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Investigating Insects with Light Diode Lights for Fish Food

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Annotation. In the article, in order to obtain fish productivity of ponds, it is necessary to increase the proportion of the feed base of ponds and reservoirs in the fish feeding diet using natural feed resources. The description of two LED electrical installations for attracting various insects to fish ponds is given. The first one is tuned to a certain optimal color of the radiation. The chromaticity coordinates of the RGB-LED light emitting diodes of the second electro-optical converter vary depending on the ambient temperature.

Key words: Growing fish in natural conditions, lamps with diode lamps, electro-optical convector, attraction of insects.

The head of the small grants program of the Global Environment Facility of the Institute of Zoology of the Republic of Uzbekistan, candidate of biological sciences, senior researcher B.G. Noted by Kamilov. He said fish production was only 10,000 tonnes a year.

Consumption, on the other hand, is 0.5 kg per person per year, which is less than 16 kg per person per year according to the medical norm for full provision. To reach this standard, it is necessary to produce more than 400,000 tons of fish per year. [1]

In the Republic, fish farming in indoor fisheries (ponds, cages, ponds, etc.) is carried out using intensive technologies, which allows to grow high quality fish in ponds. This is achieved through a number of measures: increasing the number of high-yielding fish species; growing them in polyculture; feeding fish with artificial feed; fertilizers and pond reclamation. In this case, a high density of fish is applied in the water bodies.

One of the important ways to activate the breeding of pond fish and the main way to increase the live weight of fish is to feed it. The effectiveness of this process depends on the environmental conditions of the reservoir, feeding techniques, the composition and quality of the feed used, which are divided into two groups: live feed and artificial feed [1].

In fisheries located in the southern regions of the Republic of Uzbekistan, carp are mainly grown in conditions close to natural conditions. In order to obtain full and healthy fish in the ponds, it is necessary to regulate the density of stocks in such a way that the share of live food given to fish by producers (60 ÷ 70)%, for young fish - (20 ÷ 25)% and for fish sold - (15 ÷ 20)% [1, 2]. When a high-yielding natural food base is available, or when feeding fish with non-living food, the fertilization rate of the fish is increased by a factor of (2 ÷ 5) or more. However, as it increases, the share of live

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nutrients decreases sharply and is replaced by non-living nutrients. In this case, the usefulness and quality of food is of particular importance.

Fisheries are actively using artificial feeding of fish. As a second, mainly mixed feed is used. Concentrated feeds are not always balanced in terms of nutrients, they do not contain enough vitamins, trace elements, biologically active substances necessary for the reproduction, development and growth of fish. They often have a lack of protein and an excess of carbohydrates. Long-term use of such feeds leads to metabolic diseases, hypovitaminosis and hypervitaminosis, metabolic diseases, alimentary toxicosis, lipoid dystrophy, toxicosis and eventual death of fish [1-3]. This leads to a decrease in the productivity of the ponds and an increase in the cost of fish farming.

In order to reduce the consumption of concentrated feed in fish farming and improve the epizootic situation in the ponds, special attention should be paid to measures to increase the natural feed base of live feed, reservoirs and reservoirs using local feed resources. One of these measures is to feed the fish with the insects involved by means of optical radiation to the surface of the fish ponds. Various electro-optical converters are used for this purpose. Their use improves the quality of fish feed by increasing the proportion of live feed. This leads to an increase in fish immunity, a decrease in morbidity, and an increase in live weight and accelerated growth.

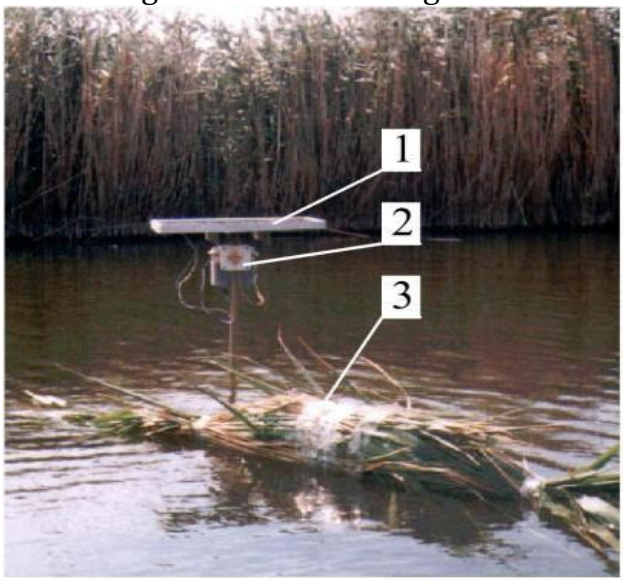

Figure 1 - Platform LED electro-optical converter for insect collection

The most advanced way to increase the proportion of live food in the diet of fish is to use electro-optical converters to attract mosquitoes to water bodies, where their larvae are a favorite food of fish. Electro-optical converters are located at the top of the water table, in places convenient for fish, and are used in conjunction with platforms for collecting mosquitoes.

