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# DETERMINATION OF EFFICIENT OPTICAL SOURCES OF AIR PROPAGATION FOR FISHERIES BIOPHYSICAL DEVICES

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**ABSTRACT: -** From the analysis of the literature, it is known that agricultural pest control devices designed to combat insects or for fishing attract flying insects, the growth of functional systems of Fish and fish larvae in one norm plays an important role in the development of light rays of optical radiation sources. Instruments with incandescent lamp, fluorescent, halogen or light-emitting semiconductor optoelectronic irradiators are widely used as sources of optical radiation in this area. When creating agricultural devices from them, light-emitting semiconductor optoelectronic devices are considered to withstand competition with performance, energy efficiency and other physical characteristics. In connection with these, the research methods and results of the study on the distribution of semiconductor optoelectronic irradiators in the air and aqueous medium as well as the spectral characteristics are described in this work.

**KEYWORDS:** Optical source, semiconductor irradiator, light intensity, light spectrum, energy source, high voltage, luxmeter, power, light power, voltage, electrical circuit, feed base, insects, fisheries.

## INTRODUCTION

It is known that agriculture is one of the main directions of the country's economy, in particular, the fishing industry is a strategic direction of ensuring food security. Fish meat is one of the most important food products in human life. The composition of fish and fish products is not inferior to the meat of other agricultural animals in terms of quality, and it is much higher in terms of digestibility. The goal of the development of the network is to supply sufficient quality fish products that meet market requirements and meet the needs of consumers. For this, it is necessary to provide fisheries farms with high-quality fish hatchery equipment and material equipment, treatment and prevention measures, disinfectants, proper breeding work, and most importantly, to solve the food base, so as to increase the production of fish and fish products and increase the population's interest in fish products. demand can be fully satisfied [1]. As we mentioned, the factor that determines the quality and productivity of fish and the price of the product in fish farming is the feed base of fish. The feed base includes natural and additional standardized feeds. Natural feeds include algae, bacteria, flying insects, which are nutritious and at the same time prevent the fish from contracting various diseases. Additional feeds are industrially prepared pellets containing forage, hay and grain products. They are considered very nutritious, but due to their high price, the cost of fish products also increases. By increasing and strengthening the natural feed base, it is possible to overcome the problem of raising quality and cheap fish. Taking into account the problems in this field, we have developed a fishing lighting device that works on the basis of light, which provides the natural food base of fish [3]. To increase the efficiency of the device, it is important to use an energy-efficient optical source with a wide light intensity. The selected optical source should attract a large number of flying insects, in addition to spreading in the air over a long distance with a wide intensity. In order to solve these problems, the most effective optical source for the device was determined using the following method.

## RESEARCH METHOD

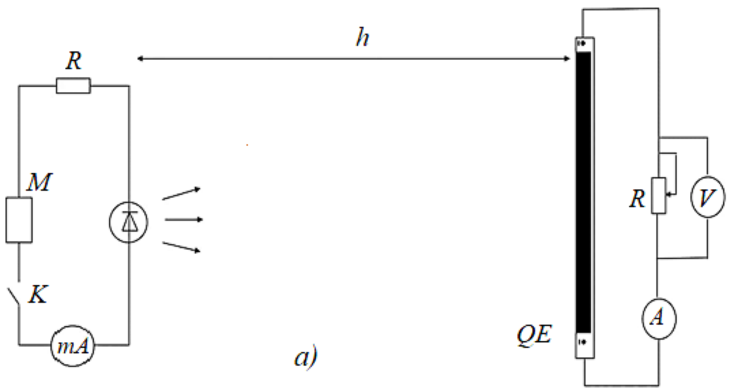
To carry out research, the methods of studying the laws of propagation of light rays in the air environment were used. Illuminators, i.e. lamps with uniform light flux as sources of optical radiation, were selected for conducting research. Table 1 lists the characteristics and parameters of the optical radiation sources selected for the study. As illuminants, a light flux of the same 1200 lm, in particular, white light-emitting semiconductor diode, fluorescent and incandescent lamps were selected (Fig. 1).

