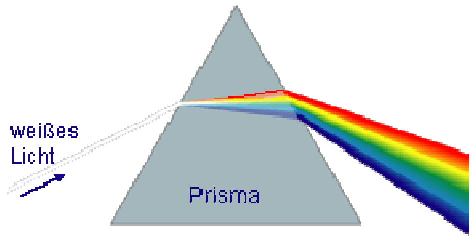
BLUECAT GERMANY

BLUECAT® Hygieneleuchte und wie es wirkt

Sichtbares Licht lässt sich mit einem Prisma ist seine einzelnen Frequenzen zerlegen. In der Natur zeigt sich dieser Effekt z.B. bei einem Regenbogen.

Der Mensch ist nur in der Lage einen kleinen Bereich des Lichtes zu sehen, diesen nennt man sichtbaren Bereich oder VIS-Bereich.

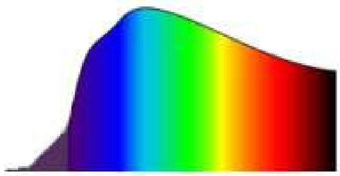


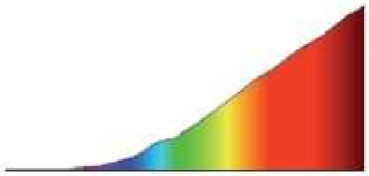
Nach oben und unten wird dieser Bereich vom Ultravioletten- und Infrarotbereich begrenzt.

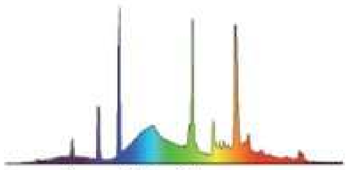
Wenn die Anteile der einzelnen sichtbaren Frequenzen sich ändern, nehmen wir Licht anders war.

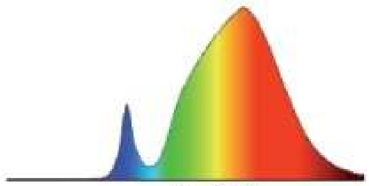
Gelb- und Rottöne empfinden wir meist als warm und angenehm.

Leuchtstoffröhren wirken eher kalt und unnatürlich.

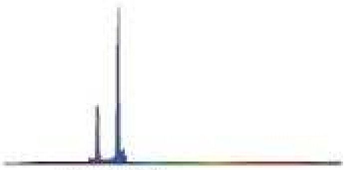

Tageslicht


Glühlampe


Leuchtstofflampe


weiße LED

Die BLUECAT®-Leuchten senden nur einen einzelnen Frequenz-Bereich im sichtbaren blauen Licht aus.


BLUECAT

Wie wirkt BLUECAT® auf den Schimmel?

Studien aus Deutschland, Italien, Österreich, USA usw. haben sich mit diesem Thema beschäftigt. Die BLUECAT®-Frequenz wirkt auf mindestens ein Gen, welches für das Wachstum, den Stoffwechsel und die Giftbildung des Schimmels zuständig ist.

Der Mechanismus wurde komplett entschlüsselt *1
*1 Quelle (J Microbiol. Author manuscript; available in PMC 2013 Jul 17.)

Man kann es mit einem Schlüssel vergleichen, der eine Tür auf, oder abschließt. Diese Stoffwechselvorgänge und die Regulation durch die Gene ist ein sehr mächtiger Prozess, gegen den sich kein Lebewesen wehren kann.

Einmal der BLUECAT® Frequenz dauerhaft ausgesetzt, kann der Schimmelpilz keinen regulären Stoffwechsel mehr treiben und verkümmert über die Zeit.
Dies gilt nach derzeitigem Stand der Wissenschaft als erwiesen und durch verschiedenste Studien belegt.

1. Studie zum Effekt blauen Lichtes im Bereich 450-*455nm auf Schimmelpilze

Das MRI (Max Rubner Institut) in Karlsruhe, ein Bundesforschungsinstitut für Ernährung und Lebensmittel, hat im Rahmen mehrerer unabhängiger Studien die Wirksamkeit von blauem Licht auf das Wachstum und die Toxinbildung (Pilz-Gift) nachgewiesen.

