

AGNIESZKA BARTNIK

 [HTTPS://ORCID.ORG/0000-0003-3518-1318](https://orcid.org/0000-0003-3518-1318)

AGNIESZKA.BARTNIK@US.EDU.PL

University of Silesia in Katowice

Faculty of Humanities

Institute of History

Feeding pigs in ancient Rome

Żywnienie trzody chlewnej w starożytnym Rzymie

Summary: Pigs were popular farm animals in ancient Rome. They were bred to obtain meat, fat and as sacrificial animals. The ancients believed that pigs were relatively low maintenance and, therefore, recommended keeping at least a few on the farm. The diet of pigs was similar to wild boars'. The Romans preferred to put pigs to pasture, but at the same time, they emphasized that animals should have access to wetlands, food of animal origin and highly diverse plant food. The works of agronomists note numerous plant species that should be native to the regions intended for pig grazing. In the autumn-winter period, the diet of pigs was supplemented by feeding acorns, leaves, chaff, etc. A separate diet based on barley or roasted wheat was used in the case of sows and piglets. The activities of the breeders were aimed at increasing the milk production of sows and ensuring the healthy development of piglets. The way pigs were fed in ancient Rome indicates the considerable knowledge of the breeders of that time. The preferred diet not only provided nutrient-rich food, but it also helped to keep the animals in good shape.

Keywords: pigs, breeding, nutrition, pastures, ancient, Rome

Streszczenie: Świnie były popularnymi zwierzętami hodowanymi w starożytnym Rzymie. Hodowano je w celu pozyskania mięsa, tłuszczu oraz jako zwierzęta ofiarne. Antyczni uważali, że świnie należą do stosunkowo niekłopotliwych w utrzymaniu zwierząt i dlatego zalecali trzymanie w gospodarstwie przynajmniej kilku sztuk. Dieta świń była zbliżona do sposobu odżywiania dzików. Rzymianie preferowali trzymanie świń w trybie pastwiskowym, jednak równocześnie podkreślali, że zwierzęta powinny mieć dostęp do mokradeł, pokarmu pochodzenia zwierzęcego oraz mocno zróżnicowanego pokarmu roślinnego. W pracach agronomów wymieniono liczne gatunki roślin,

które powinny występować na obszarach przeznaczonych pod wypas świń. W okresie jesienno-zimowym dieta świń była uzupełniana poprzez skarmianie żołądźi, liści, plew itd. Odrębną dietę opartą m.in. na jęczmieniu czy prażonej pszenicy stosowano w przypadku macior i prosiąt. Działania hodowców miały na celu zwiększenie mleczności macior oraz zapewnienie lepszego rozwoju prosiąt. Sposób żywienia świń w starożytnym Rzymie wskazuje na dużą wiedzę ówczesnych hodowców. Preferowana dieta nie tylko zapewniała bogate w składniki odżywcze pożywienie, ale także pozwalała utrzymać zwierzęta w dobrej kondycji.

Słowa klucze: świnie, hodowla, żywienie, pastwiska, starożytność, Rzym

The domestic pig (*Sus domestica*) is a domesticated form of the wild boar, a large mammal in the *Suidae* family. It was subject to so-called polytopic domestication, meaning that domestication efforts were undertaken in different parts of the world, at different times.¹ In the case of the pig, one or several centers of domestication cannot be clearly identified as it was a widespread process occurring wherever the right conditions were met, that is, wild boars existed in the region and humans were willing to initiate domestication.² The aforementioned method of domestication stemmed from the fact that the wild boar was a ubiquitous species. It populated Europe, Asia and North Africa. There are dozens of subspecies of the wild boar, which is a result of the adaptation of the species to local conditions. The ancestors of the pigs farmed during European and Asian antiquity are quite commonly considered to be subspecies of the Eurasian wild pig, including the European wild boar (*Sus scrofa scrofa*) found in Europe and North Africa, and the Asian ones: the Indian wild boar (*Sus scrofa cristatus*) and the banded pig (*Sus scrofa vittatus*). Boars are omnivorous, feeding on acorns, beechnuts, tuberous plants, rhizomes, fungi, earthworms, insects, rodents and even carrion.³

1 T. Cucchi et al., "Early Neolithic pig domestication at Jiahu, Henan Province, China: clues from molar shape analyses using geometric morphometric approaches," *Journal of Archaeological Science* 2011, vol. 38, pp. 11–13; G. Larson et al., "Worldwide Phylogeography of Wild Boar Reveals Multiple Centers of Pig Domestication," *Science* 2005, vol. 307, pp. 1618–1620; U. Albarella, S. Pyne, "Neolithic pigs from Durrington Walls, Wiltshire, England: a biometrical database," *Journal of Archaeological Science* 2005, vol. 32, p. 590.

2 U. Albarella, K. Dobney, P. Rowley-Conwy, "The domestication of the pig (*Sus scrofa*): new challenges and approaches," [in:] *Documenting domestication: new genetic and archaeological paradigms*, eds. M.A. Zeder, D.G. Emshwiller, B.D. Smith, Berkeley 2006, pp. 209–210.

3 A. Rekiel, M. Sońta, "Baza pokarmowa przedstawicieli rodziny świniowate (Suidae)," *Przegląd Hodowlany* 2019, no. 1, p. 16; G. Massei, P.V. Genov, "The Environmental impact of wild boar," *Galemys* 2004, no. 16, pp. 136–139; M. Dardaillon, "Seasonal feeding habits of the wild boar in a Mediterranean Wetland, the Camargue (Southern France)," *Acta Theriologica* 1987, vol. 32, pp. 393–396.

