J. Biodivers. Conservation 9(3): 41-49 ISSN: 2457-0761 (online)
2025 http://www.aprfjournal.in

Review Article

Saprophytic Orchids of Asia: Diversity & Conservation

Bhagwati Prashad Sharma[1], Jeline Rani J[2], Arjun Patra[3], Gireesh Tripathi[4], Brajesh Kumar Sahu[5], Balkar Singh[6], Sugimani Marndi[7], Subhalakshmi Rout[7] and Jyoti Chauhan[8*]

[1]Department of Botany, Sidharth Government College, Nadaun, Himachal Pradesh, India

[2]Department of Botany, Bishop Heber College, Tiruchirappalli, Tamil Nadu, India

[3]Department of Botany, Prabhat Kumar College, Contai, West Bengal, India

[4]Department of Pharmacy, Shri Krishna University, Village Chowka, Sagar Road, Chhatarpur, Madhya Pradesh, India

[5]Department of Botany, P.M. College of Excellence, Government College Vidisha, Madhya Pradesh, India

[6]Department of Botany, Arya PG College, Panipat, Haryana, India

[7]Ambika Prasad Research Foundation, Odisha, India

[8]Institute of Integrated and Honors Studies, Kurukshetra University, Kurukshetra, Haryana, India

*E-mail: jyoti.botany@kuk.ac.in; ORCID: https://orcid.org/0009-0008-6225-0650

DOI: https://doi.org/10.5281/zenodo.16946661

Article Details: Received: 2024-06-21 | Accepted: 2025-08-26 | Available online: 2025-08-26

Abstract: Saprophytic orchids across Asia represent a distinctive group of plants adapted to low-light environments, deriving nutrients through parasitism of fungi linked to decaying organic material. These orchids inhabit a diverse range of habitats, from tropical rainforests to temperate mountain regions. Despite their intriguing biology and ecological significance, they face numerous threats, including habitat loss, climate change, and over-collection. This research emphasizes the diversity and conservation status of these orchids in Asia. It discusses their unique traits, ecological roles, and the main threats they encounter. Additionally, it reviews current conservation efforts such as scientific studies, habitat preservation, and community participation. Gaining insight into their diversity and conservation requirements will help protect these remarkable plants and maintain the region's ecological richness. The study aims to raise awareness about the importance of saprophytic orchids and the necessity for coordinated conservation actions to secure their future.

Keywords: Asia, conservation biology, orchid ecology, plant diversity, saprophytes

Introduction

Orchids are one of the most diverse and widespread plant families, comprising over 30,000 species found worldwide (Wei et al., 2023). Among these, saprophytic orchids are a unique group of plants that have adapted to live in environments with limited light, often thriving in shaded, humid habitats (Lee et

