

CONSERVATION STATUS OF QURANIC MEDICINAL PLANT SPECIES: REVIEW OF INDONESIAN CASE STUDY

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Received : June 19, 2024

Accepted : August 27, 2024

Published : December 31, 2024

Abstract: Plant use is well documented in many religions, beliefs, and cultures, including Islam. Essential plants of Islam are mentioned in the Quran. Indonesia, a biodiversity-rich country, has numerous medicinal plants, some of which are listed in the Quran. However, scientific approaches to documenting this plant conservation still need to be improved. Thus, this study aims to provide information regarding the conservation status of Quranic medicinal plant species and the ex-situ conservation efforts conducted in Indonesia. This study was conducted using secondary data acquirement. This study found that 35 medicinal plants are listed in the Quran, with two species listed as a vulnerable conservation status. Twelve of these plants are conserved in the Indonesian botanic gardens. At the same time, the newly founded Quranic plant thematic garden in Bogor Botanic Garden also contains several Quranic medicinal plants listed in this study. This study concludes that Quranic medicinal plants exist, and some are already conserved ex-situ in Indonesia. Although conservation should be improved for plants yet to be conserved, the study data could formulate future conservation, education, and research programs covering Quranic plant botany and bioprospecting to support its conservation and sustainable utilization.

Keywords: Conservation; Ex-situ; Medicinal plant; Quran.

Abstrak: Pemanfaatan tumbuhan telah terdokumentasi secara baik dalam berbagai agama, kepercayaan dan kebudayaan, termasuk Islam. Tumbuhan penting dalam Islam disebutkan dalam Al-Quran. Sebagai negara yang kaya biodiversitas, Indonesia memiliki banyak tumbuhan obat yang beberapa diantaranya disebutkan pula dalam Al-Quran. Namun, pendekatan ilmiah untuk mendokumentasikan status konservasi tumbuhan-tumbuhan tersebut masih perlu ditingkatkan. Karena itu, studi ini bertujuan untuk menyediakan informasi mengenai status konservasi dan upaya konservasi ex-situ tumbuhan obat Al-Quran di Indonesia. Studi ini dilaksanakan dengan menggunakan data sekunder. Hasil studi ini menunjukkan bahwa 35 jenis tumbuhan obat disebutkan dalam Al-Quran, dengan dua di antaranya merupakan tumbuhan dengan status rentan. Dua belas di antara jenis-jenis tumbuhan tersebut telah dikoleksi pada beberapa kebun raya di Indonesia. Sementara itu, taman tematik khusus berisi tumbuhan Al-Quran yang menampung sebagian tumbuhan yang termuat dalam daftar pada studi ini juga didirikan di Kebun Raya Bogor. Studi ini menyimpulkan bahwa tumbuhan obat yang disebutkan dalam Al-Quran hidup dan beberapa telah dikonservasi secara ex-situ di Indonesia. Walaupun upaya konservasi tumbuhan obat Al-Quran masih perlu ditingkatkan,

terutama untuk tumbuhan yang belum dikoleksi secara ex-situ, data pada studi ini dapat digunakan dalam menyusun upaya konservasi, pendidikan dan penelitian mengenai botani dan biosproeksi tumbuhan obat Al-Quran untuk mendukung upaya konservasi dan pemanfaatan berkelanjutan.

Kata kunci: Ex-situ; Konservasi; Tumbuhan obat; Quran

Recommended APA Citation :

Solihah, S. M., & Kuswanto, F. (2024). Conservation Status of Quranic Medicinal Plant Species: Review of Indonesian Case Study. *Elkawnie*, 10(2), 250-262. <https://doi.org/10.22373/ekw.v10i2.24363>

Introduction

The long association between humans and valuable plant species made plants mentioned in many cultural and religious teachings. Studies to document essential plant species in various cultures have already been conducted in many cultural groups in Indonesia (Diliarosta et al., 2021; Sujarwo et al., 2019; Wijana & Rahmawati, 2020) and aboard (Zhou et al., 2023). In Islam, plants are mentioned in two of the most important literature of the religion, the Holy Quran and Ahadith (El-Seedi et al., 2019; Mufid et al., 2021).