The domesticated pig gained new morphological features: its skeleton became smaller and more delicate, its teeth grew smaller, and its skull became broader, with a short front section and a collapsed profile.⁴ Down hairs disappeared, while multicolored coat and patches appeared, and striation faded in piglets.⁵ The ears became floppy, the tail hairless and curled, and the length of the intestines increased.⁶

The earliest skeletal material showing domestication traits dates from the 9th to 8th centuries BC and comes from the Middle Eastern site of Çemi Hallan.⁷ However, a notable spread of pig breeding and an increase in the number of sites where the remains of these animals can be found had not occurred until the 7th century BC.⁸ In earlier periods, domestication was not consistent; occurring sporadically, it was interspersed with periods when pigs were not raised at all.⁹

The earliest traces of the presence of pigs in Europe are dated to around 6500 BC – and based on analysis of bone material, it was considered local domestication.¹⁰ In the prehistoric period in the Central European Plain, pigs were not

- 4 C. Lega et al., “Size matters: A comparative analysis of pig domestication,” *The Holocene* 2016, vol. 26, pp. 327–332; J. Owen et al., “The zooarcheological application of quantifying cranial shape differences in wild boar and domestic pigs (*Sus scrofa*) using 3D geometric morphometric,” *Journal of Archaeological Science* 2014, vol. 43, pp. 159–167; A. Evin et al., “The long and winding road: identifying pig domestication through molar size and shape,” *Journal of Archaeological Science* 2013, vol. 40, pp. 735–743.
- 5 M. Fang et al., “Contrasting mode of evolution at a coat color locus in wild and domestic pigs,” *PLoS Genetics* 2009, vol. 5, pp. 1–6.
- 6 M.D. Price, A. Evin, “Long-term morphological changes and evolving human-pig relations in the northern Fertile Crescent from 11,000 to 2000 cal. BC,” *Archaeological and Anthropological Sciences* 2019, vol. 11, pp. 241–245.
- 7 S. Weber, M.D. Price, “What the pig ate: A microbotanical study of pig dental calculus from 10th–3rd millennium BC northern Mesopotamia,” *Journal of Archaeological Science: Reports* 2016, vol. 6, p. 821; B.M. Starkovich, M.C. Stiner, “Halan Çemi Tepesi: High-ranked Game Exploitation alongside Intensive Seed Processing at the Epipaleolithic-Neolithic Transition in Southeastern Turkey,” *Anthropozoologica* 2009, vol. 44, pp. 42–44; B.L. Peasnell et al., “Hallan Çemi, pig husbandry, and post-Pleistocene adaptations along the Taurus-Zargos Arc (Turkey),” *Paléorient* 1998, vol. 24, pp. 35–41.
- 8 A. Lasota-Moskalewska, *Zwierzęta udomowione w dziejach ludzkości*, Warszawa 2005, p. 137.
- 9 M. Price, H. Hongo, “The Archaeology of Pig Domestication in Eurasia,” *Journal of Archaeological Research* 2020, vol. 28, pp. 606–615; M. Fang, L. Andersson, “Mitochondrial diversity in European and Chinese pigs is consistent with population expansions that occurred prior to domestication,” *Proceedings of the Royal Society B. Biological Sciences* 2006, vol. 273, pp. 1803–1810; E. Giuffa et al., “The Origin of the Domestic Pig: Independent Domestication and Subsequent Introgression,” *Genetics* 2000, vol. 154, pp. 1785–1791.
- 10 G. Larson et al., “Ancient DNA, pig domestication, and the spread of the Neolithic into Europe,” *Proceedings of the National Academy of Sciences of the United States of America* 2007, vol. 104, pp. 15276–15281.

particularly popular. The situation changed in antiquity. In Egypt in the Predynastic and early Dynastic periods, these animals were of major economic importance,¹¹ and the ancient Greeks raised them on a large scale.¹²

A further increase in the significance of pig farming occurred in ancient Rome, where the animals were raised primarily for their meat, eaten after cooking or processed into various types of cured meats, although their fat, lard and blood were also used. Pork was one of the most popular meats on Roman tables. Numerous recipes for dishes prepared from pork were given by Apicius and Anthimius. Dishes were made from virtually all parts of the pig, while Galen, among others, considered it the most nutritious of all foods. Cured meats and hams prepared from pork were also frequently consumed.¹³

This article aims to discuss and analyze the extremely important issue of pig feeding in ancient Rome. Animal husbandry, including pig breeding, was at a high level. Breeders were aware of the individual needs and preferences of each animal species. They also attached great importance to their welfare, the preparation of suitable housing, their diet and health. Furthermore, they saw a connection between the feeding methods and the quality of the product. For this reason, an analysis

11 L. Bertini, E. Cruz-Rivera, "The size of ancient Egyptian pigs. A biometrical analysis using molar width," *Bioarchaeology of the Near East* 2014, vol. 8, pp. 83–86; R.A. Lobban, "Pigs in ancient Egypt," [in:] *Ancestors for the Pigs. Pigs in Prehistory*, ed. S.M. Nelson, Philadelphia 1998, pp. 114–140; H.M. Hecker, "A zooarchaeological inquiry into pork consumption in Egypt from prehistoric to the new kingdom times," *Journal of the American Research Center in Egypt* 1982, vol. 19, pp. 59–61.

12 P. Pakkanen, "Beyond Skin-deep: Considering the pig in ancient Greece through the particularities of its skin," *Kernos* 2021, vol. 34, pp. 123–158; P. Halestead, "A pig fed by hand is worth two in the bush: ethnoarchaeology of pig husbandry in Greece and its Archaeological implications," [in:] *Ethnozooarchaeology: the present and past of human-animal relationship*, eds. U. Albarella, A. Trentacoste, Oxford 2011, pp. 160–174.

