

THE DIURNAL COURSE OF RESPIRATION INTENSITY  
IN THE LEAVES OF *SETARIA VIRIDIS* (L.) BEAUV.  
UNDER LASTING ARTIFICIAL LIGHT

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The author has performed investigations on the diurnal course of the respiration intensity in *Setaria viridis* plants, under lasting artificial light, parallelly with plants cultured under alternance light-darkness.

By the Warburg manometric method, the author ascertains that the diurnal respiration rhythmicity gradually disappears in plants grown under continuous light, by comparison with the rhythmicity of plants grown in normal conditions.

The question, whether the biological rhythms in plants are released by surrounding or by internal factors, has recently led to numerous researches.

In order to clarify this question, experiments on plants under lasting light prolonged darkness, constant temperature a.a. have been carried out. Some results have shown that biological rhythms still continue under such conditions hence the conclusion these conditions have an endogenous character, that is generated by the internal factors of organism. Other researches have, on the contrary, ascertained that continuous illumination or considerable deviations of the alternation light-dark bear injurious influence on plants and lead to rhythms disorder.

The influence of constant surrounding factors (light or dark, constant temperature) on different biological rhythms has been experienced by many researchers, among whose works we can cite H. ENGEL and I. FRIEDRICHSEN (5), M. EHRENBERG (4), S. JEREBZOFF (6), E. BÜNNING (3), L. BAILLAND (1) a.o. The results have shown that the biological rhythms, especially the circadian ones, gradually diminish their intensity until complete disappearance in the plants grown under constant conditions, either of illumination or darkness.

The rhythm shall again appear, as soon as an instant light shock (for plants under prolonged darkness), or a more lasting dark shock (for plants under continuous light) will be caused.

In the reference literature we have not found studies which deal with the respiration rhythmicity of leaves under continuous illumination, but only under prolonged darkness. For this reason, we started to experience whether the rhythmicity under normal conditions (alternation light-dark) keeps also under constant illumination. To this purpose we cultivated a groups of *Setaria viridis* (L.) Beauv. plants in earth pots, under artificial light and constant temperature, while another plants

