



Research article

Effect of three LED lights on the biomass production and copper remediation by shoot cultures of *Musa paradisiaca*

Tjie Kok*, Fenny Irawati

Faculty of Biotechnology, University of Surabaya, Indonesia

ARTICLE INFO

Keywords:

Environmental science
White, red, and blue LED lights
Musa paradisiaca
Copper remediation
Biomass production
Growth index

ABSTRACT

In photosynthesis, certain wavelengths of radiation are absorbed by photosynthetic pigments in plants, depending on the molecular structures of the pigments. Two main radiation wavelengths absorbed by plants for photosynthesis and biomass production are in the range of red and blue lights. Therefore, in addition to white light, observation applying the red and blue lights in plant researches gain great interest. The aim of this project is to compare the effect of three LED lights on the biomass production and copper remediation by previously-screened shoot cultures of *Musa paradisiaca*. The LED lights applied are arrangements of white, red, and blue LEDs, each arrangement having the same voltage of 12 V and the same power of 24 Watts. The shoot cultures were cultivated aseptically in 25 mL Murashige and Skoog agar media supplemented with 5 mg/L copper ions. Both parameters –the biomass production and copper concentration in biomass– determine the overall copper remediation by the shoot cultures from media. The results of this project show about 1.5-fold biomass production –expressed as growth index– was obtained upon the application of white light compared to that of the other two lights. Meanwhile, there is no significant difference in the concentration of copper in biomass upon the application of the three lights. Combined together, the application of white light still predominates for the overall copper remediation by the shoot cultures of *Musa paradisiaca* from media.

1. Introduction

Various contaminants in environment have been described as severely hazardous the health of living creatures [1]. Heavy metals, among them, are well known as dangerous contaminants because of their nonbiodegradable properties. Hence they persist in environment for long period. Consequently, they may cause toxicity, even mutagenesis in living organisms. Biotechnology has employed plants for heavy metal remediation. The use of conventional plants for such purpose only uses variation of a species genetics to meet the characteristics required for remediation. Whereas, the elevation in the expression of certain protein or peptide in the plant's cells is expected to improve the remediation capacity of plants for metal ions [2, 3]. Such elevation could be achieved, among others, by plant-tissue-culture techniques. To this end, we need to modify the traits of plant candidates by certain treatments to produce more biomass and to improve their capability in removing metal ions from contaminated media.

The term "biomass" refers to the biological materials that can be used to achieve certain purpose, which in this case, is to remediate heavy metal ions from the growth media. This biomass could also be used to

generate energy; and because the plants can be recultivated, then this source is a renewable source of biomass [4].

The commonly encountered problem when cultivating plant cultures in abnormal growth media, for example media containing heavy metals, is their low growth rate, resulting in the low biomass production. In our previous project, we have successfully screened shoot cultures of *Musa paradisiaca* that are able to grow in media containing copper ions with concentration up to 5 mg/L or 80 μ M and capable in absorbing the ions from their growth media [5]. However, their capacity to remediate the ions from media was relatively low.

The use of artificial lights to improve crop production was made possible after the invention of robust and long-lasting electrical lamps in the beginning of twentieth century [6]. Nowadays, electrical lighting could be used as a steady and reliable source of radiation to control plant growth environment [7]. The use of LEDs gives higher lighting efficiency or lower energy consumption, over incandescent or compact fluorescent lamps [8, 9]. The red and blue LED alone or in combination has been applied for plant morphogenesis both in vivo and in vitro over the decades [10, 11, 12]. Light emitting diodes (LEDs) with customized color or wavelength could probably be applied on the plantlets to improve the

* Corresponding author.

E-mail address: tjie_kok@staff.ubaya.ac.id (T. Kok).<https://doi.org/10.1016/j.heliyon.2020.e04981>

Received 3 May 2020; Received in revised form 31 July 2020; Accepted 16 September 2020

2405-8440/© 2020 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

biomass production [13, 14]. Hence the aim of this project is to apply red and blue LEDs –in addition to the white LED– on the previously-screened shoot cultures of *Musa paradisiaca* and compare the biomass production and overall copper remediation from growth media.

To this end, we made arrangements of white, red, and blue LEDs and apply them to the previously-screened shoot cultures of *Musa paradisiaca* cultivated on media containing copper ions of 5 mg/L. White LED, in this project, is used as a control. All the light arrangements are of the same voltage of 12 V and the same power of 24 Watts. The biomass production and the copper concentration in biomass of the shoot cultures are evaluated after 30-day incubation. The former is measured and expressed as growth index, that is the ratio of the fresh weight of harvested biomass to that of the initially-cultivated biomass. The latter is measured and expressed as milligram of copper per gram of dried biomass.

It is expected that having the greater growth index and/or increased concentration of copper in biomass, the selected group of shoot cultures of *Musa paradisiaca* could further be grown to produce plants having potential to remediate copper ions in polluted soil.

2. Materials and methods

All chemicals were purchased from Sigma-Aldrich, Indonesia. The lamps used were LEDs Strip Light SMD-12V IP 44, 24 W, Krisbow, Cina, consisting of white, red, and blue color (the wavelengths are not specified). The inductively couple plasma (ICP) used was ICAP 6200 Duo ICP-OES Spectrometer s/n: IC2D20124114, Thermo Scientific, UK. Shoot cultures were cultivated aseptically in 25 mL Murashige and Skoog (MS) agar media supplemented with 5 mg/L copper ions [5]. The cultures were grouped depending on the three LED lights applied, i.e. white, red, and blue. Each group consisted of 18 shoot cultures. The individual weight of fresh shoot culture, between 450 mg and 600 mg, was properly measured and was recorded as the initial weight of each. They were then incubated for 30 days and 14 out of 18 shoot cultures, that grew well and not contaminated, were harvested for subsequent steps. Harvest was

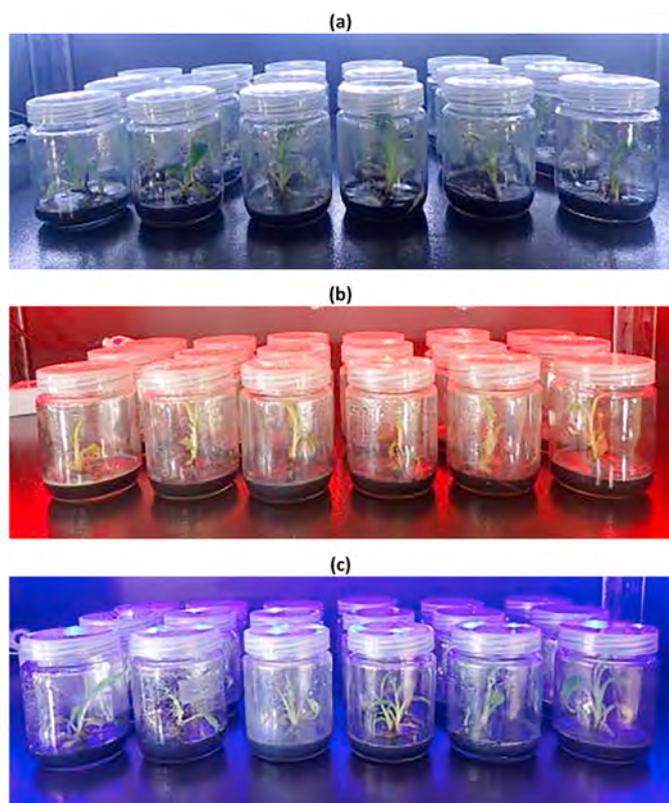


Figure 1. *Musa paradisiaca* shoot cultures. (a) White LED is applied (b) Red LED is applied (c) Blue LED is applied.

Table 1. Biomass production expressed as growth index of each group of *Musa paradisiaca* shoot cultures upon the application of three LED lights (n = 14 for each group).

Type of LED light applied	Growth index*
White	2.658 ± 0.419
Red	1.758 ± 0.182
Blue	1.696 ± 0.326

* expressed as mean ± SE.

conducted by first rinsing the shoot cultures with distilled water to free their surface from adsorbed media. The water was then allowed to evaporate on flowing air. The weight of individual harvested shoot culture was measured. The growth index was calculated as a ratio of the weight of each shoot culture at harvest time to the initial weight of it at time of cultivation. After drying in an oven and pulverizing the dried biomass, ± 10 mg of individual sample was destructed with 7.5 mL HNO₃ 2%, sonicated for 10 min and filtrated with Whatman filter paper of 0.2 µm. The concentration of copper ions in filtrate was measured using ICP at wavelength of 324.75 nm [15]. The data was analyzed using SPSS V27.