An electro-optical converter using electrical technology for feeding live fish is shown in Figure 1 [4]. This power plant works as follows. In the late afternoon, a photorelay is activated that supplies voltage from the power supply to the light emitting diodes (LEDs). Insects involved in optical radiation 2 fly to the installation site and land on the floating platform 3, which creates favorable conditions for the insects to lay eggs. The larvae that emerge from them become food for the fish.

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The autonomous operation of the electro-optical converter is provided by a rechargeable battery 1 from the solar module [4].

The electrical structure in this design is an effective means of feeding fish with live food because it uses a color stimulator to attract insects. As a result, the study [4] determined the chromaticity coordinates corresponding to the maximum number of insects involved, in terms of positive phototaxis:

Optimal chromaticity of optical radiation (hopt = 0.2294; yopt = 0.2366) is averaged over a year during the flight activity of insects and does not take into account the effects of external environmental factors on insects: air temperature and humidity, precipitation, wind, atmospheric pressure, electricity and magnetic disturbance of areas, natural lighting [5, 6]. Analysis of modern research on the effects of optical radiation on biological objects shows that the perception of a particular color of radiation depends in many respects on the ambient temperature [8, 9].

Studies [7] have found that the optimal color of optical radiation involving insects depends on the ambient temperature. This dependence is shown in Figure 2, which shows how important it is to change the optimal coordinates of the chromaticity of optical radiation from the ambient temperature corresponding to the active flight of insects (14 ÷ 38 ° C): (Dx = 0.5330 ÷ 0.1862, Dy = 0.3073 ÷ 0.1437). As the air temperature rises, the optimal chromaticity changes from orange-red to blue-purple (Figure 2).

Thus, by changing the color of its radiation depending on the ambient temperature, it is possible to increase the efficiency of electrical technology of feeding fish with live food by increasing the number of insects attracted by the electro-optical converter.

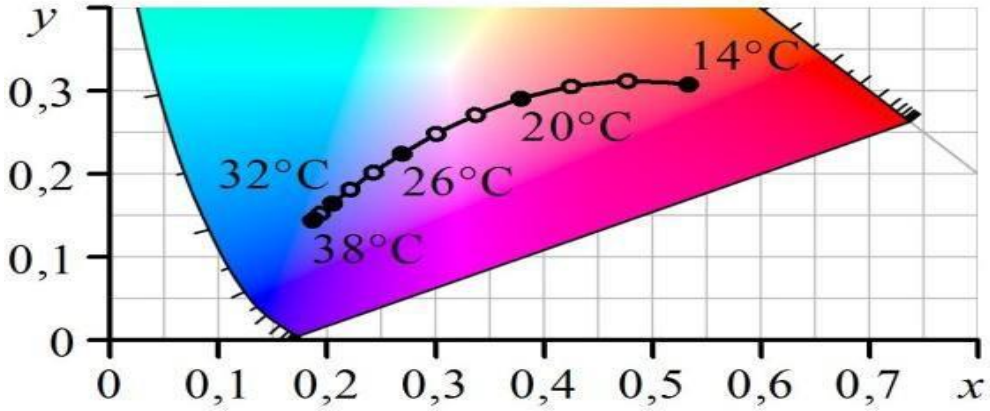

Figure 2 - Optimal optical radiation in the CIE 31 chromaticity atlas change the chromaticity

The chromaticity of the radiation produced by the LED electro-optical converter can be changed according to the dependence shown in Figure 2 [9]. A functional diagram of this electrical installation is shown in Figure 3.