13 Apicius, *De re coquinaria*, 8.7.1–17; Anthimius, 9–10. See more: Z. Rzeźnicka, "Rola mięsa w diecie okresu pomiędzy II a VII w. w świetle źródeł antycznych," [in:] *Dieetyka i sztuka kulinarna antyku i wczesnego Bizancjum (II–VII w.)*. Część II. Pokarm dla ciała i ducha, ed. M. Kokoszko, Łódź 1997, pp. 226–237; cf.: eadem, "Ham in Ancient and Byzantine Dietetics, Medicine and Gastronomy," [in:] *Tasting Cultures: Thoughts for Food*, ed. M.J. Pires, Oxford 2015, pp. 115–130. See also: Z. Rzeźnicka, M. Kokoszko, K. Jagusiak, "Cured Meats in Ancient and Byzantine Sources: Ham, Bacon and 'Tucchetum,'" *Studia Ceranea* 2014, vol. 4, pp. 252–259; M. MacKinnon, "High on the hog: linking zooarchaeological, literary and artistic data for pig breeds in Roman Italy," *American Journal of Archaeology* 2001, vol. 105, pp. 649–673; F. Frost, "Sausage and meat preservation in antiquity," *Greek, Roman and Byzantine Studies* 1999, vol. 40, pp. 243–247; M. Corbier, "The ambiguous status of meat in ancient Rome," *Food and Foodways. Explorations in the History and Culture of Human Nourishment* 1989, vol. 3, pp. 223–264.

of the methods of feeding pigs and an assessment of the impact of the methods used at the time on the condition of the animals can provide important information about the zootechnical knowledge of the ancient Romans and their ability to select a diet that was best-suited for particular groups of animals.

Pig breeding in ancient Rome was quite prevalent. They were probably kept on most farms, at least to meet a household's own needs. Pork was very popular, as were the meats made from it; the fat was used both in cooking and in human and veterinary medicine. It was believed that the owner of a farm should keep pigs, which is confirmed, e.g., by the account of Terentius Varro, who, referring to his ancestors, noted: "quis enim fundum colit nostrum, quin sues habeat, et qui non audierit patres nostros dicere ignavum et sumptuosum esse, qui succidiam in carnario suspenderit potius ab lanario quam e domestico fundo?"¹⁴ Lucius Junius Moderatus Columella added about the pigs: "nam ubi est ubertas pabuli, submittere prolem semper expedit."¹⁵ Pigs for breeding were selected carefully, paying attention to their age, coat color and conformation.¹⁶ Great importance was attached to the length and build of their legs. This issue was crucial due to the mobility of animals. It was also recommended that the breeds of pigs be selected according to the characteristics of the farms where they would be kept. For cold and mountainous areas, different breeds were recommended than for farms in coastal regions, plains or areas with higher temperatures.

Proper nutrition of pigs was of utmost importance, as the breeding goal was to achieve healthy animals raised to the appropriate weight, whose meat was characterized by tastiness and aroma. In ancient Rome, pigs were raised primarily for meat, and as a result, efforts were made to attain regular, rapid weight gains. Equally important was the question of the taste of the meat. The ancients were aware that the diet of animals could affect the taste of the meat or milk obtained from them. Galen and Pliny the Elder mentioned that feeding dried figs to the swine made their liver taste sweeter. Adding acorns and beechnuts to their diet was also said to have a positive effect on the quality of meat.¹⁷ Furthermore, the improper feeding of sows,

14 Varro, *Rerum rusticarum*, 2.4.3. "And who has not heard that our fathers called him lazy and extravagant who hung in his larder a flitch of bacon which he had purchased from the butcher rather than got from his own farm?"

15 Columella, *De re rustica*, 7.9.5. "For where there is abundance of fodder, it always pays to rear stock."

16 Varro, *Rerum rusticarum*, 2.4.3–5.

17 Varro, *Rerum rusticarum*, 2.4.6; Galen, *De alimentorum facultatibus*, 679.6–12, 620.9–11; Plinius, *Historia Naturalis*, 8.77.209, 16.8.25. Cf.: M. Karwowska, "Wpływ zastosowania ekstraktu lucerny w żywieniu świń na barwę mięsa," *Żywność. Nauka. Technologia. Jakość* 2008, vol. 15, pp. 282–287.

or farrowing sows or piglets could lead to a number of diseases, the treatment of which generated costs, thus reducing the profitability of breeding.¹⁸

Pigs are omnivorous animals, which means that the structure of their digestive system is adapted to take in and digest food of both plant and animal origin. Hence, their diet can include a wide set of feeds, such as green fodder, dried fodder, grains, and industrial/production waste, etc.¹⁹ The gastrointestinal tract of the pig is relatively short²⁰ as a result of which food content passes through it quickly, so the time required for digestion and absorption of food is shorter than in other livestock. Pigs take their food greedily, swallowing the fodder quickly without thoroughly breaking it down in the mouth. The fodder taken in such a manner lingers in the stomach, where digestive juices have little or no access to the chyme, resulting in poor utilization of nutrients. This affects pigs' health and productivity negatively. This issue is not only a problem nowadays – in ancient Rome breeders also had to face similar challenges.

The Romans tended to believe that pigs should be put to pasture. Humid places were considered particularly desirable, as pigs were thought to like not only water,

18 Improper feeding of piglets can cause hypoglycemia, anemia, immune disorders, diarrhea, parakeratosis and even sudden cardiac death. See A. Zaworska, "Choroby prosiąt spowodowane nieprawidłowym żywieniem," *Hodowca Trzody Chlewnej* 2012, no. 3–4, pp. 10–14; M. Pomorska-Mol, K. Kwit, "Niedokrwistość u prosiąt," *Weterynaria w Terenach* 2014, vol. 8, pp. 24–28; A. Kwit, A. Jabłoński, "Niedokrwistość prosiąt osesków," *Lecznica Dużych Zwierząt. Ogólnopolski Kwartalnik dla Lekarzy Weterynarii* 2011, vol. 6, pp. 29–32; J.R. Mroczek, "Niedokrwistość prosiąt – przyczyny i zapobieganie," *Hodowca Trzody Chlewnej* 2008, no. 1, pp. 14–16; Z. Trawal, "Hipoglikemia prosiąt – choroba osesków," *Top Agrar Polska* 1995, no. 3, pp. 54–55. In sows, dietary mistakes can lead to malnutrition, infertility and birth complications, cannibalism, gastric ulcers, gastric overload and the MMA syndrome. See: B. Fuchs, "Żywnienie świń," [in:] *Żywnienie zwierząt i paszoznawstwo. Podstawy szczegółowego żywienia zwierząt*, eds. D. Jamróz, A. Potkański, Warszawa 2013, pp. 243–244; K. Kotowski, "Bezmleczność poporodowa u loch (zespół MMA)," *Hodowca Trzody Chlewnej* 2011, no. 3, pp. 22–28; K. Kotowski, B. Kotowski, "Wybrane poglądy na występowanie zespołu MMA u loch, zapobieganie i leczenie," *Trzoda Chlewna* 2007, vol. 45, pp. 110–114.

