

SHORT COMMUNICATION

LIGHT EFFECTS ON THE SPORULATION OF SOME
SPECIES OF *HELMINTHOSPORIUM* ⁽¹⁾⁽²⁾

HO-SHII CHANG

*Institute of Botany, Academia Sinica, Taipei, Taiwan,
Republic of China*

(Received for publication November 1, 1973)

Previous reports by several workers have demonstrated that the conidiation of the species of *Helminthosporium*, in most species tested, was light requirement, i.e., radiation stimulates conidiation (Honda, 1969; Leach, 1962; Trione and Leach, 1969). In conidiation the conidiophore development was light dependent, whereas the conidial development proceeded at darkness and was inhibited by radiation particularly at the wavelengths of blue region (Honda, 1969; Trione and Leach, 1969; Lukens, 1963).

The experimental results to be reported here were to probe the responses of several species of *Helminthosporium* isolated in Taiwan to the impact of radiation particularly to the conidiation and to present a simple device to study the conidiation. To learn the processes of conidiation has significant role in terms of the understanding the dissemination of the inoculum which incited the epidemic in the field and also provides the inoculum for inoculation experiments at small scale conditions.

The test species of *Helminthosporium* in present experiment were *H. maydis*, *H. oryzae*, *H. zizaniae*, *H. sativum* (isolated from barley), *H. panici*, *H. nodulosum*, and *H. rostrata*, all species were cultured on either potato sucrose agar (PSA) or Czapek's agar slants at 25°C.

Sources of light were a 20-watt fluorescent lamp and a 20-watt black light lamp. The former lamp provided mainly the wave-lengths at blue region and the latter one was for the near ultra-violet (NUV). Continuous darkness was made by wrapping the cultures inside of thick black paper envelopes. The distance of the lamps to the culture surfaces is 25 cm.

Preliminary experimental results showed that all species except *H. maydis*, *H. panici* and *H. sativum* produced no or few conidia at darkness, i.e., *H.*

(1) This study was supported by the National Science Council and JCRR, Republic of China.

(2) Paper No. 133 of the Scientific Journal Series, Institute of Botany Academia Sinica.

maydis, *H. panici* and *H. sativum* produced conidia either at light or darkness. The experiments were made by inoculating a small block of agar grown with mycelia on PSA and Czapek's agar slant media. A great amount of conidia were produced by keeping the cultures at the illumination of black light lamp for 48 hr and followed by 48 hr of darkness. No conidium was produced at continuous illumination from the combination of black light lamp and fluorescent lamp. The results were similar to those reported by Leach (1962) and Aragaki (1964).

A detailed experiment was arranged to further confirm the result obtained by previous workers and this author. The whole arrangement to study the effect of light on conidiation was as follows: a square agar block (2 mm²) grown with mycelia was cut from the margin of colony and was placed on the center of a cover glass right side up. The cover glass was then fixed up side down on a glass ring (van Tieghem cell) by vaseline. The van Tieghem cell was fixed on a glass slide which was placed in a moist petri dish made by putting two layers of wet tissue paper on the dish bottom. The glass-wares and tissue papers used in the whole set up were sterilized before experiment began. Once they were set they were kept at three different treatments, namely 1) at continuous darkness; 2) at continuous illumination by the combination of the NUV and white light; and 3) started with 48 hr of NUV irradiation and then followed by 48 hr of darkness. This arrangement provided a convenient way to examine clearly the processes of the conidiophore and conidial development under the microscope because parts of hyphae grew on glass surface and produced conidiophores and conidia on the glass surface or were nearly parallel to it (Fig. 1).

