores. Muscle and fatty tissue microstructure was analysed by scanning electron microscopy (Leo 435VP). Samples for structure analysis were preserved by osmium tetrachloride and gluthar aldehyde, then after dehydration with acetone they were spread with gold [Cieciura, 1989]. The results of the study were then statistically processed using Statgraphics v.5.0 and Microsoft Excel v. 2000 at a significance level of $p \leq 0.05$.

RESULTS AND DISCUSSION

Crossbred of domestic pig with wild boar were characterised by thicker backfat in all analysed area of the carcass (Table 1). The difference between thickness of backfat measured in particular area of the carcass differed from 0.81 cm to 1.59 cm. Experimental animals expressed also higher content of leaf fat in comparison to control pigs. Higher content of subcutaneous and channel fat in carcasses from crossbred animals could be caused by longer, for 60 days, period of fattening. Along with extending the period of pig fattening increases the ability to subcutaneous and leaf fat accumulation in animal tissues [Szyndler-Nędza & Mucha, 2006].

Tendency to subcutaneous fat accumulation in crossbred carcasses did not correlate with intramuscular fatness. LT muscle excised from crossbred carcasses, in comparison to PLW, was characterised by lower marbling as well as lower intramuscular fat content. Opposite correlation was stated for SM muscle, which was characterised by higher fat content in case of crossbred animals. Analysis of variance revealed statistically significant differences in intramuscular fat content between PLW and CB fatteners (Table 1). Higher level of lipids was analysed for LT muscle from PLW pigs. Whereas, for SM muscle higher fat content was analysed for CB group. Differences in fat content in LT and SM muscles between experimental groups were confirmed when the results were expressed in relation to dry matter content. Higher content of intramuscular fat in LT of PLW pigs was also showed by microstructure analysis (Figure 1). Despite the identical environmental conditions during fattening period and similar genotype of the fatteners within experimental groups quite big changeability in intramuscular fat content was observed for particular animals. The results collected for intramuscular fat content were similar to previously published and characteristic for pork [Jarczyk, 1996].

TABLE 1. Physicochemical characteristics of fat (n=20).

Parameters		Experimental group			
		PLW		Crossbred	
		$\bar{x}$	SD	$\bar{x}$	SD
Fat content per 100 g of meat (%)	LT	1.71b	0.32	1.48a	0.40
	SM	0.75a	0.32	1.06b	0.78
Fat content in dry matter (%)	LT	7.95b	3.32	5.72a	2.48
	SM	2.76a	1.33	4.28b	1.24
Marbling (points)	LT	1.90b	0.50	1.40a	0.45
Backfat thickness (cm)	1 breast vertebrae	3.81a	0.43	4.99b	1.05
	3 breast vertebrae	2.77a	0.37	3.58b	0.36
	14 breast vertebrae	2.83a	0.62	3.68b	0.35
	3 lumbar vertebrae	2.45a	0.38	4.04b	0.75
	above thigh bone	1.51a	0.38	2.85b	0.90
Leaf fat weight (kg)		1.56a	0.46	2.20b	0.81
Backfat toughness (N)		6.97a	0.02	7.03b	0.01
Melting temperature (°C)		33.22a	0.20	34.55b	0.30
Solidifying temperature (°C)		24.36a	0.29	25.15b	0.21

Mean values denoted by different superscripts between columns within rows differ significantly from each other (a, b – $p \leq 0.05$)

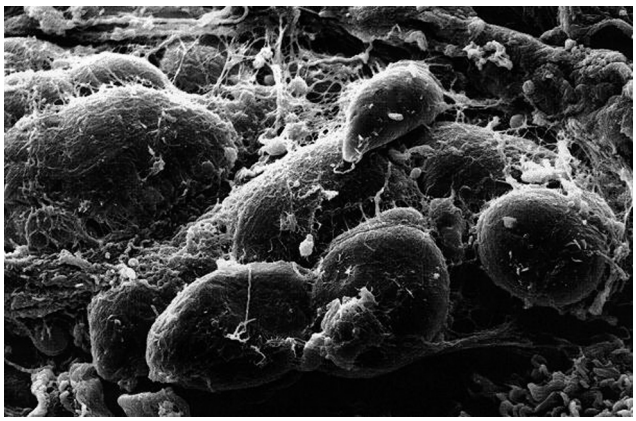

FIGURE 1. Typical microstructure of intramuscular adipose tissue from LT muscle excised from PLW carcass (x1.30K).