19 B. Wojtaszczyk, "Żywnienie świń. Pasza gospodarska czy pełnoporcjowa?" *Farmer* 2018, no. 4, pp. 226–229; K. Lipiński, "Pszemica w żywieniu świń," *Trzoda Chlewna* 2014, vol. 52, pp. 39–43; M. Świątkiewicz, E. Hanczakowa, A. Olszewska, "Suszony zbożowy wywar gorzelniany (DDGS) w żywieniu świń," *Wiadomości Zootechniczne* 2014, vol. 52, pp. 141–153; P. Bieliński, "Żywnienie świń 'na mokro,'" *Hoduj z Głową – Świnie* 2011, no. 3, pp. 20–22; M. Kasproicz-Potocka, "Kukurudza w żywieniu świń," *Trzoda Chlewna* 2009, vol. 47, pp. 34–38; A. Mai-Kaldonska, "Prawidłowe żywienie świń," *Rada: Rolnictwo, Aktualności, Doradztwo, Analizy. Miesięcznik Wojewódzkiego Ośrodka Doradztwa Rolniczego w Bartoszewicach* 2008, no. 4, p. 19; A. Konarkowski, "Śruta słonecznikowa w żywieniu świń," *Trzoda Chlewna* 2007, vol. 45, pp. 56–61.

20 The total length of the digestive tract of an adult pig is 22–27 meters and has a capacity of 25–27 liters.

but also mud.²¹ Columella added that the pig could be grazed both in the mountains and the lowlands, although, like Terentius Varro, he stressed that the pig preferred muddy lands.²² The author of *De re rustica* mentioned that the best places for grazing pigs were groves with trees, such as the oak (*Quercus L.*), the cork oak (*Quercus suber L.*), the beech tree (*Fagus L.*), the Turkey oak (*Quercus cerris L.*), the evergreen oak (*Quercus ilex L.*), the wild olive (*Olea europaea var silvestris*), the terebinth tree (*Pistacia terebinthus L.*), and the hazel (*Corylus L.*), as well as wild fruit trees, including the Midland hawthorn (*Crataegus laevigata Poir.*), the carob (*Ceratonia siliqua L.*),²³ the common juniper (*Juniperus communis L.*), the bird's-foot trefoil (*Lotus L.*), the grape vine (*Vitis vinifera L.*), the dogwood (*Cornus L.*), the strawberry tree (*Arbutus uendo*), the plum tree (*Prunus L.*), the Chinese date (*Ziziphus jujuba*), and the wild pear (*Pyrus pyraster*).²⁴ The aforementioned group of plants was preferred due to their different fruiting seasons, which provided valuable, varied food throughout the year. Palladius made similar comments on pig feeding.²⁵ In places where there was no access to groves, pigs were to be grazed on muddy plains, so they could riffle in the swamp, pick earthworms, and in the summer, pull the roots of aquatic plants, such as the lakeshore bulrush (*Schoenoplectus lacustris L.*), club rush (*Scripus L.*) or reeds (*Phragmites L.*).²⁶ Pastures were the basis for feeding pigs during the summer. The animals were driven out in the morning before the heat arrived. They were led to a shady place with access to water.²⁷ Grazing was resumed after the midday heat subsided. Interestingly, the Romans also drove pigs out to pasture during the winter but not until the frost had cleared and the ice melted.

Based on the accounts of ancient authors, it is clear that there was a preference for the natural feeding of pigs with pasture greens, plants found in wetlands, various types of shrub twigs, and fruits of trees growing in groves. Such a method of feeding pigs was well thought out and also indicated the deep knowledge of breeders about the needs of the swine. The authors of agronomic works were aware that farms were located in various settings, which translated into differences with respect to access to water, native vegetation, etc. Given the variety of climatic conditions

21 Varro, *Rerum rusticarum*, 2.4.5.

22 Columella, *De re rustica*, 7.9.6.

23 The carob (*Ceratonia siliqua L.*) and the period of its sowing or planting seedlings were also mentioned by Palladius (*Palladius, Opus agriculturae*, 3.25.27).

