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Research Article

Light-trap Catch of the Turnip Moth (*Agrotis segetum* Den. et Schiff.) in connection with the Atmospheric Electricity

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ABSTRACT

The study examines the success of light-trap catch of the turnip moth (Agrotis segetum Den. et Schiff.) and the various values of atmospheric electricity. The number of specimens trapped is the largest near by the region close to 0 V/m. The rising positive values have a slight effect on the catch, while the negative values of atmospheric electricity are extraordinarily unfavourable for trapping. Accordingly, it is expedient to consider the modifying effect of atmospheric electricity when light-trap catch data are being evaluated.
Key words: *light-trap, atmospheric electricity, turnip moth*

INTRODUCTION

A number of papers in entomological literature discuss the modifying effect of electric fields on the life phenomena of insects. Jahn [1] holds that an electric field influences the pupation of the black-arches moth (*Lymantria monacha* L.). Elimination of the field, by use of the Faraday cage, had an unfavourable effect on young caterpillars and a favourable effect on old ones. In subsequent studies, [2 and 3] sums up the results of his research into the connection between biophysical fields and the life phenomena, behaviour and gradations of insects. Haine [4] examined the moulting of *Myzus persicae* Schulz in permanent temperature in laboratory conditions. This process which in natural circumstances requires about 3 hours took place in 15-20 minutes in an electric field. Moulting is facilitated especially be negative ions. Maw [5] reports that the ion concentration of air exerts an influence on the biological activity of insects. He proved by laboratory experiments that any reduction of the ion concentration of the air is accompanied by diminishing activity on the part of the species belonging to the orders of Hymenoptera, Diptera and Lepidoptera. If the ion concentration rises, the above insects display stepped up activity. Maw [6] also reports that females of the *Itoplectis conquisitor* Say wasp are much more active on an electrically charged plastic surface than they are in their usual surroundings. Tshernyshev et al. [7] observed a significant rise in the abundance of two Collembola species and a fallback in that of another one when they filtered out the natural electric field of the atmosphere with a Faraday cage. Afonina et al. [8] also studied the effect of static and varying electric fields in laboratory conditions. Bergh [9] examined under constant conditions the effect of meteorological factors on the take-off activity of the desert locust *Schistocerca gregaria* Forsk and found that it was not affected by electromagnetic radiation of a very low frequency. Schneider [10] proved that the regular orientation by magnetic field of the cockchafer (*Melolontha vulgaris* F.) changes in a static electromagnetic field. Taft et al. [11] found that the dry ripening cotton plant becomes electrically charged under the impact of the wind and thus exerts stronger attraction on the pest *Anthonomus grandis* Boheman. A smaller number of insects appeared on the plants once the accumulated electricity was discharged. Perumpral et al. [12] wrote: "House flies, *Musca domestica* L., were given a choice of either an electrostatic field gradient ranging from 200-1500 v/cm or no field. They preferred no electrical field to one of 1000 v/cm or higher. At 750 v/cm slightly, but significantly, more flies preferred the electrostatic field. At less than 500 v/cm no preference was observed. A significant effect on wing-beat frequency among male cabbage loopers, *Trichoplusia ni* (Hübner), was observed for electrostatic field gradients ranging from 200-1500 v/cm."

Callahan and Mankin [13] discuss an interesting topic. They assume that the UFO phenomena observed in many cases over the territory of the USA and Canada in 1965-1968 can be attributed to the migration of the species *Choristoneura fumiferana* Clemens in the higher layers of the atmosphere. This is because during storms, in a highly charged electrostatic field, these insects may produce light phenomena resembling Saint Elmo's fire. The publication was widely debated in literature [14, 15, 16]. The papers referred to support the idea of the probability of electric fields having an influence on the vital functions of insects, while we have come across with hardly any publication on the interrelationship of atmospheric electricity and light trapping. Helson and Penman [17] analyzed their light trapping results in connection with approaching cold fronts in New Zealand. They found that there was a sudden and short lived ion activity peak preceding by about 55 hours the arrival of these fronts. After that another ion activity peak could be experienced about 30 hours before the rain. This phenomenon, accompanied by an abundant light-trap catch, can be observed in early spring and in the summer months. We have no information of any similar study in special literature.