An important part of quality characteristic of food lipid is their nutritive value with the special respect to fatty acids profile [Ha *et al*., 1987; Pariza *et al*., 2001]. There were no statistically significant difference ($p \leq 0.05$) in content either saturated or unsaturated fatty acids in subcutaneous fat between experimental groups (Tables 2 and 3.). Fat obtained from the carcass of crossbred of domestic pig with wild boar was characterised by the tendency to have lower content of saturated fatty acids, especially C^0_{10}, C^0_{14}, C^0_{16}, C^0_{18}, as well as higher content of unsaturated fatty acids, especially C^1_{18}, C^2_{18}, C^3_{18}, C^1_{20}, C^2_{20}. With the exception of palmitooleic acid C^1_{16}, which was found in higher concentration in fat possessed from pure bred of pigs. Higher content of fatty acids with one unsaturated bond as well as the tendency to have higher content of oleic acid C^1_{18} showed on higher nutritional value of backfat from CB animals.

TABLE 2. Saturated fatty acids content in lipid fraction from backfat (%), n=20.

Fatty acids	Experimental group				LSD
	PLW		Crossbred		
	$\bar{x}$	SD	$\bar{x}$	SD	
C^0_{10} caprinic (%)	0.16	0.05	0.14	0.02	0.04
C^0_{12} laurynic (%)	0.12	0.02	0.12	0.03	0.03
C^0_{14} miristic (%)	1.99	0.24	1.87	0.27	0.24
C^0_{16} palmitic (%)	30.96	1.74	29.37	2.52	2.03
C^0_{17} margarinic (%)	0.21	0.09	0.23	0.08	0.08
C^0_{18} stearic (%)	15.12	0.92	14.71	1.12	0.97
Sum of saturated fatty acids	48.56	-	46.44	-	-

Mean values denoted by different superscripts between columns within rows differ significantly from each other (a, b – $p \leq 0.05$)

TABLE 3. Unsaturated fatty acids content in lipid fraction from backfat (%), n=20.

Fatty acids	Experimental group				LSD
	PLW		Crossbred		
	$\bar{x}$	SD	$\bar{x}$	SD	
C^1_{16} palmitoleic (%)	0.27b	0.04	0.22a	0.05	0.05
C^1_{18} oleic (%)	36.03	2.50	37.98	5.25	3.87
C^2_{18} linoleic (%)	13.27	1.05	13.31	1.71	1.34
C^3_{18} linolenic (%)	1.03	0.10	1.06	0.15	0.12
C^1_{20} eicosenic (%)	0.52	0.17	0.60	0.13	0.14
C^2_{20} eicosadienoic (%)	0.32	0.08	0.39	0.10	0.08
Sum of unsaturated fatty acids	51.44	-	53.56	-	-
Monounsaturated	36.82		38.80		
Polyunsaturated	14.62		14.76		
DFA (UFA+$C_{18:0}$)	66.56		68.27		
OFA ($C_{14:0}$+$C_{16:0}$)	32.95		31.24		

Mean values denoted by different superscripts between columns within rows differ significantly from each other (a, b – $p \leq 0.05$)

The results collected in this study were comparable to those published by van Laack & Spencer [1999], whose stated that pigs genotype had only minor effect on fatty acids profile (SFA, MUFA, PUFA) analysed in fatteners meat. Literature data pointed the significant influence of feeding modification on fatty acids composition of animals carcasses [Migdał & Kaczmarczyk, 1993; Niculita *et al*., 2007; Noci *et al*., 2007; Duynisveld *et al*., 2006; Migdał *et al.,* 1997, 1998; Morgan, 1992]. Some authors claimed that CLA content in meat is dependent from 75% to 90% on animal feeding status [Pariza *et al*., 2001]. Conjugated linoleic acid level in meat is affected by the presence of plant oils and plant seeds rich in PUFA [Noci, 2007; Morgan, 1992]. In this experiment all fatteners were fed with standard fodder, so any differences observed in fatty acids profile could be caused only by genetic diversity.