24 Columella, *De re rustica*, 7.9.6.

25 Palladius, *Opus agriculturae*, 3.26.3.

26 Columella, *De re rustica*, 7.9.7; cf.: Palladius, *Opus agriculturae*, 3.26.3.

27 Varro, *Rerum rusticarum*, 2.4.6.

and locations of individual farms, it is clear that the recommendations were theoretical to some extent. However, their diversity suggests that they tried to ensure the welfare of animals regardless of the location of the farm. They stressed that pigs were not particularly picky about terrain, but should have access to water or mud. Agronomists also listed several plant species that should be included in pig foraging areas. In antiquity, plants popular in pig feeding included the cork oak (*Quercus suber* L.), the Turkey oak, also known as the Austrian oak (*Quercus cerris* L.), and the evergreen oak or holly oak (*Quercus ilex* L.). The cork oak is a common tree in the Mediterranean, the Austrian oak is found in southeastern Europe and Asia Minor, and the evergreen oak grows throughout the Mediterranean, so their leaves and acorns were readily available. Their acquisition did not require financial outlay, which made farming more profitable. Furthermore, the ancients believed that the consumption of acorns by pigs had a positive effect on the texture of pork.²⁸ Other plants commonly found in the Mediterranean were the wild olive (*Olea europaea* var. *silvestris*), the vine (*Vitis vinifera* L.), and terebinth trees (*Pistacia lerebinthus* L.). As in the case of oaks, access to them was relatively easy and did not generate costs for the farmer. The issue of “fruit trees,” which were recommended for feeding pigs, was similar. Interestingly, not all plants identified by agronomists as fruit trees meet these criteria. Among the fruit trees listed in the ancient messages were the Midland hawthorn (*Crataegus laevigata* Poir.), the carob (*Ceratonia siliqua* L.), the common juniper (*Juniperus communis* L.), the bird’s-foot trefoil (*Lotus* L.), the grape vine (*Vitis vinifera* L.), the dogwood (*Cornus* L.), the strawberry tree (*Arbutus uendo*), the plum tree (*Prunus* L.), the Chinese date (*Ziziphus jujuba*), and the wild pear (*Pyrus pyraster*).²⁹ All these plants were commonly found in the Mediterranean region. Most of them were not intentionally cultivated by humans, and therefore, did not require labor and investment. The choice of areas where the aforementioned plants grew naturally reduced the cost of feeding the pigs while providing them with a balanced diet. For the same reason, it was important to have access to swampy areas and the vegetation found there, such as the lakeshore bulrush and the club rush (*Scirpus* L.). In the case of the aforementioned plants, it was equally important for the pigs to be able to root in the soil. The need to obtain food on their own forced the animals to move, which had a positive effect on their physical condition.

An analysis of the pig diet proposed by ancient authors clearly shows that it largely coincided with how wild boars fed.³⁰ The large variety of plants and fruits used in the feeding of pigs enriched their diet, which increased the chance of keeping them

28 Galen, *De alimentorum facultatibus*, 620.9–11.

29 Columella, *De re rustica*, 7.9.6.

30 A. Rekiel, M. Soñta, op. cit., pp. 16–17.

in good health. The different plant species suggested for pig feeding were characterized by different nutrient contents. The bird's-foot trefoil is high in protein, minerals, including calcium and magnesium, and has a higher carotene content than other legumes. Today, the fruits listed by the Romans are still used in the diet of pigs, as is animal protein, except that nowadays it is usually fed to them in the form of post-production waste obtained from dairies or meat plants. Undoubtedly, the diet proposed by the ancient Romans was healthy for the animals, especially since it was known that the swine should have access to swamps and food of animal origin. The possibility of rooting had a positive influence on the level of their fitness and well-being, and the access to animal protein, such as earthworms and snails, had a beneficial effect on the digestive system of the animals.³¹ The breeds of pigs raised by the ancient Romans were more primitive than modern breeds, and as a result, the diet proposed by the ancients, similar to that of the wild boars, was beneficial to them.

In addition to pasture feeding, pigs received supplementary food for part of the year due to the inability to provide them with sufficient amounts of nutritious fodder on pastures. Terentius Varro claimed that pigs primarily fed on acorns,³² broad beans³³ and grains,³⁴ such as barley. According to the agronomist, the use of the aforementioned fodder not only contributed to an increase in the weight of the animals, but also supposedly made the meat taste better.³⁵ The way pigs were fed was

31 Modern breeders also realize the importance of animal protein in pig nutrition, see: A. Weiner et al., "Przetworzone białko zwierzęce – aktualne aspekty stosowania i wykrywania," *Życie Weterynaryjne* 2014, vol. 89, pp. 427–430.

32 Varro, *Rerum rusticarum*, 2.4.6. On the role of acorns in pig nutrition, see: S. Mason, "Acornutopia? Determining the role of acorns in past human subsistence," [in:] *Food in antiquity*, eds. J. Wilkins, D. Harvey, M. Dobson, Exeter 1999, pp. 15–16.

33 Varro, *Rerum rusticarum*, 2.4.6. Broad beans, in various forms, are also used in pig nutrition today, see: M. Kasprowicz-Potocka, "Nasiona roślin strączkowych w żywieniu świń – bób i bobik," *Trzoda Chlewna* 2012, vol. 50, pp. 44–46.

34 Varro, *Rerum rusticarum*, 2.4.6. Grains still play an important role in pig nutrition today. Compared to antiquity, the types of grains used for fodder have slightly changed. In antiquity, it was most often barley, while today, wheat and millet are used on a much wider scale, see.: M. Kasprowicz-Potocka, "Jęczmień – podstawowe zboże w żywieniu świń," *Trzoda Chlewna* 2016, vol. 54, pp. 27–29. Cf.: K. Lipiński, op. cit., pp. 39–43; eadem, "Zboża w żywieniu świń – proso," *Trzoda Chlewna* 2012, vol. 50, pp. 45–46; eadem, "Zboża w żywieniu świń – pszenica," *Trzoda Chlewna* 2011, vol. 49, pp. 48–51; A. Frankiewicz, "Pszenica i produkty jej przetwarzania w żywieniu trzody chlewnej," *Trzoda Chlewna* 2008, vol. 46, pp. 56–58.

35 Galen and Pliny the Elder also wrote about the effect of food on the taste of meat, recommending feeding dried figs to pigs, which reportedly makes the liver taste sweeter. See: Galen, *De alimentorum facultatibus*, 679.6–12; 704.3–4. Cf.: Plinius, *Historia Naturalis*, 8.77.209. Feeding acorns and beech fruit was also thought to have a positive effect on meat quality, see: ibidem, 16.8.25.

