

Bibliography

- Agarwal, P., & Goyal, A. (2021). A comprehensive review on adulteration and substitution of crude drugs. *Asian Journal of Pharmaceutical and Clinical Research*, 14(4), 33–38.
- Ahmad, N., Fazal, H., Abbasi, B. H., Farooq, S., Ali, M., & Khan, M. A. (2012). Biological role of *Piper nigrum* L. (Black pepper): A review. *Asian Pacific Journal of Tropical Biomedicine*, 2(3), S1945–S1953.
- Ahmed, S., & Hasan, M. M. (2015). Crude drug adulteration: A concise review. *World Journal of Pharmacy and Pharmaceutical Sciences*, 4(10), 274–283.
- Altschul, S. F., Gish, W., Miller, W., Myers, E. W., & Lipman, D. J. (1990). Basic local alignment search tool. *Journal of Molecular Biology*, 215(3), 403–410.
- Anirban Roy, A. R., Mallick, A., & Kaur, A. (2013). Adulteration and substitution in Indian medicinal plants.
- Anthoons, B., Karamichali, I., Schrøder-Nielsen, A., Drouzas, A. D., de Boer, H., & Madesis, P. (2021). Metabarcoding reveals low fidelity and presence of toxic species in short chain-of-commercialization of herbal products. *Journal of Food Composition and Analysis*, 97, 103767.
- Arulandhu, A. J., Staats, M., Hagelaar, R., Peelen, T., & Kok, E. J. (2019). The application of multi-locus DNA metabarcoding in traditional medicines. *Journal of Food Composition and Analysis*, 79, 87–94.
- Arulandhu, A. J., Staats, M., Hagelaar, R., Voorhuijzen, M. M., Prins, T. W., Scholtens, I., ... & Kok, E. (2017). Development and validation of a multi-locus DNA metabarcoding method to identify endangered species in complex samples. *Gigascience*, 6(10), gix080.
- Arwa Ahmed Alyas, H., Aldewach, H., & Aladul, M. I. (2024). Adulteration of Herbal Medicine and its Detection Methods.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Asish, G. R., Parthasarathy, U., & Nithya, N. G. (2010). Standardization of DNA isolation and PCR parameters in *Garcinia* spp. for RAPD analysis. *Indian Journal of Biotechnology*, 9(4), 424–426.
- Attrey, D. P. (2017). Detection of food adulterants/contaminants. In *Food Safety in the 21st Century* (pp. 129–143). Academic Press.
- Bandyopadhyay, S., & Raychaudhuri, S. S. (2010). Development of ITS-based SCAR markers for some medicinally important species of *Phyllanthus*. *Asian Journal of Plant Sciences*, 9(5), 264.
- BCC Publishing. (2023). *Global herbal medicine market* (Report No. PHM278A). BCC Research. Retrieved November 2024, from [Global Herbal Medicine Market Size & Growth Analysis Report](#)
- Beebe, S. (2023). Herbal Medicine Regulation, Adverse Events, and Herb-Drug Interactions. *Integrative Veterinary Medicine*, 79-84.
- Behr, M., Garlant, L., Pietretti, D., Pellegrin, C., Lievens, A., Sanfeliu, A. B., ... & Alvarellos, L. (2024). A robust set of qPCR methods to evaluate adulteration in major spices and herbs. *Food Control*, 110623.
- Biltes, R., Villa, C., Costa, J., & Mafra, I. (n.d.). Botanical authentication of *Bacopa monnieri* herbal products based on a novel Evagreen real-time PCR approach. Available at SSRN 4952365.
- Bodeker, G., & Ong, C.-K. (2005). *WHO global atlas of traditional, complementary, and alternative medicine* (Vol. 1). World Health Organization.
- Bohmann, K., Elbrecht, V., Carøe, C., Bista, I., Leese, F., Bunce, M., Yu, D. W., Seymour, M., Dumbrell, A. J., & Creer, S. (2022). Strategies for sample labelling and library preparation in DNA metabarcoding studies. *Molecular Ecology Resources*, 22(4), 1231–1246.
- British Pharmacopeia Commission. (2016). British Pharmacopoeia 2016: Deoxyribonucleic acid (DNA) based identification techniques for herbal drugs. Appendix XIV. TSO.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Burgess, K. S., Fazekas, A. J., Kesanakurti, P. R., Graham, S. W., Husband, B. C., Newmaster, S. G., ... & Barrett, S. C. (2011). Discriminating plant species in a local temperate flora using the rbcL+ matK DNA barcode. *Methods in Ecology and Evolution*, 2(4), 333-340.
- Busia, K. (2018). African traditional medicine: The way forward. In *African Indigenous Medical Knowledge and Human Health* (Vol. 10, pp. 10–17).
- Bussmann, R. W., Applequist, W., & Paniagua-Zambrana, N. (2014). Traditional medicine in a global environment. *Evidence-Based Complementary and Alternative Medicine: ECAM*, 2014. <https://doi.org/10.1155/2014/739657>
- Bustin, S. A., & Nolan, T. (2004). Pitfalls of quantitative real-time reverse-transcription polymerase chain reaction. *Journal of Biomolecular Techniques: JBT*, 15(3), 155.
- Byard, R. W., Musgrave, I., Maker, G., & Bunce, M. (2017). What risks do herbal products pose to the Australian community? *Medical Journal of Australia*, 206(2), 86–90.
- Chattopadhyay, R. R., & Bhattacharyya, S. K. (2007). PHCOG REV: plant review. *Terminalia chebula*: An update. *Pharmacognosy Reviews*, 1(1), 151-156.
- Chen, S., Yao, H., Han, J., Liu, C., Song, J., Shi, L., Zhu, Y., Ma, X., Gao, T., Pang, X., Luo, K., Li, Y., Li, X., Jia, X., Lin, Y., & Leon, C. (2010). Validation of the ITS2 region as a novel DNA barcode for identifying medicinal plant species. *PLoS ONE*, 5(1), 1–8. <https://doi.org/10.1371/journal.pone.0008613>
- Cheng, X., Su, X., Chen, X., Zhao, H., Bo, C., Xu, J., ... & Ning, K. (2014). Biological ingredient analysis of traditional Chinese medicine preparation based on high-throughput sequencing: the story for Liuwei Dihuang Wan. *Scientific reports*, 4(1), 5147.
- Choudhury, A., Singh, P. A., Bajwa, N., Dash, S., & Bisht, P. (2023). Pharmacovigilance of herbal medicines: Concerns and future prospects. *Journal of Ethnopharmacology*, 309, 116383.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Cock, I. E. (2015). The medicinal properties and phytochemistry of plants of the genus *Terminalia* (Combretaceae). *Inflammopharmacology*, 23(5), 203–229.
- Coghlan, M. L., Haile, J., Houston, J., Murray, D. C., White, N. E., Moolhuijzen, P., Bellgard, M. I., & Bunce, M. (2012). Deep sequencing of plant and animal DNA contained within traditional Chinese medicines reveals legality issues and health safety concerns. *PLoS Genetics*, 8(4).
- de Boer, H. J., Ichim, M. C., & Newmaster, S. G. (2015). DNA barcoding and pharmacovigilance of herbal medicines. *Drug safety*, 38, 611-620.
- Deb, A., Barua, S., & Das, B. (2016). Pharmacological activities of Baheda (*Terminalia*). *International Journal of Pharmaceutical Sciences and Research*, 5(1), 194–197.
- Dias, E., & Joshi, N. (2024). A Study on the Marketing Challenges faced by Manufacturers of Ayush Products in India. *Educational Administration: Theory and Practice*, 30(4), 3972-3978.
- Directive, E. U. (2002). Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements. *Official Journal of the European Communities: Legislation*, 45, 51–57.
- Dnyaneshwar, W., Preeti, C., Kalpana, J., & Bhushan, P. (2006). Development and application of RAPD-SCAR marker for identification of *Phyllanthus emblica* Linn. *Biological and Pharmaceutical Bulletin*, 29(11), 2313–2316.
- Doganay-Knapp, K., Orland, A., König, G. M., & Knöss, W. (2018). The potential of three different PCR-related approaches for the authentication of mixtures of herbal substances and finished herbal medicinal products. *Phytomedicine*, 43, 60–67.
- Doyle, J. J., & Doyle, J. L. (1987). A rapid DNA isolation procedure for small quantities of fresh leaf tissue. *Phytochemical Bulletin*, 19(1), 11–15.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