Subcutaneous fat obtained from CB carcasses was characterised by higher toughness and higher melting as well as solidifying temperatures than backfat from pure bred pigs, which represented a good technological prosperities and possibility to use this material in further processing (Table 1). Due to the fact that backfat from CB animals was rich in polyunsaturated fatty acids, the only explanation of higher toughness of the material was specific microstructure of fatty tissue, which was probably characterised by specific structure of the connective tissue.

Sensory analysis is the key point in quality evaluation of foodstuffs. Lard produced by melting of backfat from crossbred animals was characterised by higher sensory scores than fat from control group within all analysed parameters. Crossbred of domestic pig with wild boar produced lard with intensive white colour, which is highly desirable by the consumers (Table 4). Moreover, fat from CB animals was characterised by higher intensity and desirability of specific lard flavour. Despite the higher sensory scores obtained for lard from CB when analysing taste intensity and desirability, statistically significant differences ($p \leq 0.05$) were observed only for taste intensity. There were no differences in consistency between groups of experimental material. The overall sensory acceptance was higher for lard produced by crossbred animals in

TABLE 4. Sensory characteristics of lard possessed from PLW pigs and crossbred of PLW with wild boar (points), n=20.

Parameters	Experimental group				LSD
	PLW		Crossbred		
	$\bar{x}$	SD	$\bar{x}$	SD	
Colour intensity	4.90a	0.09	4.99b	0.03	0.07
Colour desirability	4.95a	0.07	5.00b	0.00	0.05
Flavour intensity	4.92b	0.10	5.00a	0.00	0.07
Flavour desirability	4.92	0.08	4.99	0.03	0.06
Taste intensity	4.95a	0.07	5.00b	0.00	0.05
Taste desirability	4.80	0.32	5.00	0.00	0.21
Consistency desirability	4.92	0.15	4.99	0.03	0.11
Overall sensory desirability	4.89a	0.15	4.99b	0.01	0.08

Mean values denoted by different superscripts between columns within rows differ significantly from each other (a, b – $p \leq 0.05$)

comparison to control pigs. The average value of overall sensory acceptance for lard from CB was close to a maximum acceptability.

CONCLUSIONS

Subcutaneous fat obtained from crossbred of domestic pig with wild boar is characterised by the tendency to have higher content of unsaturated fatty acids as well as saturated fatty acids with low molecular weight. CB animals produced tougher fat, which melts and solidifies at higher temperatures than obtained from domestic pigs. Such properties of fat from crossbred animals make it useful for further processing.

