Azolla of poultry farms, reproduction, production of its biomass'use as additional feed

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Abstract. In this article, poultry enterprises in wastewater Azolla (Azolla carolinianaWILL) the results of scientific and practical research carried out for the purpose of plant propagation and water purification, as well as the use of the resulting azolla biomass as additional feed for feeding broilers, are described. During the research poultry farm enterprise After planting Azolla in wastewater, its physico-chemical composition was studied (day 8), it was found that the water temperature in the experiment increased from 27.5 0C to 33.8 0C, the water (pH) environment changed from acidity to alkalinity (6.8-7, 6) increased, the color changed from reddish-yellow to transparent, the smell disappeared, the amount of suspended matter decreased (107.5-72.5 mg/l), the amount of oxygen (1.4-12.3 mg/l l) increased, the amount of KBS5 (123.5-28.7 mg/l) decreased, the amount of O2 in the oxidation process increased from 118.4 mg/l to 28.9 mg/l, and the amount of ammonia decreased from 9.0-1.8 mg/l l, as well as the loss of nitrites, nitrates, sulfates by 121.0-67.0 mg/l, chlorides by 113.0-54.8 mg/l, phosphates by 8.3-1.4 mg/l it was noted that it decreased to. At the same time, the biomass of Azolla in 8 days when Azolla is planted in poultry waste water is 100 g/m2from 750g/m2has been found to have increased to Broiler by giving 10-25-30% additional feed from Azolla biomass to the main feedohall are fed. Broiler johThe animals were fed for 35 days, with 30% azolla biomass as the main feedohOut of the total 340 kg of feed used during feeding, the main feed was 238 and the additional feed was 102 kg. In this case, broiler j compared to the controlohIt is scientifically proven that the weight of the cattle increased by 0.2 kg and 102 kg of basic feed was saved.

1 Introduction

Due to the presence of harmful compounds in the water polluted by various wastes worldwide, due to the violation of the health of the population and the ecological balance, it is necessary to create opportunities for water purification using biological methods and the reuse of purified water, to increase the productivity of poultry farms. Scientific research is being conducted to study feed ration and biomass of water plants. By reducing the consumption of fresh water, the use of waste water with high economic efficiency, the

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process of waste water generation andrich in biologically active substancesby determining the degree of purification of such water using macrophyte plants and researching its properties, its effective reuse in the field of national economy, It is of great scientific and practical importance to breed nutritious high plant species and obtain biomass from them, to use the obtained biomass as additional feed for poultry and to increase poultry productivity. There are problems in this regard in the Khorezm region.

The region has a complex continental climate, the level of water salinity is very strong. Most of the agricultural crops are grown under irrigation. That is why the annual water consumption of the region is very high. At the same time, waste water coming out of communal and agricultural enterprises is getting mixed with irrigation water through concrete ditches and pipes. This has a negative impact on the ecological environment of the region. Implementation of wastewater treatment in simple, cheap, convenient, ecologically safe biological methods,biological treatment of waters and creation of opportunities for reuse of the generated biomass is one of the most important issues of today.

2 Literature analysis

Biofiltration and nutritional properties of Azollafrom foreign scientists Biplob Basak(2002),Ahsan Habib Pramanik(2002),Fadzlin AA(2020),Samad (2020), Lokman H.(2020), Idris Hasliza(2020), Abu Hassim(2020), Yong Meng Goh(2020), Shambhvi(2020), Shivani Katoch(2020), Prince Chauhan(2020), Bandu Gangadhar Mane(2020),AMAbdelatty(2020), MIMandouh(2020), HAMansour(2020), HMAKhalil(2020), AMAbdelatty(2021), MIMandouh(2021), AK Al-Mokaddem(2021) and researched in the works of other scientists.

Researches were conducted by Indian scientists on the feeding of poultry by adding Azolla directly and with bacteria. Growth indicators, nutrient utilization, biochemical parameters, carcass characteristics were studied for 360 days. Poultry feeding with 2.5% Azolla and DFM (L.Plantarum, L.rhamnosus) has a positive effect on blood plasma cholesterol reduction, calcium content increase, body weight gain, breast muscle development and egg weight [1-7].