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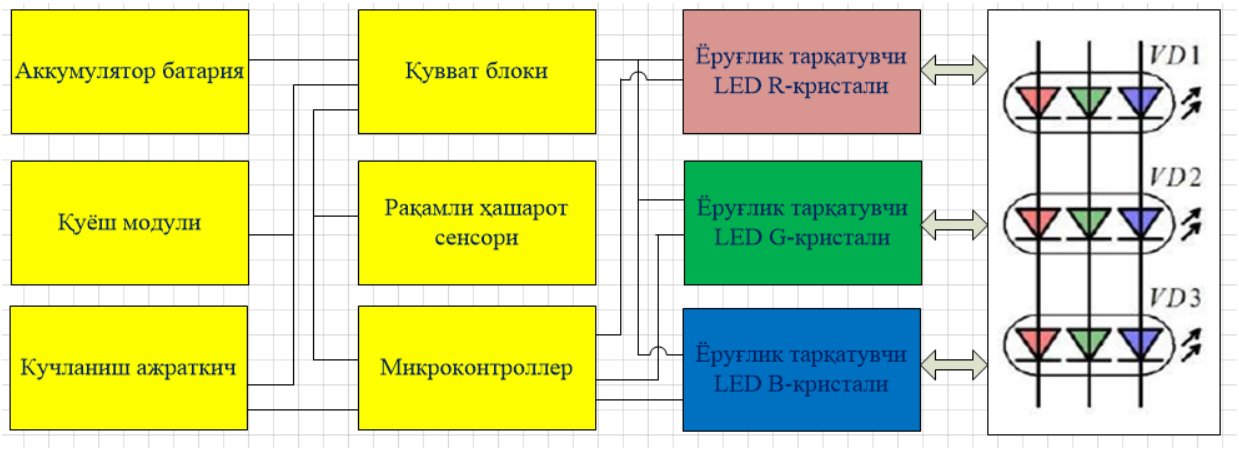

Figure 3 is a functional diagram of an electro-optical converter whose radiation chromaticity varies.

Three powerful RGB LEDs (VD1, VD2, VD3) of PL6N-3LFE type, located at an angle of 120 ° in the horizontal plane, are used as attracting lamps. The color of the LED radiation changes by adjusting the currents through light-emitting crystals of a different color (R - red, G - green, B - blue). Stabilization and regulation of currents is done by LED drivers with DIM interface. They receive three PWM control signals (approximately 2 kHz frequency) from an AT mega 8535 microcontroller with programmed settings to control the color of the radiation. The ambient temperature controlled by a digital ADT 75 sensor is transmitted to the microcontroller via the I2C interface.

The microcontroller performs general control over the operation of electrical installations:

- turn the light on and off of the issuer during the day in the evening and in the morning, during the active summer period of insects;
- Turn off the LEDs at air temperatures outside the temperature range of active summer insects.

The electrical installation has a power supply based on a storage battery charged from a solar module (Figure 3). The solar module also controls the level of natural light. To do this, the voltage is transferred from the solar module through a separator to the microcontroller.

experimental studies were conducted to compare the effectiveness of two methods of stabilizing the chromatism coordinates of hop = 0.2294 and uopt = 0.2366 (control) and attracting insects with optical radiation with color change depending on air temperature [10]. The results of these experiments are shown in Figure 4.

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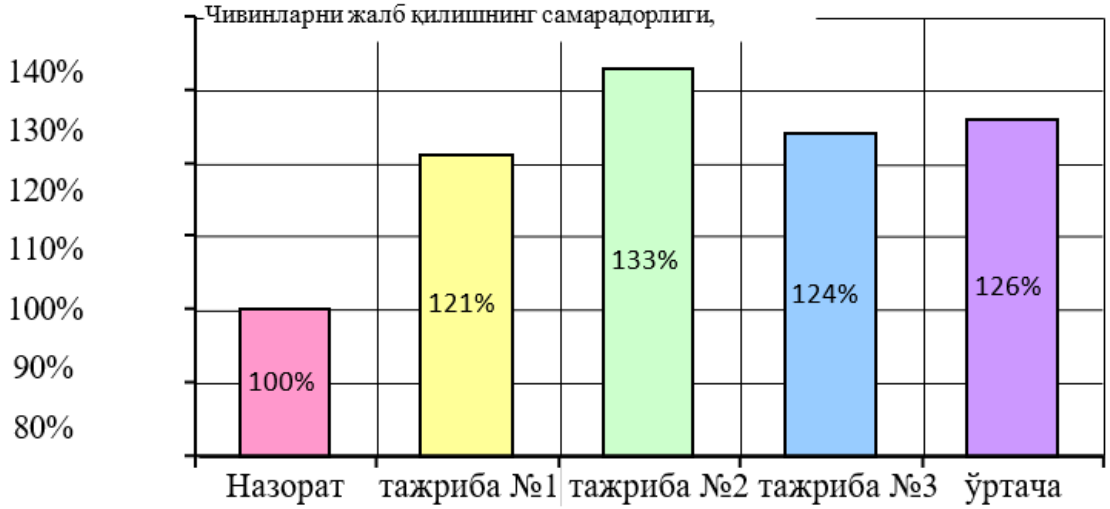

Figure 4 Efficiency of insect capture using electro-optical converters

Conclusion.

Changing the color of the electro-optical converter radiation depending on the ambient temperature increases the efficiency of attracting insects by an average of 26%. To technically implement the color change of the optical illumination of the attractive lamps, it is necessary to use RGB LED lighting lamps controlled by a microcontroller.

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