Eichhorn, T., Greten, H. J., & Efferth, T. (2011). Self-medication with nutritional supplements and herbal over-the-counter products. *Natural Products and Bioprospecting*, 1(1), 62–70.

Ekor, M. (2014). The growing use of herbal medicines: Issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in Pharmacology*, 4, 177.

European Commission. (2002). Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements. *Official Journal of the European Union*. Retrieved November 2024 from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:183:0051:0057:EN:PDF>

European Commission. (2004). Directive 2004/24/EC of the European Parliament and of the Council of 31 March 2004 amending, as regards traditional herbal medicinal products, Directive 2001/83/EC on the Community code relating to medicinal products for human use. *Official Journal of the European Union*. Retrieved from https://ec.europa.eu/health/sites/default/files/files/eudralex/vol-1/dir_2004_24/dir_2004_24_en.pdf

European Medicine Agency (EMA). (2006). Guideline on specifications: Test procedures and acceptance criteria for herbal substances, herbal preparations, and herbal medicinal products. Document No. EMA/CPMP/QWP/2820/00. Retrieved November 2024 from http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2011/09/WC500113210.pdf

Fan, T.-P., Deal, G., Koo, H.-L., Rees, D., Sun, H., Chen, S., Dou, J.-H., Makarov, V. G., Pozharitskaya, O. N., & Shikov, A. N. (2012). Future development of global regulations of Chinese herbal products. *Journal of Ethnopharmacology*, 140(3), 568–586.

Fazekas, A. J., Burgess, K. S., Kesanakurti, P. R., Graham, S. W., Newmaster, S. G., Husband, B. C., Percy, D. M., Hajibabaei, M., & Barrett, S. C. H. (2009). Are

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

plant species inherently harder to discriminate than animal species using DNA barcoding markers? *Molecular Ecology Resources*, 9(SUPPL. 1), 130–139.

Fazekas, A. J., Burgess, K. S., Kesanakurti, P. R., Graham, S. W., Newmaster, S. G., Husband, B. C., ... & Barrett, S. C. (2008). Multiple multilocus DNA barcodes from the plastid genome discriminate plant species equally well. *PloS one*, 3(7), e2802.

Fischer, F. H., Lewith, G., Witt, C. M., Linde, K., von Ammon, K., Cardini, F., Falkenberg, T., Fønnebø, V., Johannessen, H., & Reiter, B. (2014). High prevalence but limited evidence in complementary and alternative medicine: Guidelines for future research. *BMC Complementary and Alternative Medicine*, 14, 1–9.

Frigerio, J., Agostinetto, G., Mezzasalma, V., De Mattia, F., Labra, M., & Bruno, A. (2021). DNA-based herbal teas' authentication: An ITS2 and psbA-trnH multi-marker DNA metabarcoding approach. *Plants*, 10(10), 1–14.

Gaire, B. P., & Subedi, L. (2014). Phytochemistry, pharmacology and medicinal properties of *Phyllanthus emblica* Linn. *Chinese journal of integrative medicine*, 1–8.

Ghadia, B., Patel, H., Pandya, H., & Pandya, J. (2016). An improved method of DNA purification from secondary metabolites rich medicinal plants using certain chaotropic agents. *Acta Physiologiae Plantarum*, 38(8).

Global Triphala Extracts Market Size, Share, and Trends Analysis Report. (2024). *Market Research Insights*. Retrieved November 2024 from <https://www.databridgemarketresearch.com/reports/global-triphala-extracts-market>

Goraya, G. S., & Ved, D. K. (2017). *Medicinal plants in India: An assessment of their demand and supply*. National Medicinal Plants Board, Ministry of AYUSH, Government of India, New Delhi and Indian Council of Forestry Research and Education, Dehradun, 100–105.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Gunjan, M., Naing, T. W., Saini, R. S., Ahmad, A., Naidu, J. R., & Kumar, I. (2015). Marketing trends & future prospects of herbal medicine in the treatment of various diseases. *World Journal of Pharmaceutical Research*, 4(9), 132–155.
- Gurib-Fakim, A. (2006). Medicinal plants: Traditions of yesterday and drugs of tomorrow. *Molecular Aspects of Medicine*, 27(1), 1–93.
- Harris, C. M., Kim, D. Y., Jordan, C. R., Miranda, M. I., & Hellberg, R. S. (2024). DNA barcoding of herbal supplements on the US commercial market associated with the purported treatment of COVID-19. *Phytochemical Analysis*.
- Hazra, S., & Singh, P. A. (2024). Safety aspects of herb interactions: Current understanding and future prospects. *Current Drug Metabolism*, 25(1), 28-53.
- Hebert, P. D. N., Cywinska, A., Ball, S. L., & DeWaard, J. R. (2003). Biological identifications through DNA barcodes. *Proceedings of the Royal Society B: Biological Sciences*, 270(1512), 313–321.
- Heikruijam, J., Kishor, R., & Mazumder, P. B. (2020). The chemistry behind plant DNA isolation protocols. In O. M. Boldura, C. Baltă, & N. S. Awwad (Eds.), *Medicinal Chemistry & Analysis*. Rijeka: IntechOpen.
- Heubl, G. (2010). New aspects of DNA-based authentication of Chinese medicinal plants by molecular biological techniques. *Planta Medica*, 76(17), 1963–1974.
- Higuchi, R., Dollinger, G., Walsh, P. S., & Griffith, R. (1992). Simultaneous amplification and detection of specific DNA sequences. *Bio/technology*, 10(4), 413-417.
- Hindson, B. J., Ness, K. D., Masquelier, D. A., Belgrader, P., Heredia, N. J., Makarewicz, A. J., Bright, I. J., Lucero, M. Y., Hiddeessen, A. L., & Legler, T. C. (2011). High-throughput droplet digital PCR system for absolute quantitation of DNA copy number. *Analytical Chemistry*, 83(22), 8604–8610.
- Hsieh, Y.-C., Wu, M.-S., Lee, H.-C., Hsieh, C.-Y., Huang, S.-S., Tsai, C.-F., Lin, Y.-T., Lin, M.-C., Tseng, S.-H., & Wang, D.-Y. (2021). Development of the species-specific multiplex PCR and DNA sequencing methods for rapid