modified periodically, depending on the availability of a certain type of fodder, and the age and condition of the animals. Columella pointed out that putting the pigs to pasture could be insufficient, and during periods when there was a shortage of fodder outside, they had to be fed additionally in pigsties.³⁶ For this reason, the agronomist recommended collecting water in cisterns and as many acorns as possible.³⁷ Similarly to Varro, Columella also mentioned the use of broad beans and legumes in the pigs' diet, although he stressed that these should be added when they reach a low price.³⁸ Like the older authors, Palladius recommended feeding pigs with acorns during the winter. Additionally, he was one of the first to include chestnuts and peelings from various fruits in pig nutrition.³⁹ The use of the aforementioned feeds, according to the ancients, was especially important in the spring, since it was believed that the juices contained in green plants harmed pigs.⁴⁰ For this reason, it was advised that before the pigs were driven out to spring pastures, they should be fed on the stored fodder to avoid upsetting their stomachs, which could lead to weight loss.⁴¹ The feeds mentioned by agronomists, including grains or broad beans, are still widely used in pig nutrition today. The ancients preferred grains such as barley, while today many other species are used, which is linked, on the one hand, to the cultivation of grains unknown in antiquity, and, on the other, to a greater knowledge of nutrient absorption, resulting in a more efficient selection of fodder. Acorns, which were one of the most popular feeds in ancient Rome, are barely used in industrial farming. This is not because they are considered to have low value as feed, but because the scale of breeding is too massive today. Herds kept on Roman farms were much smaller, and as a result, stockpiling acorns was much easier. Nowadays, due to the scale of production and the number of acorns that can be extracted from a single tree, it is uneconomical to use them on a larger scale in the feeding of pigs. Acorns as an element of the pig diet are used in small specialized farms, often focused on raising old local breeds and producing traditional pork products.⁴² Breeders try to feed the animals in the old-fashioned way, which is supposed to translate into a unique taste and texture of the meat obtained.

³⁶ Columella, *De re rustica*, 7.9.8.

³⁷ *Ibidem*, 7.4.8.

³⁸ *Ibidem*, *De re rustica*, 7.4.9.

³⁹ Palladius, *Opus agriculturae*, 3.26.3.

⁴⁰ *Ibidem*.

⁴¹ Columella, *De re rustica*, 7.4.9.

⁴² Today acorns are still a staple in the diet of Iberian pigs, the meat of which is used to make traditional cured meats. See: V. Rodríguez-Estévez, A. García, A.G. Gómez, "Characteristic of the acorns selected by free range Iberian pigs during the montanera season,"

The ancient Romans devoted considerable attention to pig nutrition. Agronomists of that time also recorded information on the need to change the diet of pregnant sows and young piglets. Already Terentius Varro observed that after farrowing, the sow should be further strengthened with the right food to increase her milk production for the piglets. It was recommended to feed the female two pounds of barley soaked in water and give her a drink twice a day, which was supposed to promote her lactation.⁴³ Breeders paid close attention to whether the sow had enough milk to feed all her young. If the female was unable to provide the suckling piglets with sufficient milk, the young were additionally fed roasted wheat until they reached the age of three months.⁴⁴ Terentius Varro stressed the importance of the suitable preparation of wheat, as served raw was believed to cause an upset stomach. The use of wheat in piglet feeding also indicates considerable concern for the young in the herd, as wheat fetched high prices and farmers tried to avoid using it as fodder.

According to ancient authors, initially, the basis for the piglets' diet should be their mother's milk. Then they were fed grape pomace and when they got older, they joined the herd out on pasture.⁴⁵ The aforementioned diet was used until they grew teeth – then their diet was the same as adult pigs.²

The ancient Romans based the diet of the swine on plants, fruits, etc. which the animals found on their own while grazing. Their preferred pasture rearing had many advantages, as it allowed the animals to consume a variety of foods, both of plant and animal origin. It also had a positive effect on their health and significantly reduced breeding costs. It was not without reason that the Romans recommended the selection of wet, marshy areas, where the animals could not only dig up the roots of aquatic plants, but also eat the animals found there, providing the body with the necessary animal protein. Selecting groves and areas covered with numerous, diverse species of shrubs and trees for pasture served a similar purpose – the animals had access to food that did not generate additional costs. Different flowering and fruiting periods of the plants found on farms and grazing grounds extended the time when no additional expenses had to be incurred for feeding the pigs. The method of feeding pigs, favored by the ancients, resembled the diet of the wild boars. Efforts were made to avoid feeding the animals grain, even in winter; instead, they were given

Livestock Science 2009, vol. 122, pp. 169–175; A.J. Rey et al., “Feeding Iberian pigs with acorns and grass in either free-range or confinement affects the carcass characteristics and fatty acids and tocopherols accumulation in Longissimus dorsi muscle and backfat,” *Meat Science* 2006, vol. 73, pp. 66–73; R. Nieto et al., “Amino acid availability and energy value of acorn in the Iberian pig,” *Livestock Production Science* 2002, vol. 77, pp. 227–238.

⁴³ Varro, *Rerum rusticarum*, 2.4.15–17.

⁴⁴ *Ibidem*, 2.4.21.

⁴⁵ *Ibidem*, 2.4.20.

acorns or waste, including fruit peelings or pomace, which undoubtedly had a positive effect on the cost of breeding. The price of fodder, as mentioned by agronomists, was one of the decisive factors in limiting its use in the pigs' diet. Only sows and piglets were fed grain. Even today, breeders try to minimize breeding costs by using various types of feed mixes or industrial waste, although the significant difference in the diet of modern pigs is due to two main factors: 1) the breeding of completely different breeds of pigs with different nutritional requirements; 2) the possibility of using plants and products not available in antiquity. The differences in ancient and modern pig nutrition do not mean that the diet used by the ancients was ineffective. Nowadays, pasture-raising and feeding, which was a staple in antiquity, is practiced only marginally. This is probably due to the different breeds currently raised and the greater efficiency, for example, in terms of weight gain, when using ready-made feed mixtures provided in the piggeries. This does not imply a complete abandonment of pasture feeding, nevertheless, this method is used in a small number of regions when raising pigs used for traditional local pork products. Currently, this type of traditional breeding is much more expensive than industrial breeding, and as a result, it is not used on a large scale. The method of feeding pigs preferred by the ancient Romans had advantages in addition to disadvantages. Keeping animals on pasture increased the likelihood of disease, especially parasitic. Pasture infections were not only a problem in the past. Today, the reduction or complete abandonment of grazing pigs stems not only from the differences in the breeds' requirements, but also from the efforts to eliminate potential infections.

