

[< Back](#)

ORIGINAL ARTICLE

## Antimicrobial activity of *Chrysophyllum albidum* seed extract and its effect on the physicochemical properties of cherry tomato fruits during postharvest storage

Abimbola P. Oluyori , Adewumi O. Dada, Temitope A. Ogunnupebi, Akinyomade O. Owolabi, Tabitha A. Adelani-Akande, Adejumo A. Inyinbor

First published: 22 August 2022

<https://doi.org/10.1111/jfpp.17062>

[↗ VIEW METRICS](#)

### Abstract

The high water content of *Lycopersicon esculentum* usually favors microbial growth, thus resulting in shelf-life reduction and economic loss. In an effort to develop an ecofriendly preservative for cherry tomatoes, a comprehensive study establishing the antimicrobial activity of the seeds of *Chrysophyllum albidum* and *Persea americana* was carried out. Folin Ciocalteu,  $AlCl_3$  colorimetric, and agar well diffusion assays were, respectively, used to determine the total phenolic content (TPC), total flavonoid content, and the antimicrobial potential of the extracts. Although the ethanolic extract of *C. albidum* displayed the highest TPC ( $90.71 \pm 2.17$  mg/g GAE), the antimicrobial studies indicated that aqueous extract of *C. albidum* seed (CAA), which showed the presence of saponins (total saponin content: 7.82%) had the highest zone of inhibition against *Salmonella typhi* ( $24.5 \pm 0.05$  mm) and *Pseudomonas aeruginosa* ( $22.5 \pm 0.05$  mm). Treatments with 50 and 100 mg/ml of CAA retained firmness in tomatoes and significantly ( $p < .05$ ) preserved the postharvest qualities (total soluble solids, total acidity, and ascorbic acid content) of cherry tomatoes.

### Novelty impact statement

Seeds of *Chrysophyllum albidum* and *Persea americana*, which are usually discarded, possess antioxidant and antimicrobial phytochemicals with the aqueous extract of *C. albidum* (CAA) exhibiting more impressive antimicrobial properties. CAA

[< Back](#)

postharvest wastage of tomatoes.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## REFERENCES

Adeleye, S. A., Orji, C. C., Braide, W., & Akaluka, C. K. (2016). Phytochemistry and antimicrobial property of fruits of *Chrysophyllum albidum* against selected clinical isolates. *International Letters of Natural Sciences*, *55*, 44–51. <https://doi.org/10.18052/www.scipress.com/ilns.55.44>

[Google Scholar](#) 

Adelani-Akande, A. T., Chidimma, A. L., Olatunde, D. S., & Oluyori, A. P. (2015). Antibacterial activity of watermelon (*Citrullus lanatus*) seed against selected microorganisms. *African Journal of Biotechnology*, *14*(14), 1224–1229.

[Google Scholar](#) 

Akin-osanaiye, B. C., Gabriel, A. F., Salau, T. O., & Murana, O. O. (2018). *Chrysophyllum albidum* seed (African star apple) as an additive in agricultural feed and a potent antimicrobial. *Direct Research Journal of Agriculture and Food Science*, *6*(5), 107–113. <https://doi.org/10.26765/DRJAFS.2018.8369>

[< Back](#)

Alghooneh, A., Behbahani, B. A., Noorbakhsh, H., & Yazdi, F. T. (2015). Application of intelligent modeling to predict the population dynamics of *Pseudomonas aeruginosa* in Frankfurter sausage containing *Satureja* extract. *Microbial Pathogenesis*, **85**, 58–65.

[PubMed](#) [Web of Science®](#) [Google Scholar](#)

Arah, I. K., Ahorbo, G. K., Anku, E. K., Kumah, E. K., & Amaglo, H. (2016). Postharvest handling practices and treatment methods for tomato handlers in developing countries: A mini review. *Advances in Agriculture*, **2016**, 1–8. <https://doi.org/10.1155/2016/6436945>

[Google Scholar](#)

Banu, T. A., Ramani, S. P., & Aswini, M. (2020). Effect of seaweed coating on quality characteristics and shelf life of tomato (*Lycopersicon esculentum* mill). *Food Science and Human Wellness*, **9**, 176–183. <https://doi.org/10.1016/j.fshw.2020.03.002>

[Google Scholar](#)

Barakat, O. M., Elsebaie, E. M., Ammar, A. K., & Elnemr, K. M. (2017). Utilization of faba bean hulls (seeds coat) as a source to produce antioxidants. *Journal of Food and Dairy Sciences*, **8**(7), 275–278.