3. Results

3.1. *Musa paradisiaca* shoot cultures and their growth indexes

The shoot cultures of *Musa paradisiaca* cultivated in MS agar media supplemented with 5 mg/L copper ions [5] with the application of white LED (Figure 1a) produced the greatest growth index (expressed as mean ± SE), 2.658 ± 0.419 (Table 1 and Figure 2). Whereas, the ones with application of red and blue LEDs (Figure 1b and 1c) gave relatively the same growth index, 1.758 ± 0.182 and 1.696 ± 0.326 (Table 1 and Figure 2).

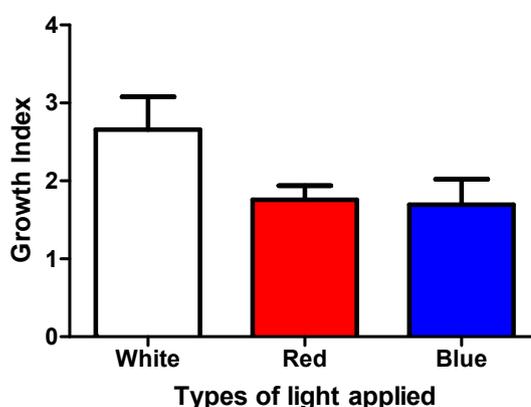


Figure 2. Biomass production expressed as growth index of each group of *Musa paradisiaca* shoot cultures upon the application of three LED lights (n = 14 for each group).

Table 2. Copper concentration in dried biomass of each group of *Musa paradisiaca* shoot cultures upon the application of three LED lights (n = 14 for each group).

Type of LED light applied	Copper concentration in dried biomass (mg of copper/mg of biomass)*
White	0.079 ± 0.006
Red	0.086 ± 0.008
Blue	0.089 ± 0.006

* expressed as mean ± SE.

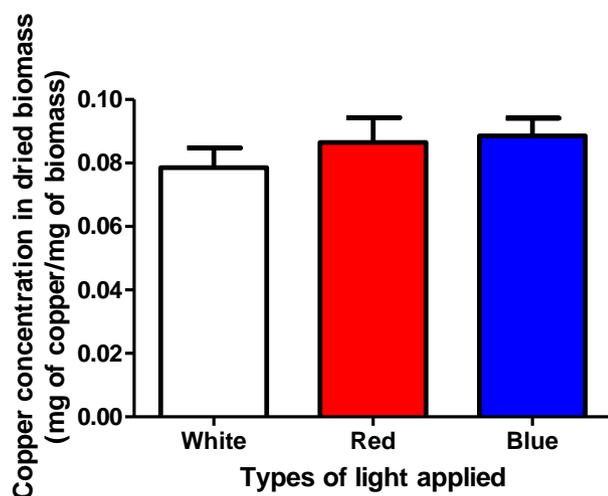


Figure 3. Copper concentration in the dried biomass of each group of *Musa paradisiaca* shoot cultures upon the application of three LED lights (n = 14 for each group).

3.2. Copper concentration in dried biomass of *Musa paradisiaca* shoot cultures

The copper concentration in dried biomass of the group of shoot cultures of *Musa paradisiaca* irradiated with white LED (expressed as mean ± SE) is 0.079 ± 0.006 mg of copper/mg of biomass, as compared to 0.086 ± 0.008 mg of copper/mg of biomass and 0.089 ± 0.006 mg of copper/mg of biomass, respectively, of those irradiated with red and blue LEDs (Table 2 and Figure 3).

4. Discussion

The previously-screened shoot cultures of *Musa paradisiaca* were cultivated in 25 mL MS agar media supplemented with 5 mg/L copper ions [5] and irradiated with white, red, and blue LEDs. They all grew well (Figure 1) with reasonable growth indexes (Table 1 and Figure 2). In this project, we expected the group of shoot cultures irradiated with the customized wavelengths of radiation would yield overall greater remediation of copper ions from media.

The results of the project show that the group of *Musa paradisiaca* shoot cultures with the application of white LED produced growth index of 2.658 ± 0.419 . Meanwhile, the ones irradiated with red and blue LEDs yielded growth index of 1.758 ± 0.182 and 1.696 ± 0.326 , respectively. The analysis of varian –showing $P < 0.05$ followed by Duncan post hoc test– reveal that the growth index of the group of shoot cultures irradiated with white LED differs significantly, ca. 1.5-fold higher, from the one of the groups irradiated with red and blue LEDs. Meanwhile, the growth index of the group of cultures irradiated with red and blue LEDs are not different significantly from each other (Table 3). It may suggest that photosynthetic pigments of the shoot cultures enable the plants to select wavelengths of radiation suiting better their need for growth. The red and blue LEDs may suffer from the wavelength mismatch with the photosynthetic action spectrum. This can happen because even though

Table 3. Duncan post hoc test of growth index for each group of *Musa paradisiaca* shoot cultures upon the application of three LED lights (n = 14 for each group).

Type of LED light applied	Growth index
White	$0.7700^a \pm 0.006$
Red	$0.8314^a \pm 0.008$
Blue	$1.8029^b \pm 0.006$

^{a, b}The same symbols represents no real difference, the different ones represents a real difference.

the spectrum of LED is sufficiently narrow and it appears as a single color to human eyes, it is neither spectrally coherent nor highly monochromatic [9].

Further, the results show that the group of *Musa paradisiaca* shoot cultures irradiated with white LED produced concentration of copper in dried biomass of 0.079 ± 0.006 mg of copper/mg of biomass, as compared to the one irradiated with red and blue LEDs, 0.086 ± 0.008 mg of copper/mg of biomass and 0.089 ± 0.006 mg of copper/mg of biomass, respectively (Table 2 and Figure 3). However, all the three are not significantly different from each other in analysis of varian ($P < 0.05$).

Combined together, the results show that application of white light still predominates over the red and blue lights for the project. Hence, we would rather apply white light that is more available on the market and cheaper rather than red and blue lights. This may also suggest that the application of customized wavelengths of radiation would not be really needed for such kind of work in plant tissue cultures.

5. Conclusion

The results of this project reveal that the application of white light still predominates over the red and blue lights for the overall copper remediation by the shoot cultures of *Musa paradisiaca*. Therefore, for such kind of work the application of white light would be more preferable than that of red and blue lights.

Declarations

Author contribution statement

Tjie Kok: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Fenny Irawati: Performed the experiments; Contributed reagents, materials, analysis tools or data.

Funding statement

This work was supported by University of Surabaya, Indonesia (013/ST-Lit/LPPM-01/FTB/II/2019).

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

References

- [1] G. Saxena, R.N. Bharagava, *Organic and inorganic pollutants in industrial wastes*, in: *Environmental Pollutants and Their Bioremediation Approaches* 23–56, CRC Press, Boca Raton, 2017.
- [2] R. Chandra, G. Saxena, V. Kumar, *Phytoremediation of environmental pollutants: an eco-sustainable green technology to environmental management*, in: *Advances in Biodegradation and Bioremediation of Industrial Waste*, 1–30, CRC Press, Boca Raton, 2015.
- [3] R.A. Chirakkara, C. Cameselle, K.R. Reddy, *Assessing the applicability of phytoremediation of soils with mixed organic and heavy metal contaminants*, *Rev. Environ. Sci. Biotechnol.* 15 (2016) 299–326.
- [4] C. Stephenson, C.R. Black, *One step forward, two steps back: the evolution of phytoremediation into commercial technologies*, *Biosci. Horizons* 7 (2014) 1–15.
- [5] T. Kok, *The accumulation of copper ions in biomass and its influence on the production of phytochelatin in shoot culture of Musa paradisiaca*, in: *International Conference on Chemical, Environmental and Biological Sciences (ICCEBS'2012)* 38–40, Planetary Scientific Research Centre, 2012.
- [6] P. Pinho, L. Halonen, *Agricultural and horticultural lighting*, in: *Handbook Of Advanced Lighting Technology* 703–720, Springer International Publishing, 2017.
- [7] S.D. Gupta, *Light Emitting Diodes for Agriculture: Smart Lighting*, 2017.