REFERENCES

1. Berge P., Lepetit J., Renerre M., Touraille C., Meat quality traits in the emu (*Dromaius novaehollandiac)* as affected by muscle type and animal age. Meat Sci., 1997, 45, 209-221.
2. Chin S.F., Liu W., Storkson J.M., Ha Y.L., Pariza M.W., Dietary sources of conjugated linoleic acid, a newly recognised class of anticarcinogens. J. Food Comp. Anal., 1992, 5, 185-197.
3. Cieciura L. Techniki stosowane w mikroskopii elektronowej. 1989, PWN, Warszawa, pp. 20-40 (in Polish).
4. Duynisveld J.L., Charmley E., Mir P., Meat quality and fatty acid composition of pasture-finished beef steers fed barley and soybeans. Can. J. Anim. Sci., 2006, 86, 535-545.
5. Ha Y.L., Grimm N.L., Pariza M.W., Anticarcinogens from fried ground beef: heat altered derivatives of linoleic acid. Carcinogenesis, 1987, 8, 1881-1887.
6. Hoffman L.C., Kritzinger B., Ferreira A.V., The effects of region and gender on the fatty acid, amino acid, mineral, myoglobin and collagen contents of impala (*Aepyceros melampus*) meat. Meat Sci., 2005, 69, 551-558.
7. Jarczyk J. Factors influencing the improvement of fatteners meatiness and profitability of their production. Trzoda Chlewna, 1996.11, 16-20 (in Polish).
8. Jerez-Timaure N., Arenas de Moreno L., Colmenares C., Navas-Sanchez Y., Canonical correlations between mineral content and meat quality traits of buffalo and zebu-type cattle. 52nd ICOMST, 2006, pp. 725-726.
9. Kozdrowski R., Dubiel A., The effect of season on the properties of wild boar (*Sus scrofa*) semen. Anim. Reprod. Sci., 2004, 80, 281-289.
10. McGandy R.B., Hegsted D.M., Quantitative effects of dietary fat and cholesterol on serum cholesterol in man. 1975, *in*: The Role of Fats in Human Nutrition (ed. Vergroesen A.J.) Academic Press, London, pp. 211-230.
11. Migdał W., Borowiec F., Koczanowski J., Furgał K., Klocek C., Kamiński J., Milewska B., Stawarz M., Changes in fatty acid kontent of back and internal fat in gilts-fatteners fed with crude or steam-treated rapeseeds. Zesz. Nauk. AR Kraków, 1998, 345, 33-43 (in Polish; English abstract).
12. Migdał W., Furgał K., Koczanowski J., Borowiec F., Kamiński J., Klocek C., Effect of various doses of Erafet on back and internal fat quality in gilts. Zesz. Nauk. AR Kraków, 1997, 323, 65-73 (in Polish; English abstract).
13. Migdał W., Kaczmarczyk J., Composition of fatty AIDS in the fat of fatteners fed with post-refining fatty acids. Zesz. Nauk. AR Kraków, 1993, 283, 91-98 (in Polish; English abstract).
14. Morgan C.A., Manipulation of the fatty acid composition of pig meat lipids by dietary means. J. Sci. Food. Agric., 1992, 58, 357--368.
15. Niculita P., Popa M.E, Ghidurus M., Turtoi M., Effect of vitamin E in swine diet on animal growth performance and meat quality parameters. Pol. J. Food Nutr. Sci., 2007, 57, 125-130.
16. Noci F., Monahan F.J., Scollan N.D., Moloney A.P., The fatty acids composition of muscle and adipose tissue of steers offered unwilted or wilted grass silage supplemented with sunflower oil and fishoil. Brit. J. Nutr., 2007, 97, 502-513.
17. Paleari M.A., Camisasca S., Beretta G., Renon P., Corsico P., Bertolo G., Crivelli G., Ostrich meat: physicochemical characteristics and comparison with turkey and bovine meat. Meat Sci., 1998, 48, 205-210.
18. Pariza M.W., Park Y., Cook M.E., The biologically active isomers of conjugated linoleic acid. Prog. Lipid Res., 2001, 40, 283-298.
19. PN-61/A-86927. Edible fats – Analytical methods – Evaluation of solidifying temperature (in Polish).
20. PN-73/A-83111.1973. Meat and meat products. Analysis of fat content (in Polish).
21. PN-ISO 6321:2000. Oils and plant and animal lipids – Analysis of melting point in open capillary (in Polish).
22. PN-ISO 6658.1998. Sensory analysis. Methodology. General guideline (in Polish).
23. Romans J.R., Costello W.J., Carlson C.W., Greaser M.L., Jones K.W., The meat we eat. International Publishers, Inc., Danville, 1994, pp. 464.
24. Szczepański J., Szmańko T., Korzeniowska M. Characteristics of carcass traits and physicochemical properties of meat from crossbreed of pig with wild boar. Anim. Sci., 2007, 58, 134-135.
25. Szmańko T., Szczepański J., Korzeniowska M. Culinary and technological usefulness of meat from crossbreed of pig with wild boar. Anim. Sci., 2007, 58, 136-137.
26. Szyndler-Nędza M., Mucha A., Changes in boar backfat and loin muscle thickness as related to body weight and carcass meat percentage. Ann. Anim. Sci., 2006, 6, 271-276.
27. van Laack R.L.J.M., Spencer E., Influence of swine genotype on fatty acid composition of phospholipids in *Longissimus* muscle. J. Anim. Sci., 1999, 77, 1742-1745.
28. Von Arneth W. Lebt länger, wer das Richtige isst? Fleischwirtsch., 2007, 87, 102-106.
29. Walkiewicz A., Wielbo E., Matyka S., Babicz M., Burdzanowski M., Technological value of meat and fat of „Broiler-Grill" class piglets from siamese pig and hybrids with PWL breed. Annales Universitatis Mariae Curie-Skłodowska Lublin-Polonia, XVIII, 2000, 11, 77-85 (in Polish).
30. Walkiewicz A.,Wielbo E.,Stasiak A., Kamyk P., Baranowska M., A fatty acids profilic in loin and ham of wild boar (*Sus scrofa*) meat. 1994, *in*: Proceed. Conf.: On Influence of Genetic Traits on Carcass and Meat Quality. Siedlce, pp. 7-8.
31. Wielbo E., Walkiewicz A., Matyka S., Burdzanowski J., Babicz M., Effect of wild boar (*Sus scrofa*) blood share wild pig slaughter mass on Qualitative properties of slaughter material. Ann. Univ. Mariae Curie-Skłodowska Lublin-Polonia, 2000, 11, 69-76 (in Polish).
32. Żmijewski T., Korzeniowski W., Technological properties of wild boars meat. EJPAU. Food Sci. Technol., 2001, 4, 2.

