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Research Article

New Aspects of Non-Waste Use of Secondary Raw Materials of Horse Breeding Yakutia

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Received: November 26, 2019; **Published:** December 23, 2019

Abstract

In the diet of the population of Yakutia, the foal and cone of local herd horses are highly valued for their high nutritional value, excellent taste and dietary properties. In addition to meat, a number of other slaughter products, such as by-products, intestinal raw materials, internal fat, blood, etc., are also produced during primary processing. Many of them are not used completely, although they could be a valuable raw material for the food and processing industries. The relevance of this work is to explore the possibilities of non-waste use of Yakut horse products. To solve this problem, we examined the secondary products of slaughter (fat, blood, offal, intestinal raw materials) of a Yakut horse. Biochemical studies of the composition of these products were conducted, and also the first attempts were made to obtain concentrate from the internal fat of foals, dry blood and developed NTD for by-products, intestinal raw materials and meat products.

Internal fat Yakut horses in polyunsaturated fatty acids PUFA surpasses subcutaneous fat, with the exception of abdominal fat. So, the content of linoleic acid was 10.91 - 12.25%. A low-temperature method of fat production has been tested.

Dry blood of Yakut horses effectively acts on the human body due to the whole complex of biologically active substances. It consists of peptides, amino acids, hormones, nucleotides, minerals and vitamins.

The results of the study of offal foals of the Yakut horse showed that from the offal of the first category, the liver, heart, kidneys (from 19.07 ± 0.075 to 22.04 ± 0.08%) are rich in protein, high in fat content of the esophagus (22.33 ± 0.06%). The stomach and intestines are characterized by high ash content (from 3.15 ± 0.21 to 8.02 ± 0.73%).

Indicators of nutritional value of meat products from jellied vary depending on the species. In the foal jelly "Alaas" protein content of 12,80%, fat 9,83%, calorie-140.6 kcal.

The technology of preparation of blood sausage with observance of national traditions is studied.

The technology of the product "Amtan As", which is made from foals and horse meat and fat (haha) without heat treatment.

Keywords: *Yakut Horse; Internal Fat; Polyunsaturated Fatty Acids; Omega-3 and Omega-6 Fatty Acids; Killer Blood; Infrared Drying; Dry Blood; Blood Macronutrients; Meat Products; Consumer Preferences; Dietary Correction; Protein Deficiency; Energy Value*

Introduction

Herd horse breeding in Yakutia is a traditional livestock industry specializing in meat production. In addition to meat carcasses, a number of other slaughter products, such as by-products, internal fat, blood, etc. receive primary processing.

The most interesting of them is internal fat. The output of internal fat depending on the age, breeds and types of Yakut horse varies within mares older than 5 years - 7.66 - 15.3 kg, young 2.5 years - 1.9 - 3.5 kg, foals 6-month -2.9 kg. represented by a unique composition. It differs from other animal fats with a low melting point, high digestibility, which is determined by the high content of unsaturated fatty acids. Cholesterol and a fraction of unsaturated fatty acids are in the most beneficial balanced state. Horse fats have a high trendy number, light smelting, rich in vital polyunsaturated fatty acids and vitamin A.

The high content of palmitine, stearin and oleic acids, the amount of which can exceed three-quarters of the total amount of fatty acids that make up fat, is characteristic of animal fats it's not a the animals of different species are very different about the position of the optimum and the ecological valence. From -70°C to 45°C.

Killing blood is also a high-value raw material and can serve as a start-up for the production of food, health and preventive drugs for humans as a source of iron, amino acids and other components, and also dietary supplements to food. There are significant seasonal changes in quality and quantity of blood, most of which reach their maximum value in winter.

The properties and composition of the blood of horses in amino acid, fatty acid, mineral composition are not inferior to the blood of marals, according to some indicators even surpass. The blood of marals and horses is a complete, from a dietary point of view, a product rich in essential aminoacids.

The efficiency of the production of national meat products lies in the waste-free use of meat raw materials, in the enrichment of their phytonutrients of wild food plants.

We have developed technological foundations for the use of horse-breeding products that meet the requirements of the Technical Regulations of the Customs Union, such as: «Is Ware,» «Is Mine,» «Filling from Meat Products» and the standard Amtan as Meat Products [1-23].

