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Разработка продукционных комбикормов для канального сома, выращиваемого в ЦФО РФ

Виталий Н. Василенко [1] Vvn_1977@mail.ru 0000-0002-1547-9814
Лариса Н. Фролова [1] Fln-84@mail.ru 0000-0002-6505-4136
Иван В. Драган [1] vanes1989@mail.ru 0000-0003-2737-8380
Надежда А. Михайлова [1] mna8686@mail.ru 0000-0002-7789-9224
София И. Жильцова [1] Fln-84@mail.ru

1 Воронежский государственный университет инженерных технологий, пр-т Революции, 19, г. Воронеж, 394036, Россия

Аннотация. В результате анализа отечественного опыта за последние 10 лет зарубежного опыта (например, 9 стран: Вьетнам, Индия, Испания, Канада, Китай, Норвегия, США, Чили, Япония, которые обладают самыми передовыми технологиями и оборудованием для высокоэффективного производства кормов для рыб) при разработке инновационных технологий и оборудования для производства высокопроизводительных кормов для рыб было выявлено, что методы как сухого, так и влажного прессования устарели и не соответствуют современным требованиям в производстве кормов для рыб, поскольку не допускает глубоких физико-химических превращений в белково-углеводном комплексе и при физических нагрузках вводит жировые компоненты на 40 %. Современные рыбные технологии основаны на использовании экструзионной обработки многокомпонентной смеси для придания различной плавучести и регулируемой скорости погружения получаемого корма. Технология экструзии позволит ввести в продукт большое количество жира - до 35-40%, добиться 100 % расщепления крахмала. На основе изучения питания канального сома, выращенного в Центральном федеральном округе Российской Федерации, показана пищевая ценность каждого из компонентов кормовой смеси, обеспечивающая потребность рыбы для обеспечения значительного увеличения роста живого масса и улучшение химического состава мяса, оценивалась для разных возрастных групп. Для решения этой проблемы в программе оптимизации «Корм Оптима Эксперт» разработаны изделия из экструдированных кормов. Пищевые потребности канального сома: 30-40 процентов белка, 4-6 % жира, не более 5 % клетчатки, 35-40 % веществ экстракта нозазотика и 12-13 тысяч килограммов перевариваемой энергии Джоуля на 1 килограмм (в пересчете на сухой иметь значение).

Ключевые слова: сом, продукционный комбикорм, кормопроизводство, оптимизация рационов

Development of industrial feed for channel catfish grown in the Central Federal District of the Russian Federation

Vitalii N.Vasilenko [1] Vvn_1977@mail.ru 0000-0002-1547-9814
Larisa N.Frolova [1] Fln-84@mail.ru 0000-0002-6505-4136
IvanV.Dragan [1] vanes1989@mail.ru 0000-0003-2737-8380
Nadezhda A. Mihajlova [1] mna8686@mail.ru 0000-0002-7789-9224
Sofia I. Zhil’tsova [1] Fln-84@mail.ru

1 Voronezh State University of Engineering Technologies, Revolution Av., 19 Voronezh, 394036, Russia

Abstract. In the result of the analysis of domestic experience over the last 10 years of foreign experience (for example, 9 countries: Vietnam, India, Spain, Canada, China, Norway, USA, Chile, Japan, which possess the most advanced technologies and equipment for highly efficient production of feed for fish) in the development of innovative technologies and equipment for production of high-performance fish feeds were identified that the methods both dry and wet pressing are outdated and do not meet modern requirements in the production of fish feeds since it does not allow a deep physical-chemical transformations in protein-carbohydrate complex and exercise enter fat components at 40 %. Modern fish technologies are based on the use of extrusion processing of multicomponent mixture to give different buoyancy and adjustable rate of immersion of the resulting feed. Extrusion technology will allow to introduce a large amount of fat into the product - up to 35-40 %, to achieve 100 % starch splitting level. Based on the study of the nutrition of the canal catfish grown in the Central Federal District of the Russian Federation, the nutritional value of each of the components of the feed mixture, providing the need for fish to ensure a significant increase in the growth of live mass and improve the chemical composition of meat, was assessed for different age groups. To solve this problem, the "Feed Optima Expert" optimization program has developed products of extruded feed. Food needs of canal som: 30 - 40 percent protein, 4 - 6 percent fat, no more than 5 percent fiber, 35 - 40 percent Nosazotic Extract substances and 12 - 13 thousand kilos of Joule digestible energy in 1 kilogram (in recalculation on dry matter).

