



Global diversity of *Cinnamomum* and conservation: what the Red List species review shows

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1. ABSTRACT

The review by Mohandass and colleagues examines the diversity of the *Cinnamomum* genus using assessments from the International Union for Conservation of Nature (IUCN) Red List. This work is valuable because it shows that the genus name encompasses many species, with widely varying distributions, available data, and conservation needs. The authors' synthesis evaluated 230 taxa—that is, species or other recognized botanical units—of the *Cinnamomum* genus present on the IUCN Red List. The main message is simple: speaking of *Cinnamomum* as if it were a single plant obscures significant biological diversity and varying conditions of vulnerability. The authors report that 195 taxa require urgent conservation interventions. To interpret the assessments, they considered geographical indicators used by the IUCN, such as the extent of occurrence or EOO (the overall area within which a species is known to exist) and the area of occupancy or AOO (the portion actually occupied by the species). They also reference species distribution modeling, which are tools that estimate where an organism can find compatible environmental conditions. The review proposes integrating protection in natural environments with ex-situ conservation, for example in germplasm banks and living collections. However, it does not directly measure the number of individuals of each species, nor does it demonstrate that a single propagation technique can resolve the risk of extinction.

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2. WHAT THIS RESEARCH ANALYZED

For the reader, the essential point is that the cinnamon found on the market represents only a small fraction of a much broader botanical group. In 2026, Mohandass and colleagues conducted a systematic review—an organized synthesis of existing information—on 230 *Cinnamomum* taxa included in the IUCN Red List. The authors examined data on distribution, threat status, ecological requirements, and information gaps. They also discussed EOO, AOO, and species distribution models. These tools do not automatically determine a plant's fate; rather, they help estimate how restricted, fragmented, or poorly documented its range is. This highlights the importance of the quality of botanical data.

3. WHAT RESULTS EMERGE FROM THE STUDY

The most immediate finding is that the *Cinnamomum* genus encompasses a wide diversity, with evergreen tree and shrub species found in tropical and subtropical zones. In the review, 195 of the 230 taxa analyzed are identified as being in urgent need of conservation. This indicates a widespread critical situation, not the imminent extinction of every single species. The authors emphasize that for many botanical entities, there is insufficient information regarding specific threats, ecological needs, reproduction, and protection strategies. They therefore point to the need to adopt complementary interventions: *in situ* conservation (protection of populations in their natural environment) and *ex situ* conservation (preservation of seeds, tissues, or plants outside their natural environment). They cite controlled germination and somatic embryogenesis, a technique by which plant cells can form embryos in culture. These are options to be adapted to each individual species, not universal solutions.

4. WHY THIS STUDY IS RELEVANT

This work is relevant because it clarifies a step that is often overlooked: a botanical genus is not equivalent to a single raw material or a single plant population. Correctly identifying species allows us to distinguish the food product from other related plants and to recognize that some may have very different conservation needs. The outlined sequence adopts a

cautious approach: a restricted or fragmented distribution can increase the need for conservation attention; more robust taxonomic and genetic data then help define which populations to protect; only afterwards can targeted measures be planned. Studies on specific *Cinnamomum* species show, in fact, that fragmentation, low gene flow, and difficulty in regeneration may require differentiated interventions [1,2,3].

5. STUDY LIMITATIONS AND WHAT IT DOES NOT DEMONSTRATE

The 2026 publication by Mohandass and colleagues is a review, not a field observation conducted by the authors on all 230 entities considered. Its conclusions therefore depend on the completeness, currency, and comparability of the assessments found in the IUCN Red List. The work does not provide a new, uniform estimate of population numbers for each taxon. Furthermore, a risk status does not automatically describe genetic diversity, i.e., the variety of the hereditary heritage within a species. Genetic diversity can influence the ability to adapt, but it requires dedicated assessments. Nor does the number of taxa in need of protection demonstrate that all aromatic species used commercially are rare or threatened. To reach conclusions about a specific species or product, verifiable botanical identification and targeted data are required.