**Table 1**

**Properties and parameters of optical radiation sources [1-8]**

| Types | Power, W | Luminous flux, Lm | Light efficiency, Lm/W | Structural strength | The presence of harmful substances in the composition |
|---|---|---|---|---|---|
| Incandescence | 100 | 1200 | 12 | very fragile | no |
| Fluorescent | 25 | 1200 | 48 | fragile | mercury |
| Semiconductor optoelectronic illuminator emitting white light | 15 | 1200 | 80 | durable | no |

It should be noted that the maximum spectral light sensitivity of the semiconductor silicon-based solar cell corresponds to the infrared wavelength. Taking this into account, an optical method for determining the laws of propagation of light rays in aqueous medium and spectral light sensitivity was developed based on a semiconductor silicon solar cell, and a traditional luxmeter was used in parallel with it. Figures 2.1a and 2.1b, respectively, show a simplified scheme of the method for determining the laws of light propagation in air and spectral light sensitivity using a semiconductor silicon solar cell and a luxmeter.




a)

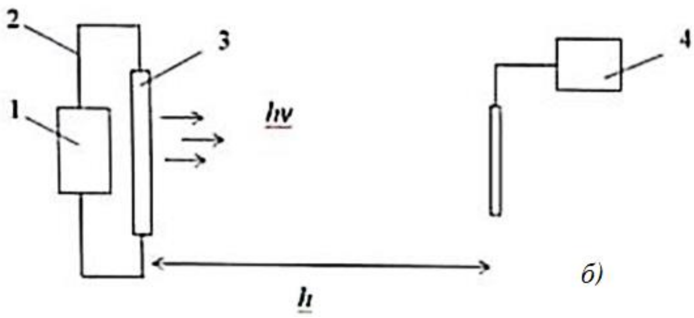



**Figure 1. Determining the laws of light propagation in the air environment of optocouplers: 1 – source of illumination, 2 – connecting wires, 3 – illumination, 4 – luxmeter, h – distance from illumination to luxmeter**

Researches were carried out in the process of changing the distance from the source of optical radiation to the semiconductor silicon-based solar cell or luxmeter in the range h=50÷1800 cm. The luminous intensity generated in the luxmeter was measured using a LX1330B luxmeter, the photocurrent and photovoltage generated in a semiconductor silicon-based solar cell were measured using a GDM-8245 universal multimeter. The experiment was carried out several times between late 1800 and 0400 and the results were found to be consistent.

**RESULTS OBTAINED AND THE MECHANISM OF THEIR EXPLANATION**

The results of the research conducted in determining the laws of propagation of light rays in the air environment and spectral light sensitivity are discussed. Figure 2 shows the dependence of the distance (h) from the irradiator to the luxmeter.

It is known that the luxmeter is one of the main devices that measure the light distribution capabilities of optical radiation sources [8-16]. Considering this, the results obtained using the luxmeter are more reliable for the air environment. It can be seen from the results obtained using a luxmeter that the ability of the white light semiconductor optoelectronic illuminator to distribute light in the air environment is significantly higher than other types of illuminators (Fig. 2, line 1).