MATERIAL AND METHODS

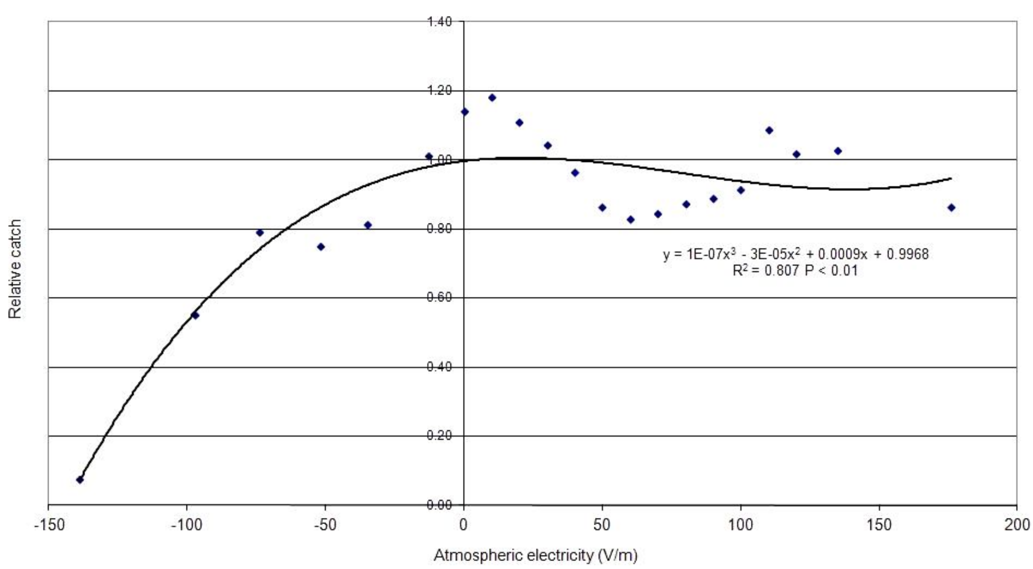
The values of atmospheric electricity given in V/m are measured at the Sopron-Nagycenk Observatory of the Geodetic and Geophysical Research Institute of the Hungarian Academy of Sciences and are published in the Yearbooks of the Institute. We used the volumes to obtain the data we needed. Measuring is carried out with the help of a radioactive collector fitted with a Ra preparatum rated at 20 C activities and placed on an insulating bar one meter above the ground in free space above a grounded, electrically heated measuring enclosure with a double wall. An electronic device measures the current in the collector. The system has linear characteristics in the -300 to +300 V/m regions. The device is in operation day and night without interruption. Registered hourly, the measuring results are published in the yearbooks.

For the purposes of our study we selected the catch data for turnip moth (*Agrotis segetum* Den. et Schiff.) from the material in 1962-1976 of the Sopron light-trap of the Forestry Scientific Institute. The trap caught 610 specimens in 563 nights. From the catch data we calculated relative catch values for generations and nights. We arranged the data of atmospheric electricity and the related relative catch values in classes, and then drew averages within each class. Of these we formed 3 point weighted moving averages. We made correlation calculations of the related pairs of values.

RESULTS AND DISCUSSION

Our result can be seen in Fig. 1.

Fig. 1. Light-trap catch of the turnip moth (*Agrotis segetum* Den. et Schiff.) depending on the atmospheric electricity



Within a certain range of values, atmospheric electricity has a modifying effect on the number of specimens light-trapped. The trap is the most effective near by the range around 0 V/m. Rising positive values do not considerably influence the results of light trapping. However, all the negative values of atmospheric electricity are unfavourable.

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