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REVIEW ARTICLE

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MEAT PERFORMANCE OF WATER BUFFALOES (*BUBALUS BUBALIS*)

UŻYTKOWANIE MIĘSNE BAWOŁÓW WODNYCH (*BUBALUS BUBALIS*)

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Streszczenie. W ostatnich latach wraz ze wzrostem zainteresowania rolnictwem proekologicznym wzrosło zainteresowanie tym gatunkiem zwierząt. Światowa produkcja mięsa bawolego wynosi 4,9 mln t rocznie. Przyrosty dzienne bawołów wodnych, użytkowanych w kierunku mięsnym, wynoszą średnio 0,772 kg. Zwierzęta ubijane są w wieku 16–18 miesięcy. Bawola wołowina jest porównywalna, pod względem cech fizykochemicznych, sensorycznych oraz wartości odżywczej, z mięsem bydła domowego. U bawołów nie stwierdzono do tej pory BSE (ang. Bovine Spongiform Encephalopathy) – gąbczastego zwyrodnienia mózgu.

Key words: *Bubalus bubalis*, carcass, meat production, water buffalo.
Słowa kluczowe: bawół wodny, *Bubalus bubalis*, tusza, użytkowanie mięsne.

INTRODUCTION

There is no written information on buffalo keeping in Poland in the 20th century. In recent years a rediscovery of the merits of water buffalo can be observed in Poland along with development of pro-ecological trends in agriculture. However, this species is believed to be less flexible in its adaptation to climatic conditions than cattle (Antkowiak et el. 2012). It is possible to keep cattle of this sort throughout the year on wet fields where breeding of domestic cattle is impossible (*Bos taurus*). A typical feature of these animals is their substantial immunity to illnesses (Sivakumar et al. 2006) and ability to feed on large amounts of cheap fodder while utilizing feed components well. They are valued in many countries for unique attributes of their milk (Czerniawska-Piątkowska et al. 2010).

Buffalo meat has gained importance in the recent years because of its domestic usage and export potential. Buffalo meat is comparable to beef in many of its physicochemical, nutritional and functional properties and sensory attributes (Kandeepan et al. 2009a).

The aim of this paper was to outline the meat performance of water buffalo (*Bubalus bubalis*) and comparison of meat of water buffalo and domestic cattle.

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MEAT PRODUCTION

The world-wide production of buffalo meat is 4,9 million tons (FAO 2013). Buffaloes are raised for meat particularly in countries like Italy, Bulgaria, Czech, Slovakia, Egypt (Kandeepan et al. 2009b), South America, Asia and also in extremely cold climate (e.g. Caucasus). The largest producer of this meat is India, which produces 4.7 milion tons of buffalo meat annually, taking eighth place in the ranking of the world's meat production (Högberg and Lind 2003, Borghese 2005).

The pasture production systems reveal each time more competitive, not only for the low costs of production, but also for the possibility to offer meat produced in the forage, transforming forage grasses in animal protein in a system where if it values the social evolvement, preserve the environment and is related with animal welfare (Jorge and de Lima Francisco 2010). Högberg and Lind (2003) point to the fact that the basic food of buffaloes ore bulky feeds, i.e. hay or haylage. Among papilionaceous plants, lucerne and clover are most suitable.

According to Perera (2008) reproduction of water buffalos (*Bubalus bubalis*) does not differ substantially from reproduction of domestic cattle (*Bos taurus*). Buffalos mature late (Zoheir et al. 2007). Females are sexually mature at the age of 15–18 months and ready to reproduce when they are 24–36 months old (Barile 2005). Ingawale and Double (2004) claim, however, that females are ready to reproduce aged 36–42 months. When mating heifers, the breeder must consider not only their age, but also their weight. For the first mating or insemination, they should weigh between 250 and 275 kg (Barile 2005). The first calving takes place when heifer is approximately 37–40 months old (Högberg and Lind 2003). When born, calves weigh between 35 and 40 kg (Popenoe et al. 1984).

In herd of 10–12 females attend by a one male (Bubalus arnee. Asian water buffalo, http://www.ultimateungulate.com/Artiodactyla/Bubalus_arnee.html).

Daily increase of water buffalo used in the meat performance averages 0.772 kg. Animals are slaughtered at the age of 16–18 months. When the females at the age of 18 months may weight 455 kg, and males 490 kg. The buffaloes had lower yield (53.3%) than the cattle. Percentage of meat, bone and fat in carcass is as follows: 62.00%, 16.87%, 21.13% (Borghese 2005). According to Jorge and de Lima Francisco (2010) (Table 1) percentage of meat, bone and fat in carcass decreases with increase in body weight, but increases the bone part.