Aim of the Study

The aim is to explore the possibilities of using herd horse breeding products for the production of functional food.

Materials and Methods

For the study, we took samples of the fat of the horse of the Jan and indigenous types of Yakut breed from the following parts of the carcass - subcutaneous, internal, cervical, abdominal. Fat samples are selected during the mass slaughter of horses at a stable low temperature of -20 - 30°C, in late October, in early November. Immediately after the slaughter, the fatty raw materials were cleaned of contaminants, blood clots and fringes of muscle tissue and frost lived at a temperature of -25 - 30 degrees Celsius. To extract fat from raw fat, we have chosen a low-temperature method. C Up to the size of particles 3 - 4 mm, centrifuge at 3000 rpm for 45 minutes followed by separation. chloroform/methanol by Folcha method. The purity of the highlighted lipids was checked by the method of thin-layer chromatography. The composition of fatty acids was determined on the gas chromatographer NR 6890 of Hewlett Packard.

Blood samples for food purposes are selected only from healthy animals. The methods and equipment used to bleed animals affect the completeness of the collection and the quality of the blood received. Killing blood is prepared in stationary conditions in blood harvesting points in special, standard polymer containers with a volume of 250, 500 ml. Each batch of blood is defibrile. The amount of blood collected is frozen by natural cold or in freezers.

Studies of the biochemical composition of blood were carried out in the accredited testing center of the FGBNU Institute of MP V.M. Gorbatov on GOST 30178-96. with and using infrared drying to ensure maximum preservation of properties and biological fullness of blood proteins. definitions of macro- and micronutrients whole blood dried at a temperature of 70 - 80°C to a constant mass.

Studies of biochemical composition of by-products and intestinal raw materials in the laboratory of agricultural processing and biochemical analyses by the near-infrared spectroscopy analyzer NIR SCANN ER model 4250 manufactured in the United States.

Samples of finished products have been developed, tested and put into production at processing plants of the Republic of Sakha (Yakutia).

Statistical data processing is performed using the Excel for Windows XP 2002 software package and is expressed as M ± m. The degree of reliability of the revealed differences was determined using Student's t-test.

Results and Discussion

We studied the biochemical composition of the fat of the Yakut horse on various anatomically-topographical parts of the carcass.

As a result of studies of the fat of the Yakut horse, we found the content of 38 fatty acids: of which 10 fatty acids were found in the highest amount. Saturated fatty acids account for 32.88% to 38.65%, monounsaturated - 29.11% to 34.48%, polyunsaturated from 20.40% to 29.14%, respectively, from the total content of acids.

The composition of fatty acids in various anatomo-topographical parts of the carcass of the Yakut horse varies considerably. Thus, the largest proportion of atherogenically active saturated acids is concentrated in abdominal fat in the Jan type of Yakut horse - 38.65% and in the indigenous type of horse - 37.18%, and the smallest - in the neck fat of the Jan type Yakut horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the indigenous horse - 33.22% and in the subcutaneous fat of the 32.82% of the Yakut horse. Among them, palmitic acid prevails, especially in the subcutaneous - 19.34% and abdominal - 20.82% of parts of the carcass.

Animal fats are characterized by high levels of palmitine, stearin and oleic acids, the amount of which can exceed three-quarters of the total amount of fatty acids that make up the fat. In the fats of the Yakut horse the largest share is palmitine - from 15.15 - 16.43% to 19.34 - 20.82%, oleic - from 19.14 - 20.4% to 21.95 - 23.22% and linolenic acid - from 10.91 - 12.25% to 17.35 15-in different parts of the carcass, amount of which, more than half of the amount of fatty acids.

The most valuable are polyunsaturated fatty acids, which are essential for maintaining normal human health. The main role of polyunsaturated fatty acids is that they are part of the structure of biological membranes and are precursors to the synthesis of prostaglandins, which are involved in a variety of intracellular processes. The level of polyunsaturated fatty acids of the Yakut horse fat is 3.5 and 2.2 times higher than the levels of deer and pork fat.

According to Krivoshapkin VG., *et al.* (2009) the content of PNPC in the fat part of the meat of Yakut horses is usually higher than in beef fat, especially in horsemeat derived from 6-month-old foals (5 times the difference). And the PWC is represented mainly by linolenic and linoleic acid.