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

authentication of *Isatidis Folium* and its adulterants. *Journal of Food and Drug Analysis*, 29(2), 303–310. <https://doi.org/10.1016/j.jfda.2020.07.008>

Huang, Y., Niu, B., Gao, Y., Fu, L., & Li, W. (2010). CD-HIT Suite: a web server for clustering and comparing biological sequences. *Bioinformatics*, 26(5), 680-682.

Ichim, M. C. (2019). The DNA-based authentication of commercial herbal products reveals their globally widespread adulteration. *Frontiers in pharmacology*, 10, 1227.

Ichim, M. C., & Booker, A. (2021). Chemical authentication of botanical ingredients: a review of commercial herbal products. *Frontiers in pharmacology*, 12, 666850.

Ichim, M. C., Häser, A., & Nick, P. (2020). Microscopic authentication of commercial herbal products in the globalized market: Potential and limitations. *Frontiers in Pharmacology*, 11, 876.

Intharuksa, A., Ando, H., Miyake, K., Sirisa-Ard, P., Mikage, M., & Sasaki, Y. (2016). Molecular analysis of *Terminalia* spp. distributed in Thailand and authentication of crude drugs from *Terminalia* plants. *Biological and Pharmaceutical Bulletin*, 39(4), 492-501.

Ivanova, N. V., Kuzmina, M. L., Braukmann, T. W. A., & Borisenko, A. V. (2016). Authentication of herbal supplements using next-generation sequencing. 1–24.

Jaya Preethi, P., Padmini, K., Lohita, M., Swetha, K., Priyanka, B., & Vengal Rao, P. (2014) *Medicinal Chemistry & Analysis* 213-217.

Joshi, V. K., Joshi, A., & Dhiman, K. S. (2017). The Ayurvedic pharmacopoeia of India, development and perspectives. *Journal of Ethnopharmacology*, 197, 32–38.

