Inhibition of Uredospore Germination by Light Partially Relieved by Soaking Spores in Water

Ho-Shii Chang, Roy D. Wilcoxson, and L. Calpouzos

Department of Plant Pathology, University of Minnesota, St. Paul 55101.

Scientific Journal Series Paper No. 8351, University of Minnesota Agricultural Experiment Station.

ABSTRACT

Light (white light or radiation at 720 nm) inhibited uredospore germination in *Puccinia graminis tritici* when the spores were hydrated in a water-saturated atmosphere, but not after they were soaked in water. The spores made sensitive to light by hydration were desensitized by soaking them in water.

Phytopathology 64:158

Light inhibits germination of uredospores in *Puccinia graminis* Pers. f. sp. *tritici* Eriks. & Henn. and recently Calpouzos and Chang (1) reported that the inhibition is caused primarily by wavelengths in the blue and far-red regions of the spectrum. Our report indicates that the inhibition may be partially relieved by soaking the uredospores in water before exposing them to light.

Uredospores of race 56 of *P. graminis* f. sp. *tritici* were stored at 5 C in darkness over silica gel about 1 month and then were subjected to one of the following treatments: hydration at room temperature (about 25 C) on a glass slide in a water-saturated atmosphere for about 15 hr, hydration by suspending 2 mg of spores in a large drop of distilled water for about 15 hr, and no hydration. Spores not hydrated were kept dry in a covered vial on the laboratory bench near those being hydrated. When the hydration treatments were completed, masses of the spores were picked up with a transfer loop and streaked onto water agar (1.3% agar) so there was about 25-30 spores/mm^2 on the agar surface. All spores were then irradiated for 2 hr. In one experiment, the spores were exposed to irradiation at 720 nm and 8,000 ergs/cm^2 per sec at the agar surface. The light came from 500 W incandescent lamp and was passed through a Baird Atomic interference filter to obtain the desired quality. In another experiment the light was less precisely controlled; it came from cool-white fluorescent lamps and intensity was 5,380 lux at the agar surface. In both experiments, spores were kept in darkness as checks. Each experiment was repeated twice; germination of 100 spores was determined each time for each treatment. All the work was done in an incubator at 20 C as indicated by a thermocouple placed on the agar surface.

TABLE 1. Effect of light on germination when uredospores of *Puccinia graminis tritici* race 56 were hydrated in different ways

	% germination[a]/hydration method					
	100% RH		Distilled H_2O		Nonhydrated	
Light source[b]	Light	Dark	Light	Dark	Light	Dark
White light	6	87	81	84	45	44
720 nm	2	91	89	87	39	42

[a] Avg three trials, 100 spores/treatment each trial on water agar.

[b] White light from cool-white fluorescent tubes, 5,380 lux, 20 C. 720 nm from a 500 W photo slide lamp through a Baird interference filter 8,000 ergs/cm^2, 20 C.

Light inhibited the germination of uredospores only when they were hydrated in the water-saturated atmosphere (Table 1). Light did not affect germination of spores that were not hydrated, or if they were hydrated in liquid water.

Another experiment was made to determine whether the sensitivity of hydrated spores to light could be removed by soaking them in water. Spores were removed from storage, hydrated 12 hr in water-saturated atmosphere, then placed in a large drop of distilled water another 12 hr. These spores and other hydrated spores not soaked in water were then streaked onto water agar and exposed to 720 nm (8,000 ergs/cm^2 per sec) or to cool-white light, 5,300 lux, at 20 C for 2 hr. The experiment was repeated twice; germination of 100 spores was observed for each treatment.

About 90% of the spores germinated in darkness (regardless of the hydration treatments). About 40% of the spores germinated if they were soaked in water after hydration in water-saturated atmosphere. None of the spores germinated if they were not soaked in water.

The mechanism by which light inhibits fungus spore germination is the subject of much speculation, and the photoreceptor still remains unidentified. Our data suggest that a water-soluble, photochemically active substance is present in hydrated uredospores that inhibits their germination in light. Perhaps this substance can be useful in studies on the regulation of spore germination. Further work should now be done to identify the water-soluble substance which apparently sensitizes spores to light.

LITERATURE CITED

1. CALPOUZOS, L., and H. CHANG. 1971. Fungus spore germination inhibited by blue and far-red radiation. Plant Physiol. 47:727-730.