- [8] A. Zeb, M. De Andrade Romero, D. Baiguskarov, S. Aitbayev, K. Strelets, LED lightbulbs as a source of electricity saving in buildings, *MATEC Web Conf.* 73 (2016).
- [9] Y. Deng, D. Chu, Coherence properties of different light sources and their effect on the image sharpness and speckle of holographic displays, *Sci. Rep.* 7 (2017) 1–12.
- [10] A. Agarwal, S.D. Gupta, Impact of light-emitting diodes (LEDs) and its potential on plant growth and development in controlled-environment plant production system, *Curr. Biotechnol.* 5 (2016) 28–43.
- [11] S.D. Gupta, B. Jatothu, Fundamentals and applications of light-emitting diodes (LEDs) in in vitro plant growth and morphogenesis, *Plant Biotechnol. Rep.* 7 (2013) 211–220.
- [12] M.T. Naznin, M. Lefsrud, V. Gravel, X. Hao, Using different ratios of red and blue LEDs to improve the growth of strawberry plants, *Acta Hortic.* 1134 (2016) 125–130.
- [13] N. Korbee, F.L. Figueroa, J. Aguilera, Effect of light quality on the accumulation of photosynthetic pigments, proteins and mycosporine-like amino acids in the red alga *Porphyra leucosticta* (Bangiales, Rhodophyta), *Photochem. Photobiol.* 80 (2005) 71–78.
- [14] C. Yan, L. Zhang, X. Luo, Z. Zheng, Effects of various LED light qualities and light intensity supply strategies on purification of slurry from anaerobic digestion process by *Chlorella vulgaris*, *Int. Biodeterior. Biodegrad.* 79 (2013) 81–87.
- [15] M. Thompson, J.N. Walsh, Analysis of metals by ICP-AES. *Handbook of Inductively Coupled Plasma Spectrometry*, Blackie & Son, 1989, pp. 270–286.

Heliyon



 CellPress

Ads by Google

Stop seeing this ad Why this ad?

Heliyon

COUNTRY

Netherlands

Universities and research institutions in Netherlands

SUBJECT AREA AND CATEGORY

Multidisciplinary
Multidisciplinary

PUBLISHER

Elsevier BV

H-INDEX

28

PUBLICATION TYPE

Journals

ISSN

24058440

COVERAGE

2015-2020

INFORMATION

[Homepage](#)

[How to publish in this journal](#)

c.schulz@icell.com

SCOPE

Heliyon is an all-science, open access journal that is part of the Cell Press family. Any paper reporting scientifically accurate and valuable research, which adheres to accepted ethical and scientific publishing standards, will be considered for publication. Our growing team of dedicated section editors, along with our in-house team, handle your paper and manage the publication process end-to-end, giving your research the editorial support it deserves.

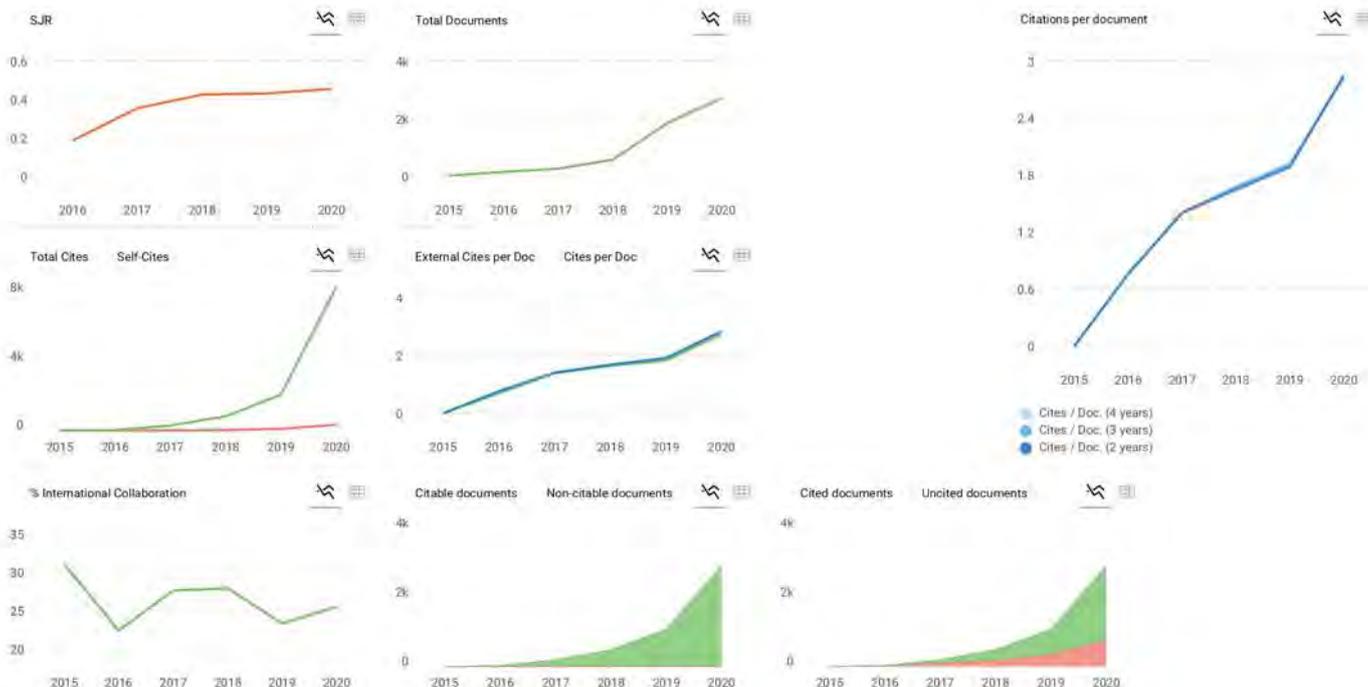
 Join the conversation about this journal

Quartile

FIND SIMILAR JOURNALS

options 

- | | | | | |
|---|---|--|---|---|
| <p>1</p> <p>Journal of Advanced Research</p> <p>EGY</p> <p>53%
similarity</p> | <p>2</p> <p>Scientific African</p> <p>NLD</p> <p>51%
similarity</p> | <p>3</p> <p>Journal of Global Pharma Technology</p> <p>IND</p> <p>50%
similarity</p> | <p>4</p> <p>Current Pharmaceutical Biotechnology</p> <p>ARE</p> <p>49%
similarity</p> | <p>5</p> <p>Saudi Journal of Biological Sciences</p> <p>SAU</p> <p>48%
similarity</p> |
|---|---|--|---|---|



Heliyon

← Show this widget in your own website

Just copy the code below and paste within your html code:

``

Q1 Multidisciplinary

SJR 2020 0.46

powered by Scopus.com

SCImago Graphica

Explore, visually communicate and make sense of data with our new **free tool**.

Get it

Metrics based on Scopus® data as of April 2021

A Anwar 2 months ago

What is the difference between Heliyon Elsevier and Heliyon Cell press

reply

Melanie Ortiz 2 months ago SCImago Team

Dear Anwar,

Thank you for contacting us. We suggest you consult the link below:

https://en.wikipedia.org/wiki/Cell_Press

Best Regards, SCImago Team

S siavash sharif 4 months ago

Dear Secretary

Please how much rate the Impact factor and Quarterly of Heliyon journal?

Wishing you good health

Dr Siavash sharif

reply

Melanie Ortiz 4 months ago SCImago Team

Dear Siavash, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

S **Sherif Mohamed shawky** 5 months ago

I would like to ask about the journal impact factor.
It is not mentioned in Clarivate and SJR.
It is only showing the quartile.

Many Thanks
Sherif shawky

reply

SCImago Team



Melanie Ortiz 5 months ago

Dear Sherif, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

M **M.Shravanthi Dandari** 5 months ago

Hello,

Can I know if Heliyon is in UGC approved 2020-2021 journal's list and can I know it's IF?

reply

SCImago Team



Melanie Ortiz 5 months ago

Dear M.Shravanthi, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source.
Best Regards, SCImago Team

A **Ajmal Hameed** 5 months ago

Dear

How can I submit my paper to this journal? please send me the procedure

Thank you,
Ajmal

reply

SCImago Team



Melanie Ortiz 5 months ago

Dear Ajmal, thank you very much for your comment, we suggest you look for the author's instructions/submission guidelines in the journal's website. Best Regards, SCImago Team

A **Asmaa** 6 months ago

Is this journal free for Egypt?

reply

SCImago Team



Melanie Ortiz 6 months ago

Dear Asmaa,
Thank you for contacting us.
Unfortunately, we cannot help you with your request, we suggest you visit the journal's homepage or contact the journal's editorial staff, so they could inform you more deeply.
Best Regards, SCImago Team

D **Dr. Md. Ismail Hossain** 6 months ago

APC for this journal showing USD 1750. How can I get wave for this APC? Please let me know asap.

reply

N **Nur Hasan Mahmud Shahan** 6 months ago

Dear,
What country do you belong? If its type C country then its automaticly reduceed.
or if you can write to the head of Elsevier publisher then they can minimize it.
Please go to the journal APC process for more details.
Thank you.