Malaysian scientists have conducted research to treat domestic wastewater under the influence of Azolla pinnata. For 15 parameters in domestic wastewater, including dissolved oxygen, KBS5, oxygen consumption for chemical processes, total solids, total phosphorus, total nitrogen, ammonia, turbidity, pH, electrical conductivity, iron (Fe), magnesium (Mg), the reduction of heavy metals such as manganese (Mn), lead (Pb) and zinc (Zn) was analyzed. Experiments were conducted in season 2. Metals decreased significantly in the first season, and Zn, Pb and Mn disappeared in the second season. At the same time, it was determined that there are positive changes in all indicators [8].

In the experiments conducted by the scientists of Giza University, studies were conducted by adding 5% and 10% of azolam to the main feed. It has been studied that such soft feed products increased the weight of broiler chickens compared to ordinary grain, and did not affect the increase in the weight of internal organs, liver and stomach. During the experiment, it was found that when azole was increased by more than 10%, oxygen deficiency occurred in the liver during feeding and there were negative changes in the liver. Adding 5% azole to the main feed had a positive effect on the internal organs of chickens, it was noted that the intestinal weight did not increase, the microflora improved and there was no adverse effect on the internal organs [9].

Malaysian scientists added 15% Azolla to the main feed and gave it to broiler chicks for 42 days. In this case, it was proved that protein synthesis in the body of chickens increased, food digestibility improved, and the weight of chickens increased compared to the control option [10]. Scientists at the University of Giza experimented with the addition of azole as

a quality protein source to replace soybean meal in the staple feed. For this purpose, dry biomass was dried in the sun and added to the main feed. Addition of azolla leaf up to 5% was effective in this. Azolla is rich in nitrogen in its leaves because it is grown in water, so it is rich in the amino acid leucine, which chickens need. During the study, taking into account that soybean is expensive, it was proved that it can be used instead of azolla leaf [11].

Biological treatment of industrial enterprises, municipal-household, agricultural enterprises, sewage plants and oil refineries in Uzbekistan under the influence of azolla, pistia, eichhornia belonging to the group of high water plants and studying their nutritional properties A number of studies were conducted and the results obtained by A.M. Muzaffarov (1972), R.SH.Shoyakubov (1975), R. Maliyeva (1987), A.Abdukadirov (1990), E.E. Yunusov (1991), M.A.Kochkarova (1991), SB Boriyev (1993), K.I. Aytmyetova (1998), Y.Q. Haitov (2001), N.E. Rashidov (2001), J. Qutliyev (2004), M.I. Mustafoyeva (2003), S.O. Xho'jiyev (2010), T.N. Xolmurodova (2018), L.T.Yuldoshov (2021) and described in the works of other scientists.

3 Materials and methods

3.1 Research object

As a research object Bogot district, Khorezm regionwastewater from the "Tursinboy oglu Jamolbek" poultry enterprise specializing in poultry farming in Azolla (*Azolla carolinianaWILL*) was selected. "Tursinboy oglu Jamolbek" farm specializing in poultry farming, M. Kuvokov Farmers Union of Bogot District, Khorezm Region is located in the territory of Kipchak MFY, totaling 21.5 hectares. Chickens, ducks and turkeys are raised from poultry. A building specializing in poultry farming is located on 1.7 hectares.Clean water is used to clean the nests of all breeds of chickens kept in the poultry farm, from chicken waste and droppings twice daily, and to clean the slaughterhouse from blood and feathers. 10-12 m3 of waste water is produced per day from all the working shops of the enterprise.

3.2 Biological description of Azolla and its acclimatization to the conditions of Uzbekistan

Representatives of the Azolla family grow well in natural conditions in the waters of North America, Western and Central Europe, South America and the Galapagos Islands. This plant is mainly propagated as a biofilter and feed.Azolla is a small, beautiful, spore-reproducing, surface-floating herbaceous plant, up to 2.5 cm in size, with leaf plates up to 1 mm in size. Azolla grows floating on the surface of the water and reaches a length of 0.7-1.8 cm. In the upper part of the sporaphyte, 2 rows of small (0.5 - 1 mm) leaves cover the branch like coins located on top of each other, and in the lower part of the body, a 2.0-2.5 cm long root is formed.Azollas grow quickly in favorable conditions and cover the surface of the water in the form of a carpet, saturating the water with oxygen. Watercress is a high-yielding plant. It doubles its biomass every 2-3 days [2]. Small-leaved Azolla of Azoladosh(*Azolla microphylla*), Anabaena azollae (*Anabaena azollae*), Nile azolla (*A. nilotica*), Corolina azolla(*Azolla caroliniana*), Nostoc azollae (Nostoc azollae), Tropical azolla (*A.tropica*), Mexican azolla (*A.mexicana*) species. Experiments were carried out in Corolina azolla species [1].