Es wurden verschiedene Studien zum Einfluss von Licht verschiedener Frequenz auf das Wachstum und die Toxinbildung (Pilzgift) gemacht.

Es hat sich Frequenzbereich gezeigt, in denen 80% der Pilzsporen inaktiv wurden und bis zu 100% der getesteten Schimmelpilze das Wachstum einstellten.

MRI Karlsruhe:

„Mit Licht einer Wellenlänge von ca. 450nm lassen sich Schimmelpilze wirksam ausschalten. Wachstum und Giftbildung werden behindert. „

Die BLUECAT-Leuchten nutzen gezielt diesen Effekt.

Die BLUECAT-Frequenz arbeitet somit in einem Frequenzbereich, der in unabhängigen Studien die Wirksamkeit bewiesen hat um den Schimmel abzutöten bzw. stark zu reduzieren.

Schimmelpilze und ihre Sporen sind allgegenwärtig. Nahrung effektiv vor einem Befall zu schützen, ist kaum möglich.

MRI-Forscher haben innerhalb des EU-weiten-Projektes **„Novel strategies for world wide reduction of mycotoxins in foods und feed chain“** (MycoRed) nun ein Verfahren entwickelt, mit dem die Pilze zwar nicht vollständig abgetötet, aber in ihrer Entwicklung wirkungsvoll gehemmt werden:

Sichtbares Licht bestimmter Wellenlängen stört den Lebensrhythmus von vielen Schimmelpilzen so nachhaltig, dass kein Pilzgift gebildet wird und im besten Fall sogar das Wachstum unterbleibt.

Pilze haben, wie die meisten Lebewesen, eine innere Uhr, die Wachstum und Stoffwechsel steuert.

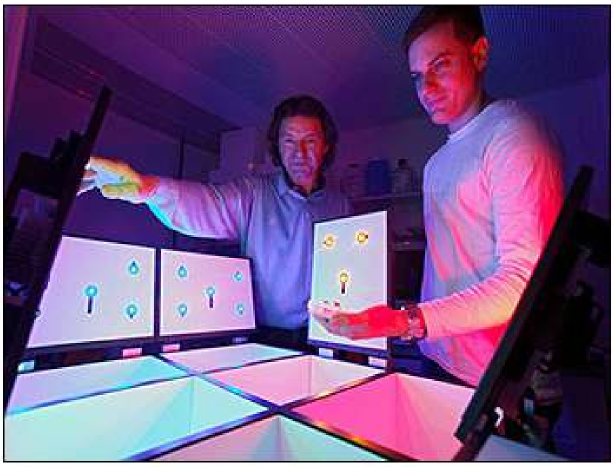
Blaues Licht mit einer Wellenlänge von ca. 450 Nanometern ist etwa bei einer großen Schimmelpilzgruppe besonders effektiv, zu der auch Penicillium und Aspergillus-Arten gehören.

Quelle: MRI, Karlsruhe

Light Inhibits Fungal Growth

KARLSRUHE, Germany, May 19, 2010 — It is quite possible that the days of moldy fruit have come to an end. Researchers at the Max Rubner Institute (formerly the Federal Research Center for Nutrition and Food) in Germany have discovered that certain wavelengths of visible light disrupt the rhythm of life of many forms of mildew so successfully that they stop producing fungal toxins.

Ochratoxins are the toxins of a large group of mildews that also include various penicillium and aspergillus species. Like most living organisms, these molds have a biological clock that regulates growth and metabolism. At the beginning of the project, professor Rolf Geisen, a researcher at the institute, suspected that "if we can manage to change the rhythm of this clock, then we can stop the production of toxins."



Researchers at the Max Rubner Institute inhibit the production of toxins. (Image: Joachim E. Röttgers)

According to the researchers, blue light with a wavelength of 450 nm has proved to be a particularly effective inhibitor.

"We don't use harmful UV radiation. The blue light is sufficient to destroy 80 percent of the mold spores," said Dr. Markus Schmidt-Heydt, a researcher on Geisen's team.