SCImago Team

 **Melanie Ortiz** 6 months ago

Dear Dr. Md. Ismail, thank you very much for your comment. Unfortunately, we cannot help you with your request, we suggest you contact the journal's editorial staff so they could inform you more deeply. Best Regards, SCImago Team

Z **zainal hasan** 6 months ago

In the near future, I will submit it to this journal. best regards...aez hasan

reply

SCImago Team

 **Melanie Ortiz** 6 months ago

Dear Zainal, thanks for your participation! Best Regards, SCImago Team

M **Mohamed E. Hasan** 7 months ago

what is the impact factor of this journal?

reply

SCImago Team

 **Melanie Ortiz** 7 months ago

Dear Mohamed, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

O **Omolara** 7 months ago

Please tell us the publication fee

reply

SCImago Team

 **Melanie Ortiz** 7 months ago

Dear Omolara,
Thank you for contacting us.
Unfortunately, we cannot help you with your request, we suggest you visit the journal's homepage or contact the journal's editorial staff, so they could inform you more deeply.
Best Regards, SCImago Team

W **wasim bari** 9 months ago

In heliyon journal what is the time to decision after submit the paper correction according to reviewer question?

reply

SCImago Team

 **Melanie Ortiz** 9 months ago

Dear Wasim,

Thank you for contacting us. Please see comments below.

Best Regards, SCImago Team

C **Cristian Torres** 9 months ago

When will Heliyon have the impact factor calculated? Is there an estimated date?

reply



Melanie Ortiz 9 months ago

SCImago Team

Dear Cristian, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

M **Mark** 10 months ago

It is an unreliable journal. A year after sending my manuscript, they told me that it was initially accepted, there were minor revisions, I made the respective corrections, six months passed and they did not give me a response. I sent my manuscript to another journal and in four months they accepted it without a publication charge and it is also Q1.

reply

M **Magdy Fouad** 6 months ago

Dear Mark,

Can you tell me the name of the journal that accept your paper in 4 months please?

I need rapid publication in Q1 journal for my upgrading.

Thanks.



Mey 10 months ago

Hi, Mark! I wonder if you can share here the second journal where you submitted your manuscript. It's interesting that a Q1 journal responds and decides in 4 months.

D **Dyg** 10 months ago

Hi Mark...just curious which journal did you submit the second and got accepted...it is Q1 and no charge...that is good.

U **unkown** 10 months ago

I am having a similar problem like mark. I submitted my paper in July 2020. They gave me major revisions to do after 4 months. After I made the respective corrections and resubmitted the revised one in December. After 2 months they told me decision is under process. After few days status changed to decision rescinded. Now the new status is showing as reviewer invited. I am wondering what will be the future of my paper with this journal. Any suggestions will be highly appreciated. Kindly suggest me how to expedite with this journal. Please. What should be the best way to do as of now

M **Mahmud** 10 months ago

You could just mail them. They response very frequently. Moreover, many of the journals take too much time in publishing papers. Sometimes, reviewers delay for personal reasons.

If you face similar problem, I recommend you to mail them.



Melanie Ortiz 10 months ago

SCImago Team

Dear Mark, thanks for your participation! Best Regards, SCImago Team

B **Biyanu Medenes Zerom** 11 months ago

what is the JIF (Journal Impact factor) of this journal

reply

E **Ebesam** 10 months ago

Journal Impact factor of this journal is still not calculated, it is indexed in WOS, Emerging citation index source which means that the journal has been already in WOS but didn't

get IF yet. But it is growing journal. Its citation is increasing in good way.



Melanie Ortiz 11 months ago

SCImago Team

Dear Biyanu, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

N

Nazmul 11 months ago

Is Heliyon a good journal? How many Issues does it publish in a year?

reply



Melanie Ortiz 11 months ago

SCImago Team

Dear Nazmul,

Thank you for contacting us. You can check the scientometric indicators for Heliyon just above. For further information about the publication frequency, please consult its website.

Best Regards, SCImago Team

M

Mohamed 1 year ago

Hello,
Does this journal is indexed as ISI journal

Thank you in advance

reply

E

Ebtesam 10 months ago

Yes, it is indexed.

L

Lanfranco Corazzi 12 months ago

Dear team,
when Heliyon will be mentioned by WOS (WEB OF SCIENCES) in the Journal Citations Reports?
Many thanks for your reply.
Lanfranco Corazzi



Melanie Ortiz 12 months ago

SCImago Team

Dear Lanfranco,

Thank you for contacting us. Unfortunately, we cannot help you with your request, we suggest you contact WoS Team.

Best Regards, SCImago Team



Melanie Ortiz 1 year ago

SCImago Team

Dear Mohamed,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus. Unfortunately, we cannot help you with your request referring to the index status. We suggest you consult Scopus database (see the current status of the journal) or the mentioned database for further information. You can also check that information in the journal's website or contact directly with the editorial staff.

Best Regards, SCImago Team

A

aspirant eagle 1 year ago

- what does the quartile mean? What is its importance?
-And Why the journal quartile her is Q1 but in the scoups is Q2?

Thanks

reply



Melanie Ortiz 1 year ago

SCImago Team

Dear Sir/Madam,

Thank you for contacting us.

Our data come from Scopus, they annually send us an update of the data. This update is sent to us around April / May every year.

The calculation of the indicators is performed with the copy of the Scopus database provided to us annually. However, the methodology used by Scopus is different from the one's used by SCImago, even if, since the past year, the scientometrics indicators' calculation procedure changed in order to resemble SciVal.

In the case of SCImago, for every journal, the annual value of the SJR is integrated into the distribution of SJR values of all the thematic categories to which the journal belongs.

There are more than 300 thematic categories; the position of each journal is different in any category and depends on the performance of the category, in general, and the journal, in particular.

The SJR indicator is a very sophisticated indicator that is much more complex to calculate and understand than the Impact Factor. Several variables must be taken into account to calculate the SJR. There are two important variables that we cannot leave out:

-The number of citations is one of those variables but not the only one because it is weighted by the citations received and where the journal is cited in. It is different if the citations come from highly-cited Journals or not. Imagine that these 5 quotes appear in the most cited Journals. That part of the calculation is no longer worth 5, it is worth much more. This variable is called "authority principle".

-The second variable is the thematic Category's distribution. If most of the journals categorized in X thematic category are cited by lowly-cited journals, the quartile of a journal cited in highly-cited Journals will be better than the other ones.

Best Regards, SCImago Team

D **Daniel Bravo** 2 years ago

Dear Editors team,

I would like to know what is the frame-time to the first answers of revision (in weeks). All the very best.

reply



Melanie Ortiz 2 years ago

SCImago Team

Dear Daniel,

thank you for contacting us.

Unfortunately, we cannot help you with your request, we suggest you visit the journal's homepage or contact the journal's editorial staff , so they could inform you more deeply.

Best Regards, SCImago Team

K **kaḥsu Atsbḥa** 2 years ago

What is the difference between Heliyon cell press and heliyon Elsevier? Are they the same or not?

reply

R

Rocktim R Das 1 year ago

Thanks, Kahsu,

I too was thinking about this issue. In the online HTML I see the Elsevier logo and Cell press, but when downloading the pdf only the cell press logo is present. One possibility might be that the journal is published by Cell press but hosted by Elsevier in Science direct.com. Apart from that, I don't have much clue.

Sincerely

Rocktim



Melanie Ortiz 2 years ago

SCImago Team

Dear Kahsu,
Thank you for contacting us. Could you please expand a little bit your comment? Do these journals have different ISSN numbers? Best Regards, SCImago Team

H

Hesti Maheswari 2 years ago

Is the Heliyon journal still indexed by Scopus in 2019?

reply

R

Rocktim R Das 1 year ago

Yes.

A

Achmad Fanani 1 year ago

Masih



Melanie Ortiz 2 years ago

SCImago Team

Dear Hesti, thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you to consult the Scopus database directly. Keep in mind that the SJR is a static image (the update is made one time per year) of a database (Scopus) which is changing every day.
Best Regards, SCImago Team

F

Frank 2 years ago

That is not the scope of the journal. Change it to the scope...
<https://www.cell.com/heliyon/home>

"Heliyon is an open access journal publishing scientifically accurate and valuable research across life, physical, social, and medical sciences."

reply



Melanie Ortiz 2 years ago

SCImago Team

Dear Frank,

thank you for contacting us. The Scope's information has been updated based on what appears in the journal's website (check here: <https://www.cell.com/heliyon/aims-and-scope>) Best Regards, SCImago Team

G

GsmA 2 years ago

Thanks...

reply

G

GsmA 2 years ago

Hi,

Just I want to ask about the fees to publish in the journal, can you help me?

reply



Melanie Ortiz 2 years ago

SCImago Team

Dear Sir,
Thank you for contacting us.
Sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.
Unfortunately, we cannot help you with your request, we suggest you to visit the journal's homepage or contact the journal's editorial staff, so they could inform you more deeply.
Best Regards, SCImago Team

A **Ali** 2 years ago

Dear Ali,

I hope anybody knows about the speed of response and decision it takes to let us know about it.