Kasilo, O. M., & Nikiema, J. B. (2014). World Health Organization perspective for traditional medicine. *Novel Plant Bioresources: Applications in Food, Medicine and Cosmetics*, 23-42.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Katiyar, C. K., Chakrabarty, A. K., Dubey, S. K., Pandey, P. K., Tumulu, M., & Narwaria, A. (2023). Enhancing quality of Ayush products—Strategies and efforts of the ministry of Ayush and Ayush industry. *Journal of Research in Ayurvedic Sciences*, 7(Suppl 1), S73-S81.
- Kb, M. (1987). Specific synthesis of DNA in vitro via a polymerase-catalyzed chain reaction. *Methods Enzymol*, 155, 335-50.
- Keshari, P. (2021). Controversy, adulteration and substitution: Burning problems in Ayurveda practices.
- Khan, A., Ahmad, M., Sultan, A., Khan, R., Raza, J., Ul Abidin, S. Z., Khan, S., Zafar, M., Uddin, M. N., & Kazi, M. (2024). Herbal spices as food and medicine: Microscopic authentication of commercial herbal spices. *Plants*, 13(8), 1067.
- Khopde, S. M., Priyadarsini, K. I., Mohan, H., Gawandi, V. B., Satav, J. G., Yakhmi, J. V., ... & Mittal, J. P. (2001). Characterizing the antioxidant activity of amla (*Phyllanthus emblica*) extract. *Current science*, 185-190.
- Kim, W. J., Yang, S., Choi, G., Park, I., Noh, P., Lee, A. Y., ... & Moon, B. C. (2020). Establishment of conventional PCR and real-time PCR assays for accurate, rapid and quantitative authentication of four mistletoe species. *Phytochemistry*, 176, 112400.
- Knoess, W., & Wiesner, J. (2019). The globalization of traditional medicines: Perspectives related to the European Union regulatory environment. *Engineering*, 5(1), 22-31.
- Knöss, W. (2018). Current regulatory environment of herbal medicinal products in the European Union. *Natural Products as Source of Molecules with Therapeutic Potential: Research & Development, Challenges and Perspectives*, 365-389.
- Kondawar, M. S., Kamble, K. G., & Mali, D. S. (2011). Quantitative estimation of Gallic acid and Ascorbic acid in a marketed herbal medicine: Triphala Churna by High Performance Thin Layer Chromatography. *Int J PharmTech Res*, 3(3), 1593-1599.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Kumar, A., Rodrigues, V., Mishra, P., Baskaran, K., Shukla, A. K., Shasany, A. K., & Sundaresan, V. (2018). ISSR-Derived species-specific SCAR marker for rapid and accurate authentication of *Ocimum tenuiflorum* L. *Planta Medica*, 84(02), 117-122.
- Kumar, J. U. S., Ramakrishnan, M., Seethapathy, G. S., Krishna, V., Shaanker, R. U., & Ravikanth, G. (2020). DNA barcoding of *Momordica* species and assessment of adulteration in *Momordica* herbal products, an anti-diabetic drug. *Plant Gene*, 22, 100227.
- Kumar, K. S. (2015). Herbal Pharmacopoeias—an overview of international and Indian representation. *J Ayu Herb Med*, 1, 59-60.
- Kumari, S., Joshi, A. B., Gurav, S., Bhandarkar, A. V., Agarwal, A., Deepak, M., & Gururaj, G. M. (2017). A pharmacognostic, phytochemical and pharmacological review of *Terminalia bellerica*. *Journal of Pharmacognosy and Phytochemistry*, 6(5), 368-376.
- Leonti, M. (2011). The future is written: Impact of scripts on the cognition, selection, knowledge and transmission of medicinal plant use and its implications for ethnobotany and ethnopharmacology. *Journal of Ethnopharmacology*, 134(3), 542–555.
- Leonti, M., & Casu, L. (2013). Traditional medicines and globalization: current and future perspectives in ethnopharmacology. *Frontiers in pharmacology*, 4, 92.
- Letsyo, E., Dzikunoo, J., Dzah, C. S., Adams, Z. S., & Asante-Donyinah, D. (2023). Hepatic phytotoxins in herbal medicines: a review of Africa's pyrrolizidine alkaloid-containing plants, their traditional uses, contamination pathways and associated health risks. *South African Journal of Botany*, 161, 78-89.
- Li, T., Qiao, Z., Li, M., Zhou, N., Ren, G., Jiang, D., & Liu, C. (2023). Species identification and quality evaluation of licorice in the herbal trade using DNA barcoding, HPLC and colorimetry. *International Journal of Food Properties*, 26(1), 197–207.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Lin, M., Wang, H., Yu, Q., & Wang, D. (2023). A sensitive and robust DNA method for authenticity determination of Glehnia littoralis F. Schmidt ex Miq. and its commercial products. *Journal of Applied Research on Medicinal and Aromatic Plants*, 35, 100489.
- Linhart, C., & Shamir, R. (2005). The degenerate primer design problem: Theory and applications. *Journal of Computational Biology*, 12(4), 431–456.
- Liu, C., Guo, D. A., & Liu, L. (2018). Quality transitivity and traceability system of herbal medicine products based on quality markers. *Phytomedicine*, 44, 247-257.
- Liu, W. J. (2024). Regulation and application of Chinese herbs in the US: misuse is the main cause of toxic incidents. *Acupuncture and Herbal Medicine*, 4(2), 159-166.
- Lodhi, M. A., Ye, G. N., Weeden, N. F., & Reisch, B. I. (1994). A simple and efficient method for DNA extraction from grapevine cultivars and Vitis species. *Plant Molecular Biology Reporter*, 12(1), 6–13.
- Lu, Z., Handy, S. M., Zhang, N., Quan, Z., Xu, Q., Ambrose, M., ... & Sarma, N. D. (2022). Development and validation of a species-specific PCR method for the identification of ginseng species using orthogonal approaches. *Planta Medica*, 88(12), 1004-1019.
- Luo, Y., Yang, H., & Tao, G. (2024). Systematic review on fingerprinting development to determine adulteration of Chinese herbal medicines. *Phytomedicine*, 155667.
- Mahima, K., Sunil Kumar, K. N., Rakhesh, K. V., Rajeswaran, P. S., Sharma, A., & Sathishkumar, R. (2022). Advancements and future prospective of DNA barcodes in the herbal drug industry. *Frontiers in Pharmacology*, 13, 947512.
- Maloukh, L., Kumarappan, A., Jarrar, M., Salehi, J., El-Wakil, H., & Rajya Lakshmi, T. V. (2017). Discriminatory power of rbcL barcode locus for authentication of some of United Arab Emirates (UAE) native plants. *3 Biotech*, 7, 1-7.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Malherbe, C. J., De Beer, D., & Joubert, E. (2012). Development of on-line high performance liquid chromatography (HPLC)-biochemical detection methods as tools in the identification of bioactives. *International journal of molecular sciences*, 13(3), 3101-3133.
- Matos, L. C., Machado, J. P., Monteiro, F. J., & Greten, H. J. (2021). Understanding traditional Chinese medicine therapeutics: An overview of the basics and clinical applications. *Healthcare*, 9(3), 257.
- Mattummal, R., Gopi, D. K., Bobbili, E., & Narayana, S. K. K. (2019). A review on molecular techniques employed for authentication of Indian medicinal plants. *Plant Science Today*, 6(4), 465-478.
- Michetti, K. M., Cuadra, V. P., & Cambi, V. N. (2019). Botanical quality control of digestive tisanes commercialized in an urban area (Bahía Blanca, Argentina). *Revista Brasileira de Farmacognosia*, 29(2), 137–146.
- Mirunalini, S., & Krishnaveni, M. (2010). Therapeutic potential of *Phyllanthus emblica* (amla): the ayurvedic wonder. *Journal of basic and clinical physiology and pharmacology*, 21(1), 93-105.
- Mishra, P., Kumar, A., Nagireddy, A., Mani, D. N., Shukla, A. K., Tiwari, R., & Sundaresan, V. (2016). DNA barcoding: an efficient tool to overcome authentication challenges in the herbal market. *Plant biotechnology journal*, 14(1), 8-21.
- Modi, D., Chauhan, P., Seemabalu, M., Giri, S., Patel, K., & Patel, C. N. (2024). Quantitative Estimation of Gallic Acid in Triphala Tablets by UV Spectrophotometric Method. *Asian Journal of Pharmaceutical Analysis*, 14(3).
- Morgia, C., Ghizzoni, R., Delogu, C., Andreani, L., Carnevali, P., & Terzi, V. (2020). Digital PCR: What relevance to plant studies? *Biology*, 9(12), 1–16.
- Mordeniz, C. (Ed.). (2019). *Traditional and complementary medicine*. BoD–Books on Demand.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Mück, F., Scotti, F., Mauvisseau, Q., Thorbek, B. L. G., Wangensteen, H., & de Boer, H. J. (2024). Three-tiered authentication of herbal traditional Chinese medicine ingredients used in women's health provides progressive qualitative and quantitative insight. *Frontiers in Pharmacology*, 15, 1353434.
- Mundkinajeddu, D., Sawant, L. P., Koshy, R., Akunuri, P., Singh, V. K., Mayachari, A., ... & Agarwal, A. (2014). Development and validation of high performance liquid chromatography method for simultaneous estimation of flavonoid glycosides in *Withania somnifera* aerial parts. *International Scholarly Research Notices*, 2014(1), 351547.