However, the importance of plant species to humans implies that conservation efforts need to be conducted both inside the plant's natural habitat (in-situ) or outside its natural habitat (ex-situ), such as in the Botanic Garden (Breman et al., 2021). Currently, 43 botanic gardens are distributed throughout Indonesia (Purnomo et al., 2020). Among these botanic gardens, five are under the management of the National Research and Innovation Agency Republic of Indonesia (BRIN), while the other 38 are under the management of various regional governments and universities (Apriyanto et al., 2022). The number of botanical gardens, the diverse management, and the vast number of plant collections prompted the development of an integrated plant collection system called "Makoyana" (Apriyanto, 2022; Apriyanto et al., 2022). Until 31st May 2024, the "Makoyana" database includes plant collection data from five BRIN-managed and 19 regional botanic gardens. The ability of the "Makoyana" database to inform the collection of plant species in Indonesian botanic gardens implies that the database will represent the current condition of ex-situ Quranic medicinal plant species conservation in Indonesia.

Such study is essential as the study on culturally significant plants, such as traditional medicinal plants collected in botanic gardens both in Indonesia and other countries (Hidayat et al., 2021; Seta & Belay, 2022) have already been conducted but still needs to be improved, especially regarding Quranic plant species. This condition is unfortunate as Indonesia is a mega-biodiversity country with millions of plant species, many of which are medicinally important (Arozal et al., 2020). The lack of study on Quranic medicinal plant conservation in Indonesia is also apparent as there was no specified garden to collect Quranic medicinal plant species in the

Indonesian Botanic Garden. At the same time, the Usada garden as a Balinese traditional medicine plant garden is present (Putri, 2019). This condition was resolved by the newly established “Taman Tumbuhan Quran” in Bogor Botanic Garden. This garden was built to promote ex-situ conservation and education of Quranic plant species.

The absence of studies on Quranic medicinal plant species conservation in Indonesia and the new emergence of Quranic plant gardens implies that such research should be conducted to support Quranic plant species conservation in Indonesia. Thus, this study aims to fill that knowledge gap by documenting medicinal plants listed in the Quran, their conservation status, and their ex-situ conservation effort in Indonesian botanical gardens. This study will provide the first data to fill this subject's knowledge gaps. Those data will benefit many medicinal plant stakeholders from Indonesia and abroad, such as researchers, gardeners, students, and the general public.

Method

This study applied secondary data acquisition from several sources, such as scholarly articles and plant databases. Quranic medicinal plant species data was acquired from Ghazanfar & Wickison (2023), Qamariah (2019), and Sheikh & Dixit (2015). The literature was selected to present the most recent and complete data. The plant species accepted name, synonym, and distribution, including its endemicity range, was determined using an online plant name database (POWO, 2024). The rare plant was categorized as vulnerable, endangered, and critically endangered in the IUCN Red List online database (IUCN, 2024). This categorization is following (Rugayah et al., 2017). Meanwhile, to understand the ex-situ conservation of this plant species in the Indonesian Botanic Gardens, the names of the species were matched with the online collection database “Makoyana” (Pusdatin BRIN, 2021). Plant protection status determination was conducted based on Government Regulation No. 7 of 1999 concerning the preservation of plant and animal species and Regulation of the Minister of Environment and Forestry No. P.20/MENLHK/SETJEN/KUM.1/6/2018 concerning protected plant and animal species.

The inventory and identification results were compiled into a table and then sorted based on the categories of protected, endemic, and rare plants. All data were analyzed descriptively and presented as figures and tables. We also describe the conservation effort of Quranic medicinal plant species in Bogor Botanic Garden's newly established Quranic garden.

Result and Discussion

Quranic Medicinal Plant and its Conservation Status

This study listed 35 medicinal plant species in the Quran (Table 1). This result is higher than the previous literature, which listed 27 (Qamariah, 2019; Sheikh &

Dixit, 2015) and 30 plant species (Ghazanfar & Wickison, 2023). This higher number was obtained as this study combines plant species attributed to medicinal properties in the cited literature. Thus, It is unsurprising that the result is higher as some species might not be mentioned in the literature but are in other literature.