al., 2015). These plants have evolved to obtain their nutrients by parasitizing fungi associated with decaying organic matter, rather than through the process of photosynthesis (Selosse et al., 2010). Saprophytic orchids are fascinating examples of evolutionary adaptation and play a vital role in the ecosystems they inhabit (Zhang et al., 2018). In Asia, saprophytic orchids are found in a wide range of habitats, from tropical forests to temperate mountainous regions (Kirillova et al., 2022). The continent's diverse geography and climate support a rich variety of orchid species, many of which are endemic to specific regions (Gaskett and Gallagher, 2018). Saprophytic orchids in Asia are often characterized by their delicate, often inconspicuous flowers and their dependence on specific fungal associates (Suetsugu and Okada, 2025). These plants are an important part of the region's biodiversity, and their conservation is crucial for maintaining the health of ecosystems (Zhang et al., 2015). Despite their importance, saprophytic orchids in Asia face numerous threats to their survival. Habitat destruction, climate change, and over-collection are some of the major factors contributing to the decline of these plants (Swarts and Dixon, 2009). Many saprophytic orchid species are highly specific in their habitat requirements, making them particularly vulnerable to environmental changes. Conservation efforts are necessary to protect these unique plants and their habitats, not only for their intrinsic value but also for the ecosystem services they provide (Scramoncin et al., 2024). The diversity of saprophytic orchids in Asia is remarkable, with many species still undescribed or poorly understood. These plants often have complex relationships with their fungal associates and the surrounding environment, making them fascinating subjects for scientific study (Dearnaley, 2007). Understanding the ecology and biology of saprophytic orchids is essential for developing effective conservation strategies and protecting these plants from extinction (Fay et al., 2015). In recent years, there has been growing interest in the conservation of saprophytic orchids, driven in part by the recognition of their importance in ecosystems and the threats they face (Sahu et al., 2023). Efforts to study, protect, and conserve these plants are underway in several Asian countries, involving a range of stakeholders from scientists and conservationists to local communities (Phillips et al., 2020). These initiatives aim to raise awareness about the importance of saprophytic orchids and to develop effective strategies for their conservation (Selosse et al., 2010). The conservation of saprophytic orchids in Asia requires a multifaceted approach, incorporating scientific research, habitat protection, and community engagement (Fay et al., 2015). The present study sets the stage for a deeper exploration of the diversity and conservation of saprophytic orchids in Asia, illuminating their significance and the need for concerted conservation efforts. In short, saprophytic orchids in Asia are a fascinating group of plants that play a vital role in the region's ecosystems. Their diversity and conservation are critical issues that require attention and action from scientists, conservationists, and policymakers. By understanding and protecting these plants, work can be done towards preserving the rich biodiversity of Asia's natural habitats.

Methodology

A comprehensive survey of the existing literature on the diversity of the saprophytic orchids present worldwide was carried out, focusing on their availability and conservation strategies. A range of databases, including Govaerts et al., (2012) http://apps.kew.org/wcsp; Tropicos, (2012) www.tropicos.org; IPNI, (2012) www.ipni.org; and eFloras, (2012) www.efloras.org, were searched for

data collection. Relevant books and articles were reviewed to gather information on the diversity of saprophytic orchids such as Jalal and Jayanthi, (2012); Singh et al., (2019); Swami, (2016); Prasad et al., (2019); Qin et al., (2021); Suetsugu et al., (2025); Ahmed and Dhiman, (2023); Gogoi and Nyorak, (2021); Lee et al., (2015); Luo et al., (2021); Aoyama, (2008); FOC, (2025); Lok et al., (2009); Chowlu et al., (2025); and Wang et al., (2023).

Results and discussion

The study provided a detailed list of saprophytic orchids found across various regions, including India, China, Japan, Korea, and Southeast Asia. The data highlighted the diversity of saprophytic orchid species, comprising 46 species from 17 genera (Table 1). The table also showed the geographical distribution of each species, enabling an analysis of their ranges and overlaps. It also indicated that India hosts a significant number of saprophytic orchid species, especially in the northeastern regions such as Sikkim and Arunachal Pradesh. China and Japan also exhibited rich diversity, with several species endemic to these countries. Southeast Asian nations, like Indonesia, Malaysia, and the Philippines, also have a notable presence of saprophytic orchids. The data has been gathered from various sources, including research papers and books, demonstrating a growing interest in studying and documenting saprophytic orchids. Most references were from recent studies, emphasizing ongoing efforts to explore and understand the diversity of these unique plants. Documenting saprophytic orchids is vital for conservation, as many are rare and threatened by habitat loss and human activities. Many of these species have limited geographic ranges, making them susceptible to extinction. Documenting their distribution and diversity can guide conservation strategies, such as habitat preservation and species-specific plans. Additionally, studying these orchids can provide valuable insights into their unique biology and ecology, supporting efforts to protect these fascinating plants.