[Google Scholar](#)

Behbahani, B. A., Noshad, M., & Falah, F. (2019). Study of chemical structure, antimicrobial, cytotoxic and mechanism of action of *Syzygium aromaticum* essential oil on foodborne pathogens. *Potravinarstvo Slovak Journal of Food Sciences*, **13**(1), 875–883. <https://doi.org/10.5219/1226>

[Google Scholar](#)

[< Back](#)[Google Scholar](#) 

---

Dabas, D., Shegog, R., Ziegler, G., & Lambert, J. (2013). Avocado (*Persea americana*) seed as a source of bioactive phytochemicals. *Current Pharmaceutical Design*, 19(34), 6133–6140. <https://doi.org/10.2174/1381612811319340007>

[CAS](#)  | [PubMed](#)  | [Web of Science®](#)  | [Google Scholar](#) 

---

Degirmenci, H., & Erkurt, H. (2020). Chemical profile and antioxidant potency of *Citrus aurantium* L. flower extracts with antibacterial effect against foodborne pathogens in rice pudding. *LWT - Food Science and Technology*, 126, 109273. <https://doi.org/10.1016/j.lwt.2020.109273>

[CAS](#)  | [Web of Science®](#)  | [Google Scholar](#) 

---

Dibacto, R. E. K., Tchunte, B. R. T., Nguedjo, M. W., Tientcheu, Y. M. T., Nyobe, E. C., Edoun, F. L. E., Kamini, M. F. G., Dibanda, R. F., & Medoua, G. N. (2021). Total polyphenol and flavonoid content and antioxidant capacity of some varieties of *Persea americana* peels consumed in Cameroon. *The Scientific World Journal*, 2021, 1–11. <https://doi.org/10.1155/2021/8882594>

[Google Scholar](#) 

---

Dhawan, D., & Gupta, J. (2016). Comparison of different solvents for phytochemical extraction potential from *Datura metel* plant leaves. *International Journal of Biological Chemistry*, 11(1), 17–22. <https://doi.org/10.3923/ijbc.2017.17.22>

[Google Scholar](#) 

[< Back](#)[CAS](#) | [Google Scholar](#)

---

Egbuonu, A. C. C., Opara, I. C., Onyeabo, C., & Uchenna, N. O. (2018). Proximate, functional, antinutrient and antimicrobial properties of avocado pear (*Persea americana*) seeds. *Journal of Nutritional Health & Food Engineering*, 8(1), 78–82. <https://doi.org/10.15406/jnhfe.2018.08.00260>

[Google Scholar](#)

---

Ghosh, A. (2009). Identification of microorganisms responsible for spoilage of tomato (*Lycopersicon esculentum*) fruit. *Journal of Phytology*, 1(6), 414–416.

[Google Scholar](#)

---

Godwill, E. A., Unaegbu, M., Uchenna Esther, A., Amarachukwu Gloria, O., Kingsley, A. N., Ayobami Aiyegoro, O., & Anthony, O. (2016). Antioxidant and antidiabetic activities of the seed and leaf extracts of *Chrysophyllum albidum*. *Asian Pacific Journal of Tropical Disease*, 6(8), 642–649. [https://doi.org/10.1016/S2222-1808\(16\)61102-7](https://doi.org/10.1016/S2222-1808(16)61102-7)

[Google Scholar](#)

---

Hassanpour, H. (2015). Effect of Aloe vera gel coating on antioxidant capacity, antioxidant enzyme activities and decay in raspberry fruit. *LWT - Food Science and Technology*, 60(1), 495–501. <https://doi.org/10.1016/j.lwt.2014.07.049>

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

[< Back](#)[Google Scholar](#) 

---

Ibrahim, T. A., Salama, A. M., & Zahran, E. B. (2019). Antimicrobial efficacy of moringa seed extracts against some postharvest disease pathogens of tomato. *Gezira Journal of Agricultural Science*, *17*(1), 1–15.

