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THE STUDY MEAT PRODUCTIVITY OF HORSES YAKUT BREED

A.A. Sidorov, E.D. Alekseev, M.F. Grigorev, A.I. Grigoreva

The paper presents data on study of meat productivity horses Yakut breed. As a result, it was found that meat productivity of horses, including quality of meat products, largely depends on feed conditions.

As result of research, it was found that animals from second and third groups exceeded first group in pre-slaughter weight by 3.29 and 2.99%, carcass weight by 4.42 and 3.38%, fat by 8.85 and 3.05%.

The study of meat quality was carried out in terms of chemical composition and organoleptic characteristics. During analysis, it was found that meat samples of first group contained more moisture compared to second and third groups by 1.96 and 1.10%. At the same time, second and third groups exceeded the first group in protein by 1.43 and 0.73%, fat by 0.53 and 0.36%, P by 1.62 and 0.54%, Cu by 9.52 and 4.76%, Mg by 9.23 and 5.14%, Se by 3.57 and 1.79%, as well as vitamins A, C, E, B1, B2 and B3.

The organoleptic evaluation of meat products found that all samples met quality requirements of the standard. Thus, analysis of the data showed that meat productivity of horses depends to a greater extent on feeding conditions.

Keywords: *horses; meat productivity; analysis; comparison; conditions*

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ИЗУЧЕНИЕ МЯСНОЙ ПРОДУКТИВНОСТИ ЛОШАДЕЙ ЯКУТСКОЙ ПОРОДЫ

А.А. Сидоров, Е.Д. Алексеев, М.Ф. Григорьев, А.И. Григорьева

В работе представлены данные изучения мясной продуктивности лошадей якутской породы. В результате установлено, что мясная продуктивность лошадей, в том числе и качество мясной продукции, во многом зависят от условий кормления.

В результате исследований установлено, что животные второй и третьей групп превосходили первую группу по предубойной массе на 3,29 и 2,99%, массе туши на 4,42 и 3,38%, жиру на 8,85 и 3,05%. Изучение качества мяса проводили по химическому составу и органолептическим показателям.

При анализе установлено, что образцы мяса первой группы содержали больше влаги по сравнению со второй и третьей группами на 1,96 и 1,10%. При этом вторая и третья группы превосходили первую группу по белку на 1,43 и 0,73%, жиру на 0,53 и 0,36 %, P на 1,62 и 0,54%, Cu на 9,52 и 4,76%, Mg на 9,23 и 5,14%, Se на 3,57 и 1,79%, а также витамины A, C, E, B1, B2 и B3. При органолептической оценке мясных продуктов установлено, что все образцы соответствуют требованиям стандарта по качеству. Таким образом, анализ данных показал, что мясная продуктивность лошадей в большей степени зависит от условий кормления.

Ключевые слова: лошади; мясная продуктивность; анализ; сравнение; условия

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Introduction

Horse breeding is an important livestock industry. The industry is represented by such main areas as productive horse breeding, sports and etc. It is believed that the Russian Federation ranks 19th in the production of horsemeat (in terms of per capita). Productive horse breeding is mainly developing dynamically in the regions (Republic of Sakha (Yakutia), Republic of Tyva, Republic of Altai, Altai Territory, Republic of Khakassia, Republic of Buryatia, Trans-Baikal

Territory, Republic of Bashkortostan, Astrakhan Region, Republic of Kalmykia) – where herd horse breeding is one of the main areas of traditional livestock industries. A significant increase in the number of horses in the regions (from 8 and more than 20 %) is associated with the economic efficiency of horse breeding. At the same time, state and regional support had a significant impact on the development of the industry [7].

In scientific paper [13] an analysis of horse breeding in the Russian Federation is given, as well as a detailed analysis of it by federal districts. It is noted that changes in the dynamics of the number of horses in different years did not have the same pace. The statistical data (1990-2018) show that the number of horses in the country has decreased by more than 8 times. At the same time, it was noted that during these periods in the enlarged federal districts, the proportion of the number of horses changed. In the Far Eastern Federal District, their number increased from 8.9 to 26.9 %, Siberian Federal District from 31.4 to 32.7 % and vice versa decreased in the Ural Federal District from 7.2 to 5.3 %, Northwestern Federal District - from 2.4 to 0.7 %, Volga Federal District - from 24.6 to 16.9 %, Central Federal District - from 12.4 to 3.0 %, Southern Federal District – from 13.1 to 7.7 %, North Caucasian Federal District - by 6.9 %. It is also indicated that the total number of animals has decreased due to the liquidation of organizations and farms. In 2018, the number of horses increased due to household plots and peasant farms.

