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THE USE OF AN ULTRAVIOLET LAMP TO INCREASE THE EFFICIENCY OF LIVE FEEDING OF FISH BY MOSQUITOES

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Annotation: The article discusses the problems of providing mosquitoes in ponds and fish farms, increasing the share of live food in the fish diet due to the mosquito base of internal artificial ponds. A review of an experiment for feeding fish with mosquitoes, in which different LED ultraviolet lamp color stimuli and pulse width modulation controllers are used for bait, is carried out. The use of this electro technological equipment leads to increased efficiency in artificial ponds and reduced costs for other types of fish food.

Ultraviolet LED strip can change the illumination thanks to pulse width modulation regulator through the voltage and find the desired brightness, which attracts flying mosquitoes. In addition, you can use RGB - LED lamps with color control with specialized pulse-width modulation LED controllers. Ambient air temperature is controlled by a digital temperature sensor.

Key words: Alternative energy, pulse width modulation (PWM) controllers , electrical technology, constant voltage, fuses and switches, feeding fish with live food, mosquitoes, flying insects, attracting mosquitoes, electric fan, silicon solar cell (SSC), fish farms (RF), renewable energy sources (RES), ultraviolet lamps, ultrasonic devices, regulators, RGB LED , multi-colored LED lamps.

1. Introduction

In order to improve the management system of the fishing industry, increase the efficiency of fish farming and fishing organizations, expand production capacity for processing fish products, rational use of natural and artificial reservoirs, as well as the introduction of scientifically based methods and intensive technologies for growing fish, measures to improve the system WERE stopped management of the fishing industry agree with the proposal of the Ministry of Agriculture and Water Resources, the Ministry of Economy of the Republic of Uzbekistan, the State Committee for Promotion of Privatized Enterprises and Development of Competition, to determine the main tasks and areas of activity of the Uzbekbaliksanoat Association in terms of: a) improving the reproduction of fish seeding material: assistance to organizations and enterprises of the fishing industry in organizing the reproduction of valuable fish species for further stocking of natural and artificial reservoirs with fish; creation of new hatchery workshops for the release of larvae, increase in the production of juvenile fish, modernization and expansion of existing ponds for growing fish seed; [1].

b) rational use of resources of natural and artificial reservoirs: ensuring effective interaction with relevant local executive authorities in matters of provision of land plots for the creation of reservoirs; increasing the volume of fish catches through the widespread introduction of modern intensive technologies, including the cage method of growing fish, and increasing the productivity of natural and artificial reservoirs; strengthening the feed base of the fishing industry by creating new and modernizing existing production facilities for the production of balanced and high-protein fish feed; [2].

The role of natural feed when growing fish in artificial ponds Feeding fish with dipole feeds in a complex of intensification measures is a decisive factor in natural feeds.

Feeding fish with artificial food is resorted to in cases where significantly more fish are planted per unit area of the pond to feed than there are natural food and flying insects available to ensure normal growth of the fish.
The productive effects of feed largely depend on the conditions in which fish are grown. Water temperature and oxygen regime, chemical composition and the degree of water pollution with organic substances have a significant impact on the metabolism in the body of fish, as a result of which the productive effects of feed can increase or decrease, and fish growth can be inhibited or enhanced.

Science has proven that when planting yearlings of carp 2.0-2.5 thousand pieces/ha, the share of natural food in the diet is 20-25%, at 3.5 thousand pieces/ha and above it decreases to 10%, and increases accordingly influence of artificial feed.
refers to the field of fish farming, in particular to the enrichment of ponds with live food, such as flying mosquitoes and insects.

1. Materials and Methods

In terms of feed nutritional value, locust meal has no equal: it surpasses all existing animal proteins used in feed. The facts are amazing: in pork and lamb the protein content is 17%, in fish – 21%, and in locusts – 78%! To obtain 1 kg of conventional protein, a cow needs 8 kg of feed or only 300 grams of locusts

Insects have a higher protein content compared to traditional soy and fish meal. Insects are an important link in the food chain, as they have a composition of proteins, fats and carbohydrates that is important for the good growth of fish, and are a useful natural supplement to the main food. If the food does not contain everything needed, the fish will grow slowly and become sick. Fish farming is one of the key areas of the agro-industrial complex, based on the cultivation of marketable fish in natural and artificial reservoirs.