It is known that the fats of terrestrial animals are usually dominated by fatsof-6 acids, and q-3 acids tend to prevail in the fats of marine organisms and in oilseed crops. compared to deer and pork fat, there is a fairly high content of omega-6 (z-6) acids, the concentration of which is from 15.49% to 21.07%, from the amount of fatty acids. It should be noted that of all the fat samples studied, only the internal fat

of the Yakut horse has the highest concentration of acid (z-3) - 3.7-3.87%. In deer and pork fats it is 0.6% and 1.5%, which is 6.3 and 2.5 times less than in the fat of the Yakut horse.

Thus, the fat of the Yakut breed horse has a wide range of fatty acids, with a significant concentration of omega-6 in abdominal mascara fat and omega-3 acids in the internal fat.

In addition to studying the biochemical composition of the fat of the Yakut horse, we made the first attempts to extract lipids from fat, in order to produce fat-containing raw materials with polyunsaturated fatty acids. To extract fat from raw fat, we have chosen a low-temperature method.

As a result of research, we have obtained fatty raw materials with the following composition of fatty acids (Table 1). The table presents the main fatty acids, which are present in the composition of fat in the greatest amount.

n/p	The name of fatty acid	Young's internal fat	Young abdominal fat	The abdominal fat is visible. Horse	Subcutaneous fat in the air. Horse
1	MiristineC14:0	6,85,5 ± 0,52	5,25 ± 0,005	6,81 ± 0,22	4,75 ± 0,03
2	Palmitine C16:0	24,73 ± 0,66	25,51 ± 1,29	24,57 ± 1,47	26,60 ± 0,60
	The amount of the NWC	43,16 ± 0,58	42,33 ± 0,85	42,98 ± 0,96	43,93 ± 0,54
3	Palmitoleic C16:1	5,57 ± 0,51	5,56 ± 0,015	5,87 ± 0,15	5,71 ± 0,20
4	Olein C18:1	23,55 ± 0,1	27,53 ± 1,23	25,71 ± 3,28	29,62 ± 2,41
	The amount of THE MJK	30,48 ± 0,84	34,23 ± 0,1,13	33,42 ± 2,44	35,96 ± 1,92
5	Linoleic C18: 2 w6	7,52 ± 0,94	7,66 ± 0,04	6,6 ± 0,37	6,48 ± 0,34
6	γ-Linolenic C18: 3 w6	13,63 ± 0,58	9,86 ± 0,36	10,22 ± 0,03	9,005 ± 0,76
7.	α-Linolenic C18: 3 w3	0,52 ± 0,05	0,44 ± 0,03	0,41 ± 0,06	0,36 ± 0,07
	The amount of the PNPC	23,22 ± 0,76	19,45 ± 0,25	18,15 ± 3,2	17,3 ± 0,56
	Total	100	100	100	100

Table 1: *Fatty acid composition of fat in low-temperature way, in %*

Table 1 shows that the fat raw materials of the Yakut horse, obtained in a low-temperature way, contain enough linoleic and z-linolenic acid from the PNPC. 7.52% and 7, 66% received from internal and abdominal fat of young. Maximum value of z-linoleno (13.63%) observed in the composition of fat, excreted from the internal fat-raw young Yakut horse, and the smallest - in fat, excreted from the subcutaneous fat of an adult horse of Yakut breed: linole - 6.48% and linoleno - 9.005% 14q.

Fat obtained in a low-temperature way retains its useful qualities, i.e. the content of essential fatty acids - linole - 6.48% and z-linoleno is at least 9.005%.

When comparing the internal fat from low-temperature fat to raw fat, it is clear that the content of z-linolenic acid has decreased. This is because the z-linolenic acid (z-3) is very unstable to technological processes.

With a low-temperature method of obtaining fat, the total amount of PNPC does not change, but the amount of essential fatty acids of the family of z-3 decreases.

The internal fat of the Yakut horse can serve as a high-value raw material for the production of food and preventive drugs for humans as a source of polyunsaturated fatty acids, as well as dietary supplements for food in effective way of excreting them from raw fat.