The Republic of Sakha (Yakutia) contains approximately 90 % of the horse population in the Far Eastern Federal District of the Russian Federation. The Yakut horse is characterized by a massive body, the ability to quickly feed and in comparison with other farm animals - the best adaptive qualities to the extreme continental climate, as well as unpretentiousness to the forage conditions of the region. Animal slaughter yield can easily exceed 60 %. Yakut horses can intensively increase their live weight during the summer. Autumn for animals is the best time of the year, because the summer heat is replaced by more moderate temperatures and the number of bloodsucking insects is reduced. Therefore, this time of the year is considered the most optimal for animals [1, 8, 18, 19].

The high efficiency of horse breeding is due to the fact that the cost of labor and monetary resources for the production of a unit of output is reduced, while remotely located natural tracts are used more efficiently. Here it is necessary to note the unpretentiousness of animals to local climatic conditions of keeping. There is a lot of information on the effectiveness of horse breeding. But at the same time, it is indicated that the forecast for the efficiency of the industry should be based on a number of estimated indicators [15].

Currently, the industry is developing dynamically, scientific developments are being actively introduced in the field of selection and breeding work, veterinary medicine and etc. [7, 9, 13]. In the article [10] – detailed review of the scientific literature on the resistance of nematodes in horses to anthelmintic drugs is presented.

In experimental works [17, 20] rationale the inclusion of local non-traditional feed additives in the rations of horses in the conditions of Yakutia. The use of feed additives from local natural resources in the rations of horses had a positive effect on their productivity and physiological state in the winter period of keeping.

Along with this, there is quite a lot of scientific information on the meat productivity of horses of the Yakut breed [3, 5, 14, 16, 21]. At the same time, it should be noted that the assessment of the meat productivity of animals is indicated without taking into account the characteristics of the main routes and forage lands.

It is known that good conditions for keeping horses are areas near horse farms, river floodplains or other relatively remote areas [12, 15]. As you know, the meat productivity of animals depends to a greater extent on feed conditions.

Previously, we conducted experiments, but another scientific experiment was carried out in the conditions of the Verkhoyansk region (Arctic group of the Yakutia region). In the experiments, the influence of feeding routes on the meat productivity of young Yakut horse breeds of the Yan type was studied [14]. In the presented experiment, we studied the influence of the main feeding routes on the meat productivity of young stock of the Yakut breed of horses of the indigenous type. The obtained data complement the scientific base in the field of productive horse breeding.

As is known, the characteristics of the basic zones of Yakutia (Western, Central, Southern, Eastern and Northern groups, including the Arctic zones) and the characteristics of forage vegetation are more different. In a scientific monograph, these differences are presented in detail [2].

Therefore, we analyzed the meat productivity of horses of the Yakut breed, depending on the feeding routes.

Material and research methods

The purpose of the study: to study the meat productivity of horses of the Yakut breed, depending on the feeding routes.

Research objectives:

- analysis of the results of slaughter of horses and their dependence on feed conditions;
- assessment of the quality of meat products.

The scientific experiment was carried out on young horses of the Yakut breed under the conditions of the Farm Rumyantsev S.I. Ust-Aldansky district of the Republic of Sakha (Yakutia). In accordance with the research program, the animals were kept in different conditions, the difference between the groups was in the feeding conditions areas: keeping near the horse farms – I group (soddy meadow pastures), II group – on two remote tracts (soddy meadow pastures and small valley meadows); III group (soddy meadow pastures and floodplain areas).

Detailed description of the plant community, nutritional value and chemical composition of plants is presented in a published work [2].

In summer, animals from all groups grazed in predominantly open, well-ventilated glades.

At the end of the experiment, young horses were slaughtered to study meat productivity and product quality. Meat productivity and meat quality were determined in accordance with the method [4]. Mathematical processing of the research results was carried out according to the method [11].

The results and discussion

The consumption of feed and nutrients per animal is presented in Table 1.

Table 1.

Feed consumption by young horses, per head

Indicators	Per day, kg	Period duration, days	Total feed, kg	Contained in feed	
				Energy feed unit (EFU)	digestible protein, kg
Milk, kg	4	60	240	64.8	7.9
Meadow hay, kg	4	30	120	82.8	6.5
Pasture feed, kg	8	60	480	153.6	15.8
Oats, kg	1.25	105	131.3	131.3	10.5
Pasture grass, kg	12	45	540	151.2	10.8
Total				583.7	51.5
Protein levels in the rations, g/EFU					88.3
Norm				504	
Compliance with the norm, %				115.8	

Feed intake analyzed with material [6]. At the end of the experience – studied meat productivity (Table 2).