Taxonomically, these medicinal plant species belong to 20 families, with Fabaceae contributing the most with eight species, followed by Cucurbitaceae with three species. Meanwhile, other plant families contributed to one and two species, respectively. The high number of Fabaceae species present in this list is unsurprising as the family is a multipurpose plant group adapted to broad climate conditions, forming the third most prominent family in the plant kingdom and the second largest and most important plant family in crop plant species (Smýkal et al., 2015).

This study also found that listed medicinal Quranic plant species came from various floristic regions. Most listed species are non-native in Indonesia and come from the Middle East and Africa. This condition is unsurprising as Islam first emerged in the Middle East region of Mecca. However, the list also contains plant species from other floristic regions, including Indonesian native plants, such as *Dryobalanops aromatica*. The existing trading route to the Middle East since the pre-Islamic era (Michalopoulos et al., 2012) might facilitate this condition. The trading of *D. aromatica* is due to its long regarded as a valuable incense plant used centuries ago (Royyani et al., 2024).

Our study also found that various conservation statuses. Of all listed plant species, 18 are listed in the IUCN Red List database. Among those listed species, *Cedrus libani* and *D. aromatica* are listed as vulnerable and thus are the only rare plant species. The species' continuing population decrease due to habitat loss and other factors are the main reasons for its vulnerable status in the IUCN Red List (Barstow & Randi, 2018; Gardner, 2013).

Our study also found that another plant species, *Zingiber officinale*, is listed as data deficient, while other IUCN Red List listed species in this study are considered least concern. Numerous other listed species in this study are also not listed in the IUCN Red List database yet. This finding is expected, as the IUCN can only assess the conservation status of about 10% of earth-living organisms (IUCN, 2024). This condition might be because the assessment process is incomplete or has not yet been conducted for the species.

However, despite the presence of plant species listed as vulnerable on the IUCN Red List database, our study found that none of the species is included as protected plants according to Indonesian regulations. This implies that listed plants are not considered species that need protection. This condition might be due to several reasons, such as being considered a common plant, untreated plant species such as *Z. officinale* or not Indonesian native plant species such as *C. libani*, or considered not yet threatened in Indonesia such as *D. aromatica*.

Table 1. The Quranic Medicinal Plant Mentioned in Ghazanfar & Wickison (2023), Qamariah (2019), and Sheikh & Dixit (2015), its distribution and conservation status are according to IUCN (2024) and Indonesian regulations and ex-situ conservation sites.