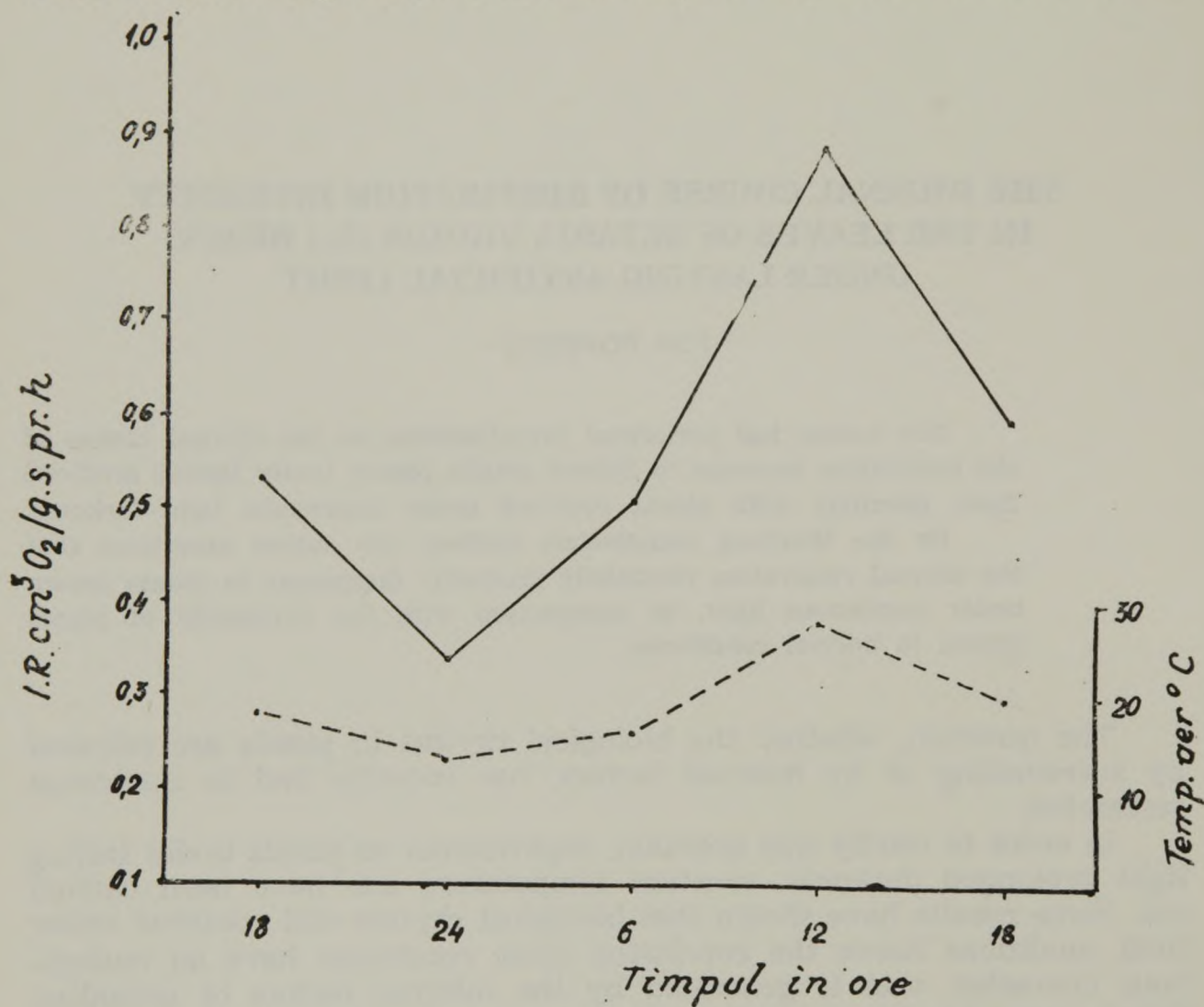


Fig. 1. The course of respiration intensity, during 24 hours, in *Setaria viridis* cultured under the alternance light-darkness  
 ————— respiration intensity  
 - - - - - air temperature

group was exposed to natural conditions, that is to the alternation light-dark, at surrounding temperature. For illuminating we used incandescent lamps.

The production of carbon dioxide was determined at six hours intervals during 24 hours.

The plants which had grown only at light were further left in pots, until fructification; their seed was again put in other pots and kept under the same illumination and temperature conditions. The respiration intensity during the day was measured after the plants had sufficiently grown.

For determining the respiration intensity we used the manometric method Warburg.

The results show that the respiration diurnal rhythmicity has high values at 12 o'clock and low values at 24 o'clock, in the plants cultivated under normal conditions (fig. 1). But in the first generation of the plants cultivated under continuous light and constant temperature (fig. 2), the respiration rhythmicity is still present, although it has much lesser values by comparison with the first case. In the second generation of plants (fig. 3), respiration still occurs, but it has no more a rhythmical course, because of the uniformity.

Our results strengthen the opinion of some authors (5), who have found that under surrounding constant conditions the biological rhythms gradually diminish their intensity until complete ceasing.

H. ENGEL and I. FRIEDRICHSEN, during their investigations on the diurnal guttation course in the etiolated coleoptiles of oat, at lasting white light and parallel permanent dark, have seen that there is no more diurnal rhythmicity. They also performed experiments by which they observed the action of various radiations in the light spectrum on the guttation diurnal course. If the plants are kept in lasting red light the results show that the rhythm keeps with some modification by comparison with those in natural conditions.

There have also been observed various physiological processes in the plants kept under permanent dark. For instance E. BÜNNING (3), after exposing the plants of *Bryophyllum* to prolonged darkness and constant temperature, has found that respiration still presents rhythmical oscillations some days after the plant has been removed to darkness, but the intensity of variations gradually diminishes as the darkness is delayed. L. LÖCHER (7), for the movement of bean leaves, J. SCHMITTE (8) a.a. have reached similar results.