Keywords: catfish, feed, feed production, optimization of rations

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Introduction

In accordance with the Food Security Doctrine of the Russian Federation, approved by the Decree of the President of the Russian Federation on January 30, 2010 No. 120, the share (threshold value) of consumption of domestic fish products in the total amount of fish resources (taking into account the shifting reserves) of the domestic market should be at least 80 percent. The industry program "Development of commercial aquaculture (commodity fish farming) in the Russian Federation for 2015–2020" envisages an increase of 3.9 times in the production of commercial fish by 2020: from 40.1 thousand tons in 2015 to 156.4 thousand tons [1-3, 8, 9].

The planned increase in the production of commercial fish products will require a proportional increase in the production of specialized fish feed, namely, to achieve these target indicators of the industry program for these objects of commercial fish farming will require 200.0 thousand tons of specialized feed for an estimated amount of 13.0 billion rubles. Subject to a full import substitution of fish feed, the volume of Russian feed production should be increased by 13.3 times [2, 5-7, 14-16].

The few Russian enterprises producing feed for fish (the share of domestic enterprises in the feed market for salmon, sturgeon, whitefish and somies fish by various estimates ranges between 5–10%), use imported technologies, are equipped with imported technological equipment. The recipe for feed for fish includes mainly imported raw materials (fish flour, blood flour, soybean meal and more). Due to the high cost of such feed, the cost of commercial fish products also increases significantly [4, 10-13].

Canal som (Jctalurus punctatus Raf.) – American acclimatist, is a promising object of commercial fish farming. It is grown both in industrial production and in pond farmsIt has several advantages: it feels equally good in fresh and salty water, grows rapidly, reproduces easily, survives in an overcrowded body of water and is able to tolerate a temporary drop in oxygen up to 1 gram/liter. It has no scales and small bones, his meat has valuable taste and dietary qualities, and the tenderness and taste is not inferior to the popular trout and sturgeon.

Methods

A wide analysis of plant and animal raw materials was carried out to compile recipes for raw organic feeds for canal som. From the raw materials available, the "Feed Optima Expert" optimization program ensures that a prescription is observed in which the exchange and nutritional value is fully compliant, while minimizing the cost of feed. The rations are optimized for at least 27 nutritional indicators; open database allows the user to set additional restrictions, as a result, made promising recipes.

Neither the current state nor the dominant technology for the production of fish feed based on "fish feeding" (feed that includes fish meal and fish oil), do not meet the objectives of long-term sustainable development of agriculture on a global scale and strongly affect the development of fish production. Therefore, the qualitative and quantitative limitation of the well-known technology of fodder production, using fish oil and fish flour, will not allow to ensure neither now nor then the necessary growth rates of the industry, which needs an increasing volume of feed, and the world community has the task to answer to hunger, population growth, environmental problems [1-2].

Choosing the recipe composition of feed for canal som considered a number of factors. First, it is necessary to enrich extruded feed with fats and proteins of plant origin and minerals to achieve their physiological dose. It is necessary to get balanced on food value and with a developed structure extrudat. Secondly, achieve a pleasant taste, aroma and attractive structure that will change the traditional characteristics of the components. Third, increase the shelf life of feed.

The main raw materials in the production of extruded feeds in accordance with the study's objective are fat wastes of the oil and fat industry (phosphates, deodorization, fuz), meal and meal of etheromasal cultures. Given the amount of oil and fat waste, they were used for the experiment.

Sunflower fuse is a product that is rich in fats and proteins, so it is an obligatory part of the feed that makes up the daily diet of fish, birds and animals.