Bibliography

Print sources

- Anthimius – Anthimus, *On the observance of foods. De observatione ciborum*, ed. M. Grant, Totnes-Blackawton 2007.
- Apicius, *De re coquinaria* – Apicius, *A critical edition with an introduction and an English translation of the Latin recipe text Apicius*, eds. Ch. Grocock, S. Grainger, Blackawton-Totnes 2006.
- Columella, *De re rustica* – Lucius Iunius Moderatus Columella, *On agriculturae and trees*, eds. H.B. Ash, E.S. Forester, E.H. Heffner, London–Cambridge 1941–1955.
- Galen, *De alimentorum facultatibus* – Galeni, “De alimentorum facultatibus libri III,” [in:] *Claudii Galeni opera omnia*, ed. D.C.G. Kühn, vol. VI, Lipsiae 1923.
- Palladius, *Opus agriculturae* – Palladius, *Opus agriculturae, De veterinaria medicina, De Institutione*, ed. R.H. Rodgers, Leipzig 1975.
- Plinius, *Historia Naturalis* – Pliny, *Natural History*, Vol. III: Books 8–11, ed. H. Rackham, Cambridge 1940.
- Varro, *Rerum rusticarum*. – M. Terentii Varronis, *Rerum rusticarum libri tres*, Leipzig 1929.

Literature

- Albarella U., Dobney K., Rowley-Conwy P., "The domestication of the pig (*Sus scrofa*): new challenges and approaches," [in:] *Documenting domestication: new genetic and archaeological paradigms*, eds. M.A. Zeder, D.G. Emshwiller, B.D. Smith, Berkeley 2006.
- Albarella U., Pyne S., "Neolithic pigs from Durrington Walls, Wiltshire, England: a biometrical database," *Journal of Archaeological Science* 2005, vol. 32.
- Bertini L., Cruz-Rivera E., "The size of ancient Egyptian pigs. A biometrical analysis using molar width," *Bioarchaeology of the Near East* 2014, vol. 8.
- Bieliński P., "Żywienie świń 'na mokro,'" *Hoduj z Głową – Świnie* 2011, no. 3.
- Corbier M., "The ambiguous status of meat in ancient Rome," *Food and Foodways. Explorations in the History and Culture of Human Nourishment* 1989, vol. 3.
- Cucchi T. et al., "Early Neolithic pig domestication at Jiahu, Henan Province, China: clues from molar shape analyses using geometric morphometric approaches," *Journal of Archaeological Science* 2011, vol. 38.
- Dardaillon M., "Seasonal feeding habits of the wild boar in a Mediterranean Wetland, the Camargue (Southern France)," *Acta Theriologica* 1987, vol. 32.
- Evin A. et al., "The long and winding road: identifying pig domestication through molar size and shape," *Journal of Archaeological Science* 2013, vol. 40.
- Fang M. et al., "Contrasting mode of evolution at a coat color locus in wild and domestic pigs," *PLoS Genetics* 2009, vol. 5.
- Fang M., Andersson L., "Mitochondrial diversity in European and Chinese pigs is consistent with population expansions that occurred prior to domestication," *Proceedings of the Royal Society B. Biological Sciences* 2006, vol. 273.
- Frankiewicz A., "Pszenica i produkty jej przetwarzania w żywieniu trzody chlewnej," *Trzoda Chlewna* 2008, vol. 46.
- Frost F., "Sausage and meat preservation in antiquity," *Greek, Roman and Byzantine Studies* 1999, vol. 40.
- Fuchs B., "Żywienie świń," [in:] *Żywienie zwierząt i paszoznawstwo. Podstawy szczegółowego żywienia zwierząt*, eds. D. Jamróz, A. Potkański, Warszawa 2013.
- Giuffa E. et al., "The Origin of the Domestic Pig: Independent Domestication and Subsequent Introgression," *Genetics* 2000, vol. 154.
- Halestead P., "A pig fed by hand is worth two in the bush: ethnoarchaeology of pig husbandry in Greece and its Archaeological implications," [in:] *Ethnozooarchaeology: the present and past of human-animal relationship*, eds. U. Albarella, A. Trentacoste, Oxford 2011.
- Hecker H.M., "A zooarchaeological inquiry into pork consumption in Egypt from prehistoric to the new kingdom times," *Journal of the American Research Center in Egypt* 1982, vol. 19.
- Karwowska M., "Wpływ zastosowania ekstraktu lucerny w żywieniu świń na barwę mięsa," *Żywność. Nauka. Technologia. Jakość* 2008, vol. 15.