Azolla(*Azolla caroliniana*) scientific and practical work on the acclimatization of the aquatic plant in natural and artificial water bodies of Uzbekistan by R. Sh. Shoyogubov,

professor of the Scientific Research Institute of Microbiology of the Academy of Sciences of Uzbekistan, doctor of biological sciences, and his students 1993-1995 carried out in [2].

3.3 Chemical composition of Azolla

Azolla is a plant with high nutritional properties. It contains various minerals, proteins and other nutrientsthe presence of substances has been determined by scientists.

When analyzing the composition of Azolla, its dry biomass contains 19.46 - 21.38% proteins, 3.28% fats, 33% ash, 35.7-39.2% fiber, 2.24% calcium, 0.3% phosphorus, 63.8 mg/kg of carotene. Pesticides DDT-(dichlorodiphenyl trichloromethylmethane), GXB-hexachlorobenzene, caldrin, heptochlor, disease-spreading bacteria and aflatoxins were not detected [1].

3.4 The composition of the wastewater of the poultry enterprise before planting Azolla

The initial physico-chemical composition of the wastewater of the poultry enterprise was analyzed. The composition of water was studied before planting Azolla. In this case, the temperature of the waste water is 25^0C, environmentpH-6.5 ni, color yellow, smell 4 points,no dissolved oxygen, biochemical oxygen consumption 144.8 mg O_2/l, oxidation level 134.5 mg O_2/l, ammonia 4.2 mg/l, nitrites 0.02 mg/l, nitrates 3.7 mg/l ,chlorides 78.4 mg/l, sulfates 97.4 mg/l, phosphates5.7 mg/land suspended solidsIt was found to be 48.4 mg/l.

3.5 Methods of determining the chemical composition of wastewater

The recommendations of VM Katanskaya were used to determine the productivity of the plant [4]. The physical and chemical composition of wastewater, the composition before planting and after planting, was determined on the basis of general hydrochemical YYLure and NS Strogonov methods [5, 6].Water temperature (in laboratory and biological ponds) was determined using a mercury thermometer, hydrogen ion (pH) indicator using indicator papers and LPU-01 brand Ph meter. Available odors in the water were determined based on scores. The color of the water is measured by standard solution cobalto-chromium scale, spectrophotometer and photoelectrocolorimeter, the amount of dissolved oxygen in water by the Winkler method, the biochemical consumption of oxygen by KBS_5 - by dilution of wastewater,The degree of oxidation of chemicals in wastewater was determined by the permanganate method.

Ammoniacal nitrogen - Nessler's solution, Griss's solution was used for the determination of nitrite nitrogens. The amount of sulfates was determined by precipitation with barium sulfate and weighed on an analytical balance, and the amount of chlorine ions was determined by adding potassium dichromate and shaking with silver nitrate. Suspended substances in the water were settled using a centrifuge, placed in bags, dried in a dryer at 105^0 C, and determined by measuring on an analytical balance. The yield of Azolla grown in wastewater was determined by weighing on an electronic scale.

3.6 Broiler'determining the productivity of the products

In the poultry industry in the meat direction in our republic, the leading meat chicken crosses - "Ross" (England), "Hubbard" (France), "Cobb", "Arbor Aikres" (USA) broiler crosses are widely used [3]. They differ from each other in their rapid growth. Azolla

biomass'to carry out experiments by giving it as additional food"Ross-308" (England) breed was selected from the leading meat chicken crosses in the meat poultry industry.From 100 chickens fed in options I (control), II, III, IV to determine and compare the weight of broilers10 chickens weighedaveraged.

4 Results of the experiment

4.1 Experiment 1. Results of studies on azole development, productivity and water treatment properties in wastewater

Initially, 3 variants of azolla were planted in the wastewater in the biological ponds established near the enterprise, and its growth and development were monitored. In this case, 100 grams of Azolla were planted in all three biological ponds and the results of 8 days were analyzed. During the experiments, 704 g of biomass was formed on the surface of the wastewater in the first biological pond, 618 g on the surface of the wastewater in the second biological pond, and 476 grams in the wastewater in the third biological pond.