On the other hand, researchers have also discovered that yellow and green light promotes the growth of the molds. Molds are therefore certainly not "blind." They have light receptors for different wavelengths. Unfortunately, however, the varieties of mold have different levels of sensitivity. Typical cereal molds like the fusaria react differently to being illuminated, producing higher levels of light protection pigments like carotin, for instance.

This discovery is being intensively tested for its practical application in the context of the EU project "Novel strategies for worldwide reduction of mycotoxins in foods and feed chain" (MycoRed). If the illumination strategy meets its promise in the practical testing stage, the institute's findings would be considered a huge step forward in the battle against the spoilage of food in Germany and throughout the world.

For more information, visit: www.mri.bund.de

2. Verifikation:

Die Arbeiten des MRI in Karlsruhe wurden von den Kollegen F. Fanelli, A.F. Logrieco und G. Mulé vom Institute of Sciences of Food Production, Bari, Italy, verfiziert und zusammen publiziert.

Light regulation of mycotoxin biosynthesis: new perspectives for food safety

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Light regulation of mycotoxin biosynthesis: new perspectives for food safety

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REVIEW ARTICLE

Abstract

Mycotoxins are secondary metabolites produced by toxigenic fungi contaminating foods and feeds in pre-, post-harvest and processing, and represent a great concern worldwide, both for the economic implications and for the health of the consumers. Many environmental conditions are involved in the regulation of mycotoxin biosynthesis. Among these, light represents one of the most important signals for fungi, influencing several physiological responses such as pigmentation, sexual development and asexual conidiation, primary and secondary metabolism, including mycotoxin biosynthesis. In this review we summarise some recent findings on the effect of specific light wavelength and intensity on mycotoxin biosynthesis in the main toxigenic fungal genera. We describe the molecular mechanism underlying light perception and its involvement in the regulation of secondary metabolism, focusing on VeA, global regulator in *Aspergillus nidulans*, and the White-Collar proteins, key components of light response in *Neurospora crassa*. Light of specific wavelength and intensity exerts different effects both on growth and on toxin production depending on the fungal genus. In *Penicillium* spp. red (627 nm) and blue wavelengths (455-470 nm) reduce ochratoxin A (OTA) biosynthesis by modulating the level of expression of the ochratoxin polyketide synthase. Furthermore a mutual regulation between citrinin and OTA production is reported in *Penicillium* toxigenic species. In *Aspergillus* spp. the effect of light treatment is strongly dependent on the species and culture conditions. Royal blue wavelength (455 nm) of high intensity (1,700 Lux) is capable of completely inhibit fungal growth and OTA production in *Aspergillus stenyii* and *Penicillum verrucosum*. In *Fusarium* spp. the effect of light exposure is less effective; mycotoxin-producing species, such as *Fusarium verticillioides* and *Fusarium proliferatum*, grow better under light conditions, and fumonisin production increased. This review provides a comprehensive picture on light regulation of mycotoxin biosynthesis and discusses possible new applications of this resource in food safety.

Keywords: light, mycotoxins, *Aspergillus*, *Penicillium*, *Fusarium*, food safety

1. Introduction

Mycotoxins are secondary metabolites (SM) produced by toxigenic fungi that contaminate foods and feeds in pre-, post-harvest and processing and represent a great concern worldwide either for the economic implications and for public health. International trade in agricultural commodities such as wheat, rice, barley, corn, sorghum, soybeans, groundnuts and oilseeds amounts to hundreds of millions of tons each year. Many of these commodities are subjected to a high risk of mycotoxin contamination. The Food and Agriculture Organization of the United Nations (FAO) estimated that each year, between 25 and 50% of the world's food crops are contaminated by mycotoxins (FAO, 1988; Mannon and Johnson, 1985).

The mycotoxins of most concern from a food safety perspective include aflatoxins, ochratoxin, toxins produced by *Fusarium* spp., such as fumonisins, trichothecenes and zearalenone (ZEA) and *Alternaria* toxins (Desjardins and Proctor, 2007). These molecules have different chemical structures and biosynthetic pathways and can cause a variety of diseases in human and animals with a wide range of severity (Bennett and Klich, 2003).