In the conclusions of our experiments, we state a diminution for the amplitude of respiration variations in the plants cultivated under continuous light and constant temperature. If those conditions are maintained during a very long period, then appears an uniformity of the respiration rhythmicity, which keeps some what analogous values during 24 hours.

The diurnal rhythm of respiration still keeping some time under constant conditions could prove for its endogenous character, although the physiological activity of vegetal organisms is conditioned, in some proportion, by surrounding factors. The rhythm reflects the adaptation of the living organism to the periodical changes of surrounding conditions; it is, in fact, the result of an interaction. This interaction still keeps after the biological rhythms have appeared, though these rhythms display some independence and autonomy, as it could be ascertained by the experiments of numerous researchers, as well as by our own.

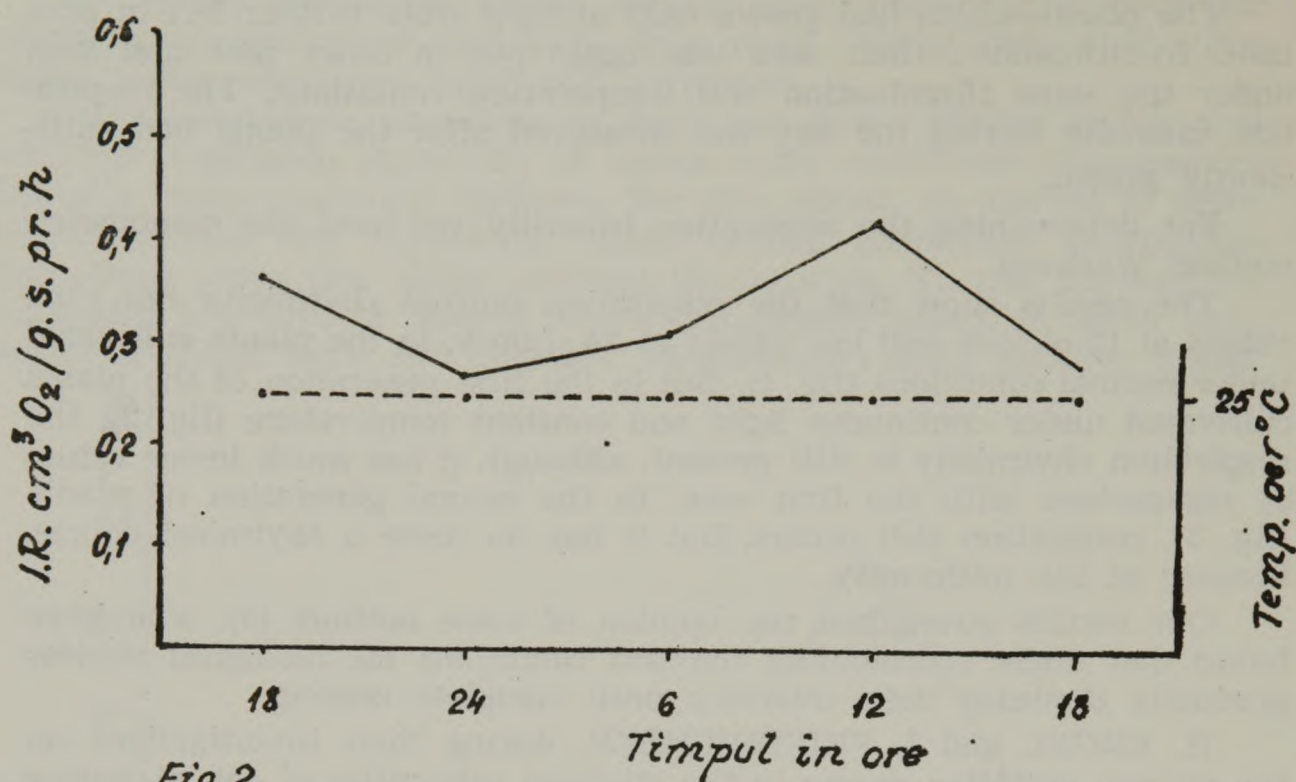


Fig. 2

Fig. 2. The course of respiration intensity, during 24 hours, in the first generation of *Setaria viridis* cultured under continuous artificial light

