



[Bioenergy and Biochemical Processing Technologies](#) pp 163–174 [Cite as](#)

1. [Home](#)
2. [Bioenergy and Biochemical Processing Technologies](#)
3. Chapter

Assessing the Safety of Tiger Nut Drinks Produced from *Cyperus esculentus* L. Seeds Sold in Ota

- [M. B. Alade](#),
- [E. F. Ahuekwe](#),
- [A. O. Adeyemi](#) &
- [O. C. Nwinyi](#)
- Chapter
- [First Online: 01 July 2022](#)
- **189** Accesses

Part of the [Green Energy and Technology](#) book series (GREEN)

Abstract

Aflatoxins produced by *Aspergillus flavus* and *Aspergillus parasiticus* are secondary metabolites that pose a major threat to global food security resulting in detrimental impacts on human and animal health. This study screened for the presence of aflatoxigenic fungi and their metabolites – aflatoxins in tiger nut (*Cyperus esculentus* L.) seeds and the produced tiger nut drinks. Samples were obtained from three major dealers in Ota, Ogun state, using the snowball sampling technique. The seeds were cleaned and processed into milk drinks thereafter stored at 4 °C for 15 hours prior to

analysis. The milk drink was serially diluted and plated on Rose Bengal chloramphenicol media at 28 °C for 7 days for initial fungal isolation. The pure isolates were obtained on potato dextrose agar. Total fungal count ranged from 1.0×10^4 cfu/ml (in tiger nut drinks) to 3.0×10^6 cfu/g (in tiger nut). Qualitative assessment of the toxigenic potential of the fungi was assessed on ammonium hydroxide on yeast extract sucrose agar where positive isolates showed pink or red coloration. Preliminary findings from this study reveal that the seeds used to prepare the tiger nut drinks were contaminated with aflatoxins produced by the fungal contaminants. It is imperative that proper storage of grains is important for the overall health benefits of humans, thus reducing disease burden in the society.

Keywords

- **Aflatoxin**
- **Toxigenicity**
- **Tiger nut milk**
- ***Cyperus esculentus***

This is a preview of subscription content, [access via your institution](#).

References

-
- Achar PN, Quyen P, Adukwu EC, Sharma A et al (2020) 'Investigation of the Antifungal and Anti-Aflatoxigenic Potential of Plant-Based Essential Oils against *Aspergillus flavus* in Peanuts'. J Fungi 6(4): 383.

[CrossRef Google Scholar](#)

- Adeyeye SAO (2016) Fungal mycotoxin in foods: A review. Cog Food Agri 2: 1-11.

[Google Scholar](#)

- Akomolafe OM, Awe TV (2017) Microbial contamination and polyethylene packaging of some fruits and vegetables retailed at Akure and Ado Ekiti, South Western Nigeria. J Stor Prod Posthar Res 8(6): 65-72.
-

[Google Scholar](#)

- Asante FA, Ellis WO, Oduro I, Saalia F K (2014) Effect of soaking and cooking methods on extraction of solids and acceptability of tigernut (*Cyperus esculentus* L.) milk. J Agri Stud 2(92): 76-86.

[Google Scholar](#)

- Belewu MA, Abodunrin OA (2006) Preparation of Kunnu from unexploited rich food source: Tiger Nut (*Cyperus esculentus*). Wor J Dairy Food Sci 1: 19- 21.

[Google Scholar](#)

- Chukwuma ER, Obiama N, Christopher OI (2010) The phytochemical composition and some biochemical effect of Nigerian tiger-nut (*Cyperus esculentus*) tuber. Pakis J Nutr 9(7): 709-715.

[CrossRef Google Scholar](#)

- Daramola JA, Kester CT, Adeleye AO (2018) Microflora associated with smoked shrimps (*Farfantepenaeus notialis*) in some markets in Ota Metropolis, Ogun State, Nigeria. Nig J Fisheries 15: 1490-1496.

[Google Scholar](#)

- D'Mello JPF, Macdonald, AMC (1997) Mycotoxins. Ani Feed Sci Tech 69: 155-166.

[CrossRef Google Scholar](#)

- Fani SR, Moradi M, Probst C, Zamanizadeh HR et al (2014) 'A critical evaluation of cultural methods for the identification of atoxigenic *Aspergillus flavus* isolates for aflatoxin mitigation in pistachio orchards of Iran', Eur J Plant Pathol 140(4): 631-642.