- Newmaster, S. G., Grguric, M., Shanmughanandhan, D., Ramalingam, S., & Ragupathy, S. (2013). DNA barcoding detects contamination and substitution in North American herbal products. *BMC medicine*, 11, 1-13.
- Nithaniyal, S., & Parani, M. (2016). Evaluation of chloroplast and nuclear DNA barcodes for species identification in *Terminalia* L. *Biochemical Systematics and Ecology*, 68, 223-229.
- Noh, P., Kim, W. J., Yang, S., Choi, G., & Moon, B. C. (2021). PCR-based rapid diagnostic tools for the authentication of medicinal mistletoe species. *Phytomedicine*, 91, 153667.
- Normile, D. (2003). The new face of traditional Chinese medicine. *Science*, 299(5604), 188-190.
- Oketch-Rabah, H. A., Roe, A. L., Rider, C. V., Bonkovsky, H. L., Giancaspro, G. I., Navarro, V., Paine, M. F., Betz, J. M., Marles, R. J., & Casper, S. (2020). United States Pharmacopeia (USP) comprehensive review of the hepatotoxicity of green tea extracts. *Toxicology Reports*, 7, 386–402.
- Osman, A. G., Raman, V., Haider, S., Ali, Z., Chittiboyina, A. G., & Khan, I. A. (2019). Overview of analytical tools for the identification of adulterants in commonly traded herbs and spices. *Journal of AOAC International*, 102(2), 376–385.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Oyebode, O., Kandala, N.-B., Chilton, P. J., & Lilford, R. J. (2016). Use of traditional medicine in middle-income countries: A WHO-SAGE study. *Health Policy and Planning*, 31(8), 984–991.
- Oyedepo, T. A., & Palai, S. (2021). Herbal remedies, toxicity, and regulations. In C. Egbuna, A. P. Mishra, & M. R. Goyal (Eds.), *Preparation of phytopharmaceuticals for the management of disorders* (pp. 89–127). Academic Press.
- Pallavi, R., & Jha, S. (2021). A validated quantification of gallic acid and ellagic acid in Triphala using a high-performance thin-layer chromatography method. *JPC–Journal of Planar Chromatography–Modern TLC*, 1-7.
- Pandey, M. M., Rastogi, S., & Rawat, A. K. S. (2013). Indian traditional ayurvedic system of medicine and nutritional supplementation. *Evidence-Based Complementary and Alternative Medicine*, 2013(1), 376327.
- Pandit, R., Travadi, T., Sharma, S., Joshi, C., & Joshi, M. (2021). DNA metabarcoding using rbcL based mini-barcode revealed presence of unspecified plant species in Ayurvedic polyherbal formulations. *Phytochemical Analysis*, 32(5), 804–810.
- Parveen, I., Gafner, S., Tech, N., Murch, S. J., & Khan, I. A. (2016). DNA barcoding for the identification of botanicals in herbal medicine and dietary supplements: Strengths and limitations. *Planta Medica*, 82(14), 1225–1235.
- Patil-Patankar, V. (2024). Comparative pharmacognostic exploration of medicinal plants and their adulterants. In *Herbal Formulations, Phytochemistry and Pharmacognosy*, 199-217.
- Pawar, N. P., & Salunkhe, V. R. (2013). Development and validation of UV spectrophotometric method for simultaneous estimation of rutin and gallic acid in hydroalcoholic extract of Triphala churna. *Journal of Pharmaceutical Sciences*, 71(4), 724-729.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Pawar, R. S., Handy, S. M., Cheng, R., Shyong, N., & Grundel, E. (2017). Assessment of the authenticity of herbal dietary supplements: Comparison of chemical and DNA barcoding methods. *Planta Medica*, 83(11), 921–936.
- Pawar, V., Lahorkar, P., & Narayana, D. B. A. (2009). Development of an RP-HPLC method for analysis of Triphala Churna and its applicability to test variations in Triphala Churna preparations. *Indian Journal of Pharmaceutical Sciences*, 71(4).
- Perveen, S., & Al-Taweel, A. M. (2019). Introductory Chapter: Pharmacognosy. In *Pharmacognosy-Medicinal Plants*. IntechOpen.
- Peterson, C. T., Denniston, K., & Chopra, D. (2017). Therapeutic uses of Triphala in Ayurvedic medicine. *Journal of Alternative and Complementary Medicine*, 23(8), 607–614.
- Petrovska, B. B. (2012). Historical review of medicinal plants' usage. *Pharmacognosy Reviews*, 6(11), 1.
- Picking, D. (2024). The global regulatory framework for medicinal plants. In *Pharmacognosy* (pp. 769-782). Academic Press.
- Poornima, B. (2010). Adulteration and substitution in herbal drugs: A critical analysis. *IJRAP*, 1(1), 8–12.
- Porebski, S., Bailey, L. G., & Baum, B. R. (1997). Modification of a CTAB DNA extraction protocol for plants containing high polysaccharide and polyphenol components. *Plant Molecular Biology Reporter*, 15(1), 8–15.
- Prager, M. J., & Miskiewicz, M. A. (1982). Gas chromatographic-mass spectrometric analysis, identification, and detection of adulteration of natural and concentrated lemon oils. *Journal of the Association of Official Analytical Chemists*, 65(1), 166–171.
- Raclariu, A. C., Heinrich, M., Ichim, M. C., & de Boer, H. (2017). Comparative authentication of *Hypericum perforatum* herbal products using DNA metabarcoding, TLC and HPLC-MS. *Scientific Reports*, 7(1), 8–10.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Raclariu, A. C., Heinrich, M., Ichim, M. C., & de Boer, H. (2018). Benefits and limitations of DNA barcoding and metabarcoding in herbal product authentication. *Phytochemical Analysis*, 29(2), 123-128.
- Raclariu, A. C., Mocan, A., Popa, M. O., Vlase, L., Ichim, M. C., Crisan, G., ... & de Boer, H. (2017). Veronica officinalis product authentication using DNA metabarcoding and HPLC-MS reveals widespread adulteration with Veronica chamaedrys. *Frontiers in pharmacology*, 8, 378.
- Raclariu, A. C., Tebrencu, C. E., Ichim, M. C., Ciupercă, O. T., Brysting, A. K., & de Boer, H. (2018). What's in the box? Authentication of Echinacea herbal products using DNA metabarcoding and HPTLC. *Phytomedicine*, 44, 32-38.
- Raclariu-Manolică, A. C., & de Boer, H. J. (2022). DNA barcoding and metabarcoding for quality control of botanicals and derived herbal products. In *Evidence-Based Validation of Herbal Medicine*, 223–238.
- Raclariu-Manolică, A. C., Mauvisseau, Q., & de Boer, H. J. (2023). Horizon scan of DNA-based methods for quality control and monitoring of herbal preparations. *Frontiers in Pharmacology*, 14, 1179099.
- Raclariu-Manolică, A. C., Mauvisseau, Q., Paranaiba, R., De Boer, H. J., & Socaciu, C. (2023). Authentication of milk thistle commercial products using UHPLC-QTOF-ESI+ MS metabolomics and DNA metabarcoding. *BMC Complementary Medicine and Therapies*, 23(1), 257. <https://doi.org/10.1186/1741-7015-11-222>
- Raghavendra, P., Ganesh, P., Chalageri, G., Kannan, R., & Babu, U. V. (2024). Genetic Profiling and Taxonomic Authentication of Indian Phyllanthus (Phyllanthaceae: Phyllantheae) Genus through Molecular Phylogeny, DNA Barcoding, and ITS2 Secondary Structure Predictions: A Comprehensive Analysis.
- Raju, S., & Das, M. (2024). Medicinal plants industry in India: Challenges, opportunities and sustainability.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Rana, P., Lee, M. S., & Sheu, S. C. (2024). Authentication of *Cinnamomum verum* (Ceylon cinnamon) in commercial products by qualitative and real-time quantitative PCR assays. *European Food Research and Technology*, 250(12), 2895-2906.
- Raviraja Shetty, G., & Harsha, R. (2021). Adulteration in medicinal plants and herbal drugs. *International Journal of Agricultural Science*, 12(1), 12–17.
- Research and Information System for Developing Countries (RIS). (2023). AYUSH exports: Regulatory opportunities and challenges in key markets.
- Robinson, M. M., & Zhang, X. (2011). Traditional medicines: Global situation, issues, and challenges. *The World Medicines Situation*, 382(6).
- Robinson, N. (2006). Integrated traditional Chinese medicine. *Complementary therapies in clinical practice*, 12(2), 132-140.
- Ross, S. (2000). Functional foods: The Food and Drug Administration perspective. *The American Journal of Clinical Nutrition*, 71(6), 1735S-1738S.
- Saggar, S., Mir, P. A., Kumar, N., Chawla, A., Uppal, J., & Kaur, A. (2022). Traditional and herbal medicines: Opportunities and challenges. *Pharmacognosy Research*, 14(2).
- Sahoo, N., & Manchikanti, P. (2013). Herbal drug regulation and commercialization: an Indian industry perspective. *The Journal of alternative and complementary medicine*, 19(12), 957-963.
- Sahoo, N., Manchikanti, P., & Dey, S. (2010). Herbal drugs: standards and regulation. *Fitoterapia*, 81(6), 462-471.
- Salmerón-Manzano, E., Garrido-Cardenas, J. A., & Manzano-Agugliaro, F. (2020). Worldwide research trends on medicinal plants. *International Journal of Environmental Research and Public Health*, 17(10), 3376.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