Table 1: Some saprophytic orchids of Asia

Name	Location	Source(s)
Aphyllorchis alpina	India, Nepal and China	Singh et al., (2019)
Aphyllorchis gollanii	India, China	Singh et al., (2019)
Aphyllorchis montana	India, Bhutan, Sri Lanka, China, Japan, Indonesia, Malaysia, Philippines, Thailand	Swami, (2016); Singh et al., (2019); Prasad et al., (2019)
Aphyllorchis vaginata	India, China	Singh et al., (2019)
Aphyllorchis yachangensis	China	Qin et al., (2021)
Apostasia wallichii	Malaysian Borneo	Suetsugu et al., (2025)
Chamaegastrodia asraoa	India, Bhutan	Singh et al., (2019)
Chamaegastrodia shikokiana	India, China, Japan, Korea	Singh et al., (2019)
Corallorhiza trifida	India, Nepal, China, Japan, Korea, Russia, Europe, North America	Singh et al., (2019)

Crepidium aphyllum	India, Sikkim	Singh et al., (2019)
Crepidium saprophytum	India, Sikkim	Singh et al., (2019)
Cymbidium hengbungense	India	Singh et al., (2019)
Cymbidium macrorhizon	India	Swami, (2016)
Cyrtosia falconeri (Figure 1)	India	Ahmed and Dhiman, (2023)
Cyrtosia integra	India	Gogoi and Nyorak, (2021)
Cyrtosia javanica	India, Taiwan, Sri Lanka, China, Indonesia	Lee et al., (2015); Singh et al., (2019)
Cyrtosia nana	India	Singh et al., (2019)
Danxiaorchis yangii	China	Luo et al., (2021)
Didymoplexis himalaica	India	Singh et al., (2019)
Didymoplexis pallens	India, Nepal, Sri Lanka, China, Japan	Singh et al., (2019); Prasad et al., (2019)
Epipogium aphyllum	India, Nepal	Swami, (2016)
Epipogium japonicum	Japan	Aoyama, (2008)
Epipogium roseum (Figure 2)	India, Nepal	Swami, (2016)
Erythrorchis altissima	India, Myanmar, Indonesia, Japan, Malaysia	Singh et al., (2019)
Eulophia zollingeri	China	FOC, (2025)
Galeola cathcartii	India, Thailand	Singh et al., (2019)
Galeola falconeri	India, Nepal	Swami, (2016)
Galeola lindleyana	India, Nepal	Swami, (2016)
Galeola nudifolia	India, Bhutan, China	Singh et al., (2019)
Gastrodia appendiculata	Taiwan	Lee et al., (2015)
Gastrodia arunanchalensis	India	Singh et al., (2019)
Gastrodia dyeriana	India	Swami, (2016)
Gastrodia elata	India, Nepal	Swami, (2016)
Gastrodia exilis	India	Swami, (2016)
Gastrodia falconeri	India, Nepal	Singh et al., (2019)
Gastrodia flabilabella	Taiwan	Lee et al., (2015)
Gastrodia fontinalis	Taiwan	Lee et al., (2015)
Gastrodia javanica	Singapore	Lok et al., (2009)
Gastrodia lohitensis	India	Chowlu et al., (2025)
Gastrodia mishmensis	India	Singh et al., (2019)
Gastrodia nantoensis	Taiwan	Lee et al., (2015)
Gastrodia silentvalleyana	India	Singh et al., (2019)
Lecanorchis sikkimensis	India	Singh et al., (2019)
Lecanorchis taiwaniana	Laos	Suetsugu et al., (2018)
Lecanorchis thalassica	Taiwan	Lee et al., (2015)

Neottia acuminata	India, Nepal, Japan,	Singh et al., (2019)
Neottia asiatica	Japan	Aoyama, (2008)
Neottia bifidus	China	Wang et al., (2023)
Neottia listeroides	India, Bhutan, Nepal	Swami, (2016); Singh et al., (2019)
Neottia mackinnonii	India	Singh et al., (2019)
Neottia microglottis	India	Singh et al., (2019)
Neottia pantlingii	India, Bhutan	Singh et al., (2019)
Odontochilus poilanei	India	Swami, (2016)
Risleya atropurpurea	India, Bhutan, China, Myanmar	Singh et al., (2019)
Stereosandra javanica	India, China, Indonesia, Japan, Malaysia	Singh et al., (2019)
Stigmatodactylus paradoxus	India	Singh et al., (2019)
Stigmatodactylus serratus	India	Singh et al., (2019)
Yoania japonica	India, China, Japan	Singh et al., (2019)
Yoania prainii	India	Swami, (2016); Singh et al., (2019)

