PHYTOPATHOLOGICAL NOTES

Effects of Light on Sporulation by Pyricularia oryzae

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Pyricularia oryzae Cav., the rice blast pathogen, is reported to sporulate best when it is grown in the light (1, 3, 4, 5), and numbers of conidia increase as light intensity increases (2). We have observed, however, that cultures grown in darkness sometimes produce more conidia than those grown in light. This paper records some effects of light on sporulation when different isolates, temperatures, and cultures of different ages were compared.

Single spore isolates of *P. oryzae* were obtained from diseased rice supplied by C. R. Adair and J. G. Atkins of the USDA. The race designations and origin of the isolates were: IB2, El Salvador; IB5, Texas; ID1, Republic of The Philippines; IE1, India. The cultures were maintained on 2% rice-polish agar at 5 C. When experiments were made, fresh cultures were comminuted in a blender, and 0.5 ml of the mycelial suspension was poured onto the surface of 2% rice-polish agar in petri dishes. Each dish contained 20 ml of the medium.

Most experiments were made in cabinets where temperatures were controlled to about ± 1 C, and light intensity at the culture surface was about 250 ft-c as measured with a General Electric light meter, type 213. Illumination was provided by three 40-w cool-white fluorescent, and two incandescent, lamps. Cultures kept dark were wrapped in several layers of aluminum foil. Some experiments were made in the laboratory where temperatures were 22-26 C and light intensity varied from 85 ft-c to 125 ft-c at the culture surface. The light in the laboratory came from north windows, plus cool-white fluorescent lamps.

Spores were counted when cultures were 10 days old. From each culture, six discs (each 0.95 cm^2) were cut and crushed together in 5 ml distilled water. From this conidial suspension, four samples were taken, and the conidia counted in a hemocytometer. The number of conidia/cm^2 of culture surface was calculated. All experiments were replicated three times, and were made 2-3 times each. The analysis of variance was used to help interpret the data.

In experiments dealing with the effects of light and temperature on sporulation, four isolates were grown in cabinets at 20 and 28 C in darkness or light (22-hr light and 2-hr darkness daily). With each isolate at 20 C more conidia formed in light than in darkness (Table 1). The opposite was true when the isolates were at 28 C. Thus, the effect of light on sporulation was conditioned by temperature, and the interaction was statistically significant. The interaction between isolates and light was also significant, because isolate ID1 produced many more conidia when illuminated than did the other isolates.

TABLE 1. Sporulation by four races of *Pyricularia oryzae* on rice-polish agar at two temperatures in light or darkness

Race	Millions of conidia/cm^2 of culture surface[a]			
	20 C		28 C	
	Light	Darkness	Light	Darkness
	No.	*No.*	*No.*	*No.*
IB2	2.4	0.5	1.8	3.8
IE1	1.4	0.3	1.9	4.1
ID1	24.6	0.5	5.0	9.4
IB5	9.5	5.0	7.3	8.3

[a] Avg of two experiments, each replicated three times. Differences due to race, light, interaction of light × race, and interaction of light × temperature were statistically significant at 1%.

The age at which cultures are most sensitive to light was evaluated with race IE1 exposed to light according to the schedule shown in Table 2. Before and after exposure to light, the cultures were maintained in darkness until they were 10 days old. Two experiments were made. The first experiment was made twice in a cabinet at 23 C with light provided 12 hr daily. The second experiment was made twice on the laboratory bench at 22-26 C with light provided continuously.

Cultures exposed to light produced more conidia than those kept in darkness (Table 2). The greatest number of conidia was obtained when the cultures were illuminated for 12 or 24 hr daily throughout the experiments. In 10-day-old cultures, the first 5 days of growth appeared to be the period when they were most sensitive to light; exposure to light in the second 5 days of growth did not increase sporulation.

We concluded that light was not necessary for sporulation by *P. oryzae*. However, the fungus did sporulate somewhat more profusely when exposed to light during the first few days of culture growth, and when at 20 C rather than 28 C. Some isolates are affected by light more than are others.

TABLE 2. Sporulation by race IE1 of *Pyricularia oryzae* on rice-polish agar exposed to light on different days during 10 days of culture growth

Light treatment	Millions of conidia/cm^2 of culture surface	
	Exp. 1[a]	Exp. 2[b]
	No.	*No.*
Continuous darkness (10 days)	2.5	0.4
Light only on 4th day of growth	10.8	2.0
Light only on 7th day of growth	11.3	3.7
Light for first 5 days' growth	32.5	31.1
Continuous light (10 days)	34.5	30.8

[a] Work done in a cabinet at 23 C. Light was not continuous, but was applied for 12 hr daily. Avg of three replicates in each of two experiments.

[b] Work done on a laboratory bench at 22-26 C with continuous light. Avg of two trials each replicated three times.

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