

**MILLISECOND DELAYED LIGHT EMISSION OF “*HIBISCUS ROSA SINENSIS*”  
UNDER THE ACTION OF VARIOUS DOSES OF UV-B RADIATION**

**I.Y. Fridunbeyov**

*Baku State University*

[f.ismayil@mail.ru](mailto:f.ismayil@mail.ru)

**Abstract:** The article is devoted to the study of the ms-DLE of the plant “*Hibiscus Rosa sinensis*” under the influence of various doses of UV-B radiation. The analysis of these parameters of Ms-DLE showed that at 5, 10, 15 minutes of UV-B exposure to the leaves *Hibiscus Rosa-sinensis*, the amplitude of the induction maximum (Am) and the stationary level (East) decreases, there is a noticeable inhibition of electron transport by FS 2. The most sensitive to the action of UV-B radiation component of ms-DLE induction flash.

**Key words:** UV-B radiation, stationary level, photosynthetic apparatus, quinone molecules.

## **1. Introduction**

The millisecond delayed light emission (ms-DLE) phenomenon is observed in all types of photosynthetic organisms. The presence of luminescence is closely related to the functional integrity of the photochemical apparatus. Delayed fluorescence of green plants occurs mainly in the reaction centers of PS2. In general, the induction curves of the ms-DLE are the cumulative result of the interaction of energy transformation and electron transfer along the photosynthetic chain. We have studied the effect of different doses of UV-B radiation on the nature of changes in the kinetic parameters of ms-DLE leaves. The method of delayed fluorescence used by us by two kinetic parameters (the amplitude of the induction maximum Am and the stationary level of luminescence of the 1<sup>st</sup> degree) make it possible to more differentially analyze the nature of the process.

## **2. Materials and methods**

In higher aquatic plants, the photosynthetic apparatus is very strongly developed. The effect of some factors on the leaves of these plants has been studied by the ms-DLE method. Changes in the parameters of delayed light emission under the action of environmental factors can be used to determine the resistance of plants. The maximum amplitude of the unfavorable factor at which there are still no significant changes in the parameters of delayed light emission will characterize the resistance of the photosynthetic apparatus of plants to this factor.

In many cases, the resistance of the photosynthetic apparatus is recorded by the method of registration of the millisecond components of the DLE, which correlates with the general resistance of the plant organism to a particular factor. The registration of ms-DLE is carried out using phosphoroscopes, the main part of which is a mechanical modulator of the excitation and recording periods of WEU. The amplitude of the millisecond component depends on the difference in electrical potentials across the membrane and decreases under phosphorylating conditions or under the action of uncouplers.

At the same time, the exponential nature of the dependence of the DLE on the magnitude of the proton of the driving force makes the DLE sensitive to even small changes in it and therefore to the effects on the photosynthetic membrane causing such changes. This circumstance is the basis for the use of DLE as an indicator of the resistance of photosynthesis to stress-factors. Taking into account the correlation between the parameters of the DLE induction phenomena and photosynthesis, it seems promising for finding a connection between the DLE and the potential productivity of plants.

### 3. Results and discussion

Figures from 1 to 5 show the curves characterizing the changes in the ms-DLE of leaves from the dose of UV-B irradiation

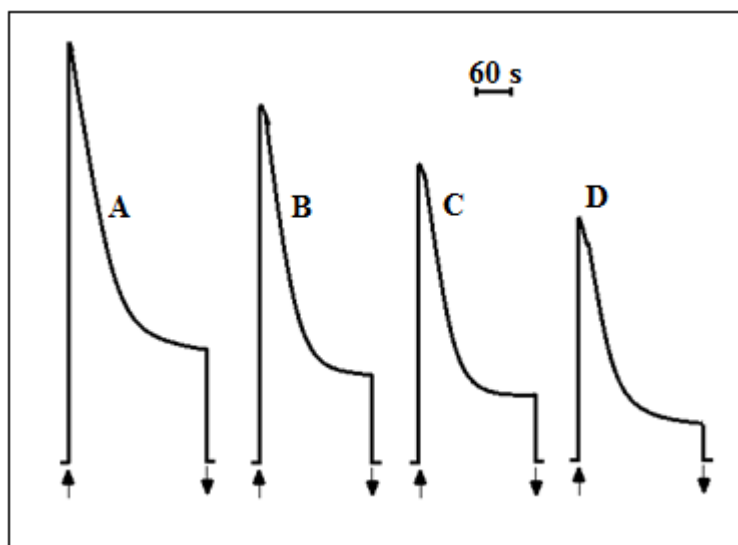


Fig. 1. Induction curves of ms-DLE *Hibiscus rosa-sinensis* leave. The vertical arrows show the switching on and off the active light