[CrossRef Google Scholar](#)

- Fathy NA, Abdel- Hadi A, Abdul-Raouf U et al (2016) 'Qualitative detection of aflatoxins and aflatoxigenic fungi in wheat flour from different regions of Egypt. IOSR J Envi Sci 10(7): 20–26.
-

[Google Scholar](#)

- Friday OA, Joeguluba O (2018) 'Microbial Quality Evaluation of Tiger Nut Beverage (Kunun Aya) Processed Sold in University of Maiduguri'. *EC Nutrition* 13: 138–142.
-

[Google Scholar](#)

- Gambo A, Da'u A (2014) Tiger nut (*Cyperus esculentus*): composition, products, uses and health benefits – a review. *Bayero J Pure Appl Sci* 7(1): 56 - 61.
-

[CrossRef Google Scholar](#)

- IARC (2015) Mycotoxin control in low- and middle-income countries. IARC Working Group report no. 9, eds. CP Wild, JD Miller, and JD Groopman. Lyon, France: International Agency for Research on Cancer.
-

[Google Scholar](#)

- Joint Food and Agriculture Organization; World Health Organization Expert Committee on Food Additives (JECFA) (2017) Co-Exposure of Fumonisin with Aflatoxins; Food Safety Digest; World Health Organization: Geneva, Switzerland, pp. 1-4.
-

[Google Scholar](#)

- Kebede H, Abbas HK, Fisher DK, Bellaloui N (2012) Relationship between aflatoxin contamination and physiological responses of corn plants under drought and heat stress. *Toxins* 4: 1385–1403.
-

[CrossRef Google Scholar](#)

- Klich MA (2002) Identification of common *Aspergillus* species. (1st ed.). Centraalbureau voor Schimmel-culture, Utrecht: The Netherlands Publishers.

[Google Scholar](#)

- Kumar S, Shekhar M, Ali KA, Sharma P (2007) A rapid technique for detection of toxigenic and non-toxigenic strain of *Aspergillus flavus* from maize grain. Ind phytopatho 1: 31-34.

[Google Scholar](#)

- Maduka N, Ire FS (2018) Tigernut Plant and Useful Application of Tigernut Tubers (*Cyperus esculentus*) - A Review. Curr J Appl Sci Tech 29(3): 1-23.

[CrossRef Google Scholar](#)

- Margherita F, Salvatore S, Gea OC (2012) Carcinogen Role of Food by Mycotoxins and Knowledge Gap, Carcinogen, Dr. Margarita Pesheva (Ed.), Available from: <http://www.intechopen.com/books/carcinogen/carcinogen-role-offood-by-mycotoxins-andknowledge> gap.
- Marin S, Ramos AJ, Cano-Sancho G, Sanchis V (2013) Mycotoxins: Occurrence, toxicology, and exposure assessment. Food Chem Toxicol 60: 218-237.

[CrossRef Google Scholar](#)

- Moghadam MM, Rezaee S, Mohammadi AH, Zamanizadeh HR et al (2020) The Potential of Aflatoxin Production in the *Aspergillus* Section *Flavi* Isolates of Pistachio in Iran. J Nutr Fasting Health 8(4): 254-263

[Google Scholar](#)

- Musa AA, Hamza A (2013) Comparative analysis of locally prepared "kununaya" (Tiger nut milk) consumed by students of Kaduna state university, Kaduna, Nigeria. Sci Worl J 8, 13-18.

[Google Scholar](#)

- Negedu A, Atawodi SE, Ameh JB, Umoh VJ, Tanko HY (2011) Economic and health perspectives of mycotoxins: a review. *Conti J Biomed Sci* 5(1): 5 -26.
-

[Google Scholar](#)

- Ntukidem V, Edima-Nyah A, Ndah L, Abraham N (2020) Assessment of Microbiological Safety and Organoleptic Properties of Tiger nut (*Cyperus esculentus*) Beverage Processed Locally and Sold in Uyo Metropolis of Akwa Ibom state, Nigeria. *Inter J Food Nutr Saf* 11(1): 37-50.
-

[Google Scholar](#)

- Nwinyi OC, Umame PO (2019) Review on probiotics potential, nutritional composition of bambara Nut (*Vigna subterranea* (L.)- An underutilized legume. *IOP Conference Series: Earth and Environmental Science* 331(1): 012057
-

[Google Scholar](#)

- Ogado AC, Agwaranze DI, Nwaneri CB, Yakubu MN, Hussaini ZJ (2018) Comparative Study on the Bacteriological Quality of Kunun-Aya Sold in Wukari, Nigeria. *Inter J Res Stud Microb Biotech* 4(1): 23-29.
-

[Google Scholar](#)

- Oladele AK, Aina JO (2007) Chemical composition and functional properties of flour produced from two varieties of tigernut (*Cyperus esculentus*). *Afr J Biotech* 6(21): 2473-2476.
-

[CrossRef Google Scholar](#)

- Olopade BK, Oranusi SU, Nwinyi OC, Njobeh PB, Lawal IA (2020) Modification of montmorillonite clay with *Cymbopogon citratus* for the decontamination of zearalenone in millet. *AIMS Agri Food* 4(3): 643-657
-

[Google Scholar](#)

- Peterson SW, Ito Y, Horn BW, Goto T (2001) *Aspergillus bombycris*, a new toxigenic species and genetic variation in its sibling species, *A. nomius*. *Mycologia* 93: 689-903.

[CrossRef](#) [Google Scholar](#)

- Pitt JI, Hocking AD (2009) *Fungi and Food Spoilage*. (3rd ed.). New York: Springer Dordrecht, (Chapter1-4).