According to the obtained data, the azolla plant developed rapidly in the wastewater of the poultry enterprise for 8 days, and in the first option, 100 g to 704 g of biomass was produced per 1 m2 of water surface, in the second option, from 100 g to 618 g, and in the third option, from 100 g to 476 g. was determined to do (Table 1).

Table 1. Dynamics of growth and development of azolla in wastewater of a poultry farm.

No	Biological ponds	Wet biomass of Azolla, g/m^2				
		At the beginning of the experiment	Daily growth		Biomass amount for 8 days	Total biomass
		g/m^2	g/m^2	%	g/m^2	g/m^2
1	The first biological pool is +azolla	100	75.5 ±0.84	75.5 ±0.16	604.0 ±0.48	704 ±0.45
2	The second biological pool is +azolla	100	64.7 ±0.46	64.7 ±0.10	518.0 ±0.42	618 ±0.38
3	The third biological pool is +azllla	100	47.1 ±0.38	47.1 ±0.22	376.0 ±0.28	476 ±0.32

4.2 Analysis of wastewater composition after planting Azolla

The results were analyzed after the 8th day after inoculation of Azolla in the wastewater of the poultry farm (Biological pool 1). This is the environment of waterph-7.1, clear color, no smell,dissolved oxygen in water 6.8mg/l, KBS511.7mg O_2/l, oxidation 17.8was mg O_2/l. Ammonia in wastewater,nyttrites and nitrates were not detected. Chlorides 14.2 mg/l, sulfates18.3mg/l, amount of phosphates-1.3mg/l and amount of suspended matter12.3mg/l and plant biomass was found to be 704 g/m2.(Table 2).

Table 2. Poultry enterprise is emptyphysico-chemical composition of waterazolachanges before planting and after planting(day 8).

No	Indicators	Until the experiment:	After the experiment:
		Wastewater composition	**Waste water composition**
1.	Temperature, C	25.0±0.46	27.0±0.41
2.	pH	6.2±0.13	7.1±0.15
3.	Smell, score	4.0±0.16	no
4.	Color	reddish	colorless
5.	Oxygen dissolved in water, mg/l	no	6.8±0.25
6.	KBS_5, mg O_2/l	144.8±5.7	11.7±0.89
7.	Oxidation,mg O_2/l	134.5±6.3	17.8±1.8
8.	Ammonia, mg/l	4.2±0.32	no
9.	Nitrites, mg/l	0.02±0.001	no
10.	Nitrates, mg/l	3.7±0.24	no
11.	Chlorides, mg/l	78.4±5.7	14.2±0.98
12.	Sulfates, mg/l	97.4±5.2	18.3±0.91
13	Phosphates, mg/l	5.7±0.25	1.3±0.04
14	Suspended substances, mg/l	48.4±1.5	12.3±0.09
15.	Plant biomass, g/m^2	100±4.3	704±6.7

4.3 Experience. Results on the use of azolla biomass as supplementary feed in poultry production

In poultry farmingAzolla (Azolla caroliniana) in order to use it as an additional feed and to save the purchase of soft feed and the money spent on itspecializes in poultry farmingBogot district, Khorezm regionExperiments were carried out in field conditions on the maintenance of azolla biomass grown in sewage water as additional feed for poultry in the biological ponds established at the "Tursinboy oglu Jamolbek" farm (Fig. 1).

Fig. 1. The process of breeding Azolla in biological ponds and feeding poultry with feed supplemented with Azolla biomass.

The experiments were carried out on the "Ross" breed (England), one of the leading meat chicken crosses in the meat poultry industry.TThe tests were carried out in 4 options, the 1st option is the control option, in which, according to the usual instructions, 40 g of starter feed for each 1 chick, 40 kg for every 100 chicks, in the period of 1-10 days of chicks , in the period of 11-21 days of chicks, 100 g of ros omukhta feed per 1 chick, 100 kg per 100 head of chicks, 200 g of finish omukhta feed per 1 chick in the period of 22-35 days of chicks, 200 kg was given to every 100 chickens. In this case, the total feed for 35 days of care was 340 kg per 100 chicks (chickens). At the end of the experiment, 10 chickens were weighed and averaged over 36 days, and each chicken weighed 2.1 kg.