- Kasprowicz-Potocka M., "Jęczmień – podstawowe zboże w żywieniu świń," *Trzoda Chlewna* 2016, vol. 54.
- Kasprowicz-Potocka M., "Kukurydza w żywieniu świń," *Trzoda Chlewna* 2009, vol. 47.
- Kasprowicz-Potocka M., "Nasiona roślin strączkowych w żywieniu świń – bób i bobik," *Trzoda Chlewna* 2012, vol. 50.
- Kasprowicz-Potocka M., "Zboża w żywieniu świń – proso," *Trzoda Chlewna* 2012, vol. 50.
- Kasprowicz-Potocka M., "Zboża w żywieniu świń – pszenica," *Trzoda Chlewna* 2011, vol. 49.
- Konarkowski A., "Śruta słonecznikowa w żywieniu świń," *Trzoda Chlewna* 2007, vol. 45.
- Kotowski K., "Bezmleczność poporodowa u loch (zespół MMA)," *Hodowca Trzody Chlewnej* 2011, no. 3.
- Kotowski K., Kotowski B., "Wybrane poglądy na występowanie zespołu MMA u loch, zapobieganie i leczenie," *Trzoda Chlewna* 2007, vol. 45.
- Kwit A., Jabłoński A., "Niedokrwistość prosiąt oseków," *Lecznica Dużych Zwierząt. Ogólnopolski Kwartalnik dla Lekarzy Weterynarii* 2011, vol. 6.
- Larson G. et al., "Ancient DNA, pig domestication, and the spread of the Neolithic into Europe," *Proceedings of the National Academy of Sciences of the United States of America* 2007, vol. 104.
- Larson G. et al., "Worldwide Phylogeography of Wild Boar Reveals Multiple Centers of Pig Domestication," *Science* 2005, vol. 307.
- Lasota-Moskalewska A., *Zwierzęta udomowione w dziejach ludzkości*, Warszawa 2005.
- Lega C. et al., "Size matters: A comparative analysis of pig domestication," *The Holocene* 2016, vol. 26.
- Lipiński K., "Pszenica w żywieniu świń," *Trzoda Chlewna* 2014, vol. 52.
- Lobban R.A., "Pigs in ancient Egypt," [in:] *Ancestors for the Pigs. Pigs in Prehistory*, ed. S.M. Nelson, Philadelphia 1998.
- MacKinnon M., "High on the hog: linking zooarchaeological, literary and artistic data for pig breeds in Roman Italy," *American Journal of Archaeology* 2001, vol. 105.
- Mai-Kaldonska A., "Prawidłowe żywienie świń," *Rada: Rolnictwo, Aktualności, Doradztwo, Analizy. Miesięcznik Wojewódzkiego Ośrodka Doradztwa Rolniczego w Bartoszewicach* 2008, no. 4.
- Mason S., "Acornutopia? Determining the role of acorns in past human subsistence," [in:] *Food in antiquity*, eds. J. Wilkins, D. Harvey, M. Dobson, Exeter 1999.
- Massei G., Genov P.V., "The Environmental impact of wild boar," *Galemys* 2004, no. 16.
- Mroczek J.R., "Niedokrwistość prosiąt – przyczyny i zapobieganie," *Hodowca Trzody Chlewnej* 2008, no. 1.
- Nieto R. et al., "Amino acid availability and energy value of acorn in the Iberian pig," *Livestock Production Science* 2002, vol. 77.
- Owen J. et al., "The zooarchaeological application of quantifying cranial shape differences in wild boar and domestic pigs (*Sus scrofa*) using 3D geometric morphometric," *Journal of Archaeological Science* 2014, vol. 43.

- Pakkanen P., "Beyond Skin-deep: Considering the pig in ancient Greece through the particularities of its skin," *Kernos* 2021, vol. 34.
- Peasnell B.L. et al., "Hallan Çemi, pig husbandry, and post-Pleistocene adaptations along the Taurus-Zargos Arc (Turkey)," *Paléorient* 1998, vol. 24.
- Pomorska-Mol M., Kwit K., "Niedokrwistość u prosiąt," *Weterynaria w Terenie* 2014, vol. 8.
- Price M.D., Evin A., "Long-term morphological changes and evolving human-pig relations in the northern Fertile Crescent from 11,000 to 2000 cal. BC," *Archaeological and Anthropological Sciences* 2019, vol. 11.
- Price M., Hongo H., "The Archaeology of Pig Domestication in Eurasia," *Journal of Archaeological Research* 2020, vol. 28.
- Rekiel A., Sońta M., "Baza pokarmowa przedstawicieli rodziny świniowate (Suidae)," *Przeгляд Hodowlany* 2019, no. 1.
- Rey A.J. et al., "Feeding Iberian pigs with acorns and grass in either free-range or confinement affects the carcass characteristics and fatty acids and tocopherols accumulation in Longissimus dorsi muscle and backfat," *Meat Science* 2006, vol. 73.
- Rodríguez-Estévez V., Garcia A., Gómez A.G., "Characteristic of the acorns selected by free range Iberian pigs during the montanera season," *Livestock Science* 2009, vol. 122.
- Rzeźnicka Z., "Ham in Ancient and Byzantine Dietetics, Medicine and Gastronomy," [in:] *Tasting Cultures: Thoughts for Food*, ed. M.J. Pires, Oxford 2015.
- Rzeźnicka Z., "Rola mięsa w diecie okresu pomiędzy II a VII w. w świetle źródeł antycznych," [in:] *Dietetyka i sztuka kulinarna antyku i wczesnego Bizancjum (II–VII w.). Część II. Pokarm dla ciała i ducha*, ed. M. Kokoszko, Łódź 1997.
- Rzeźnicka Z., Kokoszko M., Jagusiak K., "Cured Meats in Ancient and Byzantine Sources: Ham, Bacon and 'Tuccetum,'" *Studia Ceranea* 2014, vol. 4.
- Starkovich B.M., Stiner M.C., "Halan Çemi Tepesi: High-ranked Game Exploitation alongside Intensive Seed Processing at the Epipaleolithic-Neolithic Transition in Southeastern Turkey," *Anthropozoologica* 2009, vol. 44.
- Świątkiewicz M., Hanczakowa E., Olszewska A., "Suszony zbożowy wywar gorzelniany (DDGS) w żywieniu świń," *Wiadomości Zootechniczne* 2014, vol. 52.
- Trawal Z., "Hipoglikemia prosiąt – choroba osesków," *Top Agrar Polska* 1995, no. 3.
- Weber S., Price M.D., "What the pig ate: A microbotanical study of pig dental calculus from 10th–3rd millennium BC northern Mesopotamia," *Journal of Archaeological Science: Reports* 2016, vol. 6.
- Weiner A. et al., "Przetworzone białko zwierzęce – aktualne aspekty stosowania i wykrywania," *Życie Weterynaryjne* 2014, vol. 89.
- Wojtaszczyk B., "Żywnienie świń. Pasza gospodarska czy pełnoporcjowa?" *Farmer* 2018, no. 4.
- Zaworska A., "Choroby prosiąt spowodowane nieprawidłowym żywieniem," *Hodowca Trzody Chlewnej* 2012, no. 3–4.