6. INDEPENDENT SUPPORTING EVIDENCE

The available evidence supports the general premise that the conservation of *Cinnamomum* must be evaluated on a species-by-species basis. In an experimental study on 54 individuals of *Cinnamomum chago*, Dong and colleagues observed five isolated populations and a high proportion of genetic variability within the populations. The result confirms that fragmented distribution and local biological characteristics must be included in conservation planning; however, it remains specific to a single species [1]. A subsequent genetic study on five populations of the same species found low genetic diversity, strong differentiation between populations, evidence of a demographic bottleneck, and very limited gene flow. In simple terms, reproductive exchanges between groups were limited. This supports the idea of combining habitat protection and

reproductive management, without demonstrating that the same pattern applies to the entire genus [2]. A third experimental study analyzed the seed dormancy of *Cinnamomum migao*. With three replicates of 50 seeds per treatment, the combination of stratification at 15 °C and gibberellic acid brought final germination to $77.33 \pm 4.16\%$. The data show that specific protocols can improve the propagation of some threatened species, consistent with the options discussed by Mohandass and colleagues; it does not constitute proof for all *Cinnamomum* species [3].

7. CONFLICTING EVIDENCE

There are findings that suggest we should not oversimplify the link between classification, risk status, and conservation. In a molecular study of eight *Cinnamomum* species, with three samples per species,

the standard plant markers *rbcL*, *matK*, and *trnH-psbA* did not reliably distinguish between all species. This limits the use of a single genetic method for identifying botanical material and supports the need to integrate morphology with more informative genomic data [4]. In a synthesis of 919 taxa and 5,271 populations, Mastretta-Yanes and colleagues also found that genetic indicators can signal critical issues not captured by Red List status. This evidence does not contradict the necessity of IUCN assessments, but it indicates that they are not sufficient on their own to describe the genetic status of populations [5]. No directly conflicting evidence sufficiently relevant to the number of taxa reported by Mohandass and colleagues has been identified; this does not prove the absence of contrary results.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The following publications help to evaluate the extent to which the narrative regarding the diversity and protection of *Cinnamomum* is supported by independent data.

Quadro comparativo

Publication	Model and sample size	Main result	Relationship to the study by Mohandass and colleagues
Dong et al., 2016 [1]	Genetic and field study; 54 individuals of one species	Isolated populations and genetic variability primarily within populations	Direct confirmation of the need for species-specific assessments
Zhang et al., 2021 [2]	Genetic study; 5 populations of one species	Low diversity, high differentiation, and very limited gene flow	Direct confirmation of the value of integrated conservation strategies
Chen et al., 2022 [3]	Seed experiment; three replicates of 50 seeds per treatment	Stratification with gibberellic acid improved germination	Indirect confirmation of the utility of targeted reproductive protocols
Chandrasekara et al., 2021 [4]	Molecular study; 8 species and three accessions per species	Standard plant barcodes did not distinguish all species	Limits the simplification of taxonomic identification
Mastretta-Yanes et al., 2024 [5]	Multinational synthesis; 919 taxa and 5,271 populations	Genetic indicators can highlight critical issues not reflected by the Red List	Limits the interpretation based solely on risk category



9. SINTESI EDITORIALE E CONCLUSIONI

EDITORIAL CONCLUSION

The review by Mohandass and colleagues shows that *Cinnamomum* is not a uniform botanical group: it includes many species with different distributions, available information, and conservation needs. The analysis of 230 taxa from the IUCN Red List, with 195 indicated as being in urgent need of protection, highlights the scale of the problem but does not replace local and genetic assessments for each species. The independent studies examined make this conclusion more concrete. Some species show fragmented populations, low gene flow, or difficulties in regeneration; other research indicates that targeted reproductive techniques can be useful. At the same time, botanical identification may require more comprehensive tools than standard genetic markers, and Red List status alone does not describe genetic diversity. The most robust message is therefore methodological: knowing precisely which species is being studied is an essential condition for understanding and protecting its diversity.

Aggiornato al 21/10/2026. Questo contenuto riflette una sintesi divulgativa delle evidenze scientifiche al momento della pubblicazione e non sostituisce il parere medico.

10. TRANSPARENCY AND SCIENTIFIC RESPONSIBILITY

Artificial Intelligence was used solely as a tool for editorial and documentary support. All content, interpretations, bibliographic citations and conclusions have been verified, reviewed and approved by the author, who assumes full scientific responsibility for them.

The manuscript was also subjected to independent peer review prior to publication.

To ensure the greatest transparency, the complete history of the article, including the dates of submission, revision, acceptance and publication, as well as information on the peer review process, is available on the dedicated Article History page.

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