In the 2nd variant of the experiment, broiler chicks were raised with the addition of 10% Azolla (Azolla) biomass to the main feed. For 1-10-day-old chicks, 36 g of basic feed, 4 g of azolla per chick, 36 kg of basic feed, 4 kg of azolla per 100 chicks, 1 kg of azolla for each 11-21-day period of chicks Basic feed 90 g Azolla 10 g per 100 chicks Basic feed 90 kg Azolla 10 kg, during the period of 22-35 days of chicks 180 g Basic feed per 1 chick, Azolla 20 g per 100 head 180 kg of basic feed was given to chicks with 20 kg of azole. In this case, the total basic feed for 35 days was 306 kg, additional feed (azolla) was 34 kg. At the end of the experiment, when 10 chickens were weighed and averaged, each chicken weighed 1.9 kg.

In the next variant 3, experiments were conducted by adding 25% azolla biomass to the main feed. For 1-10-day-old chicks, 30 g of basic feed, 10 g of azolla per chick, 30 kg of basic feed, 10 kg of azolla for every 100 chicks, 1 head of chicks in the 11-21-day period of chicks basic feed 75 g of azolla 25 g per 100 chicks, basic feed 75 kg of azolla 25 kg,

during the period of 22-35 days of chicks, basic feed per 1 head of chicks 150 g, azolla 50 g, per 100 heads 150 kg of basic feed and 50 kg of azolla were fed to the chick. For 35 days, the total basic feed was 255 kg and additional feed (azolla) was 85 kg. At the end of the experiment, when 10 chickens were weighed and averaged, each chicken weighed 2.2 kg.

In the next variant 4, experiments were conducted by adding 30% azolla biomass to the main feed. For 1-10-day-old chicks, 28 g of basic feed, 12 g of azolla per chick, 28 kg of basic feed, 12 kg of azolla per 100 chicks, 1 head of chicks in the period of 11-21 days of chicks 70 g of basic feed per head, 30 g of azolla, 30 kg of basic feed per 100 chicks, 70 kg of basic feed, 30 kg of azolla, 140 g of basic feed per 1 head of chicks, 60 g of azolla, per 100 heads 140 kg of basic feed and 60 kg of azolla were fed to the chick. For 35 days, the total basic feed was 238 kg and additional feed (azolla) was 102 kg. At the end of the experiment, 10 chickens were weighed and averaged, each chicken weighed 2.3 kg (Table 3).

Table 3. Consumption of basic and additional feed (azolla) and weight of chicks (35 days) in breeding broilers.

Experience options	For every 100 head of chicks	Nutrient content (g)			Amount of food (kg)			Total food consumed (kg) 35 days	Weight (average of 10 chickens) kg
		Days			Days				
		1-10	11-21	22-35	1-10	11-21	22-35		
	Food type	Start	Ross	Finish	Start	Ross	Finish		
1	Main food (control)	40	100	200	40	100	200	340	2.1
2	Main food +azole (10%)	36+4	90+10	180+20	36+4	90+10	180+20	306+34	1.9
3	Main food +azole (25%)	30+10	75+25	150+50	30+10	75+25	150+50	255+85	2.2
4	Main food +azole (30%)	28+12	70+30	140+60	28+12	70+30	140+60	238+102	2.3

5 Conclusions

5.1 Experiment 1

When the results are analyzedDuring the 8-day experiments, the growth, development, biomass production and water purification levels of Azolla in the wastewater of the poultry enterprise were monitored.It was found that 100 to 704 grams of biomass accumulated on 1 m2 of water surface, and the level of purification of wastewater from organic-mineral substances reached 88-92%.

5.2 Experiment 2

A study on the use of biomass generated from wastewater as a feed supplement for broiler chicks When the results were analyzed, in the control option 1, a total of 340 kg of feed was spent for 35 days of chick care, the average weight of each chicken raised for meat was 2.1 kg, and in the 2nd option, the total feed was 340 kg. additional feed (azolla) is 34 kg, the average weight of each chicken raised for meat is 1.9 kg, in option 3 the total feed is 340 kg, of which additional feed (azolla) is 85 kg, The average weight of each chicken raised for meat is 2.2 kg, in the 4th option the total feed is 340 kg, and when 102 kg of azolla is given as additional feed, the weight of each chicken raised for meat is average was 2.3 kg.

When comparing the above research works, it was noted that the results of the experiment in the 4th option, i.e. basic food + azole (30%) are effective. It was found that due to the proteins, fats, fiber and other substances contained in this variant, the chickens grew healthy and the body size increased by 0.2 kg compared to the variant fed with the main feed. Most importantly, it has been scientifically proven to save 30% of the main feed.

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