

Ethnobotany of Mountain Regions

Series Editors:

R. W. Bussmann · N. Y. Paniagua-Zambrana

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F. Merlin Franco *Editor*

Ethnobotany of the Mountain Regions of Southeast Asia

 Springer

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Series Editors

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Saving Knowledge
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Ethnobotanical research in recent years has increasingly shifted into applied aspects of the discipline, including climate change research, conservation, and sustainable development. It has by now widely been recognized that “traditional” knowledge is always in flux and adapting to a quickly changing environment. Trends of globalization, especially the globalization of plant markets, have greatly influenced how plant resources are managed nowadays. While ethnobotanical studies are now available from many regions of the world, no comprehensive encyclopedic series focusing on the worlds mountain regions is available in the market. Scholars in plant sciences worldwide will be interested in this website and its dynamic content.

The field (and thus the market) of ethnobotany and ethnopharmacology has grown considerably in recent years. Student interest is on the rise, attendance at professional conferences has grown steadily, and the number of professionals calling themselves ethnobotanists has increased significantly (the various societies—Society for Economic Botany, International Society of Ethnopharmacology, Society of Ethnobiology, International Society for Ethnobiology, and many regional and national societies in the field currently have thousands of members). Growth has been most robust in BRIC countries.

The objective of this new series on Ethnobotany of Mountain Regions is to take advantage of the increasing international interest and scholarship in the field of mountain research. We anticipate including the best and latest research on a full range of descriptive, methodological, theoretical, and applied research on the most important plants for each region. Each contribution will be scientifically rigorous and contribute to the overall field of study.

More information about this series at <http://www.springer.com/series/15885>

F. Merlin Franco
Editor

Ethnobotany of the Mountain Regions of Southeast Asia

With 418 Figures and 1 Table

 Springer

Editor

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Dedicated to the folk healers of Southeast Asia

Preface

Plants assume ethnobotanical importance only when they are associated with human societies. Use of plants as medicine, food, fodder, and cultural purposes all happen in specific cultural and landscape contexts. This is a major factor often ignored by biologists studying human-plant relationship. Touting a plant as an ethnobotanically important one without providing adequate information on the societies that use them, or the context of use, distorts the picture. Chapters included in this volume provide comprehensive information on the medicinal, food, cultural, and phytochemical values of selected plant species, along with the cultural context. Gleaning out these information from published literature was not an easy task as a good percentage of published articles merely mention the plant use without specifying the community and context of its use. Also, most literature do not provide an understanding on how plant use has changed over times. Our authors have taken extra care to ensure that these information are presented, wherever possible. Another highlight of this volume is that majority of our contributing authors are budding ethnobiologists. These youngsters are poised to emerge as torch bearers of ethnobiology in Southeast Asia, and the larger Asian continent. We hope that this volume would serve as an important reference material for academics, plant lovers, and members of local communities of Southeast Asia.

Acknowledgments

This volume took birth with an invitation from Rainer W. Bussmann and Narel Y. Paniagua-Zambrana, series editors of *Ethnobotany of Mountain Regions*. I thank both of them for providing me the opportunity to edit the volume and also the freedom to include sections on biocultural importance of the selected species.

I express my sincere gratitude to all individual authors who have contributed to this volume. However, I should specifically place on record the important role played by Anisatu Z. Wakhidah, a young ethnobiologist from Indonesia. Her entry into the project came at a time when we had suffered a major setback with a few authors dropping out. She had helped me network with other ethnobiologists from Indonesia. Without her, this project would have taken longer to complete.

For this volume, I had the privilege to work with an extremely efficient team at Springer Nature including Eric Stannard, Johanna Klute, and Sylvia Blago. The experience and patience of Johanna and Sylvia helped a lot in troubleshooting various unforeseen glitches that arose especially during the initial stages of the project.

Special thanks to D. Narasimhan, former professor of botany at Madras Christian College, Chennai, and Santhana Ganesan of Singapore Botanical Gardens for their moral support and encouragement.

I thank the Institute of Asian Studies at Universiti Brunei Darussalam for supporting me throughout this project. Though ethnobiology is an interdisciplinary subject, in Asia it is often considered as a part of the natural sciences due to the domination of a bioprospecting narrative. I am indebted to my home institute for appreciating the interdisciplinary value of this project and permitting me to work on this.

F. Merlin Franco

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Photographs and Findings 1137



Nothofagus starkenborghiorum Steenis

NOTHOFAGACEAE

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Synonyms

Trisyngyne starkenborghiorum (Steenis) Heenan & Smissen

Local Names

Indonesia: *Sagé, sagé merah* (Wamena, Papua, Indonesian New Guinea), *kayu sagé, kayu sagé merah* (Indonesian).