Table 2.

Meat productivity of horses (M±m)

Indicators	Group		
	I	II	III
Live weight, kg	223.00±3.79	230.33±3.53	229.67±3.76
Carcass weight, kg	128.33±4.48	134.00±3.21	132.67±3.53
Mass of fat, kg	9.83±0.50	10.70±0.46	10.13±0.55
Weight of carcass and fat, kg	138.17±4.99	144.70±3.67	142.80±4.06
Carcass output, %	57.51±1.04	58.16±0.64	57.75±0.62
Fat yield, %	4.40±0.15	4.64±0.13	4.41±0.17
Slaughter output, %	61.92±1.19	62.81±0.76	62.15±0.78

Animals in the summer were kept in tracts near the settlement and horse farms - until autumn. With a cold snap, animals from two groups moved to remote areas. At the end of the scientific and economic experiment, horses were slaughtered according to the generally accepted method. The analysis of experimental data showed their high meat qualities. In terms of pre-slaughter live weight, the first group yielded to II and III groups by 3.29 and 2.99 %, also in the same groups, carcass weight was heavier by 4.42 and 3.38 %. From of II and III groups, more internal fat was obtained by 8.85 and 3.05 % and, accordingly, slaughter weight indicators were higher by 4.73 and 3.35 %. In terms of carcass yield, I group yielded to II and III groups – by 0.65 and 0.24 %, in terms of fat yield – by 0.24 and 0.01 %, and slaughter yield – by 0.89 and 0.23 %.

In Table 3 – presents the data of the chemical analysis of meat. Sampling and analysis of meat was carried out according to generally accepted research methods.

When analyzing the chemical composition of meat, a difference in indicators between groups was established. The meat of I group contained more moisture compared to II and III groups by 1.96 and 1.10 %. While in terms of protein and fat in meat, I group was inferior to II group by 1.43 % and 0.53 % (P> 0.99); and III group by 0.73 % and 0.36 % (P>0.95), respectively.

The changes concerned the mineral composition of meat, samples of I group were inferior to II and III groups in Ca by 14.03 and 4.20 %, P by 1.62 and 0.54 %, Fe by 7.94 and 2.54 %, Cu 9.52 and 4.76 %, Zn by 14.08 and 2.31 %, Mg by 9.23 and 5.14 %, Se by 3.57 and 1.79 %, respectively.

In meat samples of II and III groups, the content of Pb showed 0.04 and 0.05 mg/kg versus 0.09 mg/kg in I group. The content of Cd in the meat of animals of I group was 0.003 mg/kg, and in the meat of II and III groups, the indicators were 0.001 and 0.002 mg/kg.

Table 3.

The chemical composition of meat (M±m)

Indicators	Norm	Group		
		I	II	III
Moisture content, %		74.53±0.86	72.57±0.64	73.43±0.74
Mass fraction of protein, %		22.40±0.78	23.83±0.58	23.13±0.67
Mass fraction of fat, %		3.07±0.09	3.60±0.06**	3.43±0.09*
Ca, mg/100 g		11.90±0.46	13.57±0.45	12.40±0.74
P, mg/100 g		185±15.52	188±9.71	186±10.69
Fe, mg/kg		31.50±2.05	34.00±0.85	32.30±0.92
Cu, mg/kg		0.21±0.03	0.23±0.02	0.22±0.03
Zn, mg/kg		10.37±0.64	11.83±0.67	10.61±0.66
Mg, mg/100 g		22.00±1.05	24.03±0.76	23.13±0.82
Se, mg/kg		0.56±0.02	0.58±0.02	0.57±0.02
Pb, mg/kg	Not more than 0.5	0.09±0.01	0.04±0.01*	0.05±0.01*
Cd, mg/kg	Not more than 0.05	0.003±0.001	0.001±0.000	0.002±0.000
Vitamin A, mg/100 g		0.01±0.00	0.03±0.00	0.02±0.00
Vitamin C, mg/100 g		0.05±0.01	0.07±0.00	0.06±0.01
Vitamin E, mg/100 g		0.19±0.01	0.21±0.01	0.20±0.01
Vitamin B_1, mg/100 g		0.024±0.001	0.028±0,001*	0.027±0.001
Vitamin B_2, mg/100 g		0.13±0.01	0.16±0.01	0.15±0.01
Vitamin B_3, mg/100 g		4.88±0.07	5.53±0.07**	5.42±0.07**

Note: *P>0,95; **P>0,99

It should be noted that the meat of II and III experimental groups contained vitamin A - 0.03 and 0.02 mg/100 g, vitamin C - 0.07 and 0.06 mg/100 g, vitamin E - 0.21 and 0.20 mg/100 g, vitamin B_1 - 0.028 and 0.027 mg /100 g, vitamin B_2 - 0.16 and 0.15 mg/100 g, vitamin B_3 - 5.53 and 5.42 mg/100 g.