————— respiration intensity  
 - - - - - air temperature

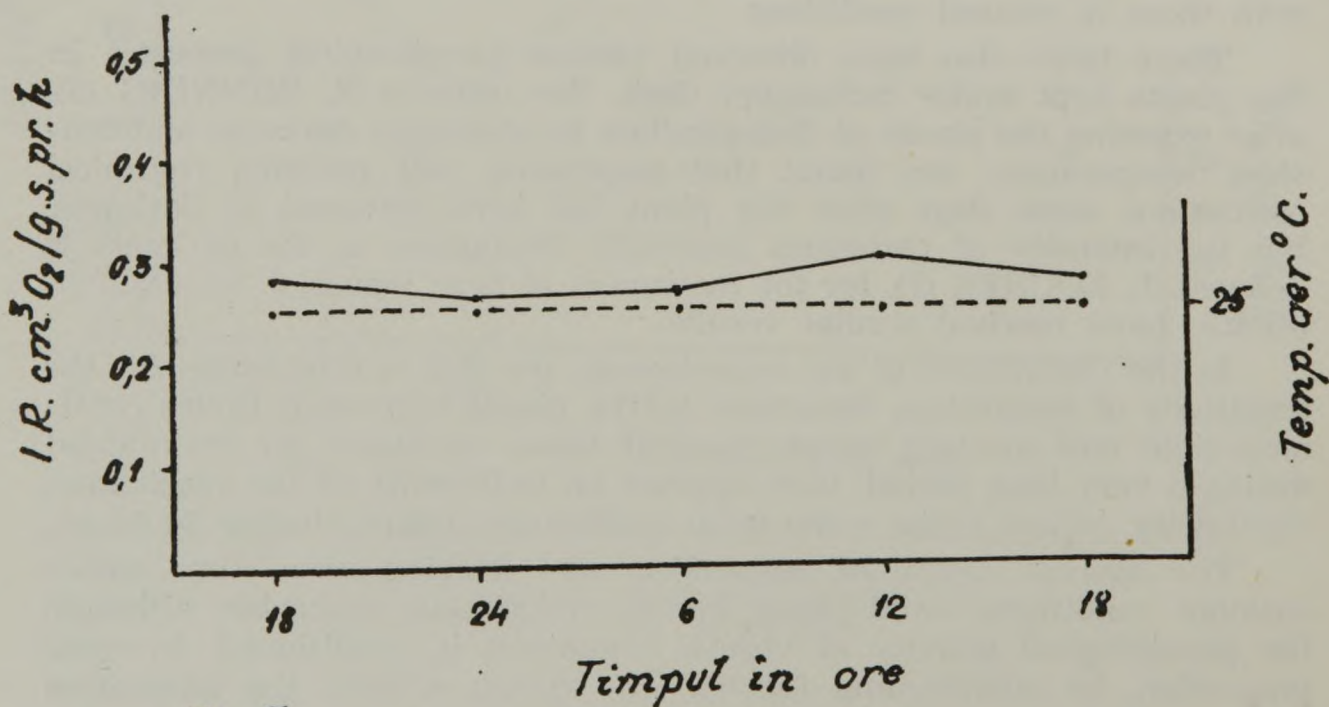


Fig. 3

Fig. 3. The course of respiration intensity, during 24 hours, in the second generation of *Setaria viridis* cultured under continuous artificial light

————— respiration intensity  
 - - - - - air temperature

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### MERSUL DIURN AL INTENSITĂȚII RESPIRAȚIEI LA FRUNZELE DE SETARIA VIRIDIS (L.) BEAUV. ÎN LUMINA ARTIFICIALĂ DE DURATĂ

#### Rezumat

Autorul a efectuat o serie de experiențe referitoare la mersul diurn al intensității respirației plantelor de *Setaria viridis* (L.) Beauv. în lumină artificială de durată în paralel cu a celor crescute la alternanță lumină-întuneric.

Folosind metoda manometrică Warburg autorul constată că pe măsura prelungirii creșterii plantelor în lumină continuă, ritmicitatea diurnă a respirației dispăre treptat față de cea a plantelor crescute în condiții normale.