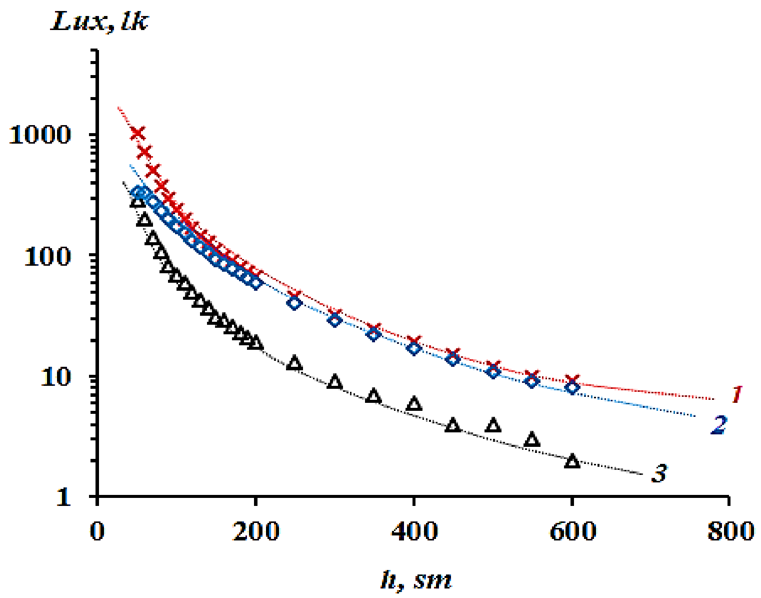



**Figure 2. Dependence of the light flux on the distance (h) from the irradiator to the solar element: 1 – white light semiconductor optoelectronic irradiator, 2 – fluorescent, 3 – incandescent lamp**

It can be seen from the results obtained by the luxmeter that the white light semiconductor optoelectronic illuminator is the preferred optical radiation source with light scattering ability and energy resource efficiency when used as illuminants in the air environment.

Figures 3 and 4 depict the photocurrent (I) and photovoltage (U) of the silicon solar cell, respectively, as a function of the distance (h) from the irradiator to the solar cell. From the results obtained using a silicon solar cell, it can be seen that the ability of an incandescent lamp to distribute light in an air environment is significantly higher than other types of lighting (line 3). The obtained results can be explained as follows depending on the maximum light spectral sensitivity of the silicon solar cell.

It is known that the sensitivity of the maximum light wavelength of the silicon solar cell is 660÷880 nm, which corresponds to the infrared light wavelength [1-5]. Due to the heating of the filament of the incandescent lamp, infrared rays are emitted from it. Therefore, a silicon solar cell is more sensitive to the infrared light emitted by an incandescent lamp than to the white light emitted by other types of lighting. However, it can be seen from Table 1 that the incandescent lamp requires a large amount of energy compared to other types of irradiators, that is, compared to the white light semiconductor optoelectronic irradiator, the energy requirement is 6, 7 times greater, and in terms of light efficiency, it is 6, 7 times smaller.

In addition, the research was conducted in different weather conditions. The results of the study show that the results in Figures 3 and 4 were observed when the weather conditions were clear and open, while the results of the white light semiconductor optoelectronic irradiator improved when the weather conditions were relatively cloudy or high humidity, while the results obtained by the incandescent lamp were observed to deteriorate. .

It is known that air molecules do not scatter all colors equally, scattering more light of shorter wavelength (eg violet blue green) than light of relatively long wavelength (eg yellow orange red). White light is composed of rays of all wavelengths. So, when the weather conditions are relatively cloudy or with high humidity, the process of refraction and scattering of light rays is observed in microparticles of air molecules. As a result, the propagation of light is shifted towards shorter wavelengths. That is, in our opinion, the shift of red and infrared rays to a shorter wavelength may be causing the deterioration of the results obtained with the incandescent lamp. These considerations are also valid for the scattering of white light, and in the process of refraction and scattering of white light by microparticles in the air, the infrared light shifts to a relatively shorter wavelength. This situation may lead to the improvement of the photoelectric characteristics of the white light emitting semiconductor optoelectronic emitter [4-8].