[Google Scholar](#) 

---

Ifemeje, J. C., Egbuna, C., Eziokwudiaso, J. O., & Ezebuo, F. C. (2014). Determination of the anti-nutrient composition of *Ocimum gratissimum*, *Corchorus olitorius*, *Murraya koenigii* spreng and *Cucurbita maxima*. *International Journal of Innovation Science and Research*, *3*(2), 127–133.

[Google Scholar](#) 

---

Itelima, J. U., Nwokedi, V. C., Ogbonna, A. I., & Nyam, M. A. (2016). Phytochemical screening and antimicrobial activity evaluation of aqueous and ethanolic extracts of the leaf of *Azadirachta indica* Juss (neem) on some microorganisms. *World Journal of Microbiology*, *3*(1), 56–60.

[Google Scholar](#) 

---

Kahraman, C., Topcu, G., Bedir, E., Tatli, I. I., Ekizoglu, M., & Akdemir, Z. S. (2019). Phytochemical screening and evaluation of the antimicrobial and antioxidant activities of *Ferula caspica* M. Bieb. extracts. *Saudi Pharmaceutical Journal*, *27*(4), 525–531. <https://doi.org/10.1016/j.jsps.2019.01.016>

[PubMed](#)  | [Web of Science®](#)  | [Google Scholar](#) 

[Back](#)

019.01.135

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

Kiarsi, Z., Hojjati, M., Behbahani, B. A., & Noshad, M. (2020). In vitro antimicrobial effects of *Myristica fragrans* essential oil on foodborne pathogens and its influence on beef quality during refrigerated storage. *Journal of Food Safety*, **40**(3), e12782.

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Loaharanu, P., & Ahmed, M. (1991). Advantages and disadvantages of the use of irradiation for food preservation. *Journal of Agricultural and Environmental Ethics*, **4**(1), 14–30. <https://doi.org/10.1007/BF02229144>

[Web of Science®](#) | [Google Scholar](#)

Mendy, T. K., Misran, A., Mahmud, T. M. M., & Ismail, S. I. (2019). Application of Aloe vera coating delays ripening and extend the shelf life of papaya fruit. *Scientia Horticulturae*, **246**, 769–776. <https://doi.org/10.1016/j.scienta.2018.11.054>

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Mogoşanu, G. D., Grumezescu, A. M., Bejenaru, C., & Bejenaru, L. E. (2017). Natural products used for food preservation, In *Nanotechnology in the Agri-Food Industry, Food Preservation* (pp. 365–411). Academic Press. <https://doi.org/10.1016/B978-0-12-804303-5.00011-0>

[Google Scholar](#)

[< Back](#)

101613. <https://doi.org/10.1016/j.bcab.2020.101613>

[Web of Science®](#) | [Google Scholar](#)

Noshad, M., Behbahani, B. A., Jooyandeh, H., Rahmati-Joneidabad, M., Kaykha, H. M. E., & Sheikhjan, G. M. (2021). Utilization of plantago major seed mucilage containing citrus limon essential oil as an edible coating to improve shelf-life of buffalo meat under refrigeration conditions. *Food Science & Nutrition*, 9(3), 1625–1639.

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

Nwaoguikpe, R. N., Braide, W., & Ujowundu, C. O. (2011). Biochemical composition and antimicrobial activities of seed extracts of avocado (*Persea americana*). *Journal of Microbiology and Antimicrobials*, 3(7), 184–190.

[Google Scholar](#)

Olaleye, N. O., Omotayo, A. M., Olanlege, O. A., & Longe, O. A. (2014). Shelf-life extension of tomato (*Lycopersicum esculentum*) and pepper (*Capsicum annum*) using aqueous extracts of some ethnomedicinal plants. *Journal of Agricultural Science and Technology A*, 4, 806–810. <https://doi.org/10.13140/RG.2.1.2952.3042>

[Google Scholar](#)

Olunike, A. A. (2014). Storage, preservation and processing of farm produce. *Food Science and Quality Management*, 27, 28–33.