As a result of the study of the fat of the horsedi Yakut breed, we obtained concentrate from the fat of a young Yakut horse, which can serve as a source of PNPC for food additives. the invention «Concentrate of the fat of the Yakut horse - raw materials for food additives» registered in the State Register of Inventions of the Russian Federation.

Killing blood is also a high-value raw material that can serve as a starting material for the production of food, health and preventive drugs for humans as a source of iron, amino acids and other components, as well as dietary supplements to food and for a wide range of dietary supplements to food of a variety of directions.

Blood of Yakut horses is a source of iron, amino acids and positively affects blood in anemia, increases immunity and assists in overwork, accelerates the adaptation of the human body to loads, improves performance.

Blood samples selected for analysis after defrosting are dried in an infrared dryer to a constant mass.

Infrared radiation has recently become increasingly common in drying of various materials, in all cases of the use of such drying, also called radiation, has been shown to be significant effectiveness compared to other ways Dehydration.

The advantage of using radiation in the production of dried raw materials:

- Preservation of organoleptic indicators, minimal nutrient loss;
- Destruction of microbes, which ensures the sterility of products;
- Save BAV blood with the least losses;
- Extending the shelf life of dried blood.

The iron content in the dry blood of horses varies in a minor range from 216.8 to 242.01 mg/kg, which indicates a stable level of supply of horses with this element.

Scorecards	Calcium mg/100g	Magnesium mg/100g	Iron mg/kg	Mass protein share, %
1m 8 years old	22,79	10,31	222,80	86,60
2- mare 8 years old	22,89	6,67	223,26	84,85
3m 8 years old	23,18	6,05	216,80	86,70
4m 12 years old	26,79	8,09	236,62	87,55
5 mare 12 years old	16,83	5,68	229,20	87,40
6- mare 15 years old	28,40	12,15	242,01	87,10
7m 16 years old	14,58	7,41	230,61	88,60
8-mare 19 years old	49,16	11,71	224,40	87,10
Average	25,58	8,51	228,21	86,99

Table 2: *Micro-macronutrients in the dry blood of a Yakut horse.*

The dynamics of the protein content in dry blood mares depends mainly on age and physiological condition. According to table 2, there are no significant fluctuations in the mass proportion of blood protein, as all the animals studied are of the same age - mature mares 8 - 19 years.

Business output of foals	Age	Goals	Average live weight, kg	Blood death, l (9%)	Dry blood output for dietary supplements (5%)
65%	Up to a year	302	180	4893,4	250,00
	Vz. Horse	52	390	1825,2	41,26
	Total	354			291,26
70%	Up to a year	116	180	1879,2	94,00
	1.5 years	115	200	2070,0	104,00
	2.5 years	115	260	2691,0	135,00
	Vz. Horse	52	390	1825,2	41,26
	Total	398			374,26
80%	Up to a year	52	180	842,4	42,00
	1.5 years	123	200	2214,0	111,00
	2.5 years	123	260	2878,2	144,00
	Vz. Horse	52	390	1825,2	41,26
	Total	462			388,26

Table 3: *Exit of dry blood of Yakut horse depending on the change in the structure of the herd.*

Dry blood of Yakut horses effectively acts on the human body due to a whole range of biologically active substances vitamins.

High iron content in the blood allows to attribute it to promising raw materials for the production of dietary supplements as an additional source of iron, iron-containing drugs and therapeutic and preventive products.

The technical conditions of TU 9215-036-00670203-2013 «Inner fat of the Yakut breed horse» and TU 9215-038-00670203-2013 «Blood of Yakut breed horses - dry» have been developed. It's 7.18.

In the testing accredited laboratory center «Institute of Meat Industry them. V.M. Gorbatova» tests were carried out to check compliance with the technical requirements «Inner fat of the Yakut breed horse» and «Blood of horses of Yakut breed - dry» in terms of physical and chemical, microbiological indicators and indicators Security.

It has been concluded that the samples presented meet the requirements of these technical conditions in terms of physical and chemical, microbiological and safety indicators.

Based on the results of the research, the process of obtaining new types of products from the fat and blood of the Yakut horse has been developed. The necessary equipment was selected and prototypes of the capletated internal fat and tablets of dry blood of the Yakut horse were obtained.