Best Regards,

reply

S **Sintayehu** 10 months ago

I published one paper on Heliyon Social Sciences and another one is just accepted for publication. They announce the first review result in 90 days. I found the review process a little bit slow but very thorough and helps a lot to improve the original work. Preliminary decision for publication will be communicated one month after the submission of the revised version of the work. Final decision of publication will be announced after two weeks. In total, it took six months to publish.

H **Hamzeh Ghahramani** 2 years ago

They gave me the first decision after 3 week with a meticulous review of my manuscript



Melanie Ortiz 2 years ago

SCImago Team

Dear Ali, thanks for your participation! Best Regards, SCImago Team

K **Khaled Karam** 2 years ago

Hi,

Is this journal published in print or online only?

Thanks for your consideration

reply



Melanie Ortiz 2 years ago

SCImago Team

Dear user,
thank you for contacting us.
We suggest you to visit the journal's homepage.
You can see the updated Journal's information just above.
Best Regards, SCImago Team

D **Dan** 2 years ago

This journal was started in 2015. It has achieved scopus Q1 rank because this is Elsevier's own journal. It is also indexed in ESCI. I can see that publishing giants have their own journals indexed with their own databases. Other journals would take years to get indexed in such databases. It all about money. Cheers!

reply

R **Rhys** 2 years ago

I believe this is a Cell Press Journal rather than Elsevier <https://www.cell.com/heliyon/home>



Melanie Ortiz 2 years ago

SCImago Team

Dear Dan, thanks for your participation! Best Regards, SCImago Team

M **Mahesh Kumar Tripathi** 2 years ago

Hello Elena,

Please tell me.....

Is Heliyon SCI journal?

When it will get impact factor?

reply

**Melanie Ortiz** 2 years ago

SCImago Team

Dear Mahesh, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check our web to locate the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

H **Hossein Sabahi** 2 years ago

Dear Editor

how many is the charge for publication a article ?

Sincerely

Dr. H. Sabahi

reply

M **Messali** 2 years ago

1750 USD

**Melanie Ortiz** 2 years ago

SCImago Team

Dear Hossein,

thank you for contacting us.

Sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.

Unfortunately, we cannot help you with your request, we suggest you to visit the journal's homepage or contact the journal's editorial staff, so they could inform you more deeply.

You can see the updated journal's information just above.

Best Regards, SCImago Team

Z **Zemenu Bires** 2 years ago

in which index Heliyon is indexed? would you tell me please?

reply

**Melanie Ortiz** 2 years ago

SCImago Team

Dear user, we suggest you to consult that information in the journal's website. You can also consult the Scopus database directly. Best Regards, SCImago Team

Z **Zemenu Bires** 2 years ago

Would you mind telling me about Heliyon journal in which it is indexed: Scopus, SCL, ISI-Index/Scopus or any index?

reply

**Melanie Ortiz** 2 years ago

SCImago Team

Dear user, we suggest you to consult the journal's website or Scopus database directly.

For other indicators like ISI or Impact Factor, we suggest you to consult the Journal Citation Report with a Web of Science data source. Best Regards, SCImago Team

S **Santosh** 2 years ago

Hi,

Can you please tell when Heliyon expected will get impact factor (will come under sci or esci)?

reply

**Melanie Ortiz** 2 years ago

SCImago Team

Dear user, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check our web to locate the journal. We suggest you to consult the Journal

Citation Report for other indicators (like Impact Factor) with a Web of Science data

source. Best Regards, SCImago Team

D **Deni** 3 years ago

Dear Elena, How long has Heliyon released the article, I have submitted?

reply



Elena Corera 3 years ago

SCImago Team

Dear Deni,
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you look for author's instructions in the journal's website.
Best Regards,
SCImago Team

S **SIFI** 3 years ago

what are the favorite and targeted topics in this journal?

reply

A **Ali** 3 years ago

Hello,

I read in your website that this journal is not free of charge for publication. let me know that is it true?

thanks.

reply



Elena Corera 3 years ago

SCImago Team

Dear Ali,

Please, check comments below.

Best regards,
SCImago Team

H **Harjati** 3 years ago

Nice to meet you, could you give me detail information of Heliyon Journal? I have checked it at SJR that this journal has 7 H Index and Q1, It is right?. thank you very much.

Best regards

Harjati

reply

F **Foad buazar** 3 years ago

Hi

I wonder how a journal like Heliyon Rank Q1 but without impact factor?

I am really confused. Would you please clarify the vague feeling of authors concerning this notion?

Thank you

reply



Elena Corera 3 years ago

SCImago Team

Dear Foad,

you can check impact factor in SJR website.

Best regards,
SCImago Team

A **Achmad Herman** 3 years ago

Dear Colleagues

I am interested to submit a paper (or more) to your journal... I would like to ask about the average period from date of submission to date of publication (if the paper is accepted)... and also about the fees (if any). Thank you..

Achmad Herman

reply



Elena Corera 3 years ago

SCImago Team

Dear Achmad, we suggest you locate the author's instructions on the journal's website.
Best Regards, SCImago Team

N **Nahed** 3 years ago

Hello,

Is it possible to know if this Journal is indexed in Thomson Reuters (M)?

Best

reply



Elena Corera 3 years ago

SCImago Team

Dear Insum, we suggest you contact the journal directly. Best Regards, SCImago Team

H **Hashim** 3 years ago

Dear Sir or Madham

Could you please give me the impact factor for this journal ?
best regards

reply

M **Maria Helena Andrade Santana** 3 years ago

Dear Sir or Madham

Could you please give me the impact factor for this journal ?
best regards



Elena Corera 3 years ago

SCImago Team

Dear Maria Helena, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team



Elena Corera 3 years ago

SCImago Team

Dear Hashim, the SJR data of the journal are on this page, see the evolution graphs of the indicators above. Best Regards, SCImago Team

M **Mikle** 3 years ago

Hello,

Does this journal has or will have an impact factor?
Thank you in advance

reply



Elena Corera 3 years ago

SCImago Team

Dear Mikle, SJR uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Report for other indicators with a Web of Science data source. Best Regards, SCImago Team



Source details

Heliyon

Open Access ⓘ

Scopus coverage years: from 2015 to Present

Publisher: Elsevier

E-ISSN: 2405-8440

Subject area: Multidisciplinary

Source type: Journal

CiteScore 2020

2.1



SJR 2020

0.455



SNIP 2020

1.079



[View all documents >](#)

[Set document alert](#)

[Save to source list](#) [Source Homepage](#)

[CiteScore](#) [CiteScore rank & trend](#) [Scopus content coverage](#)

i Improved CiteScore methodology



CiteScore 2020 counts the citations received in 2017-2020 to articles, reviews, conference papers, book chapters and data papers published in 2017-2020, and divides this by the number of publications published in 2017-2020. [Learn more >](#)

CiteScore 2020 ▼

$$2.1 = \frac{11,427 \text{ Citations } 2017 - 2020}{5,410 \text{ Documents } 2017 - 2020}$$

Calculated on 05 May, 2021

CiteScoreTracker 2021 ⓘ

$$3.9 = \frac{28,398 \text{ Citations to date}}{7,242 \text{ Documents to date}}$$

Last updated on 04 December, 2021 • Updated monthly

CiteScore rank 2020 ⓘ

Category	Rank	Percentile
Multidisciplinary	#27/110	75th

[View CiteScore methodology >](#) [CiteScore FAQ >](#) [Add CiteScore to your site ↗](#)

About Scopus

[What is Scopus](#)
[Content coverage](#)
[Scopus blog](#)
[Scopus API](#)
[Privacy matters](#)

Language

[日本語に切り替える](#)
[切换到简体中文](#)
[切换到繁體中文](#)
[Русский язык](#)

Customer Service

[Help](#)
[Contact us](#)

ELSEVIER

[Terms and conditions](#) ↗ [Privacy policy](#) ↗

Copyright © Elsevier B.V. ↗. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies.

 RELX



ScienceDirect



Heliyon

Open access

[Articles & Issues](#) ▾ [About](#) ▾ [Publish](#) ▾

Search in this journal

About the journal

Aims and scope

Heliyon is an all-science, open access journal that is part of the Cell Press family. Any paper reporting scientifically accurate and valuable research, which adheres to accepted ethical and scientific publishing standards, will be considered for publication.

Dedicated Section Editors, Associate Editor and our in-house team, handle your paper and manage the publication process end-to-end, giving your research the editorial support it deserves.