Sanadhya, S., Aapaliya, P., Jain, S., & Choudhary, G. (2015). Complementary and alternative medicine: A buzz for medical and health care systems. *Journal of Research in Pharmacy Practice*, 4(1), 42–43.

Santhosh Kumar, J. U., Krishna, V., Seethapathy, G. S., Ganesan, R., Ravikanth, G., & Shaanker, R. U. (2018). Assessment of adulteration in raw herbal trade of important medicinal plants of India using DNA barcoding. *3 Biotech*, 8, 1-8.

Santos, M. E. A. H. P., Rodrigues, M. S., Siqueira, W. J., Marques, M. O. M., & Mondego, J. M. C. (2023). Comparative analysis indicates a simple protocol for DNA extraction of the aromatic plant Lippia alba. *Analytical Biochemistry*, 675, 115225.

Sarin, Y. K. (1996). *Illustrated manual of herbal drugs used in Ayurveda*. Council of Scientific & Industrial Research: Indian Council of Medical Research.

Särkinen, T., Staats, M., Richardson, J. E., Cowan, R. S., & Bakker, F. T. (2012). How to open the treasure chest? Optimising DNA extraction from herbarium specimens.e43808

Schenk, J. J., Becklund, L. E., Carey, S. J., & Fabre, P. P. (2023). What is the “modified” CTAB protocol? Characterizing modifications to the CTAB DNA extraction protocol. *Applications in Plant Sciences*, 11(3), e11517.

Schmieder, R., & Edwards, R. (2011). Quality control and preprocessing of metagenomic datasets. *Bioinformatics*, 27(6), 863-864.

Schori, M., & Showalter, A. M. (2011). DNA barcoding as a means for identifying medicinal plants of Pakistan. *Pak. J. Bot*, 43, 1-4.

Seethapathy, G. S., Balasubramani, S. P., & Venkatasubramanian, P. (2014). nrDNA ITS sequence based SCAR marker to authenticate Aconitum heterophyllum and Cyperus rotundus in Ayurvedic raw drug source and prepared herbal products. *Food chemistry*, 145, 1015-1020.

Seethapathy, G. S., Ganesh, D., Santhosh Kumar, J. U., Senthilkumar, U., Newmaster, S. G., Ragupathy, S., ... & Ravikanth, G. (2015). Assessing product

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

adulteration in natural health products for laxative yielding plants, Cassia, Senna, and Chamaecrista, in Southern India using DNA barcoding. *International Journal of Legal Medicine*, 129, 693–700.

Seethapathy, G. S., Raclaru-Manolica, A. C., Anmarkrud, J. A., Wangensteen, H., & de Boer, H. J. (2019). DNA metabarcoding authentication of ayurvedic herbal products on the European market raises concerns of quality and fidelity. *Frontiers in plant science*, 10, 68.

Selvaraj, D., et al. (2012). DNA barcode ITS effectively distinguishes the medicinal plant *Boerhavia diffusa* from its adulterants. *Genomics, Proteomics and Bioinformatics*, 10(6), 364–367.

Sen, S., & Chakraborty, R. (2017). Revival, modernization, and integration of Indian traditional herbal medicine in clinical practice: Importance, challenges, and future. *Journal of Traditional and Complementary Medicine*, 7(2), 234–244.

Shah, A. P., Travadi, T., Sharma, S., Pandit, R., Joshi, C., & Joshi, M. (2023). Comprehensive analysis using DNA metabarcoding, SCAR marker-based PCR assay, and HPLC unveils the adulteration in Brahmi herbal products. *Molecular Biology Reports*, 50(9), 7605–7618.

Shah, A. P., Travadi, T., Sharma, S., Pandit, R., Joshi, C., & Joshi, M. (2023). Digital PCR: A Tool to Authenticate Herbal Products and Spices. In *PCR: Methods and Protocols* (pp. 17-30). New York, NY: Springer US.

Shanmughanandhan, D., Ragupathy, S., Newmaster, S. G., Mohanasundaram, S., & Sathishkumar, R. (2016). Estimating herbal product authentication and adulteration in India using a vouchered, DNA-based biological reference material library. *Drug Safety*, 39(12), 1211–1227.

Shanmughanandhan, J., Shanmughanandhan, D., Ragupathy, S., Henry, T. A., & Newmaster, S. G. (2021). Quantification of *Actaea racemosa* L. (black cohosh) from some of its potential adulterants using qPCR and dPCR methods. *Scientific Reports*, 11(1), 1–11

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

Sharma, S., & Srivastava, N. (2016). Renaissance in phytomedicines: promising implications of NGS technologies. *Planta*, 244, 19-38.

Sharma, S., Sharma, P., Yadav, S., Purohit, I., Srivastava, A., Varma, A., & Srivastava, N. (2017). Homogenous PCR of heterogeneous DNA from phenolic rich barks of Terminalia species for DNA-based adulteration detection. *Proceedings of the National Academy of Sciences India Section B - Biological Sciences*, 87(2), 507–512.

Shi, X., Zhang, Q., & Wang, H. (2024). Adulteration detection of *Gastrodia elata* Blume and its commercial products using chloroplast DNA marker-based species-specific PCR assays. *Microchemical Journal*, 201, 110513.

Shinde, S., & Rajurkar, V. (2024). Advances in High-Performance Liquid Chromatography (HPLC) Method Development and Validation: A Comprehensive Review. *Journal of Drug Delivery and Biotherapeutics*, 2(03), 16-26.

Srivastava, S. R., Srivastava, P. S., & Ramasamy, J. (2015). Mainstreaming of Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homeopathy with the health care delivery system in India. *Journal of Traditional and Complementary Medicine*, 5(2), 116–118.

Silva, D. S. N., de Sousa Silva, M., Coelho, T. L. S., Dantas, C., Júnior, C. A. L., Caldas, N. M., & Vieira, E. C. (2022). Combining high intensity ultrasound and experimental design to improve carotenoid extraction efficiency from Buriti (*Mauritia flexuosa*). *Ultrasonics Sonochemistry*, 88, 106076.

Singh, A., Sharma, H., Srivastava, B., & Singh, R. (2020). Markers assessment in Triphala (Batch-I, II & III) and its ingredients from different geographical locations of India through TPC, TFC, HPLC & HPTLC. *Current Traditional Medicine*, 6(2), 106–120.