These are the colors that mosquitoes avoid. Blue was unpopular with the mosquitoes in the study. Although it is a dark color that absorbs heat well, heat is known to attract mosquitoes. Keep this in mind and wear lighter shades to reflect warmth.

The formula for determining the photon energy (E) of light radiation can be expressed as:

$$E = \frac{hc}{\lambda}$$

where: E - photon energy,

h - bar constant$\left(6.626 \times 10 - 346.626 \times 10^{-34} Дж \times c\right)$

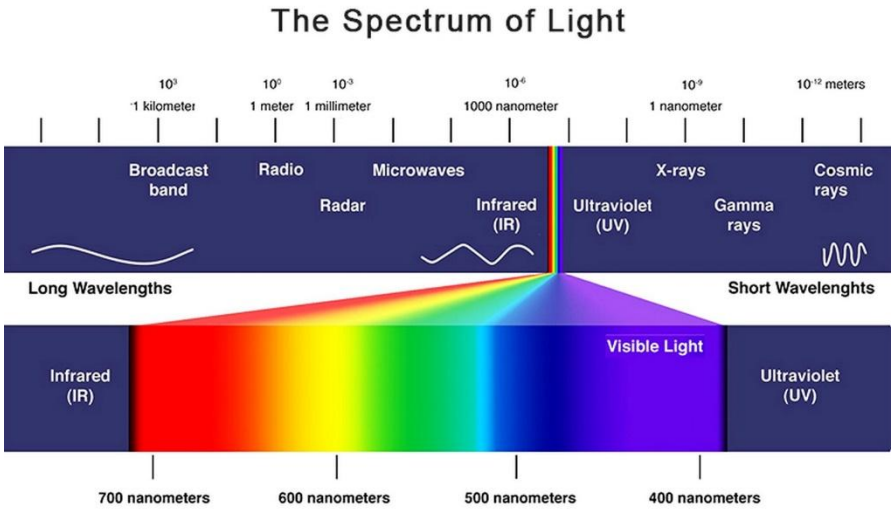
c - speed of light in vacuum equal to 299,792,458 m/s),

λ is the wavelength of light in meters.

This formula allows you to calculate the photon energy for different wavelengths. If in the range from 350 to 400 nm, you can substitute the corresponding values into this formula and select LEDs with suitable parameters.

This is a diagram of the spectrum of light. It shows different types of electromagnetic waves, including radio waves, microwaves, infrared waves, visible light, ultraviolet rays, x-rays and gamma rays. The bottom part of the image shows the spectrum of visible light in the form of a rainbow. The image also includes measurements in nanometers and meters, showing the wavelengths of different wave types. This helps us better understand how different types of light interact with the environment and how they are used in our daily lives.

The light spectrum diagram plays an important role in scientific research. It is used in spectroscopy, which helps scientists understand how objects such as black holes, neutron stars or active galaxies emit light, how fast they move and what elements they are made of [1].
The light spectrum pattern is used in scientific research on mosquitoes to study their behavior and control them. Here are some examples:
Research has shown that mosquitoes respond to different spectrums of light [1]. For example, Electra radiograms show that mosquitoes have two peaks in eye receptor sensitivity to UV and blue/green light [1].
Light-emitting diodes (LEDs), which emit specific wavelengths instead of the entire visual spectrum, may be more effective at attracting mosquitoes [2]. This allows public health and insect control agencies to make more accurate estimates of mosquito populations and better predict the spread of mosquito-borne diseases [2].
Research has shown that timing and light spectra are critical for species-specific light control of harmful mosquitoes [3].
Improved surveillance methods are required to accelerate the control of major arthropod-borne diseases such as malaria, dengue, filaria, Zika and yellow fever. Light emitting diodes (LEDs) are increasingly being used in mosquito traps because they improve energy efficiency and battery life compared to incandescent bulbs [4].
Thus, the light spectrum diagram plays an important role in mosquito research, helping scientists better understand and control these pests.



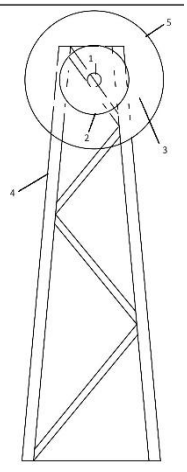
Rice. 3. Changes in the CIE 31 chromaticity atlas from air temperature and the chromaticity line from RGB

The use of an electrical installation that uses a color stimulus for insects can increase the efficiency of attracting mosquitoes by 21...44% [11,15].