CHARAKTERYSTYKA TECHNOLOGICZNA I ŻYWIENIOWA TŁUSZCZU MIESZAŃCÓW ŚWINI (WIELKA BIAŁA POLSKA) Z DZIKIEM

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Celem badań było ustalenie w jakim stopniu modyfikacja genotypu szlachetnej rasy świń przez wprowadzenie 25% genów dzikiego przodka ma wpływ na wartość żywieniową i przydatność technologiczną tłuszczu podskórnego mieszańców. Materiałem doświadczalnym było 20 tusz tuczników mieszańców (CB), loch rasy wielkiej białej polskiej (PLW) z dzikiem (WB) (*Sus scrofa ferus*). Genotyp mieszańców zawierał 75% genów PLW i 25% genów WB. Grupę kontrolną stanowiły tuczniki rasy PLW. Każda grupa składała się z 50% loszek i 50% wieprzków. Do badań wykorzystano grzbietowy tłuszcz podskórny, mięsień najdłuższy klatki piersiowej *m. longissimus thoracis* (LT) i mięsień półbłoniasty *m. semimembranosus* (SM). Wykonano analizę zawartości tłuszczu śródmięśniowego w mięśniach LT i SM, pomiary grubości tłuszczu podskórnego, twardości słoniny, temperatury krzepnięcia i topnienia tłuszczu. Przeprowadzono analizy profilu kwasów tłuszczowych oraz sensoryczną wytopionego ze słoniny smalcu. Na podstawie przeprowadzonych badań stwierdzono, że tłuszcz podskórny otrzymany z tusz mieszańców świni domowej z dzikiem charakteryzował się wyższą zawartością kwasów tłuszczowych nienasyconych oraz niższą kwasów nasyconych w porównaniu do tłuszczu świń rasy PLW. Ponadto, tłuszcz mieszańców był twardszy, a temperatury krzepnięcia i topnienia były wyższe niż dla tłuszczu tuczników rasy PLW. Właściwości te w połączeniu z wysoką oceną sensoryczną czynią go bardzo cennym surowcem do przetwórstwa.