Singh, M., Bhoge, R. K., & Randhawa, G. (2016). Crop-specific GMO matrix-multiplex PCR: A cost-efficient screening strategy for genetically modified maize and cotton events approved globally. *Food Control*, 70, 271–280.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

Singh, Mahipal, Bandana, & P. S. Ahuja. (1999). Isolation and PCR amplification of genomic DNA from market samples of dry tea. *Plant Molecular Biology Reporter*, 17(2), 171–178.

Sontag, G., Pinto, M. I., Noronha, J. P., & Burrows, H. D. (2019). Analysis of food by high performance liquid chromatography coupled with coulometric detection and related techniques: A review. *Journal of agricultural and food chemistry*, 67(15), 4113-4144.

Sousa, A. I., Ferreira, I. M. P. L. V. O., & Faria, M. A. (2019). Sensitive detection of *Piper nigrum* L. adulterants by a novel screening approach based on qPCR. *Food Chemistry*, 283, 596–603.

Srirama, R., Santhosh Kumar, J. U., Seethapathy, G. S., Newmaster, S. G., Ragupathy, S., Ganeshaiyah, K. N., ... & Ravikanth, G. (2017). Species adulteration in the herbal trade: causes, consequences and mitigation. *Drug safety*, 40, 651-661.

Staats, M., Arulandhu, A. J., Gravendeel, B., Holst-Jensen, A., Scholtens, I., Peelen, T., ... & Kok, E. (2016). Advances in DNA metabarcoding for food and wildlife forensic species identification. *Analytical and bioanalytical chemistry*, 408, 4615-4630.

Stashenko, E., & Martínez, J. (2012). GC-MS analysis of volatile plant secondary metabolites. *Gas chromatography in plant science, wine technology, toxicology and some specific applications*, 262-264.W

Steiner, D., Malachová, A., Sulyok, M., & Krska, R. (2021). Challenges and future directions in LC-MS-based multiclass method development for the quantification of food contaminants. *Analytical and Bioanalytical Chemistry*, 413, 25–34.

Sultan, M. T., Anwar, M. J., Imran, M., Khalil, I., Saeed, F., Neelum, S., ... & Al Jbawi, E. (2023). Phytochemical profile and pro-healthy properties of Terminalia chebula: A comprehensive review. *International Journal of Food Properties*, 26(1), 526-551.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Techen, N., Parveen, I., Pan, Z., & Khan, I. A. (2014). DNA barcoding of medicinal plant material for identification. *Current Opinion in Biotechnology*, 25, 103–110.
- Thakkar, S., Anklam, E., Xu, A., Ulberth, F., Li, J., Li, B., ... & Tong, W. (2020). Regulatory landscape of dietary supplements and herbal medicines from a global perspective. *Regulatory Toxicology and Pharmacology*, 114, 104647.
- The Ayurvedic Pharmacopoeia of India, 1st, Vol. I. (2016). Department of AYUSH, Ministry of Health and Family Welfare, Government of India.
- The Ayurvedic Pharmacopoeia of India, 1st, Vol. II. (2016). Department of AYUSH, Ministry of Health and Family Welfare, Government of India.
- The Ayurvedic Pharmacopoeia of India, 1st, Vol. III. (2016). Department of AYUSH, Ministry of Health and Family Welfare, Government of India.
- Tilburg, J. C., & Kaptchuk, T. J. (2008). Herbal medicine research and global health: An ethical analysis. *Bulletin of the World Health Organization*, 86, 594–599.
- Totelin, L. M. V. (2009). *Hippocratic recipes: Oral and written transmission of pharmacological knowledge in fifth- and fourth-century Greece* (Vol. 34). Brill.
- Travadi, T., Sharma, S., Pandit, R., Joshi, C., Joshi, M., & Joshi, P. (2024). Advancing Herbal Product Authentication: A Comprehensive Review Of DNA-Based Approach For Quality Control And Safety Assurance. *Educational Administration: Theory and Practice*, 30(6 (S)), 15-25.
- Travadi, T., Sharma, S., Pandit, R., Joshi, C., Joshi, P., & Joshi, M. (2024). Overcoming Challenges in DNA Extractions from Triphala Ingredients: A Way Forward for Optimization of Conventional and Digital PCR Assays for Molecular Authentication. *Food Analytical Methods*, 1-11.
- Travadi, T., Shah, A. P., Pandit, R., Sharma, S., Joshi, C., & Joshi, M. (2023). Detection of carica papaya adulteration in piper nigrum using chloroplast DNA marker-based PCR assays. *Food Analytical Methods*, 16(1), 107-114.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

Travadi, T., Shah, A. P., Pandit, R., Sharma, S., Joshi, C., & Joshi, M. (2023). A combined approach of DNA metabarcoding collectively enhances the detection efficiency of medicinal plants in single and polyherbal formulations. *Frontiers in Plant Science*, 14, 1169984.

Travadi, T., Sharma, S., Pandit, R., Nakrani, M., Joshi, C., & Joshi, M. (2022). A duplex PCR assay for authentication of Ocimum basilicum L. and Ocimum tenuiflorum L in Tulsi churna. *Food Control*, 137, 108790.

U.S. Food and Drug Administration. (2019). *Dietary supplements guidance documents & regulatory information*. U.S. Food and Drug Administration. Retrieved November 2024, from <https://www.fda.gov/food/guidance-documents-regulatory-information-topic-food-and-dietary-supplements/dietary-supplements-guidance-documents-regulatory-information>.

Uncu, A. O., Torlak, E., & Uncu, A. T. (2018). A cost-efficient and simple plant oil DNA extraction protocol optimized for DNA-based assessment of product authenticity. *Food Analytical Methods*, 11(4), 939–950.

Union, E. P. and the C. of the E. (2004). Directive 2004/24/EC of the European Parliament and of the Council of 31 March 2004 amending, as regards traditional herbal medicinal products, Directive 2001/83/EC on the Community code relating to medicinal products for human use. *Off J Eur Union*, 136, 85–90.

Upton, R., David, B., Gafner, S., & Glasl, S. (2020). Botanical ingredient identification and quality assessment: Strengths and limitations of analytical techniques. *Phytochemistry Reviews*, 19(5), 1157–1177.

Urumarudappa, S. K. J., Tungphatthong, C., Jaipaew, J., Pornputtapong, N., Pakdeesattayapong, D., Vimolmangkang, S., & Sukrong, S. (2022). Development of a DNA barcode library of plants in the Thai Herbal Pharmacopoeia and Monographs for authentication of herbal products. *Scientific Reports*, 12(1), 9624.

Urumarudappa, S. K. J., Tungphatthong, C., Prombutara, P., & Sukrong, S. (2020). DNA metabarcoding to unravel plant species composition in selected herbal

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

medicines on the National List of Essential Medicines (NLEM) of Thailand. *Scientific Reports*, 10(1), 1–11.

Varma, A., Padh, H., & Srivastava, N. (2007). Plant genomic DNA isolation: An art or a science. *Biotechnology Journal*, 2(3), 386–392.