An alternative electrical installation shown in Fig. 4, is designed to power light-emitting installations in order to attract mosquitoes with ultraviolet and RGB tape, which affects the visual organs of mosquitoes, attracting them to electrical technology. The device contains PWM controllers (pulse width modulators), which change the illumination of ultraviolet and RGB LED strips. Mosquitoes, attracted by different light modules, approach the installation and, using electrical technology, press the flying insects to the surface of the lake.

UV LED strip 3528 SMD 60 LEDs/m installation notice: The tape is soldered on each 0.5 m section in small strips. This strip only has two wires. Every 3 diodes can be cut. When connecting a single-color strip, a DC power jack is required. You can choose one color controller or not. If the LED light may not be light, please change the connection from positive (+) to negative (-) (swap the right and left wires) Features: Super bright 5050/3528 SMD UV-UV LED, high intensity and reliable waterproof flexible LED strip 60 or 120 SMD UV LEDs per meter self-adhesive back side with double-sided adhesive tape free maintenance, easy installation every 3-LED curable without damaging the rest of the strip flexible The bending tape is ultra-bright but operates at low temperatures. Parameters of UV LED strip input voltage 12VDC, wavelength: 395-405nm, long life 50000+ hours, protection degree: ip65 Waterproof, PCB color: white, brightness adjustment by PWM and dimeter, Trimmable can be cut every three LED, beam angle: 120, viewing angle: adjustable by installation, operating temperature: -20 to 50, size: W1.0cm x T0.25c, application of ultraviolet tape is used to attract mosquitoes, also testing paper money and disinfection.

The electrical installation (Fig. 4) has an ultraviolet LED source, which is turned on using special light sensors in the evening and morning hours, during the period of active mosquito flight. Power is supplied from a 60 Amp-hour battery, charged during the day from the sun; the battery provides alternative energy, complete with a controller that controls charging. The color of the mosquito-attracting radiation is adjusted to the optimal color coordinates.



The main parts are installed in a stainless-steel housing (5). Inside the device there are effective LED UV strips, semiconductor LED lamps with the wavelength necessary to attract insects, PWM controllers (3), an electric fan (1), an RGB LED strip that leaves insects no chance of survival (2). The design of the device allows for easy and quick cleaning (4). The device remains safe for humans.

Rice. 4. An alternative installation using electrotechnology is provided by feeding fish with flying insects in artificial ponds.

Insects are influenced by various environmental climate factors: air temperature and humidity, wind strength, level of natural light, and others. [14]. During operation of electrical equipment for feeding fish with flying insects, environmental conditions are constantly changing. This also affects the manifestation of the motor response of insects to a light stimulus.

It has been established that the ambient air temperature has a significant influence on the optimal color of radiation that attracts mosquitoes [8].

The influence of ambient air temperature on the color of radiation attracting mosquitoes was taken into account in the design of an electrical installation with adjustable color of radiation and changing the type of lamp with different illumination for feeding fish with flying insects and mosquitoes [6]. As attractant sources, a powerful RGB LED strip brand SMD5050 is used, which is controlled with a remote control and an autonomous power supply of 3.7 Volts DC, in addition, there is an ultraviolet lamp brand 5050 SMD m 395-405nm waterproof ultraviolet ray, there are 60 LEDs per 1 m

UV LED strip. Thanks to RGB - LEDs, regulation of the color of their radiation is possible in a wide range by changing the currents passing through the R-, G-, B -crystals using specialized PWM LED drivers. Ambient air temperature is controlled by a digital temperature sensor. [9]

2. Results and Discussion

The use of these installations does not require regular cleaning of the housing, fan, emitter, hardwired and control devices. Shading of the radiation source by insects reduces the efficiency of the installation. Bringing this installation closer to the water for feeding fish allows you to increase the operation of this installation, performing only seasonal cleaning of the sealed ultraviolet and RGB LED strip. [7]

No.	Types of lamps	Illumination (LC)	Number of flying insects (pcs)	%
1	ultraviolet	440	900	48
2	white	1800	1150	58
3	yellow	1300	1100	56
4	RGV	84	800	44
5	Blue	280	650	40
6	All lamps	2034	1800	100

Table 1 The number of attracted flying insects depending on the type of lamp.