Figure 1. Flowers of *Cyrtosia falconeri* (Photo Credit: Dr. Balkar Singh)

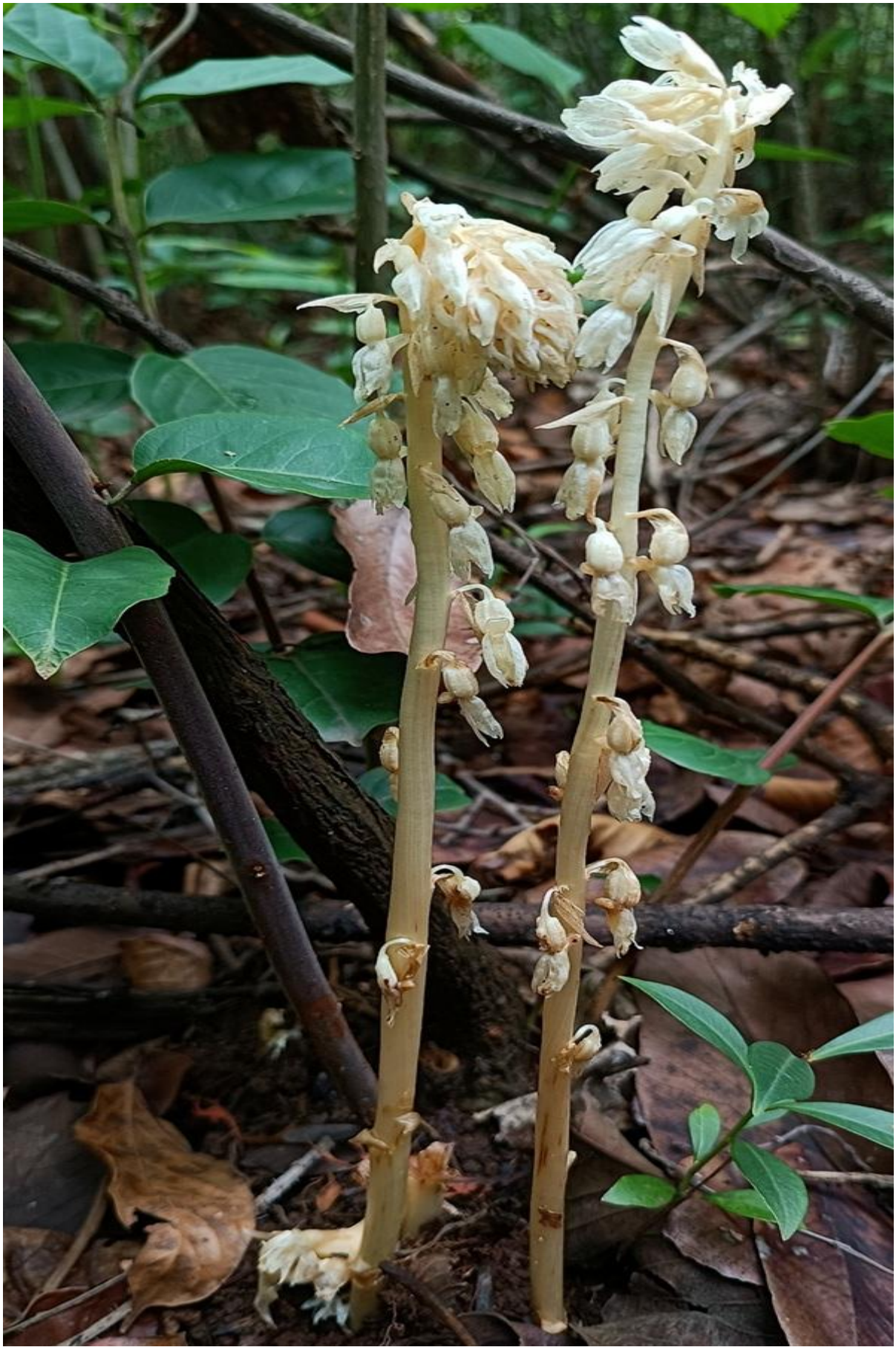

Figure 2. Saprophytic orchid, *Epipogium roseum,* in the wild

Conclusion

Saprophytic orchids of Asia are a unique and fascinating group of plants that play a vital role in the ecosystem of any region. Their diversity and adaptability enable them to thrive in various habitats, from tropical forests to temperate mountainous areas. However, these plants face numerous threats, including habitat destruction, climate change, and over-collection. Recognizing their importance and taking concerted action to protect them is essential. Conservation efforts are crucial for preserving the diversity of saprophytic orchids in Asia, which can be achieved through scientific research, habitat protection, and community engagement. By understanding their ecology and biology, there can be development of effective strategies to conserve them and prevent extinction. Protecting their habitats and engaging local communities can help ensure their long-term survival. The conservation of saprophytic orchids in Asia is not only crucial for the plants themselves but also for the ecosystems they support. These plants help maintain ecosystem balance, and their loss could have significant environmental impacts. Protecting these orchids helps preserve regional biodiversity and ecosystems. Ultimately, conserving saprophytic orchids in Asia requires collaboration among scientists, conservationists, policymakers, and local communities.

References

Ahmed M and Dhiman M. (2023). *Cyrtosia falconeri* (Hook.f.) Aver. (Orchidaceae): an addition to the flora of Jammu & Kashmir, India. Journal of Threatened Taxa. 15(3): 22916–22919.

Aoyama M. (2008). Cytological studies on two saprophytic orchid species of *Neottia asiatica* Ohwi and *Epipogium japonicum* Makino. Chromosome Botany. 3: 49-52.