The use of sunflower fuse as an additive to feed in the fishery (as well as sunflower meal and meal) is conditioned by its certain properties, namely: contains 1.5 KE feed units; contains quite a lot of oil and phosphotid, which allows it to be used as an energy additive to feed. Also, the high content of oil allows to optimize the process of enrichment of feeds – in this case to exclude additional oil enrichment; High protein content – from 20… 30% opens up another way of using fuse – it is used as a protein supplement. The cold-pressed method allows you to keep many vitamins in the process of oil production, so fuz can also be used as a vitamin supplement. Thus, fuz is a source of vitamins, proteins, fats, phosphorus and other nutrients. Using it as an additive to feed can significantly improve the growth of fish, as well as increase productivity.

Phosphate contains many unsaturated fatty acids, especially linolic type. There are many essential linolenic acids in phosphate derived from flax. Phosphate is also a source of phosphorus and choline, helping fish avoid fatty liver rebirth and anemia. Liquid phosphate should be preferred. In a closed container, phosphate can be stored for a year.

Currently, the industry produces fodder – semi-skimmed phosphate and they are a loose product. Fish farms can purchase it in liquid or pasty form, from plant components in feed can be included soy meal, sunflower meal. As a flavoring use meal and meal of ethereal cultures, for example, coriander.

The need of young catfish in raw protein is at least 40–45%, for feeding commercial fish use feed containing 24% raw protein.

Food needs of the channel soma: production feeds must contain – 30 – 40% protein, 4–6% fat, no more than 5% fiber, 35–40% non-alcoholic extractive substances and 12 – 13 thousand kilos of Joules digestible energy in 1 kg. The feed recipes we offer to use are listed in Table 1.

The proposed recipes meet all the requirements for compound feeds for the preparation of extruded feed products for channel catfish.

Table 1.

Recipes for food feed for channel catfish

The nutritional value	Value of the indicator for mixed feed production	
	for fish weighing up to 50 g (young)	for fish weighing more than 50 g (yearlings, two-year-olds, three-year-olds)
Wheat	15,7	10,0
Peas	-	19,6
Sunflower meal	-	1,1
Coriander meal	10,0	10,0
Soy meal	20,1	25,0
Meat flour	5	5
Fish flour	23,70	8,6
Blood flour	3	3,0
Sunflower fuz	8,0	5,0
Sunflower phosphatides	8,0	5,0
Feed yeast	5	5
Monocalcium phosphate	0,4	1,6
Vitamin B4	0,1	0,1
Premix	1	1

Results

To determine the exchange energy of the obtained feed, the content of the main physico-chemical and biochemical indicators was studied, which allow us to judge the advantages of the compiled production extruded feed for channel catfish (table 2).

Table 2.

Physico-chemical and biochemical parameters of extruded feed products for channel catfish

The nutritional value		Value of the indicator for mixed feed production	
		for fish weighing up to 50 g (juveniles)	for fish weighing more than 50 g (yearlings, two-year-olds, three-year-olds)
Mass fraction of moisture, %	Recipe	9,4	9,5
	GOST, no more	12,0	
Granule diameter, mm	Recipe	3,0	6,5
	GOST	2,0–15,0	
Granularity, %	Recipe	2,0	2,1
	GOST, no more	3,0	
Water resistance of pellets, min	Recipe	26,4	25,9
	GOST, not less than	20,0	
Granule swelling, min	Recipe	26,9	27,6
	GOST, not less than	25,0	
Exchange energy, MJ / kg	Recipe	13,85	13,05
	GOST, not less than	Not rated	
Crude protein, %	Recipe	44	40
	GOST, not less than	38,0	33,0
Mass fraction of crude fiber, %	Recipe	2,6	2,8
	GOST, no more	4,5	6,0
Mass fraction of lysine, %	Recipe	2,19	1,94
	GOST, not less than	2,0	1,5
Mass fraction of phosphorus, %	Recipe	1,26	1,20
	GOST, not less than	1,2	
Mass fraction of methionine+cystine, %	Recipe	1,02	0,84
	GOST, not less than	0,8	0,6
Mass fraction of raw fat, %	Recipe	18	16
	GOST, not less than	9,0	6,0
Mass fraction of crude ash, %	Recipe	6,5	6,5
	GOST, no more	10,0	

The feed, obtained at the rational parameters of the process and the optimally selected ratio of feed components, was analyzed by a set of indicators characterizing its fodder properties, metabolic energy, nutrition, as well as studied the effects of conditions and shelf life on the quality of extruded feed.