The experimental results are shown in Table 1. Some species of *Helminthosporium* tested in present experiments produced conidiophores and conidia even at darkness. They are *H. maydis*, *H. panici*, and *H. sativum*. However

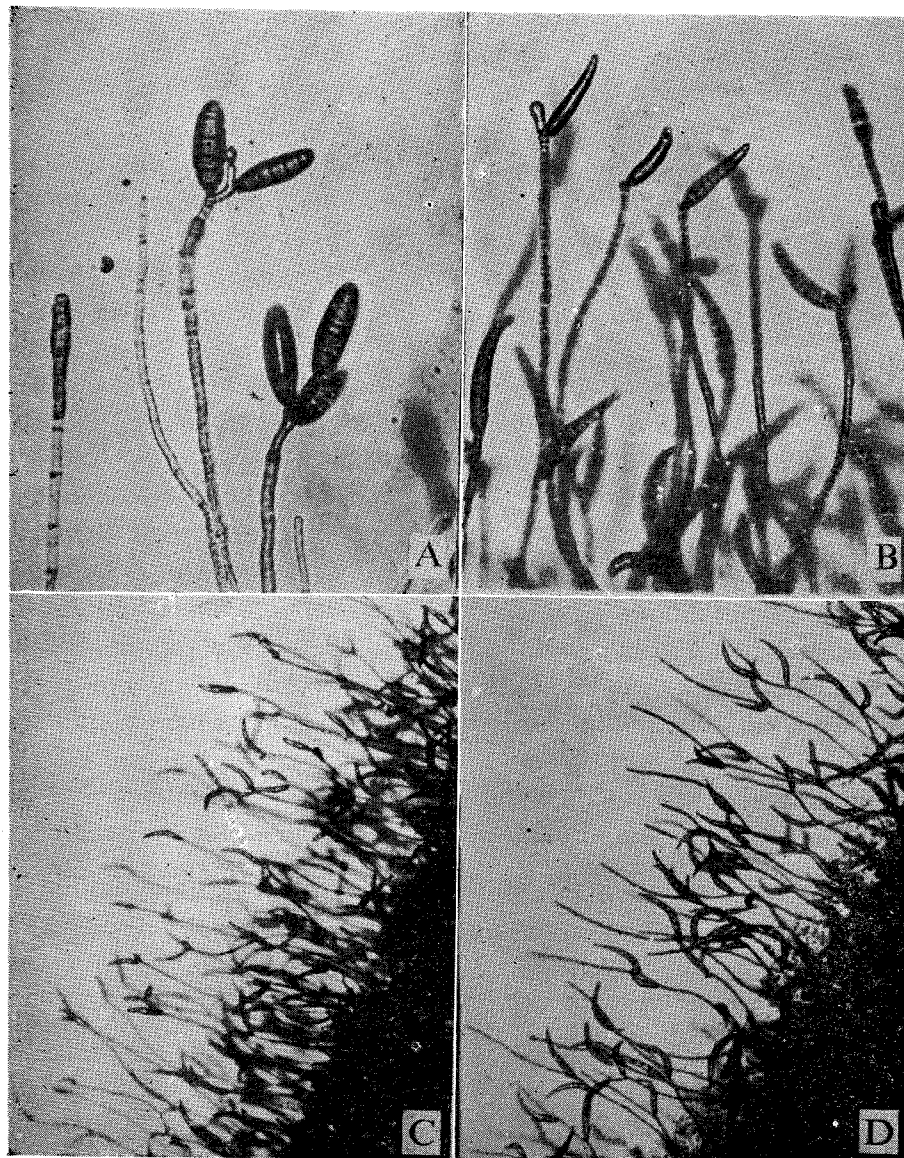
Table 1. *The effect of radiation and timing of radiation on conidiation of the species of Helminthosporium**

species	continuous darkness	continuous white light + NUV	NUV → darkness**
<i>H. maydis</i>	+	—	+
<i>H. oryzae</i>	—	—	+
<i>H. zizaniae</i>	—	—	+
<i>H. sativum</i>	+	—	+
<i>H. panici</i>	+	—	+
<i>H. nodulosum</i>	—	—	+

* The experiments were repeated triplicatedly

** Forty eight hours illumination followed by 48 hr darkness.

those species which produced conidiophores and conidia at darkness produced more when they were kept at the alternation of irradiation and darkness.