Chowlu K, Tsering J, Ray A, Rao AN, Pertin A, Dash SS and Kabeer A. (2025). *Gastrodia lohitensis* sp. nov. (Orchidaceae, Epidendroideae) from India. Nordic Journal of Botany. 2025(1): e04556. https://doi.org/10.1111/njb.04556

Dearnaley J. (2007). Further advances in orchid mycorrhizal research. Mycorrhiza. 17(6): 475-486.

Fay MF, Pailler T and Dixon KW. (2015). Orchid conservation: making the links. Annals of Botany. 116(3): 377–379. https://doi.org/10.1093/aob/mcv142

FOC (Flora of China)- *Eulophia zollingeri*. 25: 253-254. Retrieved 25 March 2025.

Gaskett AC and Gallagher RV. (2018). Orchid diversity: spatial and climatic patterns from herbarium records. Ecology and Evolution. 8(22): 11235–11245. https://doi.org/10.1002/ece3.4598

Gogoi K and Nyorak J. (2021). *Cyrtosia integra* (Orchidaceae) - a new addition to the orchid flora of India from Arunachal Pradesh. Richardiana. 5: 343-348.

Jalal JS and Jayanthi J. (2012). Endemic orchids of peninsular India: a review. Journal of Threatened Taxa. 4(15): 3415–3425.

Kirillova IA, Dubrovskiy YA, Degteva SV and Novakovskiy AB. (2022). Ecological and habitat ranges of orchids in the northernmost regions of their distribution areas: A case study from Ural Mountains, Russia. Plant Diversity. 45(2): 211–218. https://doi.org/10.1016/j.pld.2022.08.005

Lee YI, Yang CK and Gebauer G. (2015). The importance of associations with saprotrophic non-Rhizoctonia fungi among fully mycoheterotrophic orchids is currently under-estimated: novel evidence from sub-tropical Asia. Annals of Botany. 116(3): 423–435. https://doi.org/10.1093/aob/mcv085

Lok AFSL, Ang WF and Tan HTW. (2009). The status of *Gastrodia javanica* (Bl.) Lindl. in Singapore. Nature in Singapore. 2: 415-419.

Luo H, Xiao H, Liang Y, Liu N, Turner C, Tan S, Chen X, Xiong D and Yang B. (2021). Batesian mimicry in the nonrewarding saprophytic orchid *Danxiaorchis yangii*. Ecology and Evolution. 11(6): 2524-2534.