| Species Name | Synonym | Common Name | Indonesian Name | Conservation Status | Distribution Status in Indonesia | Botanic Garden(s) |
|---|---|----------------------|-----------------|---------------------|----------------------------------|-------------------|
| Amaryllidaceae | | | | | | |
| <i>Allium cepa</i> L. | <i>Cepa esculenta</i> Gray | Onion | Bawang Bombai | NL, NP | IN | |
| <i>Allium sativum</i> L. | <i>Allium sativum</i> var. <i>vulgare</i> Döll | Garlic | Bawang Putih | NL, NP | IN | |
| Arecaceae | | | | | | |
| <i>Phoenix dactylifera</i> L. | <i>Palma dactylifera</i> (L.) Mill. | Date palms | Kurma | NL, NP | IN | CIBo, PWD |
| Brassicaceae | | | | | | |
| <i>Mutarda nigra</i> (L.) Bernh. | <i>Brassica nigra</i> (L.) W.D.J.Koch | Black mustard | Sesawi hitam | LC, NP | IN | |
| Cucurbitaceae | | | | | | |
| <i>Cucumis sativus</i> L. | <i>Cucumis sativus</i> f. <i>typicus</i> Gabaev | Cucumber | Metimun | NL, NP | IN | |
| <i>Cucumis melo</i> L. | <i>Cucumis melo</i> f. <i>typicus</i> Pangalo | Melon | Melon | NL, NP | IN | |
| <i>Lagenaria siceraria</i> (Molina) Standl. | <i>Cucurbita siceraria</i> Molina | Bottle Gourd | Labu air | NL, NP | IN | |
| Dipterocarpaceae | | | | | | |
| <i>Dryobalanops aromatica</i> C.F.Gaertn. | <i>Dipterocarpus camphorus</i> (Colebr.) Mart. | Borneo camphor | Pohon kapur | VU, NP | NA | BPP, BOG, CIBi |
| Euphorbiaceae | | | | | | |
| <i>Ricinus communis</i> L. | <i>Ricinus communis</i> var. <i>aegyptiaceus</i> (Popova) Moshkin | Castor | Jarak | NL, NP | IN | BTR, CIBo |
| Fabaceae | | | | | | |
| <i>Alhagi graecorum</i> Boiss. | <i>Alhagi maurorum</i> subsp. <i>graecorum</i> (Boiss.) Awmack & Lock | Manna | Mana | NL, NP | IN | |
| <i>Alhagi maurorum</i> Medik. | <i>Alhagi alhagi</i> (L.) Huth | Manna | Mana | NL, NP | IN | |
| <i>Trifolium repens</i> L. | <i>Amoria repens</i> (L.) C.Presl | White clover | Daun semangi | LC, NP | IN | |
| <i>Vachellia gerrardi</i> (Benth.) P.J.H.Hurter | <i>Acacia gerrardi</i> Benth. | Acacia | Akasia | NL, NP | IN | |
| <i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb. | <i>Acacia nilotica</i> (L.) Willd. ex Delile | Acacia | Akasia | LC, NP | IN | BALI |
| <i>Vachellia tortilis</i> (Forssk.) Galasso & Banfi | <i>Acacia tortilis</i> (Forssk.) Hayne | Shittah tree, Acacia | Akasia | LC, NP | IN | |
| <i>Vachellia seyal</i> (Delile) P.J.H.Hurter | <i>Acacia seyal</i> Delile | Acacia | Akasia | NL, NP | IN | |
| <i>Vicia lens</i> (L.) Coss. & Germ. | <i>Lens culinaris</i> Medik. | Lentils | Kacang lentil | NL, NP | IN | |
| Lamiaceae | | | | | | |
| <i>Ocimum basilicum</i> L. | <i>Ocimum odorum</i> Salisb. | Basil | Selasih | NL, NP | NA | LIWA |
| Lauraceae | | | | | | |