3. Wirkungsmechanismus

Die Arbeiten entsprechen den Befunden von Wenbing Yin and Nancy P. Keller
Quelle:
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Transcriptional Regulatory Elements in Fungal Secondary Metabolism

PMC full text: J Microbiol. Author manuscript; available in PMC 2013 Jul 17.
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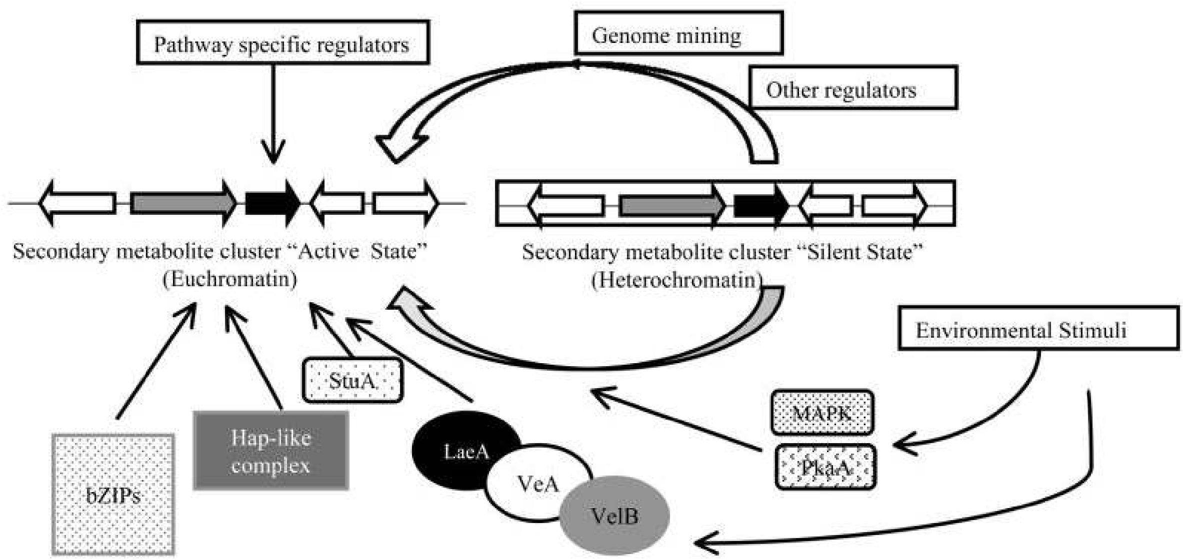
J Microbiol. 2011 Jun; 49(3): 329–339.
Published online 2011 Jun 30. doi: 10.1007/s12275-011-1009-1

Figure 1



Regulation of fungal secondary metabolism by transcriptional regulatory elements. SM gene clusters are often silent in laboratory conditions. Activation of SM clusters is complex and involves several layers of transcriptional regulators from pathway specific regulators to more global regulators such as bZip proteins, StuA and Velvet (LaeA, VeA and VelB) and Hap-like complexes. This activation is associated with conversion of heterochromatin marks (silent cluster) to euchromatin marks (active cluster). In addition, environmental stimuli are translated by signal transduction cascades, including MAPK and PkaA, to activate SM synthesis.

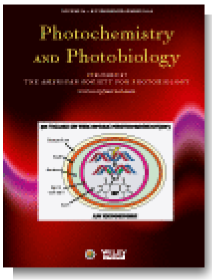
4. Weitere Arbeiten zum Thema Wirkung von blauem Licht 450/455nm

Effect of LED Blue Light on *Penicillium digitatum* and *Penicillium italicum* Strains

María T. Lafuente[*] and Fernando Alférez[†]

Article first published online: 7 OCT 2015
DOI: 10.1111/php.12519

Issue



Photochemistry and Photobiology
Volume 91, Issue 6, pages 1412–1421,
November/December 2015