[Google Scholar](#)

- Rubert J, Soler C, Mañes J (2012) 'Occurrence of fourteen mycotoxins in tiger-nuts'. *Food Cont* 25(1): 374–379.

[Google Scholar](#)

- Rubert J, Fopohunda SO, Soler C, Ezekiel C (2013) 'A survey of mycotoxins in random street-vended snacks from Lagos, Nigeria, using QuEChERS-HPLC-MS/MS'. *Food Cont* 32(2): 673–677.

[Google Scholar](#)

- Sa'id AM, Abubakar H, Bello B (2017) Sensory and microbiological analysis of tiger nut (*Cyperus esculentus*) beverage. *Pakis J Nutri* 16(10): 731-737.

[CrossRef](#) [Google Scholar](#)

- Saito M, Machida S (1999) A Rapid Identification Method for Aflatoxin – Producing Strains of *Aspergillus flavus* and *A. parasiticus* by Ammonia Vapour. *Mycoscience* 40: 205-208.

[CrossRef](#) [Google Scholar](#)

- Sebastià N, Soler C, Soriano JM, Manes J (2010) 'Occurrence of Aflatoxins in Tigernuts and Their Beverages Commercialized in Spain'. *J Agri Food Chem* 58(4): 2609–2612.

[CrossRef](#) [Google Scholar](#)

- Shamsuddeen U, Aminu H (2016) Occurrence of Aflatoxin in *Cyperus esculentus* (Tiger Nut) Sold and Consumed Raw in Kaduna. Inter J Sci Res Edu 4: 5189-5195.

[Google Scholar](#)

- Tope VA (2020) 'Physicochemical and microbial evaluation of tiger-nut milk sold in selected eateries in Awka, Anambra State theurapeutic effect of probiotics on pathogenic organisms View project Physicochemical and Microbial Evaluation of Tiger-nut milk View project Physicochemical and microbial evaluation of tiger-nut milk sold in selected eateries in Awka, Anambra State', Offl Pub Dir Res J Agri Food Sci 8(4): 111–115.

[Google Scholar](#)

- Ukpabi J, Ukenye EA (2015) An assessment of wholesome of imported Tigernut *Cyperus esculentus* used as snack food in Umuahia, Nigeria. Mal J Biosci 2(2): 132–138.

[Google Scholar](#)

- Umaru GA, Tukur IS, Akensire UA, Adamu Z et al (2014) Microflora of Kunun-zaki and Zobo Drinks in Relation to Public Health in Jalingo Metropolis, North-Eastern Nigeria. Inter J Food Res 1: 16-21.

[Google Scholar](#)

[Download references](#)

Acknowledgments

The authors appreciate Covenant University Research, Innovation, and Discovery (CUCRID) for covering the cost of publication.

Author information

Authors and Affiliations

1. **Department of Biological Sciences, College of Science and Technology Covenant University, Ota, Nigeria**

M. B. Alade, E. F. Ahuekwe & O. C. Nwinyi

**2. Department of Biochemistry, College of Science and Technology
Covenant University, Ota, Nigeria**

A. O. Adeyemi

Corresponding authors

Correspondence to [M. B. Alade](#) or [O. C. Nwinyi](#).

Editor information

Editors and Affiliations

- 1. Chemical Engineering, Covenant University, Ota, Nigeria**
Dr. Augustine O. Ayeni
- 2. Chemical Engineering, Covenant University, Ota, Nigeria**
Dr. Samuel Eshorame Sanni
- 3. Biological Sciences, Covenant University, Ota, Nigeria**
Prof. Solomon U. Oranusi

Rights and permissions

[Reprints and Permissions](#)

Copyright information

© 2022 The Author(s), under exclusive license to Springer Nature Switzerland AG

About this chapter

Cite this chapter

Alade, M.B., Ahuekwe, E.F., Adeyemi, A.O., Nwinyi, O.C. (2022). Assessing the Safety of Tiger Nut Drinks Produced from *Cyperus esculentus* L. Seeds Sold in Ota. In: Ayeni, A.O., Sanni, S.E., Oranusi, S.U. (eds) Bioenergy and Biochemical Processing Technologies. Green Energy and Technology. Springer, Cham.
https://doi.org/10.1007/978-3-030-96721-5_14

Download citation

- [.RIS](#)
- [.ENW](#)

- [.BIB](#)
- DOI https://doi.org/10.1007/978-3-030-96721-5_14
- Published 01 July 2022
- Publisher Name Springer, Cham
- Print ISBN 978-3-030-96720-8
- Online ISBN 978-3-030-96721-5
- eBook Packages [EnergyEnergy \(R0\)](#)

Buying options

Chapter

EUR 29.95

Price includes VAT (Nigeria)

- DOI: 10.1007/978-3-030-96721-5_14
- Chapter length: 12 pages

Buy Chapter

[Springer Nature](#)

© 2023 Springer Nature Switzerland AG. Part of [Springer Nature](#).