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| Species Name | Synonym | Common Name | Indonesian Name | Conservation Status | Distribution Status in Indonesia | Botanic Garden(s) |
|---|--|-------------------------------------|-----------------|---------------------|----------------------------------|----------------------------|
| <i>Camphora officinarum</i> Boerh. ex Fabr. | <i>Cinnamomum camphora</i> (L.) J.Presl | Camphor tree | Pohon Kamper | LC, NP | IN | BTR, BOG, CIBo, BALI, PWD |
| <i>Cinnamomum aromaticum</i> Nees | <i>Cinnamomum aromaticum</i> var. <i>longifolium</i> Lukman. | Cassia Cinnamon | Kayu Manis | NL, NP | IN | |
| Lythraceae | | | | | | |
| <i>Lawsonia inermis</i> L. | <i>Lawsonia alba</i> Lam. | Henna | Hena | LC, NP | IN | BOG, LIWA, PWD |
| <i>Punica granatum</i> L. | <i>Rhoea punica</i> St.-Lag. | Pomegranate | Delima | LC, NP | IN | BOG, BALI, PWD, SRW |
| Moraceae | | | | | | |
| <i>Ficus carica</i> L. | <i>Ficus carica</i> subsp. <i>carica</i> | Fig | Buah tin | LC, NP | IN | BTR, BOG, CIBo |
| Musaceae | | | | | | |
| <i>Ensete ventricosum</i> (Welw.) Cheesman | <i>Musa ventricosa</i> Welw. | Ethiopian Banana, Abyssinian Banana | Esente | LC, NP | IN | |
| <i>Musa × paradisiaca</i> L. | <i>Musa × paradisiaca</i> subsp. <i>normalis</i> Kuntze | Banana | Pisang | NL, NP | IN | PWD |
| Myrtaceae | | | | | | |
| <i>Myrtus communis</i> L. | - | Myrtle | Mersin, murad | LC, NP | IN | |
| Oleaceae | | | | | | |
| <i>Olea Europaea</i> L. | <i>Olea sativa</i> Hoffmanns. & Link | Olive | Zaitun | NL, NP | IN | CIBo |
| Pinaceae | | | | | | |
| <i>Cedrus libani</i> A.Rich. | <i>Cedrus cedrus</i> (L.) Huth | Cedar | Aras | VU, NP | IN | |
| Rhamnaceae | | | | | | |
| <i>Ziziphus mauritiana</i> Lam. | <i>Sarcomphalus mauritanus</i> (Lam.) Raf. | Indian jujube | Bidara | LC, NP | IN | |
| <i>Ziziphus spina-christi</i> (L.) Desf. | <i>Rhamnus spina-christi</i> L. | Christ's thorn jujube | Bidara | LC, NP | IN | BALI |
| Salvadoraceae | | | | | | |
| <i>Salvadora persica</i> L. | <i>Salvadora persica</i> var. <i>angustifolia</i> Verdc. | Toothbrush tree | Miswak, siwak | LC, NP | IN | |
| Tamaricaceae | | | | | | |
| <i>Tamarix aphylla</i> (L.) H.Karst. | <i>Tetraclinis aphylla</i> (L.) Rothm. | Athel tamarisk | Tamarik | LC, NP | IN | |
| <i>Tamarix senegalensis</i> DC. | <i>Tamarix gallica</i> var. <i>monodiana</i> Maire | Manna | Tamarik | NL, NP | IN | |
| Vitaceae | | | | | | |
| <i>Vitis vinifera</i> L. | <i>Cissus vinifera</i> (L.) Kuntze | Grape | Anggur | LC, NP | IN | |
| Zingiberaceae | | | | | | |
| <i>Zingiber officinale</i> Roscoe | <i>Zingiber zingiber</i> (L.) H.Karst. | Ginger | Jahe | DD, NP | IN | BTR, CIBo, BALI, IDK, LIWA |

Notes: DD: Data Deficient; LC: Least Concern; NL: Not Listed; VU: Vulnerable according to IUCN Red List (2024). NP: Not protected according to Indonesian regulations.

IN: Introduced to Indonesia; NA Native to Indonesia.

BALI: Bali; BPP: Balikpapan; BTR: Baturraden; BOG: Bogor; CIBo: Cibodas; CIBi: Cibinong; IDK: Indrokilo; LIWA: Liwa; PWD: Purwodadi; SRW: Sriwijaya Botanic Garden.

Ex-situ Conservation of Quranic Medicinal Plant in Indonesia

Our result shows that among the 35 Quranic medicinal plant species listed in this study, only 12 are collected in ten Indonesian botanic gardens. The ten botanic gardens include five BRIN-administrated botanic gardens of Bogor, Cibinong, Cibodas, Purwodadi, and Bali, as well as five regional botanic gardens of Sriwijaya, Liwa, Balikpapan, Baturraden, and Indrokilo. The number of Quranic plants collected in the Indonesian Botanic Garden is lower than the number of Quranic plants collected in the Quranic Botanic Garden, Qatar, with 20 species (ElGharib & Al-Khulaifi, 2022) and Quranic Park, Dubai, with 51 plant species (Dubai Municipality, 2024). The low number of plant species collected in Indonesian botanic gardens is attributed to the plant origin. Indonesian Botanic Garden's main objective is to conserve Indonesian threatened plant species; thus, the fact that most of the listed species are non-native to Indonesia made them underrepresented there, despite some of the plants present due to seed exchange or donation aboard botanic gardens.

The number of plant species collected in those botanic gardens is varied. Cibodas is a botanic garden with six species, followed by Bogor, Bali, and Purwodadi, which have five species. Meanwhile, Cibinong, Indrokilo, Balikpapan, and Sriwijaya Botanic Garden are the sites with the least species, with only one species, respectively (Figure 1).