Varma, S. R., Sivaprakasam, T. O., Mishra, A., Kumar, L. S., Prakash, N. S., Prabhu, S., & Ramakrishnan, S. (2016). Protective effects of triphala on dermal fibroblasts and human keratinocytes. *PLoS One*, 11(1), e0145921.

Vasisht, K., Sharma, N., & Karan, M. (2016). Current perspective in the international trade of medicinal plants material: An update. *Current Pharmaceutical Design*, 22(27), 4288–4336.

Ved, D. K., & Goraya, G. S. (2007). Demand and supply of medicinal plants in India. *NMPB, New Delhi & FRLHT, Bangalore, India*, 18(85), 210-52.

Vural, H. C., & Dağeri, A. (2009). Optimization of DNA isolation for RAPD-PCR analysis of selected (*Echinaceae purpurea* L. Moench) medicinal plants of conservation concern from Turkey. *Journal of Medicinal Plants Research*, 3(1), 016–019.

Wang, H., Chen, Y., Wang, L., Liu, Q., Yang, S., & Wang, C. (2023). Advancing herbal medicine: enhancing product quality and safety through robust quality control practices. *Frontiers in Pharmacology*, 14, 1265178.

Warude, D., Chavan, P., Joshi, K., & Patwardhan, B. (2003). DNA isolation from fresh and dry plant samples with highly acidic tissue extracts. *Plant Molecular Biology Reporter*, 21(4), 239–247.

Wetters, S., Sahi, V., Brosche, L., Häser, A., & Nick, P. (2024). Monitoring Indian “Superfood” *Moringa oleifera* Lam.–species-specific PCR-fingerprint-based authentication for more consumer safety. *npj Science of Food*, 8(1), 21.

World Health Organization. (2002). *WHO traditional medicine strategy 2002–2005*. Geneva: World Health Organization.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- World Health Organization. (2006). *Index of pharmacopoeias*. Geneva: World Health Organization.
- World Health Organization. (2006). *International regulatory cooperation for herbal medicines (IRCH)*. Geneva: World Health Organization.
- World Health Organization. (2007). *WHO guidelines for assessing the quality of herbal medicines with reference to contaminants and residues*. Geneva: World Health Organization.
- World Health Organization. (2011). *Quality control methods for herbal materials*. Geneva: World Health Organization.
- World Health Organization. (2013). *WHO traditional medicine strategy: 2014–2023*. Geneva: World Health Organization.
- Wu, C., Lee, S.-L., Taylor, C., Li, J., Chan, Y.-M., Agarwal, R., Temple, R., Throckmorton, D., & Tyner, K. (2020). Scientific and regulatory approach to botanical drug development: A US FDA perspective. *Journal of Natural Products*, 83(2), 552–562.
- Wu, H. Y., & Shaw, P. C. (2022). Strategies for molecular authentication of herbal products: from experimental design to data analysis. *Chinese Medicine*, 17(1), 38.
- Xu, M. R., Lee, M. S., Yang, B. C., Chang, H. C., Kuo, C. L., Lin, C. H., ... & Sun, F. C. (2023). Development of a specific and sensitive diagnostic PCR for rapid molecular authentication of the medicinal plant Portulaca oleracea. *Molecular and Cellular Probes*, 67, 101890.
- Xue, B. X., Tuliebieke, T., Zhang, T. T., Lai, J. X., Rao, Y., Zhang, L. H., ... & Wu, H. H. (2024). A strategy integrating GC–MS, UPLC profiling, and DNA metabarcoding for characterization and discrimination of the medicinal and culinary pieces from four Curcuma species. *Microchemical Journal*, 110895.
- Yadav, A., Ahmad, J., Chaudhary, A. A., & Ahmad, A. (2012). Development of sequence characterized amplified region (SCAR) marker for the authentication of *Bacopa monnieri* (L.) Wettst. *European Journal of Medicinal Plants*, 186–198.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

- Yang, H. Y., Chen, P. C., & Wang, J. D. (2014). Chinese herbs containing aristolochic acid associated with renal failure and urothelial carcinoma: a review from epidemiologic observations to causal inference. *BioMed Research International*, 2014(1), 569325.
- Yao, Q., Zhu, X., Han, M., Chen, C., Li, W., Bai, H., & Ning, K. (2022). Decoding herbal materials of TCM preparations with the multi-barcode sequencing approach. *Scientific reports*, 12(1), 5988.
- Yik, M. H. Y., Lo, Y. T., Lin, X., Sun, W., Chan, T. F., & Shaw, P. C. (2021). Authentication of Hedyotis products by adaptor ligation-mediated PCR and metabarcoding. *Journal of Pharmaceutical and Biomedical Analysis*, 196, 113920.
- Yu, J., Wu, X. I., Liu, C., Newmaster, S., Ragupathy, S., & Kress, W. J. (2021). Progress in the use of DNA barcodes in the identification and classification of medicinal plants. *Ecotoxicology and Environmental Safety*, 208, 111691.
- Yu, N., Xing, R., Wang, P., Deng, T., Zhang, J., Zhao, G., & Chen, Y. (2022). A novel duplex droplet digital PCR assay for simultaneous authentication and quantification of *Panax notoginseng* and its adulterants. *Food Control*, 132, 108493.
- Zhang, G., Liu, J., Gao, M., Kong, W., Zhao, Q., Shi, L., & Wang, Q. (2020). Tracing the edible and medicinal plant *Pueraria montana* and its products in the marketplace yields subspecies level distinction using DNA barcoding and DNA metabarcoding. *Frontiers in Pharmacology*, 11, 336.
- Zhang, X., Wang, R., Wang, D., & Wang, H. (2023). Development of a sensitive and user-friendly allele-specific PCR assay for adulteration detection of spices. *Journal of Applied Research on Medicinal and Aromatic Plants*, 37, 100518.
- Zhang, X. R., Kaunda, J. S., Zhu, H. T., Wang, D., Yang, C. R., & Zhang, Y. J. (2019). The genus Terminalia (Combretaceae): An ethnopharmacological, phytochemical and pharmacological review. *Natural products and bioprospecting*, 9, 357-392.

Detection of adulteration in herbal formulation containing *Phyllanthus emblica*, *Terminalia bellirica* and *Terminalia chebula* using DNA-based approach

Zhang, J., Onakpoya, I. J., Posadzki, P., & Eddouks, M. (2015). The safety of herbal medicine: from prejudice to evidence. *Evidence-based complementary and alternative medicine: eCAM, 2015*.

Zhang, L., Yan, J., Liu, X., Ye, Z., Yang, X., Meyboom, R., ... & Duez, P. (2012). Pharmacovigilance practice and risk control of Traditional Chinese Medicine drugs in China: current status and future perspective. *Journal of ethnopharmacology, 140*(3), 519-525.

Zuo, Y., Chen, Z., Kondo, K., Funamoto, T., Wen, J., & Zhou, S. (2011). DNA barcoding of *Panax* species. *Planta Medica, 77*(2), 182–187.