Table 1. Carcass traits from water buffaloes (*Bubalus bubalis*) according to slaughter live weight
Tabela 1. Cechy tuszy bawołów wodnych (*Bubalus bubalis*) w zależności od ubojowej masy ciała

Traits Cechy	Slaughter live weight Ubojowa masa ciała (kg)			
	450	480	510	540
Muscle Mięśnie (%)	53.4	52.5	51.6	50.8
Fat Tłuszcz (%)	30.0	31.3	32.6	33.9
Bone Kości (%)	16.6	16.2	16.1	15.3
Muscle: bone Mięśnie: kości	3.25	3.28	3.30	3.32

Źródło – Source: Jorge, de Lima Francisco (2010).

"Buffalo Beef" is a company in Capua (Campania region) that produces a lot of typically Italian buffalo meat products: bresaola, sausages, cacciatorini (very little salami), salami, ham or dry meat etc. (Borghese 2005). At present Italian breeders are trying to produce high quality meat for the luxury market (restaurants and gourmet food) adopting a production protocol in accordance with the IGP symbol (Indication of Protected Geographic Origin) – Borghese (2005).

Pragmatic approaches for efficient livestock production and utilization are important to sustain livestock production activities. Sustainable animal production depends on: feed supplies and costs, production efficiency and optimum utilization of produce. They further depend on hygienic production of milk and meat, value addition and diversification, better utilization of by products, cost efficient processing technology, creating sustained demand for the products, building positive image and innovative marketing approach (Anjaneyulu et al. 2007).

Fig. 1. Water buffalo on the pasture (photo Ewa Chociłowicz)
Rys. 1. Bawół wodny na pastwisku (fot. Ewa Chociłowicz)

BUFFALO MEAT

Water buffalo meat is a very good alternative for cattle beef.

Chemical parameters of *Bubalus bubalis* and *Bos taurus* meat contains Table 2 (Borghese 2005). The buffalo meat is 8.70% less fat than beef meat. It is also less of cholesterol and fatty acids. About 45.33% is lower than the energy value of the raw meat.

Table 2. Chemical composition of *Bubalus bubalis* and *Bos taurus* meat (100 g)
Tabela 2. Skład chemiczny mięsa *Bubalus bubalis* i *Bos taurus*

Meat's trait Cecha mięsa	*Bubalus bubalis*	*Bos taurus*
Protein Białko (g)	26.83	24.07
Total fat Tłuszcz ogółem (g)	1.80	20.69
Saturated fatty acid (SFA) Nasycone kwasy tłuszczowe (SFA) (g)	0.60	8.13
Monosaturated fatty acid (MUFA) Jednonienasycone kwasy tłuszczowe (MUFA) (g)	0.53	9.06
Polysaturated fatty acid (PUFA) Wielonienasycone kwasy tłuszczowe (PUFA) (g)	0.36	0.77
Cholesterol Cholesterol (mg)	61.00	90.00
Minerals Składniki mineralne (mg)	641.80	583.70
Vitamins Witaminy (mg)	20.95	18.52
Calories Wartość energetyczna (kcal)	131.00	289.00

Źródło – Source: Borghese (2005).

The meat of *Bubalus bubalis* has more protein, minerals and vitamins. The comparison shows that buffalo meat has a higher nutritional value than meat derived from domestic cattle. Fonseca et al. (2005) have noted that buffalo meat contains less fatty SFA and PUFA compared with beef, sheep and poultry.

According to Jorge (1999) the meat of Bubalus bubalis is of higher nutritional value as it contains 40% less cholesterol, 55% less calories, 11% more protein, 10% more minerals and 2% more vitamins in comparison to bovine meat. *Bubalus bubalis* meat texture is similar to the texture of meat *Bos taurus*. Buffalo meat is a lighter color, but the slaughter of the animal quickly darkens (Soares et al. 1995, Dosi et al. 2006). Muscle pH has 6.2 at slaughter, after 24 hours the pH is 5.7 (Borghese 2005). Buffalo meat is more tender than beef, even after frying, baking and cooking (Borghese 2005, Neath et al. 2007).

Furthermore, until now Bovine Spongiform Encephalopathy (BSE) has never been observed in water buffalo (Dosi et al. 2006).

REFERENCES

Anjaneyulu A.S.R., Thomas R., Kondaiah N. 2007. Technologies for value added buffalo meat products-A Review. Am. J. Food Technol. 2, 104–114.

Antkowiak I., Pytlewski J., Purczyńska A., Skrzypek R. 2012. A preliminary study of the behavior of water buffalo (*Bubalus Bubalis*) imported to Poland. Archiv. Tierzucht. 55 (5), 415–419.