Every published article will be immediately available on both cell.com/heliyon and ScienceDirect, and will be indexed by PubMed, Scopus, and Web of Science™ Emerging Sources Citation Index (ESCI), ensuring it reaches the widest possible audience. Our focus on generating impact via press coverage and social media gives papers the opportunity to be discovered.

If it's important to you, it's important to us. Submit your paper today.

Visit the Cell Press website for more information about *Heliyon*- <http://www.cell.com/heliyon/home>

ISSN: 2405-8440

Copyright © 2021 Elsevier Ltd.



[About ScienceDirect](#) [Remote access](#) [Shopping cart](#) [Advertise](#) [Contact and support](#) [Terms and conditions](#) [Privacy policy](#)

We use cookies to help provide and enhance our service and tailor content and ads. By continuing you agree to the use of cookies.

Copyright © 2021 Elsevier B.V. or its licensors or contributors. ScienceDirect® is a registered trademark of Elsevier B.V.

[Open access](#)[Submit your article](#) [Menu](#)

Volume 6, Issue 10

October 2020

[< Previous vol/issue](#)[Next vol/issue >](#)

Receive an update when the latest issues in this journal are published

[Sign in to set up alerts](#)

Research article [Open access](#)

Dust ion acoustic solitons in a complex dusty plasma system with an adiabatic state

Kazi Asraful Islam, F. Deeba, Md. Kamal-Al-Hassan

Article e05373

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Lower complexity of motor primitives ensures robust control of high-speed human locomotion

Alessandro Santuz, Antonis Ekizos, Yoko Kunimasa, Kota Kijima, ... Adamantios Arampatzis

Article e05377

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Suitability of different data sources in rainfall pattern characterization in the tropical central highlands of Kenya

Oduor O. Nathan, Ngetich K. Felix, Kiboi N. Milka, Muriuki Anne, ... Mugendi N. Daniel

Article e05375

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Establishment of human immortalized mesenchymal stem cells lines for the monitoring and analysis of osteogenic differentiation in living cells

Takashi Narai, Ryohei Watase, Yuji Nakayama, Isamu Kodani, ... Kenji Kokura

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Maria Foti, Rosario Grasso, Vittorio Fisichella, Antonietta Mascetti, ... Maria Teresa Spena

Article e05401

[Download PDF](#) [Article preview](#) Review article [Open access](#)

Infection control in dentistry during COVID – 19 pandemic: what has changed?

Mrudula Patel

Article e05402

[Download PDF](#) [Article preview](#) Research article [Open access](#)

The social-economic impact of COVID-19 pandemic: implications for potential forest degradation

Golar Golar, Adam Malik, Hasriani Muis, Achmad Herman, ... Lukman Lukman

Article e05354

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Socioeconomic factors affecting households' use of indigenous forest management practices in managing non-wood forest products: evidence from forest communities in Nigeria derived savannah

Nnaemeka Andegbe Chukwuone, Kehinde Paul Adeosun, Chiamaka Adaobi Chukwuone

Article e05281

[Download PDF](#) [Article preview](#) Research article [Open access](#)Characterization of phytochemicals, minerals and *in vitro* medicinal activities of bael (*Aegle marmelos* L.) pulp and differently dried edible leathers

Sudipta Kumar Hazra, Tanmay Sarkar, Molla Salauddin, Hassan I. Sheikh, ... Runu Chakraborty

Article e05382

[Download PDF](#) [Article preview](#) Research article [Open access](#)

PXR is a target of (-)-epicatechin in skeletal muscle

Miguel Ortiz-Flores, Andrés Portilla-Martínez, Francisco Cabrera-Pérez, Nayelli Nájera, ... Guillermo Ceballos

Article e05357

[Download PDF](#) [Article preview](#) Case report [Open access](#)

Reversible brain imaging findings with a severe neurological prognosis of neuroleptic malignant syndrome

Kazunori Fukushima, Yuto Aramaki, Yumi Ichikawa, Yuta Isshiki, ... Kiyohiro Oshima

Article e05374

[Download PDF](#) [Article preview](#) FEEDBACK 

[Open access](#)[Submit your article](#) MenuResearch article [Open access](#)

Co-creation of a health education program for improving the uptake of HIV self-testing among men in Rwanda: nominal group technique

Tafadzwa Dzinamarira, Augustin Mulindabigwi, Tivani Phosa Mashamba-Thompson

Article e05378

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Physical inactivity and sedentary behaviors in the Bangladeshi population during the COVID-19 pandemic: An online cross-sectional survey

Md. Estiar Rahman, Md. Saiful Islam, Md. Sajan Bishwas, Mst. Sabrina Moonajilin, David Gozal

Article e05392

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Characterizing internal cavity modulation of corn starch microcapsules

David Wulff, Ariel Chan, Qiang Liu, Frank X. Gu, Marc G. Aucoin

Article e05294

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Bioaccumulation of pesticide contaminants in tissue matrices of dogs suffering from malignant canine mammary tumors in Punjab, India

Siddharth Gautam, Naresh Kumar Sood, Kuldip Gupta, Chitra Joshi, ... Indrasen Chauhan

Article e05274

[Download PDF](#) [Article preview](#) Review article [Open access](#)

Small, but smelly: the importance of *Solobacterium moorei* in halitosis and other human infections

Ibrahim Barrak, Anette Stájer, Mórió Gajdács, Edit Urbán

Article e05371

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Determination of water-soluble vitamins and carotenoids in Brazilian tropical fruits by High Performance Liquid Chromatography

Renata Carmo de Assis, Rafaela de Lima Gomes Soares, Adriana Camurça Pontes Siqueira, Veridiana Vera de Rosso, ... Carla Soraya Costa Maia

Article e05307

[Download PDF](#) [Article preview](#) Research article [Open access](#)[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Camel platelet aggregation responses and the antiplatelet effect of camel urine: comparison between black and white camels

Abeer Khalid Al-Ghumlas

Article e05353

[Download PDF](#) Article preview Research article [Open access](#)

Larvicidal and histopathology effect of endophytic fungal extracts of *Aspergillus tamarii* against *Aedes aegypti* and *Culex quinquefasciatus*

Kannan Baskar, Ragavendran Chinnasamy, Karthika Pandey, Manigandan Venkatesan, ... Natarajan Devarajan

Article e05331

[Download PDF](#) Article preview Research article [Open access](#)

Optimisation of the production of corn amylase flour from corn *Atp* and *Kassaï* varieties for the fluidification and energy density increase of cassava gruel

Julie Mathilde Klang, Sylvanie-Linda Wouatidem-Nanfack, Stephano Tambo Tene, Gires Teboukeu Boungo, Hilaire Macaire Womeni

Article e05344

[Download PDF](#) Article preview Research article [Open access](#)

Sensory nerve conduction study of median ulnar and radial nerves in type 2 diabetic individuals in the age group 40–80 years

Poonam Sepat, Sandhya Wasnik

Article e05318

[Download PDF](#) Article preview Review article [Open access](#)

Understanding domestic violence: masculinity, culture, traditions

Linda Mshweshwe

Article e05334

[Download PDF](#) Article preview Research article [Open access](#)

Towards an optimal hybrid solar method for lime-drying behavior

Suherman Suherman, Hadiyanto Hadiyanto, Evan Eduard Susanto, Shesar Anis Rahmatullah, Aditya Rofi Pratama

Article e05356

[Download PDF](#) Article preview Research article [Open access](#)

AU richness within the 5' coding region of the *Escherichia coli* heat-stable enterotoxin b mRNA affects toxin secretion

Eyad Kinkar, Ayat Kinkar, Mazen Saleh

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Article e05343

[Download PDF](#) Article preview Review article [Open access](#)**Intensity threshold based solid tumour segmentation method for Positron Emission Tomography (PET) images: A review**

Mahbubunnabi Tamal

Article e05267

[Download PDF](#) Article preview Research article [Open access](#)**Non-destructive characterization of physical and chemical clogging in cylindrical drip emitters**

Venkata Ramamohan Ramachandru, Ramamohan Reddy Kasa

Article e05327

[Download PDF](#) Article preview Research article [Open access](#)**Viscous dissipation and joule heating effect on MHD flow and heat transfer past a stretching sheet embedded in a porous medium**

B.K. Swain, B.C. Parida, S. Kar, N. Senapati

Article e05338

[Download PDF](#) Article preview Research article [Open access](#)**Rapid extraction of domoic acid by a magnetic molecularly imprinted silica before HPLC measurement**

Zhengzhong Lin, Shengyang Chen, Lei Li, Aihong Peng, Zhiyong Huang

Article e05287

[Download PDF](#) Article preview Research article [Open access](#)***Saccharomyces cerevisiae* cells lacking transcription factors Skn7 or Yap1 exhibit different susceptibility to cyanidin**