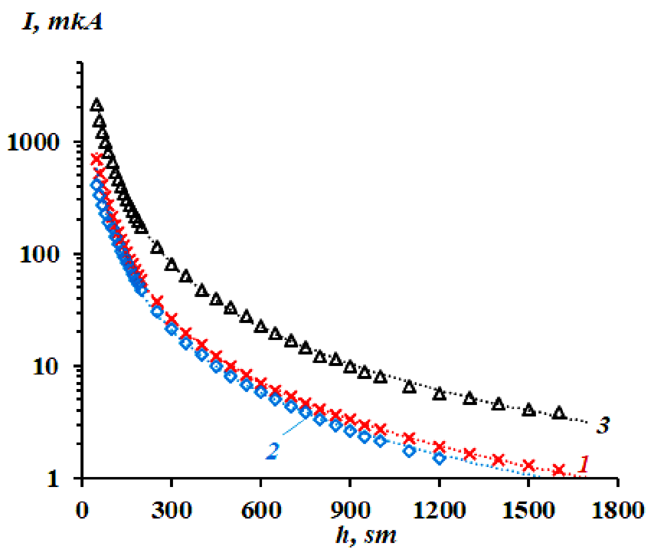



**Figure 3. The dependence of the photocurrent (I) of a silicon solar cell on the distance (h) from the irradiator to the solar cell:**

1 – semiconductor optoelectronic illuminator emitting white light, 2 – fluorescent, 3 – incandescent lamp

In addition, it should be noted that in the case of relatively cloudy or high humidity conditions, the incandescent lamp burns out quickly because it is very fragile, and fluorescent lamps are also relatively fragile and emit toxic substances due to the cracking of the glass shell. Air pollution adversely affects agricultural plants and animals. With this in mind, it has been found that the white light semiconductor optoelectronic illuminator is more robust than other types of illuminators [11-13].

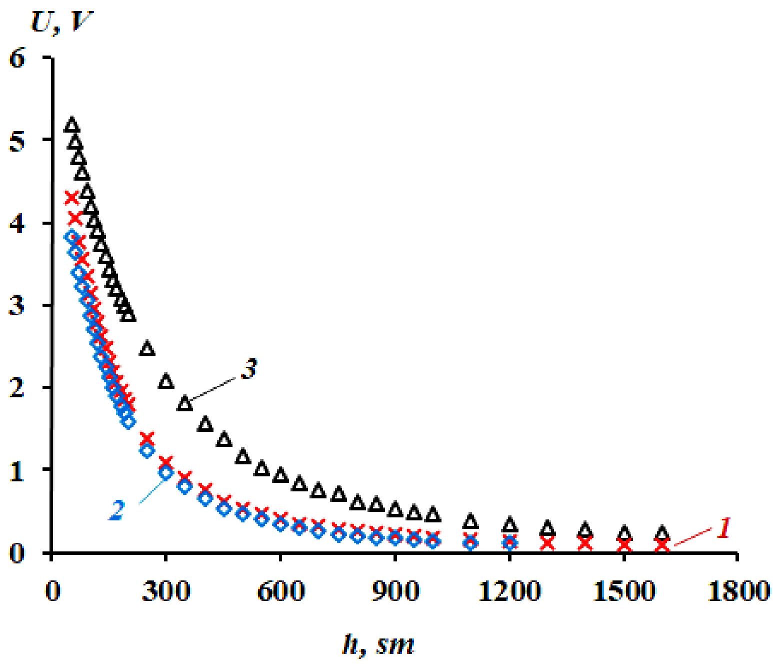



**Figure 4. Dependence of silicon solar cell photovoltage (U) on the distance (h) from the irradiator to the solar cell:**

1 – semiconductor optoelectronic illuminator emitting white light, 2 – fluorescent, 3 – incandescent lamp

**CONCLUSION**

Different optical radiation sources with the same luminous flux of 1200 lm, in particular, white light-emitting semiconductor diode, fluorescent and incandescent lamps. is significantly higher than the type of lamps based on the use of a luxmeter. With this, it has been shown that it is a preferred source of optical radiation due to its high light scattering ability and energy efficiency for use as illuminants in the air environment, as well as the attractive light wavelengths of 460-650 nm for flying insects, which are natural food for fish.

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