Abstract

Studies on the antimicrobial properties of light have considerably increased due in part to the development of resistance to actual control methods. This study investigates the potential of light-emitting diodes (LED) blue light for controlling *Penicillium digitatum* and *Penicillium italicum*. These fungi are the most devastating postharvest pathogens of citrus fruit and cause important losses due to contaminations and the development of resistant strains against fungicides. The effect of different periods and quantum fluxes, delaying light application on the growth and morphology of *P. digitatum* strains resistant and sensitive to fungicides, and *P. italicum* cultured at 20°C was examined. Results showed that blue light controls the growth of all strains and that its efficacy increases with the quantum flux. Spore germination was always avoided by exposing the cultures to high quantum flux (700 µmol m^{-2} s^{-1}) for 18 h. Continuous light had an important impact on the fungus morphology and a fungicidal effect when applied at a lower quantum flux (120 µmol m^{-2} s^{-1}) to a growing fungus. Sensitivity to light increased with mycelium age. Results show that blue light may be a tool for *P. digitatum* and *P. italicum* infection prevention during handling of citrus fruits.

http://www.ncbi.nlm.nih.gov/pubmed/23242320

Toxins (Basel). 2012 Dec 14;4(12):1535-51. doi: 10.3390/toxins4121535.

Wavelength-dependent degradation of ochratoxin and citrinin by light in vitro and in vivo and its implications on Penicillium.

Schmidt-Heydt M[1], Cramer B, Graf I, Lerch S, Humpf HU, Geisen R.

Author information

Abstract

It has previously been shown that the biosynthesis of the mycotoxins ochratoxin A and B and of citrinin by Penicillium is regulated by light. However, not only the biosynthesis of these mycotoxins, but also the molecules themselves are strongly affected by light of certain wavelengths. The white light and blue light of 470 and 455 nm are especially able to degrade ochratoxin A, ochratoxin B and citrinin after exposure for a certain time. After the same treatment of the secondary metabolites with red (627 nm), yellow (590 nm) or green (530 nm) light or in the dark, almost no degradation occurred during that time indicating the blue light as the responsible part of the spectrum. The two derivatives of ochratoxin (A and B) are degraded to certain definitive degradation products which were characterized by HPLC-FLD-FTMS. The degradation products of ochratoxin A and B did no longer contain phenylalanine however were still chlorinated in the case of ochratoxin A. Citrinin is completely degraded by blue light. A fluorescent band was no longer visible after detection by TLC suggesting a higher sensitivity and apparently greater absorbance of energy by citrinin. The fact that especially blue light degrades the three secondary metabolites is apparently attributed to the absorption spectra of the metabolites which all have an optimum in the short wave length range. The absorption range of citrinin is, in particular, broader and includes the wave length of blue light. In wheat, which was contaminated with an ochratoxin A producing culture of Penicillium verrucosum and treated with blue light after a pre-incubation by the fungus, the concentration of the preformed ochratoxin A reduced by roughly 50% compared to the control and differed by > 90% compared to the sample incubated further in the dark. This indicates that the light degrading effect is also exerted in vivo, e.g., on food surfaces. The biological consequences of the light instability of the toxins are discussed.

PMID: 23242320 [PubMed - indexed for MEDLINE] PMCID: PMC3528261 Free PMC Article

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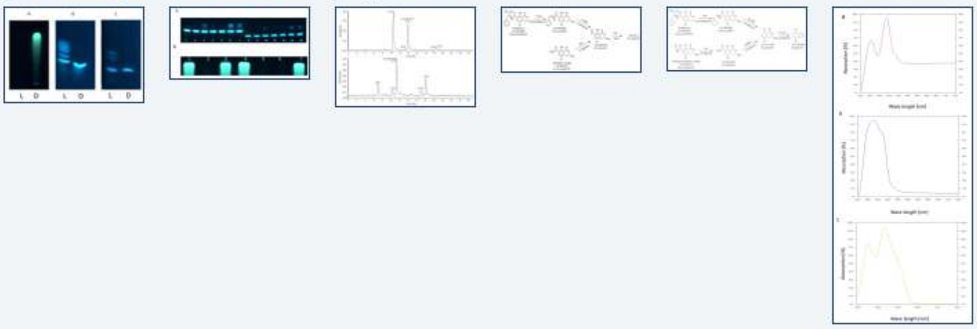

5. Komplette Zusammenfassung des Wirkprinzips der BLUECAT-Leuchten

Arbeit der TU -Wien
Appl Microbiol Biotechnol. 2010 Feb; 85(5): 1259–1277.
Published online 2009 Nov 14. doi: 10.1007/s00253-009-2320-1
PMCID: PMC2807966

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