The optimal content of nutrients and minerals in meat (II and III groups) is explained by the fact that more productive fodder lands contributed to better feeding of animals.

We also analyzed data on the conversion of protein and feed energy into food production (Table 4).

An analysis of experience data indicates that the use of remote feeding routes contributed to an increase in the efficiency of the conversion of nutrients and feed energy into meet production. At the same time, it was found that the feeding factor had a positive effect on the ability of animals to transform nutrients and feed energy into meat products.

Table 4.

Conversion rates of protein and feed energy to dietary protein and fat

Indicators	Group		
	I	II	III
Meat received, kg	36.28	39.67	38.34
Food protein yield per kg of removable live weight, g	107.22	115.70	111.12
Absolute amount of food protein, kg	8.13	9.45	8.87
Energy output per kg of removable live weight, MJ	3.12	3.43	3.28
Conversion rate of feed protein to food protein, %	10.58	12.31	11.55
Yield of edible fat per kg of removable live weight, g	14.69	17.48	16.48
Absolute amount of dietary fat, kg	1.11	1.43	1.31
Coefficient of exchange energy of feed into energy of food products of slaughter, %	4.05	4.80	4.49
Feed exchange energy consumption per kg of live weight gain during the experiment period, MJ	77.00	71.44	73.14

The first group was inferior to II and III groups in terms of the amount of meet by 9.34 and 5.68 %, and in terms of the yield of food protein per kg of live weight by 7.91 and 3.64 %, in terms of the absolute amount of protein by 16.24 and 9,10 % respectively. Feed protein consumption per kg of live weight gain for the period of experience in I group was 1013.24 g, and in II and III groups this figure was 940.07 and 962.45 g, respectively.

The energy output per kg of removable live weight in I group was 3.12 MJ, yielding to II and III groups by 9.94 and 5.13 %.

The conversion rate of protein into food protein was 10.58 % in I group, 12.31 % in II group and 11.55 % in III group.

The yield of dietary fat per kg of removable live weight in I group was 14.69 g, yielding to II group by 18.99 %, and also to III group by 12.19 %. The absolute amount of dietary fat in I group was 1.11 kg, and in II and III groups this indicator was 1.43 and 1.31 kg. It was also found that the first group in terms of the energy exchange coefficient of feed in the power of food products was inferior to II and III groups by 0.75 and 0.44 %. The consumption of feed exchange energy per kg of live weight gain for the period of the experiment in I group was 77.00 MJ; in II group - 71.44 MJ; and in III group - 73.14 MJ.

To assess the quality of meat, a check was carried out for compliance with the quality according to the standard GOST 32226-2013, data are presented in Table 5.

Table 5.

Organoleptic evaluation of meat

Indicators	Compliance	Group		
		I	II	III
Surface color	Dark-red color	+	+	+
Muscles on cut	Slightly moist, does not leave a wet spot on the filter paper	+	+	+
Consistency	The meat is dense, elastic; the hole formed when pressed with a finger is quickly leveled	+	+	+
Smell	Specific, peculiar to fresh meat	+	+	+
Fat condition	Has a white color; fat soft	+	+	+
Tendon condition	Tendons are soft, friable	+	+	+

Thus, the assessment of meat showed that meat raw materials from animals of all groups met the quality requirements of GOST 32226-2013. An analysis of the closest in subject matter and scientific content of the study of the meat productivity of horses of the Yakut breed showed that our data correspond to those obtained from other authors [3, 5, 16, 21]. But at the same time, our research shows the most detailed indicators of the difference in changes in the meat productivity of horses depending on natural conditions.