[Google Scholar](#)

[Back](#)

903–912. <https://doi.org/10.1007/s13204-015-0505-8>

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Oluyori, A. P., Dada, A. O., & Inyinbor, A. A. (2018). Phytochemical analysis and antioxidant potential of *Raphia hookeri* leaf and epicarp. *Oriental Journal of Chemistry*, *34*(6), 2742–2746. <https://doi.org/10.13005/ojc/340608>

[Web of Science®](#) | [Google Scholar](#)

Oputah, S. L., Ajanaku, K. O., Mordi, R. C., & Olugbuyiro, J. A. O. (2016). Phytochemical and antibacterial properties of ethanolic seed extracts of *Chrysophyllum albidum*. *Oriental Journal of Physical Sciences*, *1*(1), 5–9.

[Google Scholar](#)

Sharma, S. (2015). Food preservative and their harmful effects. *International Journal of Scientific and Research Publications*, *5*(4), 1–2.

[CAS](#) | [Google Scholar](#)

Swetha, K., & Banothu, L. (2018). Alternative technologies for tomato post-harvest quality preservation. *Journal of Pharmacognosy and Phytochemistry*, *7*(6), 1678–1682.

[CAS](#) | [Google Scholar](#)

Tagousop, C. N., Tamokou, J. D., Kengne, I. C., Ngnokam, D., & Voutquenne-Nazabadioko, L. (2018). Antimicrobial activities of saponins from *Melanthera elliptica* and their synergistic effects with antibiotics against pathogenic phenotypes. *Chemistry Central Journal*, *12*, 97. [http](http://dx.doi.org/10.1039/C8NJ00097A)

[← Back](#)[CAS](#) | [PubMed](#) | [Google Scholar](#)

---

Tanavar, H., Barzegar, H., Behbahani, B. A., & Mehrnia, M. A. (2021). Investigation of the chemical properties of *Mentha pulegium* essential oil and its application in *Ocimum basilicum* seed mucilage edible coating for extending the quality and shelf life of veal stored in refrigerator (4°C). *Food Science & Nutrition*, 9(10), 5600–5615. <https://doi.org/10.1002/fsn3.2522>

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

---

Tayel, A. A., Shaban, S. M., Moussa, S. H., Elguindy, N. M., Diab, A. M., Mazrou, K. E., Ghanem, R. A., & El-Sabbagh, S. M. (2018). Bioactivity and application of plant seeds' extracts to fight resistant strains of *Staphylococcus aureus*. *Annals of Agricultural Sciences*, 63(1), 47–53. <http://doi.org/10.1016/j.aosas.2018.04.006>

[Web of Science®](#) | [Google Scholar](#)

---

Ugonna, C., Jolaoso, M., & Onwualu, A. (2015). Tomato value chain in Nigeria: Issues, challenges and strategies. *Journal of Scientific Research and Reports*, 7(7), 501–515. <https://doi.org/10.9734/jsrr/2015/16921>

[Google Scholar](#)

---

Vasile, F. E., Romero, A. M., Judis, M. A., Mattalloni, M., Virgolini, M. B., & Mazzobre, M. F. (2019). Phenolics composition, antioxidant properties and toxicological assessment of *Prosopis alba* exudate gum. *Food Chemistry*, 285, 369–379. <https://doi.org/10.1016/j.foodchem.2019.02.003>

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

[← Back](#)[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Yeganegi, M., Yazdi, F. T., Mortazavi, S. A., Asili, J., Behbahani, B. A., & Beigbabaei, A. (2018). *Equisetum telmateia* extracts: Chemical compositions, antioxidant activity and antimicrobial effect on the growth of some pathogenic strain causing poisoning and infection. *Microbial Pathogenesis*, **116**, 62–67.

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

## Citing Literature

[Download PDF](#)

### ABOUT WILEY ONLINE LIBRARY

[Privacy Policy](#)[Terms of Use](#)[About Cookies](#)[Manage Cookies](#)[Accessibility](#)[Wiley Research DE&I Statement and Publishing Policies](#)

[< Back](#)

Training and Support  
DMCA & Reporting Piracy  
Sitemap

#### **OPPORTUNITIES**

Subscription Agents  
Advertisers & Corporate Partners

#### **CONNECT WITH WILEY**

The Wiley Network  
Wiley Press Room

Copyright © 1999-2026 John Wiley & Sons, Inc or related companies. All rights reserved, including rights for text and data mining and training of artificial intelligence technologies or similar technologies.