Sporulation of *Helminthosporium* spp.

Fig. 1. A. and B. The development of fruiting bodies of *H. oryzae*. C. Conidiation at the alternation of illumination of NUV followed by darkness. D. Conidial development was inhibited by white light showing no conidia at the tips of conidiophores.

The rest of the species produced conidia only when they were incubated at irradiation of the NUV for 48 hr and followed with 48 hr darkness. All the species tested produced only conidiophores were continuously kept at the illumination of the combination of the NUV and white light.

The different isolates of a given species of *Helminthosporium* might show different responses to the radiation in terms of conidiation. Honda (1969) studied two isolates of *H. oryzae* and found that they showed different responses to the radiation; one produced conidiophores and conidia at continuous darkness, the other sporulated only at the alternation of irradiation and darkness. Present author also found that some isolates of *H. oryzae* and *H. zizaniae* produced conidiophores and conidia at continuous darkness.

H. rostrata was isolated from several grasses, namely napier, bahia, guinea, and African blue grass, on which it caused leaf spots. This species isolated here produced no fruiting bodies on either the PSA or Czapek's media. An autoclaved corn leaf section of 2 cm² was placed in a petri dish with wet tissue paper on its bottom. A square agar block with mycelia was inoculated at the center of autoclaved corn leaf section. On autoclaved corn leaf section *H. rostrata* produced conidiophores and conidia at either darkness or at illumination alternated with darkness though at the latter condition more conidia were produced. No fructification occurred at the continuous irradiation of the combination of the NUV and white light.

Experimental results showed that some species of *Helminthosporium* and some races of species of *Helminthosporium* sporulated at darkness. However, the majority of the species that have been tested by this author and Leach (1962) showed light-dependency in terms of sporulation. Nevertheless the conidial development was inhibited by white light in which blue region of wavelengths is the major component and this region of wavelengths has been shown to be the most effective to inhibit conidial formation of the genera *Helminthosporium* and *Alternaria* (Lukens, 1963; Trione and Learch, 1969).

Literature Cited

- ARAGAKI, M. 1962. Quality of radiation inhibitory to sporulation of *Alternaria tomato*. *Phytopathology* **52**: 1227.
- ARAGAKI, M. 1964. Relation of radiation and temperature to the sporulation of *Alternaria tomato* and other fungi. *Phytopathology* **54**: 565-569.
- HONDA, Y. 1969. Studies on effects of light on the sporulation of *Helminthosporium oryzae*. *Bull. Inst. Agr. Res. Tohoku Univ.* **21**: 62-132. (Japanese with English summary)
- LEACH, D. M. 1962. Sporulation diverse species of fungi under ultraviolet radiation. *Can. J. Bot.* **40**: 151-161.
- LUKENS, R. J. 1963. Photo-inhibition of sporulation in *Alternaria solani*. *Am. Jour. Bot.* **50**: 720-724.

TRIONE, E. J. and C. M. LEACH. 1969. Light-induced sporulation and sporogenic substances in fungi. *Phytopathology* **59**: 1077-1083.

光對 *Helminthosporium* 屬菌分生孢子形成的影響

張 和 喜

中央研究院植物研究所

本報告所包括的菌有 *H. maydis*, *H. oryzae*, *H. zizaniae*, *H. sativum*, *H. panici*, *H. nodulosum* 和 *H. rostrata*。 *H. maydis*, *H. sativum*, *H. rostrata* 和 *H. panici* 在沒光的情影下也有孢子形成。 *H. oryzae*, *H. zizaniae* 和 *H. nodulosum* 在沒光的情形下孢子是不形成的。在螢光燈和黑管燈的繼續照明下，所有本實驗用的菌都沒有孢子形成。