Conclusion

Studies have shown that the use of more remote routes makes it possible to relatively better realize the potential of the meat productivity of young horses of the Yakut breed. When comparing these slaughter indicators, it was found that I group was inferior to II and III groups in terms of pre-slaughter live weight by 3.29 and 2.99 %, carcass weight by 4.42 and 3.38 %, fat by 8.85 and 3,05 %, slaughter weight by 4.73 and 3.35 %, carcass yield by 0.65 and 0.24 %, fat yield by 0.24 and 0.01 %, slaughter yield by 0.89 and 0.23 %. These differences also affected the quality of meat products. Meat samples of I group yielded to II and III groups in terms of the amount of protein (by 1.43 and 0.73 %), fat (by 0.53 and 0.36 %), Ca (by 14.03 and 4.20 %), P (by 1.62 and 0.54 %), Fe (by 7.94 and 2.54 %), Cu (by 9.52 and 4.76 %), Zn (by 14.08 and 2.31 %), Mg (by 9.23 and 5.14 %), Se (by 3.57 and 1.79 %), as well as a number of vitamins. The organoleptic evaluation of meat indicates that the meat products of all groups met the quality standard.

Thus, the best indicators of meat productivity, as well as the best quality of meat, are associated with more productive remote tracts, which is confirmed by the analysis of the chemical composition and data on the conversion of nutrients into meet products.

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ВКЛАД АВТОРОВ

Сидоров А.А.: сбор и обработка материалов, написание текста.
Алексеев Е.Д.: сбор и обработка материалов.
Григорьев М.Ф.: концепция и дизайн исследования, написание текста.
Григорьева А.И.: экспериментальные исследования.

AUTHOR CONTRIBUTIONS

Andrey A. Sidorov: collection and processing of materials, writing the text.
Egor D. Alekseev: collection and processing of materials.
Mikhail F. Grigorev: concept and design of the study, writing the text.
Aleksandra I. Grigoreva: experimental research.

DATA ABOUT THE AUTHORS

Andrey A. Sidorov, Candidate of Agricultural Sciences, Dean of the Faculty of Agrotechnology
Arctic State Agrotechnological University
3, Sergelyakhskoe Str., Yakutsk, 677007, Republic of Sakha (Yakutia), Russian Federation
grig_mf@mail.ru
Scopus Author ID: 57219110798

Egor D. Alekseev, Candidate of Agricultural Sciences, Associate Professor of the Department «Traditional industries of the North», Faculty of Agrotechnology
Arctic State Agrotechnological University
3, Sergelyakhskoe Str., Yakutsk, 677007, Republic of Sakha (Yakutia), Russian Federation
grig_mf@mail.ru

Mikhail F. Grigorev, Candidate of Agricultural Sciences, Associate Professor, Leading Researcher of the Research and Innovation Department; doctoral
Kuzbass State Agricultural University; Siberian Federal Scientific Centre of Agro-BioTechnologies of the Russian Academy of Sciences
5, Markovtseva Str., Kemerovo, Kemerovo region, 650056, Russian Federation; Tsentralnaya Str., Krasnoobsk, Novosibirsk region, 630501, Russian Federation
grig_mf@mail.ru
ORCID: https://orcid.org/ 0000-0002-5910-9268

Aleksandra I. Grigoreva, Researcher
Far Eastern State Agrarian University
86, Politekhnicheskaya Str., Blagoveshchensk, Amur region, 675005, Russian Federation
shadrina_ai@mail.ru
ORCID: https://orcid.org/ 0000-0002-5968-2400

ДАННЫЕ ОБ АВТОРАХ

Сидоров Андрей Андреевич, кандидат сельскохозяйственных наук, декан агротехнологического факультета
ФГБОУ ВО «Арктический государственный агротехнологический университет»
ш. Сергеляхское, 3 км, 3, , г. Якутск, Республика Саха (Якутия), 677007, Российская Федерация
grig_mf@mail.ru

Алексеев Егор Денисович, кандидат сельскохозяйственных наук, доцент кафедры общей зоотехнии, Агротехнологический факультет
ФГБОУ ВО «Арктический государственный агротехнологический университет»
ш. Сергеляхское, 3 км, 3, , г. Якутск, Республика Саха (Якутия), 677007, Российская Федерация
grig_mf@mail.ru

Григорьев Михаил Федосеевич, кандидат сельскохозяйственных наук, доцент, ведущий научный сотрудник научно-инновационного управления; докторант
ФГБОУ ВО «Кузбасский государственный аграрный университет имени В.Н. Полецкова»; Сибирский федеральный научный центр агробиотехнологий Российской академии наук (СФНЦА РАН)
ул. Марковцева, 5, г. Кемерово, 650056, Российская Федерация; ул. Центральная, г. Краснообск, Новосибирская область, 630501, Российская Федерация
grig_mf@mail.ru

Григорьева Александра Ивановна, соискатель
ФГБОУ ВО «Дальневосточный государственный аграрный университет»
ул. Политехническая, 86, г. Благовещенск, Амурская область, 675005, Российская Федерация
grig_mf@mail.ru

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