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Letter to Editor

The Past, Present and Future of Light Trapping of Insects

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It has been known since ancient observations (Plinius) that some insects active at night are attracted to artificial light.

The entomologists have used different types of light traps since the introduction of electric lights around the world. There is no more effective tool that can automatically collect insects belonging to different insect families en masse. Light trapping as a method of collecting insects that manifest positive phototaxis developed rapidly over the past decades. Throughout the world, including Hungary, research began in many directions to develop types of light-trap that can be used with efficiency on the one hand and to improve the methods of evaluation on the other.

Catch data from light traps can be used especially for faunistical, taxonomical, coenological, ethological, ecological and plant protection prognosis purposes. For example, in the states of North Carolina and Nebraska (USA), light trap catch data have been successfully used for crop protection forecasting purposes for many years.

In addition to their effectiveness, light traps also have serious shortcomings. Due to the constantly changing environmental factors, the captured insects always represent a changing proportion of the populations in the environment. It is also not known from what distance the insects came to the light trap. It is therefore natural that researchers have sought to learn about distorting effects from the very beginning. Initially, researchers had high hopes for the role of light traps in plant protection prognostics. They wanted to make a forecast from the catching number of harmful species to the amount of expected damage. It didn't work out precisely because of the many modifying factors.

Examining the effect of the weather did not cause much trouble. Insects are poikilothermic creatures, so a moderate rise in temperature - up to a certain limit - increases flight activity. Adverse weather effects, such as the strong wind, the thunderstorm, however, reduce it.

Williams [1,2,3], published the results of his research, in which he examined the time of flight of insects to light, moonlight and the ratio of sexes. A few years later, he and his colleagues [4], dealt in detail with the influence of moonlight on the collection. He confirmed in these studies that few insects are collected by the light traps during the Full Moon. According to him, there are two possible reasons for this: Moonlight reduces the flight activity of insects, or during a full moon, the distance from which insects approach the light trap is shorter. Attempts have been made to correct the distorting effects. Bowden and Morris [5], corrected the daily catch results with an index number calculated based on the collection distance.

Since then, many studies have dealt with the effect of the Moon and it seemed to be the most influential on the catch. In the decades that have passed since then, many studies have been published that deal with the factors influencing the catch, including the influence of the Moon. Researchers have different opinions about Williams' dilemma. Some of them consider the decrease in activity, others the smaller collection distance as the reason for the low catch.

For four decades, our research group has been dealing with the problems of light trapping, primarily with the environmental effects affecting the collection. The National Light Trap Network has been operating in Hungary since 1958. In some years, up to 40-45 Jermy-type light traps were in operation per night. In recent years, a huge amount of collection data has accumulated mostly from moths (Lepidoptera) species, but also from species of other insect orders. We were able to use a larger part of this huge amount of catch data for our research. This made it possible to carry out research that would not have been possible with less data and which is without precedent in the literature.

The most important of these are: polarized moonlight [6], the height of the tropopause, the interplanetary magnetic field, the solar magnetic field sector boundaries, the ground level enhancement (GLE), the gravity of the Sun and the Moon, polarization of the night sky [7].

We also proved that moonlight does not inhibit the flying activity of insects. We also found that, as a result of light pollution spreading over ever-larger areas, the collection distance only has the effect of reducing the catch in areas that are not yet affected by light pollution [8].

Based on our own research, we can say that there are many environmental factors that modify the catch, the most important

of which are solar activity and the polarization pattern of the sky. So it is not the influence of the Moon that is most important, but that of the Sun.

In recent decades, due to the rapid spread of light pollution, the number of captured insects has also decreased noticeably. In addition, pheromone traps developed for the collection of pest species compete with light traps [9]. This is the state of light trapping these days.

Although the role of light traps has undoubtedly diminished, they can still be used successfully for many research and forecasting purposes. The light trap is an almost indispensable tool in faunal, ethological and ecological research. It is also useful for crop protection forecasting, but only as an additional method. However, for the purpose of basic entomological research, it would absolutely be necessary to use the types collected separately every hour during the night.

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