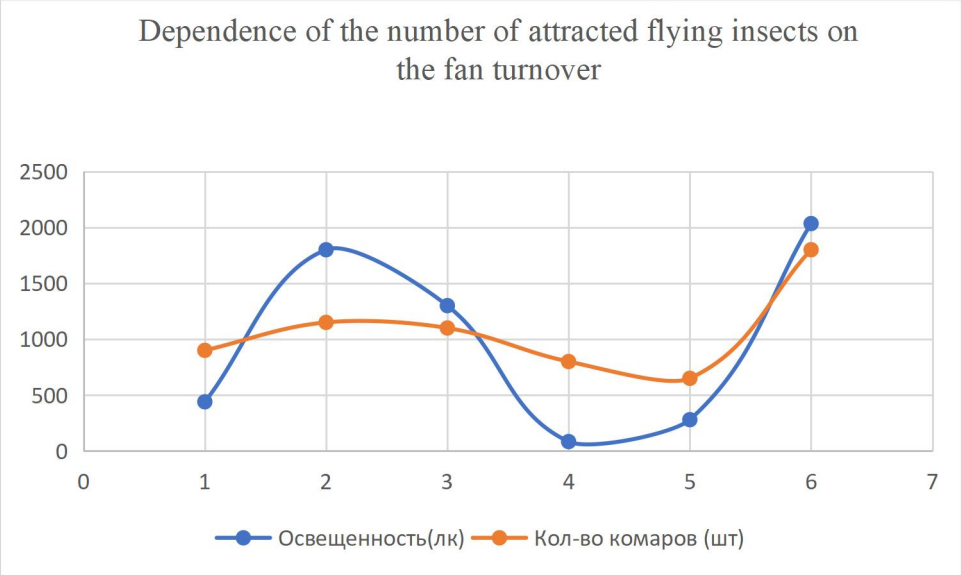


Diagram 1. Dependence of the number of attracted insects on illumination, types of ultraviolet, RGB and different color LED lamps, which ensure appropriate attraction of flying mosquitoes.

Diagram 1 shows the number of insects in the experimental device, the dependence of the number of attracted insects on illumination, types of ultraviolet, RGB and different color LED lamps, ensuring the attraction of flying insects. According to the experiment, a flight period was carried out in July from 19:50 to 21:50, the number of flying insects was greater than the rest of the evening; in addition, it depended on the power and rotation of the fan. All equipment is connected to the battery and the battery is charged from a solar battery. Analysis of what mosquitoes are attracted to shows that their eyes are good at perceiving monochromatic colors in the middle part of the spectrum: green and blue-violet. [6] With 400 nm ultraviolet light, attracting mosquitoes and other insects within a distance of 20 to 100 square meters. [13] The experiment proved that connecting all types of lamps is more effective than one lamp; the table shows that when connecting all types of lamps, the number of flying insects increases. The mosquito repellent can act as a lamp or night light, performing two functions at once: attracting flying insects and providing the pond with refreshment. Mosquitoes, like all insects, are highly susceptible to UV radiation; in addition, the sensitivity of the mosquito eye is increased to red radiation. Many other flying insects are also good at perceiving a wide range of optical wavelengths (especially RGB).

When using RGB and ultraviolet tapes as attractant sources, it is therefore necessary to study the influence of water color on the deviation of the chromaticity coordinates of the attractant source.

Conclusions

Currently, the fish farming industry has problems related to the provision of live food to farms for the artificial cultivation of fish in inland artificial lakes. One of the ways to improve the quality of fish diet is to increase the proportion of live food available to the natural food supply of ponds. For this purpose, it is advisable to use alternative electrical technological installations for feeding fish with flying mosquitoes. In Electra installations, ultraviolet LEDs are used as mosquito sources, with the help of which you can create different types of illumination and radiation of

different colors; in addition, PWM devices are used to change the illumination (Lx) and the rotation speed of the electric fan to increase the efficiency of attracting flying mosquitoes. It is convenient to use by changing the installation height and changing the brightness of illumination in any environment.

The results of the study show that the types of lamps affect the number of flying mosquitoes; according to the experiment, science has proven that it is clear that when connecting all types of lamps, the number of flying insects increases and at the same time it is necessary to choose the optimal brightness.

Increasing the proportion of live food in the fish diet has a positive effect on its health and development, while such fish are considered an organic product, which leads to an increase in the productivity of ponds and a reduction in the cost of artificial fish food.

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