A-the control, B -5 Min UV; V-10 min. UV, C-10 min UV, D-15 min UV

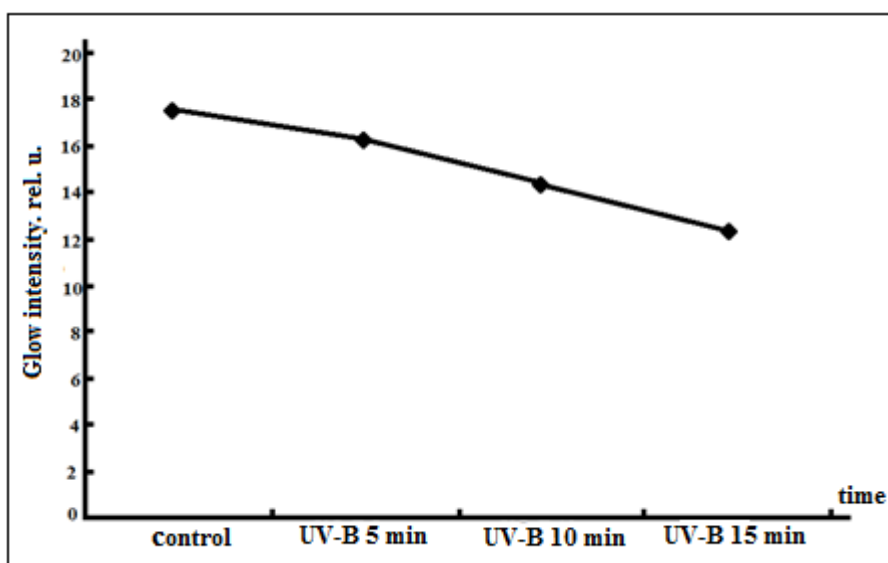


Fig. 2. Dependence of the amplitude of the induction maximum of ms-DLE on the radiation dose

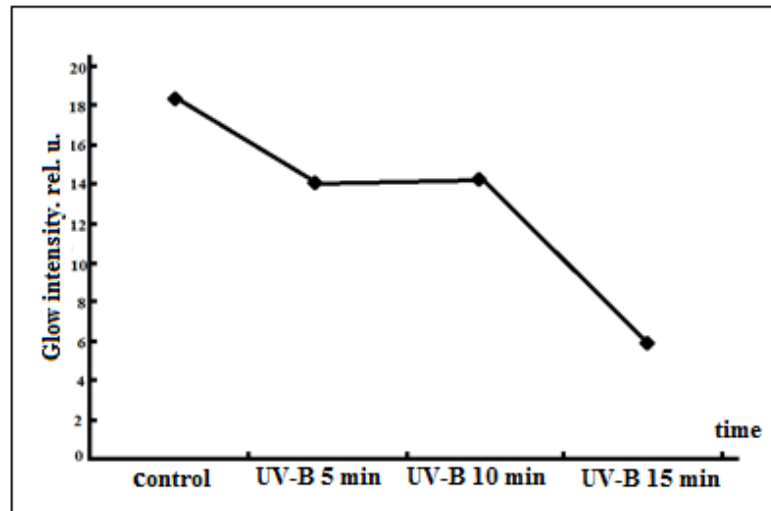


Fig. 3. Dependence of the stationary level of ms-DLE on the radiation dose.

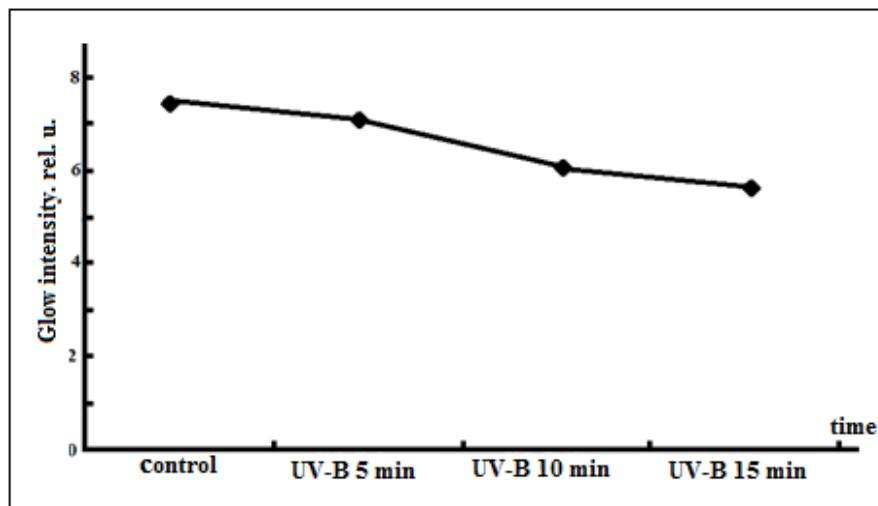


Fig. 4. Am/st degree is a parameter characterizing the energization of photosynthetic membranes