We have determined the output of raw materials and product from 1 head of the animal. 100g of internal fat contains 23 grams of PNPC. Thus, from the young you can get 2400 - 2700g of fat and, respectively, 690 grams of PNPC and from an adult horse – 4800 - 5400g of fat and, respectively, 1380 grams of PNPC.

From 1 head of a horse of Yakut breed you can get from 800 grams to 1600 grams of dry blood. Weight 1 tablet 0.5g and 40 tablets In packaging you can get 40 packages from raw killer young and 80 packs the number of slaughtered adults.

Employees of the laboratory of agricultural products processing and biochemical analyses of YANISCh developed non-traditional products from horse meat products, by-products and intestinal raw materials.

The results of the study of by-products of the Yakut horse showed that from the by-products of the first category the protein is rich in liver, heart, kidneys (from 19.07 to 0.075 to 22.04 to 0.08%), and in the language it is less than half. little protein. High fat content differ esophagus (22.33 - 0.06%). It is in the meat of the Yakut horse and the stomach and intestines are high in ash (from 3.15 to 8.02 to 0.73%). Stomach on energy value is not inferior, as they are rich in fats. Calcium content in by-products ranged from 0.14 - 23%, and phosphorus from 0.54 to 0.82%. This shows that the sub-products of calcium and phosphorus are twice as much as in horsemeat, so they are one of the good sources of filling the deficiency of these elements in the human diet. Of the by-products, the liver, esophagus, the pyloric part of the stomach is richer in zinc than the diaphragm, stomach and intestines. All by-products of the carcasses of foals are rich in iron and especially chromium.

Scientific and technological production bases have been developed that meet the requirements of the Technical Regulations of the Customs Union, the following types of meat products: «Is Ware,» «Is Mine»21 «The Filling of Meat Products» and the standard of the organization «Amtan As Meat Products». Beef and horse by-products of the First and Ii category, intestinal raw materials and phytonutrients in the form of wormwood leaves ordinary, Ivan-chai narrow-leaf and onion squiring.

The nutritional and energy value of semi-finished products is shown in table 4.

The name of semi-finished products	Squirrels, d	Fats, d	Carbohydrates, g	Energy value, cal
Option 1 beef;	12.9	19.88	0.2	231.32
Option 2 beef	13.9	16.9	0.2	208.5
Option 1 horse	9.81	26.36	0.2	277.28
Option 2 horse	5.8	29.1	0.2	285.9

Table 4: *Food and energy value of semi-finished products.*

The technical conditions of TU 9214-039-00670203-2015 «Fill from meat products» have also been developed. Filling semens are ready-made snack dishes designed for direct consumption. For example, a foal in a jelly «Alaas» with a nutritional value of 100 grams of the product: protein at least 12.80g, fat no more than 9.83 grams, with a calorie content of no more than 140.60 kcal.

The standard of the organization for «Amtan As Meat Products» is developed by STO 00670203 - 001 - 2015 from foals and horsemeat and fat (haha)without thermal treatment. Data of food and energy value of meat product «Amtan As» per 100 grams of product showed high fat content (30 - 50%) and protein (17%), which causes high energy value, respectively: 300.0 and 350.0 kcal.

All developments have been put into production at the Tumen SCPC in Yakutsk.

Conclusion

P Groved E research I have identified new aspects of waste-free use of recycled materials of Yakutia horse breeding. The results suggest that fat and blood can be used as raw materials to create food additives As well, developed processing methods make it possible to use previously unclaimed recycled materials of the Yakut horse slaughter. slaughtering raw materials and answering t consumer seat preferences the country's population, I one way to make up for animal protein deficiency polyunsaturated fatty acids and iron.

This article is based on data obtained under the State Mission 0821-2016-0005 «The theoretical foundations and principles of the development of processes and technologies for the production of food ingredients, compositions, protein concentrates and biologically functional supplementation in order to reduce losses from socially significant diseases» and State Contract No. 1148 «Develop and implement resource-saving technologies for the highly efficient processing of herd meat-breeding raw materials at the production of environmentally friendly food, dietary supplements. Develop technologies for the production of dietary supplements from the blood and fat of the Yakut breed horse».

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Volume 15 Issue 1 January 2020