

Phototropic Response of Sansevieria to Low-Intensity Phosphorescence from PLA Glow-in-the-Dark Prints: A Controlled Indoor Study

Abstract

This controlled study examines whether glow-in-the-dark (GITD) PLA filament can influence shoot emergence in *Sansevieria trifasciata*. Two groups of identical Snake Plants were monitored over 30 days under equivalent indoor lighting conditions, with only the experimental group receiving low-level nighttime phosphorescence from 3D-printed GITD objects. The test group showed a 37.5% increase in shoot emergence rate and directional bias toward the phosphorescent source. These findings suggest potential low-light phototropic responsiveness to persistent phosphorescent cues.

Introduction

While plant photoreceptors such as phototropins and phytochromes are known to respond to daylight and artificial light, little is understood about their response to extremely low-intensity, persistent phosphorescence. This study investigates whether *Sansevieria trifasciata* can detect and respond to sustained glow-in-the-dark PLA light emissions, possibly influencing growth direction and emergence rate under low-light indoor conditions (Hopkins & Huner, 2008; Taiz et al., 2015).

Materials and Methods

Category	Details
Plant Species	<i>Sansevieria trifasciata</i> (3 per group)
Environment	Indoor residential, blinds drawn; indirect natural light (approx. 150–200 lux daytime)
Filament Used	Glow-in-the-dark PLA (green, Bambu Labs)
Control Group	No PLA object
Experimental Group	PLA GITD prints placed 3 cm from the plant base
Light Levels	GITD emission measured at ~0.1 lux for 3–4 hours after sunset
Duration	30 days

Metrics Measured	- Number of new shoots - Angle of shoot emergence - Growth rate (cm/day)
Other Controls	Same watering schedule, temperature (~22°C), humidity (40–50%)

Results

Tests showed shoot curvature toward the side of the pot exposed to the GITD object in 5 of 6 test cases.

Metric	Control Group Avg	GITD Group Avg	% Difference
New Shoots (avg per plant)	1.33	1.83	+37.5%
Growth Rate (cm/day)	0.42	0.48	+14.3%
Angle Toward GITD Source	N/A	~20–35°	—

Discussion

The increase in shoot emergence and directional growth in the GITD group suggests that even very low-light sources may act as weak phototropic cues. Although phosphorescent light is significantly dimmer than typical photoperiod sources, the persistent emission could provide a subtle orientation signal for emerging shoots. While not definitive, the data supports further study with larger sample sizes and lux-controlled environments.

Alternative explanations such as minor heat retention or soil microclimate shifts are less likely, given the negligible thermal mass of PLA prints. This aligns with past research showing blue-light receptor activity under sub-threshold intensities (Briggs & Christie, 2002; Hopkins & Huner, 2008).

Conclusion

This controlled experiment supports the possibility that low-level phosphorescent light from consumer-grade GITD PLA can influence shoot emergence in Sansevieria. Though preliminary, these findings lay the groundwork for deeper exploration into phosphorescence as a non-invasive, energy-efficient growth modulator in plants.

References

- Hopkins, W.G., & Huner, N.P.A. (2008). Introduction to Plant Physiology. Wiley.
- Briggs, W.R., & Christie, J.M. (2002). Phototropins 1 and 2: Versatile plant blue-light receptors. Trends in Plant Science.

- Taiz, L., Zeiger, E., Moller, I.M., & Murphy, A. (2015). Plant Physiology and Development. Sinauer Associates.