

REVIEW

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# Plant responses to UV-B radiation: signaling, acclimation and stress tolerance

Zhiren Chen<sup>1</sup>, Yuan Dong<sup>1</sup> and Xi Huang<sup>1\*</sup> 

## Abstract

Ultraviolet-B (UV-B) light is an intrinsic part of sunlight that reaches the earth's surface, and affects plant survival and adaptation. How plants respond to UV-B light is regulated by the wavelength, intensity and duration of UV-B radiation, and is also regulated by photosynthetically active radiation perceived by phytochrome and cryptochrome photoreceptors. Non-damaging UV-B light promotes plant photomorphogenesis and UV-B acclimation which enhances plant tolerance against UV-B stress. However, high-level UV-B radiation induces DNA damage, generates reactive oxygen species (ROS) and impairs photosynthesis. Plants have evolved efficient mechanisms to utilize informational UV-B signal, and protect themselves from UV-B stress. UV RESISTANCE LOCUS8 (UVR8) is a conserved plant-specific UV-B photoreceptor. It interacts with CONSTITUTIVELY PHOTOMORPHOGENIC1 (COP1) to initiate UV-B-specific light signaling and regulate UV-B responsive gene expression. A set of transcription factors such as ELONGATED HYPOCOTYLS (HYS) function downstream of the UVR8-COP1 module to promote seedling de-etiolation for photomorphogenic development and biosynthesis of sunscreen flavonoids for UV-B stress tolerance. In addition to UVR8 signaling pathways, plants subjected to damaging UV-B radiation initiate stress protection and repair mechanisms through UVR8-independent pathways. In this review, we summarize the emerging mechanisms underlying UV-B stress acclimation and protection in plants, primarily revealed in the model plant *Arabidopsis thaliana*.

**Keywords:** UV-B stress, Photoreceptor, UVR8, Flavonoid, Transcription factor

## Introduction

Light provides plants with the energy source needed for photosynthesis and acts as an important environmental cue to regulate plant survival and development. However, light can also function as an abiotic stress factor for plants [e.g., high light, ultraviolet-B (UV-B) radiation] (Demarsy et al. 2018; Kami et al. 2010; Shi and Liu 2021; Yadav et al. 2020). UV-B (280–315 nm) light is an intrinsic part of sunlight that reaches the earth's surface. Plants are inevitably exposed to UV-B light of varied levels throughout their life cycle. Their physiological responses to UV-B light are regulated by the wavelength, intensity and

duration of UV-B irradiation (Jenkins 2009), and are also affected by photosynthetically active radiation perceived by phytochrome and cryptochrome photoreceptors (Rai et al. 2020; Tissot and Ulm 2020). Plants perceive UV-B light through the plant-specific UV-B photoreceptor UV RESISTANCE LOCUS8 (UVR8) (Kliebenstein et al. 2002; Rizzini et al. 2011), which elicits specific light signaling for photomorphogenic and acclimatory responses, including seedling de-etiolation, leaf and root development, phototropisms, flowering and the biosynthesis of phenylpropanoid derivatives (Arongaus et al. 2018; Dotto et al. 2018; Favory et al. 2009; Kim et al. 1998; Kliebenstein et al. 2002; Wargent et al. 2009; Yadav et al. 2020; Yang et al. 2020). Accumulated in the UV-B acclimation, the phenylpropanoid derivatives flavonols serve as sunscreen to contribute to UV-B stress tolerance. However, high-level UV-B irradiation provokes UV-B stress which damages plant growth and impairs their development.

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# Responses Of Plant To Uv B Radiation

**Michael Brown**



## **Responses Of Plant To Uv B Radiation:**

Responses Of Plant To Uv B Radiation: Bestsellers in 2023 The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous compelling novels enthralling the hearts of readers worldwide. Lets delve into the realm of bestselling books, exploring the fascinating narratives that have captivated audiences this year. The Must-Read : Colleen Hoover's "It Ends with Us" This touching tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover masterfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Uncover the Best : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens weaves a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These bestselling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of compelling stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and thrilling novel that will keep you guessing until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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