Phillips RD, Reiter N and Peakall R. (2020). Orchid conservation: from theory to practice. Annals of Botany. 126(3): 345–362. https://doi.org/10.1093/aob/mcaa093

Prasad K, Karuppusamy S and Pullaiah T. (2019). Orchids of Eastern Ghats (India). Scientific Publishers, India.

Qin Y, Chen H, Deng Z and Liu Y. (2021). *Aphyllorchis yachangensis* (Orchidaceae), a new holomycotrophic orchid from China. PhytoKeys. 179: 91-97.

Sahu JK, Jatav R, Joshi NH, Marndi S and Kumar S. (2023). Ecologically and medicinally important Orchidsand their conservation strategies. In: Verma RK, Sahu BK, Malhotra C, Bhattarai B and Kumar S (eds). (2023). Medico-Biowealth of India, Volume 10. Ambika Prasad Research Foundation, Odisha, India.

Scramoncin L, Gerdol R and Brancaleoni L. (2024). How effective is environmental protection for ensuring the vitality of wild orchid species? a case study of a protected area in Italy. Plants (Basel, Switzerland). 13(5): 610. https://doi.org/10.3390/plants13050610

Selosse MA, Martos F, Perry BA, Padamsee M, Roy M and Pailler T. (2010). Saprotrophic fungal mycorrhizal symbionts in achlorophyllous orchids: finding treasures among the 'molecular scraps'? Plant Signaling and Behavior. 5(4): 349–353. https://doi.org/10.4161/psb.5.4.10791

Singh SK, Agrawala DK, Jalal JS, Dash SS, Mao AA and Singh P. (2019). Orchids of India - A Pictorial Guide. Botanical Survey of India, Kolkata.

Suetsugu K and Okada H. (2025). Subterranean morphology underpins the degree of mycoheterotrophy, mycorrhizal associations, and plant vigor in a green orchid *Oreorchis patens*. The Plant Journal: for cell and molecular biology. 121(4): e70045. https://doi.org/10.1111/tpj.70045

Suetsugu K, Okada H, Suleiman M and Tsukaya H. (2025). Partial mycoheterotrophy in *Apostasia wallichii*, an early-diverging Asian tropical orchid. Plant Biology. 27(4): 614-621.

Suetsugu K, Souladeth P, Tagane S and Yahara T. (2018). First record of the mycoheterotrophic orchid *Lecanorchis taiwaniana* from Nam Ha National Protected area, Northern Laos. Acta Phytotaxa Geobotany. 69(2):139–141.

Swami N. (2016). Terrestrial Orchids. Thomson Press India Limited, Faridabad, Haryana, India.

Swarts ND and Dixon KW. (2009). Terrestrial orchid conservation in the age of extinction. Annals of Botany. 104(3): 543–556. https://doi.org/10.1093/aob/mcp025

Wang MN, Wu XY, Tan CJ, Yu P, Rao WH, Chen JS, Li J and Chen JB. (2023). *Neottia bifidus* (Orchidaceae, Epidendroideae, Neottieae), a new mycoheterotrophic species from Guizhou, China. PhytoKeys. 229: 215-227.

Wei Y, Jin J, Lin Z, Lu C, Gao J, Li J, Xie Q, Zhu W, Zhu G and Yang F. (2023). Genome-wide identification, expression, and molecular characterization of the CONSTANS-like gene family in seven orchid species. International Journal of Molecular Sciences. 24(23): 16825. https://doi.org/10.3390/ijms242316825

Zhang S, Yang Y, Li J, Qin J, Zhang W, Huang W and Hu H. (2018). Physiological diversity of orchids. Plant Diversity. 40(4): 196–208. https://doi.org/10.1016/j.pld.2018.06.003

Zhang SB, Chen WY, Huang JL, Bi YF and Yang XF. (2015). Orchid species richness along elevational and environmental gradients in Yunnan, China. PloS One. 10(11): e0142621. https://doi.org/10.1371/journal.pone.0142621