The finished product was characterized by the following organoleptic indicators: appearance – extrudate slightly deformed, cylinders with a structure of varying degrees of porosity, without cracks; Color – corresponded to the color of the extruded feed from which the pellets are prepared, or darker (when entering dyes – the color of the corresponding dye); smell – corresponded to a set of benign components included in the feed without dark, mouldy and other foreign odors.

Conclusion

The complex of scientific research in the development of formulations of production feed may be of interest in the field of full feeding of canal catfish, as well as will expand the range of multicomponent feed produced with a high enough biological, energy value, balanced in composition of essential amino acids, vitamins and minerals adapted for different types of fish.

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Сведения об авторах

Виталий Н. Василенко д.т.н., профессор, ректорат, Воронежский государственный университет инженерных технологий, пр-т Революции, 19, г. Воронеж, 394036, Россия, Vvn_1977@mail.ru
https://orcid.org/0000-0002-1547-9814

Лариса Н. Фролова д.т.н., профессор, кафедра технологии жиров, процессов и аппаратов химических и пищевых производств, Воронежский государственный университет инженерных технологий, пр-т Революции, 19, г. Воронеж, 394036, России, Fln-84@mail.ru
https://orcid.org/0000-0002-6505-4136

Иван В. Драган к.т.н., доцент, кафедра технологии жиров, процессов и аппаратов химических и пищевых производств, Воронежский государственный университет инженерных технологий, пр-т Революции, 19, г. Воронеж, 394036, России, vanes1989@mail.ru
https://orcid.org/0000-0003-2737-8380

Надежда А. Михайлова к.т.н., доцент, кафедра технологии жиров, процессов и аппаратов химических и пищевых производств, Воронежский государственный университет инженерных технологий, пр-т Революции, 19, г. Воронеж, 394036, России, mna8686@mail.ru
https://orcid.org/0000-0002-7789-9224

София И. Жильцова студент, кафедра технологии жиров, процессов и аппаратов химических и пищевых производств, Воронежский государственный университет инженерных технологий, пр-т Революции, 19, г. Воронеж, 394036, России, Fln-84@mail.ru

Information about authors

Vitalii N.Vasilenko Dr. Sci. (Engin.), prorector, Voronezh State University of Engineering Technologies, Revolution Av., 19 Voronezh, 394036, Russia, Vvn_1977@mail.ru
https://orcid.org/0000-0002-1547-9814

Larisa N.Frolova Dr. Sci. (Engin.), technology of fats, processes and devices of chemical and food productions department, Voronezh State University of Engineering Technologies, Revolution Av., 19 Voronezh, 394036, Russia, Fln-84@mail.ru
https://orcid.org/0000-0002-6505-4136

IvanV.Dragan Cand. Sci. (Engin.), associate professor, technology of fats, processes and devices of chemical and food productions department, Voronezh State University of Engineering Technologies, Revolution Av., 19 Voronezh, 394036, Russia, vanes1989@mail.ru
https://orcid.org/0000-0003-2737-8380

Nadezhda A. Mihajlova Cand. Sci. (Engin.), technology of fats, processes and devices of chemical and food productions department, Voronezh State University of Engineering Technologies, Revolution Av., 19 Voronezh, 394036, Russia, mna8686@mail.ru
https://orcid.org/0000-0002-7789-9224

Sofia I. Zhil'tsova student, technology of fats, processes and devices of chemical and food productions department, Voronezh State University of Engineering Technologies, Revolution Av., 19 Voronezh, 394036, Russia, Fln-84@mail.ru

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