Lavinia Liliana Ruta, Eliza Oprea, Claudia Valentina Popa, Ileana Cornelia Farcasanu

Article e05352

[Download PDF](#) Article preview Research article [Open access](#)**Visual contrast sensitivity could be an early marker of diabetic retinopathy**

Subhasish Pramanik, Subhankar Chowdhury, Upasana Ganguly, Anindita Banerjee, ... Lakshmi Kanta Mondal

Article e05336

[Download PDF](#) Article preview Research article [Open access](#)FEEDBACK 

[Open access](#)[Submit your article](#) Menu

Induced mathematical filtration as an innovative strategy for discrimination and estimation of glycemic control drugs in fixed dose combination

Hayam M. Lotfy, Ekram H. Mohamed

Article e05289

[Download PDF](#) Article preview Research article [Open access](#)

Prediction and optimization of tool wear rate during electric discharge machining of Al/Cu/Ni alloy using adaptive neuro-fuzzy inference system

Mangesh Phate, Aditya Bendale, Shraddha Toney, Vikas Phate

Article e05308

[Download PDF](#) Article preview Research article [Open access](#)

Phase states, microstructure and dielectric characteristics of solid solutions $(1-x)\text{NaNbO}_3 - x\text{Ca}_2\text{Nb}_2\text{O}_7$ and $(1-x)\text{NaNbO}_3 - x\text{Sr}_2\text{Nb}_2\text{O}_7$

J.Y. Zubarev, S.-H. Chang, C. Lin, N.A. Boldyrev, ... L.A. Reznichenko

Article e05197

[Download PDF](#) Article preview Research article [Open access](#)

Dynamical analysis of long-wave phenomena for the nonlinear conformable space-time fractional (2+1)-dimensional AKNS equation in water wave mechanics

Nur Hasan Mahmud Shahan, Foyjonnesa, Md. Habibul Bashar, Md. Shuzon Ali, Abdulla - Al - Mamun

Article e05276

[Download PDF](#) Article preview Research article [Open access](#)

Effects of educational program based on Precede-Proceed model in promoting low back pain behaviors (EPPLBP) in health care workers Shahid Beheshti University of medical sciences: randomized trial

Fateme Pourhaji, Mohammad Hossein Delshad, Sedigheh Sadat Tavafan, Shamsodin Niknami, Fahimeh Pourhaji

Article e05236

[Download PDF](#) Article preview Research article [Open access](#)

Use of infrared spectroscopy and geospatial techniques for measurement and spatial prediction of soil properties

Chalissa Takele, Birhanu Iticha

Article e05269

[Download PDF](#) Article preview Research article [Open access](#)

Bacillus thuringiensis strains isolated from Qatari soil, synthesizing δ -endotoxins highly active against

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Pharmacokinetic evaluation of two pirfenidone formulations in patients with idiopathic pulmonary fibrosis and chronic hypersensitivity pneumonitis

Lina Marcela Barranco-Garduño, Ivette Buendía-Roldan, Juan Jose Rodriguez, Rodrigo González-Ramírez, ... Francisco Javier Flores-Murrieta
Article e05279

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Investigation of noradrenergic receptor system in anti-nociception using formalin test in the naked mole rat (*Heterocephalus glaber*)

R.M. Mwobobia, T.I. Kanui, K.S.P. Abelson
Article e05216

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

RESILIENT: A robust statistical method for estimating multiple VOC sources from limited field measurements

Anand Kakarla, Asif Qureshi, Shashidhar Thatikonda, Swades De, Soumya Jana
Article e05296

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Generalized and pregnancy-related anxiety prevalence and predictors among pregnant women attending primary health care in Qatar, 2018–2019

Sarah Naja, Noora Al Kubaisi, Rajvir Singh, Iheb Bougmiza
Article e05264

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Learning recommendation with formal concept analysis for intelligent tutoring system

Jirapond Muangprathub, Veera Boonjing, Kosin Chamnongthai
Article e05227

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Green tea (*Camellia sinensis*) extract inhibits biofilm formation in acyl homoserine lactone-producing, antibiotic-resistant *Morganella morganii* isolated from Pasig River, Philippines

John Paul Matthew D. Guzman, Trisha Pamela L. De las Alas, Margie C. Lucban, Christine Eden C. Sevilla
Article e05284

 [Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Quasiphonon polaritons

Lu Cheng, Wei Zheng, Lemin Jia, Feng Huang

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Daniel Massote Magalhaes, Albeno Nunes-Silva, Guilherme Carvalho Rocha, Lucas Neves Vaz, ... Ana Cristina Simoes e Silva
Article e05256

[Download PDF](#)

Research article [Open access](#)

Synthesis opto-electronic characterization and NLO evaluation of 6-methyl 5-nitro Uracil crystal using XRD, spectroscopic and theoretical tools

K. Sooryakala, S. Ramalingam, R. Maheswari, R. Aarthi

Article e05329

[Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Quality of Life (QoL) of cancer patients and its association with nutritional and performance status: A pilot study

Mohammad Morshad Alam, Tania Rahman, Zinia Afroz, Promit Ananyo Chakraborty, ... Mohammad Delwer Hossain Hawlader

Article e05250

[Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Impact of prebiotics on equol production from soymilk isoflavones by two *Bifidobacterium* species

Salma Elghali Mustafa, Shuhaimi Mustafa, Amin Ismail, Faridah Abas, ... Satyajit D. Sarker

Article e05298

[Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Protease produced by *Lactobacillus brevis* enhanced nutritional values of African yam beans and demonstrated improvement in the growth and blood indices of albino rats

Tolulope Christianah Oladejo, Oladipo Oladiti Olaniyi, Adeyemi Oluwadare Ayodeji, Bamidele Juliet Akinyele

Article e05123

[Download PDF](#) [Article preview](#) 

Review article [Open access](#)

A review on *Borreria verticillata*: A potential bionematicide, channeling its significant antimicrobial activity against root-knot nematodes

Nkechi B. Izuogu, Oluwatoyin E. Bello, Oluwasesan M. Bello

Article e05322

[Download PDF](#) [Article preview](#) 

Research article [Open access](#)

Lateralization of inferior petrosal sinus sampling in Cushing's disease correlates with cavernous sinus venous drainage patterns, but not tumor lateralization

Mohammad Ghorbani, Hamideh Akbari, Christoph J. Griessenauer, Christoph Wipplinger, ... Mohammad E. Khamseh

Article e05299

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Article e05248

[Download PDF](#)Research article [Open access](#)

Development of multi-product calibration models of various root and tuber powders by fourier transform near infra-red (FT-NIR) spectroscopy for the quantification of polysaccharide contents

Rudiati Evi Masithoh, Santosh Lohumi, Won-Seob Yoon, Hanim Z. Amanah, Byoung-Kwan Cho

Article e05099

[Download PDF](#) [Article preview](#) Review article [Open access](#)

Nutraceutical and antimicrobial potentials of Bambara groundnut (*Vigna subterranean*): A review

Ebere Lovelyn Udeh, Monde A. Nyila, Sheku Alfred Kanu

Article e05205

[Download PDF](#) [Article preview](#) Review article [Open access](#)

The use of plant extracts and their phytochemicals for control of toxigenic fungi and mycotoxins

Rhulani Makhuvele, Kayleen Naidu, Sefater Gbashi, Velaphi C. Thipe, ... Patrick B. Njobeh

Article e05291

[Download PDF](#) [Article preview](#) Case report [Open access](#)

Long-term outcomes of two patients with progressive myoclonic epilepsy treated with vagus nerve stimulation therapy

Ayataka Fujimoto, Tohru Okanishi, Keishiro Sato, Hideo Enoki

Article e05324

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Detection and quantification of Aflatoxin B1 in corn and corn-grown soils in the district of Anuradhapura, Sri Lanka

W.M.S.C. Jayaratne, A.H.M.A.K. Abeyratne, H.K.S. De Zoysa, D.M.R.B.N. Dissanayake, ... S. Chang

Article e05319

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Comprehensive assessment of growth parameters for screening endophytic bacterial strains in *Solanum lycopersicum* (Tomato)

Riddha Dey, Richa Raghuvanshi

Article e05325

[Download PDF](#) [Article preview](#) [FEEDBACK](#) 

[Open access](#)[Submit your article](#) MenuResearch article [Open access](#)

Influence of Aquatain™, a monomolecular surface film on surface tension for controlling the filarial vector *Culex pipiens* (Diptera: Culicidae)

Abdel-Fattah D. Dawood, Mohamed M. Baz, Moustafa I. Ibrahim

Article e05314

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Co-addition of humic substances and humic acids with urea enhances foliar nitrogen use efficiency in sugarcane (*Saccharum officinarum* L.)