Barile V.L. 2005. Reproductive Efficiency in Female Buffaloes [in: Buffalo production and research]. Chapter IV. Rome, FAO, 77–108.

Borghese A. 2005. Buffalo Cheese and Milk Industry [in: Buffalo production and research]. Chapter X. Rome, FAO, 185–196.

Bubalus arnee. Asian water buffalo, http://www.ultimateungulate.com/Artiodactyla/Bubalus_arnee.html, dostęp dn. 29.05.2013.

Czerniawska-Piątkowska E., Chociłowicz E., Szewczuk M. 2010. Biology of *Bubalus bubalis.* Ann. Anim. Sci. 10 (2), 107–115.

Dosi R., Di Maro A., Chambery A., Colonna G., Costantini S., Geraci G., Parente A. 2006. Characterization and kinetics studies of water buffalo (Bubalus bubalis) myoglobin. Part B. Comp. Biochem. Physio. 14, 230–238.

FAO. 2013. Buffalo production and reseaarch, http://www.fao.org/, dostęp dn. 28.05.2013.

Fonseca D.M., Prado I.N., Visentainer J.V., Matsushita M., Souza N.E. de 2005. Longissimus dorsi chemical composition and fatty acid profile in Murrah Buffalo (*Bubalus bubalis*) heifers in Drylot with hormonal implementation and lead spheres in the uteru. J. Anim. Vet. Adv. 4 (4), 462–466.

Högberg M.S., Lind O. 2003. Buffalo milk production, www.milkproduction.com/Library/Articles/ Buffalo_Milk_Production, dostęp dn. 29.05.2013.

Ingawale M.V., Double R.L. 2004. Buffalo reproduction in India: An Overview. Buffalo Bull. 23 (1), 4–9.

Jorge A.M. 1999. Water buffalo in Brazil [in: Report buffalo production sector]. Rome, FAO.

Jorge A.M., Lima Francisco C. de. 2010. Predicting beef carcass quality of buffaloes [in: International Buffalo Conference on "Optimizing buffalo productivity through conventional and novel technologies"], New Delhi, India, February 1–4, 2010. New Delhi, India, Food and Animal Organization of the United Nations, 217–233.

Kandeepan G., Anjaneyulu A.S.R., Kondaiah N., Mendiratta S.K., V. Lakshmanan V. 2009a. Effect of age and gender on the processing characteristics of buffalo meat. Meat. Sci. 83, 10–14.

Kandeepan G., Biswas S., Rajkumar R.S. 2009b. Buffalo as a potential food animals. Int. J. Livest. Prod. 1 (1), 001–005.

Neath K.E., Del Barrio A.N., R.M. Lapitan R.M., Herrera J.R.V., Cruz L.C., FujiharaT., Muroya S., Chikuni K., Hirabayashi M., Kanai Y. 2007. Relation of postmortem protease activity to tenderness in buffalo meat and Brahman beef. Ital. J. Anim. Sci. 6 (2), 1175–1177.

Perera O. 2008. Reproduction in domestic buffalo. Reprod. Domestic Anim. 43 (2), 200–206.

Popenoe H., Bennett S.P., Chantalakhana C., Charles D.D., Cockwill W.R., Cripe W., Cunha T.J., De Boer A.J., Drost M., El-Ashry M.A., Ferrerd A., Gardner J.K., Hentges J.F., Howarth J., Konnerup N.M., Pleonards A., Loosli J.K., Madamba J., Nascimento C., Plucknett D.L., Pritchard W.R., Reid J.T., Schottler J.H., Singh Dev D., Touchberry R.W., Tulloch D.G., Vietmeyer N.D., Engquist M.J. 1984. The water buffalo: New prospectes for an underitilized animal. Report. Boston, National Research Council, 128–135.

Sivakumar P., Tripathi P.N., Singh N., Sharma A.K. 2006. Pathology of naturally occurring paratuberculosis in water buffaloes (*Bubalus bubalis*). Vet. Pathol. 43, 455–462.

Soares G.J.D., Arêas J.A.G., Batistuti J.P. 1995. Effect of high voltage electrical stimulation on buffalo meat conditioning. Rev. Bras. Agrociênca 1 (2), 61–68.

Zoheir M.A., Abdoon A.S., Mahrons K.F., Amer M.A., Zaher M.M., Yang L., El-Nahass E.M. 2007. Effect of season on the quality and in vitro maturation rate of Egyptian buffalo (*Bubalus bubalis*) oocytes. J. Cell. Anim. Biol. 1 (2), 029–033.

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