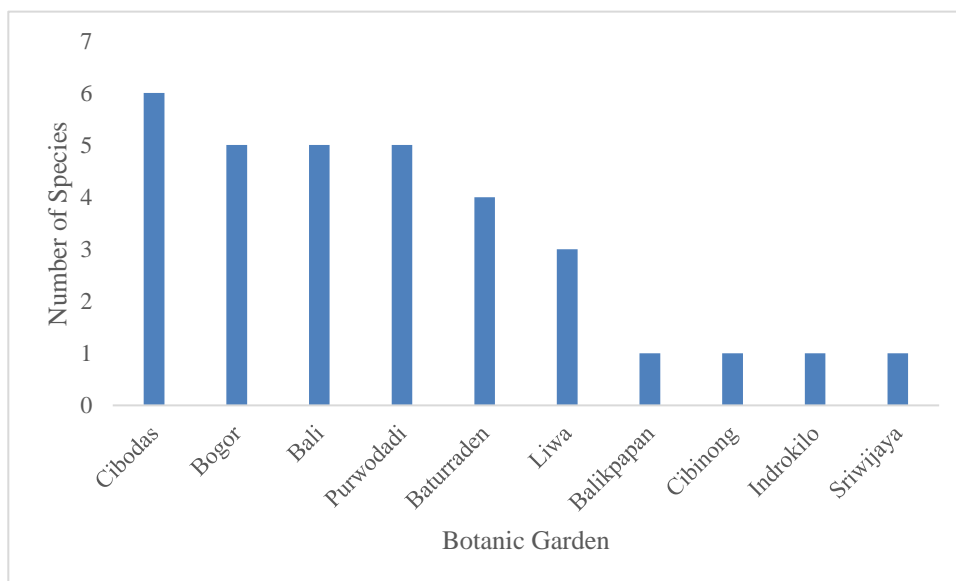


Figure 1. Botanic garden with Quranic medicinal plant species and the number of species they conserve.

It's unsurprising that Cibodas, along with Bogor, Bali, and Purwodadi, are the botanic gardens with the most species of Quranic medicinal plants, as they are among the oldest botanic gardens in Indonesia. Bogor Botanic Garden was founded in 1817 (Ariati & Widyatmoko, 2019), followed by Cibodas Botanic Garden in 1852 (Yulianti et al., 2020), and Purwodadi Botanic Garden in 1941 (Mudiana et al., 2020) and Bali Botanic Garden in 1959 (Wirawan et al., 2019). Six other botanic gardens listed in this study are newly developed, thus justifying its relatively smaller number of Quranic medicinal plant collections.

Our data also found that *C. officinarum* and *Z. officinale* are the two most collected species, as both species are collected in five botanic gardens. Regarding *C. officinarum*, the plant's ability to grow in various habitats might be attributed to the plant collection in various botanic gardens. Our data suggest that the plant species were collected in highland botanic gardens such as Bali, Liwa, and Cibodas, as well as in the lowland botanic gardens of Bogor and Purwodadi. Meanwhile, as a highly beneficial, well-known, widely distributed, easily propagated plant species in Indonesia, it's unsurprising that *Z. officinale* is collected in much of the botanic gardens.

The different number of Quranic medicinal plant species collected in each listed botanic garden in this study is attributed to several reasons, such as the botanic garden age, the habitat in which the botanic garden is situated, and the specific theme of the botanic garden (Mudiana et al., 2020; Purnomo et al., 2020). These factors contribute to the unique characteristics of each botanic garden and are represented in its plant collection, including its Quranic plant collection.

The Quranic medicinal plant species in this study are not necessarily collected in Indonesian botanic gardens due to their mention in the Quran. Some species are collected because they are present and widely used in Indonesia, such as *Z. officinale* (Nasution et al., 2020; Wahyuningrum et al., 2022) and *D. aromatica* (Aswandi & Kholibrina, 2021; Muslih et al., 2022). However, other species might also be included in the garden collection as part of the plant material exchange, such as *P. dactylifera* and *O. europaea*. This condition is also the reason for the absence of specialised Quranic gardens in Indonesian botanic gardens; such a garden was recently built in Bogor Botanic Garden.