Jose M. Leite, Pavithra S. Pitumpe Arachchige, Ignacio A. Ciampitti, Ganga M. Hettiarachchi, ... S.V. John Sunoj

Article e05100

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Assessing the biodegradability of common pharmaceutical products (PPs) on the Zambian market

James Nyirenda, Alexina Mwanza, Chilufya Lengwe

Article e05286

[Download PDF](#) [Article preview](#) Research article [Open access](#)

A compact multiband planar antenna using modified L-shape resonator slots

Indu Jiji Rajmohan, Mousa I. Hussein

Article e05288

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Variable thermoregulation of Late Cretaceous dinosaurs inferred by clumped isotope analysis of fossilized eggshell carbonates

Amzad H. Laskar, Dhananjay Mohabey, Sourendra K. Bhattacharya, Mao-Chang Liang

Article e05265

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Evaluation of smart and sustainable cities through a hybrid MCDM approach based on ANP and TOPSIS technique

Gokhan Ozkaya, Ceren Erdin

Article e05052

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Packaging design proposal motivated by the identification of damages in Andean blackberry (*Rubus glaberrimus*)

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Cultivation trials of nop (*Humulus lupulus* L.) in semi-arid environments

Roberto Marceddu, Alessandra Carrubba, Mauro Sarno

Article e05114

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Multivariate analysis for yield and yield-related traits of sesame (*Sesamum indicum* L.) genotypes

Fiseha Baraki, Zenawi Gebregergis, Yirga Belay, Muez Berhe, ... Goitom Araya

Article e05295

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Preparation and evaluation of mushroom (*Lentinus edodes*) and mealworm (*Tenebrio molitor*) as dog food attractant

Tao Feng, Zhongshan Hu, Yanzun Tong, Lingyun Yao, ... Jun Lu

Article e05302

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Prevalence of NPHS2 gene R229Q polymorphism in Bangladeshi children with nephrotic syndrome

Sharmin Sultana Jyoti, Farhana Islam, Ishrat Islam Shrabonee, Taposhi Nahid Sultana, ... Mohd Nazmul Hasan Apu

Article e05317

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Nano-carriers effects on the viability and efficiency of *Pseudomonas* strains as phosphate solubilizing bacteria

Marzieh Safari, Elaheh Motamedi, Hossein Kari Dolatabad, Seyed Ali Mohammad Modarres Sanavy

Article e05076

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Time-related changes in sex distribution of COVID-19 incidence proportion in Italy

Vanessa Bianconi, Massimo R. Mannarino, Paola Bronzo, Ettore Marini, Matteo Pirro

Article e05304

[Download PDF](#) [Article preview](#) Research article [Open access](#)

A clinical evaluation of the alterations in the level of serum zinc, copper, iron, and manganese in the ischemic heart disease patients of Bangladesh - A case-control study

Shamima Nasrin Anonna, Sayed Koushik Ahamed, Md. Giash Uddin, Md. Tarek Adnan, ... Mohammad Safiqul Islam

Article e05311

[Download PDF](#) [Article preview](#) [FEEDBACK](#) 

[Open access](#)[Submit your article](#) MenuResearch article [Open access](#)**An augmented capital asset pricing model using new macroeconomic determinants**

Chinh Duc Pham, Le Tan Phuoc

Article e05185

[Download PDF](#) Article preview Research article [Open access](#)**Soil texture and watering impact on pot recovery of soil-stripped oil palm (*Elaeis guineensis* Jacq.) seedlings**

Bienvenu Désiré Anaba, Martin Yemefack, Monique Abossolo-Angue, Godswill Ntsomboh-Ntsefong, ... Joseph Martin Bell

Article e05310

[Download PDF](#) Article preview Research article [Open access](#)**Enterprise architecture breakthrough for telecommunications transformation: A reconciliation model to solve bankruptcy**

M. Dachyar, Teuku Yuri M. Zagloel, L. Ranjaliba Saragih

Article e05273

[Download PDF](#) Article preview Research article [Open access](#)**New considerations on the validity of the Wiener-Granger causality test**

Greta Grassmann

Article e05208

[Download PDF](#) Article preview Research article [Open access](#)**Fat content reduction and lipid profile improvement in Portuguese fermented sausages *alheira***

Alfredo Teixeira, Alberto Fernandes, Etelvina Pereira

Article e05306

[Download PDF](#) Article preview Research article [Open access](#)**Nanotechnology activities: environmental protection regulatory issues data**

Luciana Almeida, Israel Felzenszwalb, Mônica Marques, Carla Cruz

Article e05303

[Download PDF](#) Article preview Research article [Open access](#)**Soil carbon status after vegetation restoration in South West Iceland**

Harrington Nyirenda

Article e05254

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu[Download PDF](#) [Article preview](#) Case report [Open access](#)**Minor stroke with bilateral acute infarctions and combined vascular anomalies: A complex case report**

Fabrizio Giannello, Cristina Dell'Aera, Francesco Grillo, Masina Cotroneo, ... Maria C. Fazio

Article e05253

[Download PDF](#) [Article preview](#) Research article [Open access](#)**Enhanced electrochemical performance of flexible and eco-friendly starch/graphene oxide nanocomposite**

Muhammad Rakibul Islam, Shafiqul I. Mollik

Article e05292

[Download PDF](#) [Article preview](#) Research article [Open access](#)**The biomechanical performance of the night-time Providence brace: experimental and finite element investigations**

Alireza Yahyaiee Babil, Gholamreza Rouhi

Article e05210

[Download PDF](#) [Article preview](#) Research article [Open access](#)**Assessment of reproductive impact of the aerial parts of *Caralluma dalzielii* N. E. Br in female Wistar rats**

Chinenye J. Ugwah-Oguejofor, Charles O. Okoli, Michael O. Ugwah, Ray U. Okolo, Shuaibu O. Bello

Article e05199

[Download PDF](#) [Article preview](#) Research article [Open access](#)**Decreased *FMR1* mRNA levels found in men with substance use disorders**

Maria Krasteva, Yana Koycheva, Rositsa Racheva, Teodora Taseva, ... Boryan Andreev

Article e05270

[Download PDF](#) [Article preview](#) Research article [Open access](#)**Design and synthesis of coumarin-triazole hybrids: biocompatible anti-diabetic agents, *in silico* molecular docking and ADME screening**

Vagish Channa Basappa, Vivek Hamse Kameshwar, Karthik Kumara, Dileep Kumar Achutha, ... Ajay Kumar Kariyappa

Article e05290

[Download PDF](#) [Article preview](#) Research article [Open access](#)**Computer-aided drug design against spike glycoprotein of SARS-CoV-2 to aid COVID-19 treatment**

Muhammad Shehroz, Tahreem Zaheer, Tanveer Hussain

[FEEDBACK](#) 

[Open access](#)[Submit your article](#) Menu

Article e05228

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Farmers' knowledge, perception, and use of phosphorus fertilization for cowpea production in Northern Guinea Savannah of Nigeria

Saba B. Mohammed, Ishiyaku F. Mohammad, Tongoona B. Pangirayi, Gracen Vernon, ... Sulaiman Umar

Article e05207

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Teachers' aggressive behaviors: what is considered acceptable and why?

Rangga Dewati Suryaningrat, Frieda Maryam Mangunsong, Corina D. Riantoputra

Article e05082

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Biogas technology in fuelwood saving and carbon emission reduction in southern Ethiopia

Getnet Alemu Desta, Yoseph Melka, Getachew Sime, Fikadu Yirga, ... Mebrahtu Haile

Article e04791

[Download PDF](#) [Article preview](#) Research article [Open access](#)

E4orf1, an Adeno-viral protein, attenuates renal lipid accumulation in high fat fed mice: A novel approach to reduce a key risk factor for chronic kidney disease

Rownock Afruza, Md Akheruzzaman, Nikhil V. Dhurandhar, Vijay Hegde

Article e05261

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Effect of different dietary levels of corn naturally contaminated with DON and its derivatives 3+15 Ac-DON and DON-3-glucoside on the performance of broilers

Regiane R. Santos, Francisc Molist

Article e05257

[Download PDF](#) [Article preview](#) Research article [Open access](#)

Assessment of physiochemical properties and concentration of heavy metals in agricultural soils fertilized with chemical fertilizers

Mansour.A. Salem, Dattatray K. Bedade, Latif Al-Ethawi, Samira.M. Al-waleed

Article e05224

[Download PDF](#) [Article preview](#) [FEEDBACK](#) 

Open access

Submit your article

Menu



ISSN: 2405-8440

Copyright © 2021 Elsevier Ltd



Copyright © 2021 Elsevier B.V. or its licensors or contributors.
ScienceDirect® is a registered trademark of Elsevier B.V.



FEEDBACK