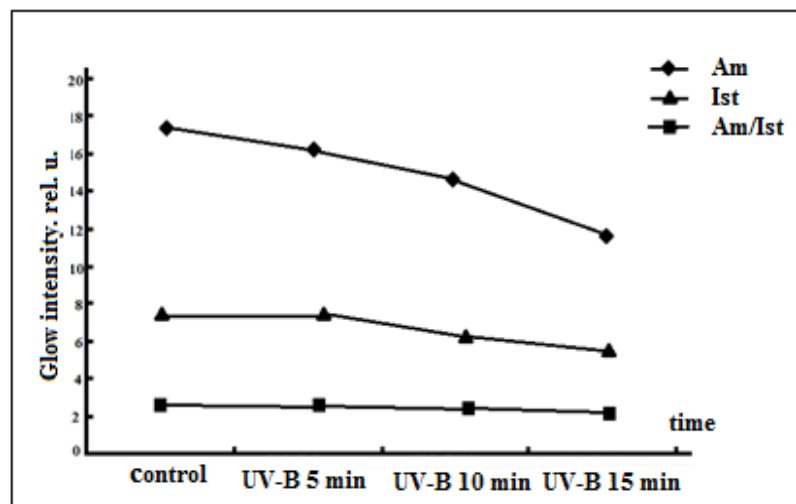


Fig 5. Dependence of the amplitude of the fast component (Am), stationary level (Idegree,) and parameter Am/Idegree of induction curves of ms-DLE on the dose of UV-B irradiation.

The analysis of these parameters of MS-DLE showed that at 5, 10, 15 minutes of UV-B exposure to the leaves *Hibiscus Rosa sinensis*, the amplitude of the induction maximum (Am) and the stationary level (Ist) decreases, there is a noticeable inhibition of electron transport by FS 2. The most sensitive to the action of UV-B radiation component of ms-DLE induction flash.

Suppression of the amplitude of the induction maximum under the action of UV-B radiation occurs by 68 %, while the stationary level decreases by 78%.

The index of energization of photosynthetic membranes AM/I degree (Fig.4) is suppressed to varying degrees, indicating damage to the reaction centers of PS2.

Summarizing the experimental and literature data, we can assume that quinone molecules serve as an endogenous sensitizer under the action of the ecological range of the UV radiation on the leaves of *Hibiscus rosa-sinensis*.

The mechanisms of the sensitizing action of chromophore molecules may be due to the photogeneration of the formation of activated oxygen, which plays the role of the main initiator of destructive reactions in the leaves.

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## МИЛЛИСЕКУНДНАЯ ЗАМЕДЛЕННАЯ ЭМИССИЯ СВЕТА ЛИСТЬЕВ *HIBISCUS ROSA SINENSIS* ПРИ ДЕЙСТВИИ РАЗЛИЧНЫХ ДОЗ УФ-Б ИЗЛУЧЕНИЯ

И. Ю. Фридунбеков

**Резюме:** Статья посвящена изучению мс-ЗЭС растения *Hibiscus Rosa sinensis* при действии различных доз УФ-Б излучения. Анализ параметров мс-ЗЭС показал, что при 5, 10, 15 минутном УФ-Б облучении листьев *Rosa sinensis* амплитуда индукционного максимума *Am* и стационарный уровень *Ist* снижается, происходит заметное ингибирование транспорта электронов ФС 2.

Наиболее чувствительном к действию УФ-Б излучения компонентом миллисекундной замедленной эмиссии света оказалась индукционная вспышка.

**Ключевые слова:** УФ-В излучение, стационарный уровень, фотосинтетический аппарат, молекулы хинона.

## **UB-B ŞÜALARININ MÜXTƏLİF DOZALARININ TƏSİRİ ZAMANI *HIBISCUS ROSA SINENSIS* YARPAQLARININ MİLLİSANIYƏ GECİKMİŞ İŞIQ EMİSSİYASI**

**İ.Y. Fridunbəyov**

**Xülasə:** Məqalə UV-B şüalarının müxtəlif dozalarının təsiri altında *Hibiscus Rosa sinensis* bitkisinin yarpaqlarının ms-GİE-nin öyrənilməsinə həsr edilmişdir. Ms-GİE parametrlərinin təhlili göstərdi ki, *Rosa sinensis* yarpaqlarının 5, 10, 15 dəqiqəlik UV-B şüalanmasında, induksiya maksimumunun amplitudası və stasionar səviyyə azalır, FS 2-nin elektron nəqlinin nəzərəcarpacaq dərəcədə zəifləməsi baş verir. UB-B şüalanmanın təsirinə ms-GİE – nin ən həssas komponenti induksiya parıltısı olmuşdur.

**Açar sözlər:** UV-B radiasiya, stasionar səviyyə, fotosintetik aparat, hinon molekulları.