Quranic Plant Garden

The Quranic plant garden at Bogor Botanic Garden is built as an educational site for Quranic plant species. The Quranic Garden was constructed on 754,3 m² of land near the Mosuque within the Bogor Botanic Garden. Built with a pentagonal shape, representing five mandatory prayer times for Muslims, this garden aligns with the mosque's primary use as a prayer site. Combining symmetric and geometric patterns, the garden focuses on garden elements and vegetation to accommodate visitors' activity around the mosque and its educational function. Developing a

garden specialising in Quranic plants was also preceded by the Quranic Botanic Garden, Qatar (ElGharib & Al-Khulaifi, 2022) and Quranic Park, Dubai (Dubai Municipality, 2024).

Seventeen Quranic plant species are planted in this garden. This species' inclusion is due to many factors, notably its high adaptability to the local climate. Seventeen species were also chosen as the garden was built on Ramadhan, and the 17th of Ramadhan is an important date as it's considered the day of the Quran or *Nuzulul Quran*. Seventeen plant species also represent the number of prayer *rakaat* in a day.

Within the Quranic garden, five plant species, namely *F. carica*, *P. granatum*, *V. vinifera*, *P. dactylifera*, and *O. europaea* were planted in the garden's main area, also known as the Pentagon area. The Pentagon and the number of plant species in this area have again taken inspiration from the number of mandatory daily prayers of Muslims. The five species were selected as they are the most mentioned in the Quran. The number of planted specimens for these five species (17) again reflects the number of *Rakaat* Muslims who must do daily.



Figure 2. Quranic Plant Garden in Bogor Botanic Garden. a. *O. Europaea*; b. *P. granatum*; c. *P. dactylifera*; d. *V. vinifera*; e. *F. carica*; f. *C. melo*; g. *L. Siceraria*; h. *R. Communis*; i. *Z. officinale*; j. *Z. mauritiana*; k. *Musa x paradisiaca*; l. *E. ventricosum*; m. *O. Basilicum*; n. *A. sativum*; o. *A. cepa*; p. *C. officinarum*; q. *V. lens*; r. Quranic Garden Signage.

Regarding the plant species' status in the botanic garden collection, this study found that many plants planted in the Quranic Garden were not listed on the Makoyana database as plants collected in the Bogor Botanic Garden. This absence is due to its status as an ornamental plant species. Thus, the plants are not considered the garden collection and are absent from the Makoyana database. This is common as ornamental plants are also an unseparated part of botanic gardens worldwide.

Conclusion

This study listed 35 species of medicinal plants mentioned in the holy Quran. Among these species, only two are listed as vulnerable in the IUCN redlist database, while others are listed as least concerned and data deficient or not listed. Among these species, 12 are listed as plant collections of ten botanic gardens, with five BRIN-managed and five regional botanic gardens. Seventeen species listed as medicinal Quranic plants in this study are planted in the recently built Quranic plant garden in Bogor Botanic Garden known as the “Taman Tumbuhan Quran. This study provides the first comprehensive data on the Quranic medicinal plants in Indonesia and their ex-situ conservation, which various stakeholders can use to enhance the preservation, research, and education efforts of this plant species in Indonesia. That effort can be made by planting and collecting more listed plant species to provide material for education, research on plant botany, and bioprospecting to support its conservation through sustainable use.

Conflict of interest

The authors state that no conflict of interest is present in this study. Both authors contribute equally to this study and writing process, thus considered as the co-main authors of this paper. The first author contributes to data acquisition for Quranic medicine plant species. The second author contributes to data acquirement of ex-situ conservation of plant species in the Indonesian botanic gardens. Both authors contribute equally to formulating the study method, conclusion, writing, and revision process. Artificial Intelligence (AI) was used limited for English correction using Grammarly.

Acknowledgements

The authors thank Pusdatin-BRIN, Directorate of Scientific Collection Management-BRIN, Regional Botanic Gardens, and all stakeholders for developing “Makoyana” as an Indonesian Botanic Garden online plant collection database. Gratitude is also expressed to PT Mitra Natura Raya, especially the management of the Bogor Botanical Gardens, for all forms of support in building the Quranic Plant Garden.

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