Botany and Ecology

Description: *Nothofagus starkenborghiorum* is apparently a monoecious tree up to over 30 m tall, over 1 m diameter (Fig. 1). Twigs minutely puberulous, glabrescent. Perule minute. Leaves oblong, sub-coriaceous, 3–3.5 by 1.25–2.25 cm, generally ca. 2.5 times as long as broad, flat, tip emarginated, base broad-cuneate, margin cartilaginous, feebly recurved; midrib sulcate on the upper surface, without an elevated ridge, strongly prominent beneath; nerves ca. 6–8 pairs, indistinct on both sides; reticulations indistinct on the upper surface, somewhat prominent on the lower surface; glands on the lower surface ca. 0.5–1 mm, spaced. Petioles 4.5–7 mm, terete, upper surface sulcate with an elevated ridge. Stipules peltate, ovate, not very soon caducous, 2.5–4 by 1–2.5 mm. Staminate flowers (all detached) in recurved triads; pedicels nearly free from the base or over 2 mm connate in a short peduncle; constricted basal portion of the perianth angled, ca. 2 mm long, minutely hairy; perianth above the constriction campanulate tubular, truncate, 2–4 mm high or more

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Fig. 1 *Nothofagus starkenborghiorum*.
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tubular 4–5 mm high. Stamens ca. 12; stamina column reaching halfway the perianth-tube, filaments minutely hairy; anthers ca. 3 mm, nearly 0.75 mm broad when open, apex and base minutely papillose-hairy, connective thickened-apiculate. Pistillate inflorescence erect. Cupule ca. 3–4 mm, stalked, rounded, 7–9 mm diameter; lamellae 2 or 3. Pistillate flower broad-elliptic or roundish, ca. 6–4 mm, rather broadly winged, wings surrounding the basal part of the style; style 0.5–1.25 mm.

Phenology: The flowering and fruiting time are observed from October to November (Van Steenis 1953; Van Royen 1980; Keim et al. 2018).

Distribution and Habitat: *Nothofagus starkenborghiorum* was previously known as an endemic species of highland New Guinea, particularly within the Jayawijaya Range in the Indonesian part of mainland New Guinea (Van Steenis 1952, 1953). The distribution has been extended into New Britain Island in the Bismarck Archipelago, Papua New Guinea, by Heenan and Smissen (2013) as *Trisyngyne starkenborghiorum*. *Nothofagus starkenborghiorum* is one of the two principal species (the other is *N. brassii*) of the genus found in the upper montane forest around Lake Habbema in the Jayawijaya Range at about 2000–3000 m altitude, and the mossy forest at around 3000–3500 m altitude (Fig. 2) (Van Steenis 1953; Van Royen 1980; Keim et al. 2018). The species is more commonly found in the upper montane forest, whereas *N. brassii* is more adapted to the higher altitudes and predominantly occupy the mossy forest near Lake Habbema (Van Steenis 1953; Read and Hope 1996). Nevertheless, the two species are more frequently found cohabiting (Keim et al. 2018).

Fig. 2 *Nothofagus starkenborghiorum* is found in the upper montane forest around Lake Habbema in the Jayawijaya Range at about 2000–3000 m altitude. (© Ary P. Keim)



Local Medicinal Uses

Indonesia: Keim et al. (2018) recorded that the Dhani of Baliem Valley, Jayawijaya, believe that the leaves and barks of *sage* (refers to both *N. starkenborghiorum* and *N. brassii*) cure many chronic illnesses with symptoms clinically resembling cancer and degenerative sicknesses. This is apparently one of the reason Lake Habbema has been regarded sacred by the Dani people.

Phytochemistry

Nothofagus starkenborghiorum may contain the same chemical constituent found in *N. fusca* from New Zealand, Nothofaganin (see Hills and Inoue 1967). Nothofaganin is a dihydrochalcone, which is a C-linked phloretin glucoside and a phenolic antioxidant (Hills and Inoue 1967). This could be factor responsible for its efficacy as a traditional medicine (see Keim et al. 2018).

Biocultural Importance

Indonesia: *Nothofagus starkenborghiorum* is a massive-robust tall tree with the distinctive bright reddish-brown young leaves, outer wood rose colored (hence the origin of the vernacular name *sage merah*, in Indonesian *merah* means red; thus red *sage*), and brown inner wood. The Dani people regard the wood of *N. starkenborghiorum* as exceptionally important and employ it for building houses and fences (Powell 1976; Milliken 2006). The Dani regard the wood as sacred that links them with their predecessors (personal observation). Also, the Dani people

Fig. 3 Wood of *Nothofagus starckenborghiorum*.
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regard *N. starckenborghiorum* as less sacred than *N. brassii* or the black *sage* (personal observation). The reason for this is unknown. It is suggested to be related with the fact that the wood of *N. starckenborghiorum* is regarded by the Dani as unsuitable for fuel, in accordance with the result of the study done by Milliken (2006) with the Yali people. On the contrary, the wood of *N. brassii* is one of the best fuels (fire wood) known to the Dani.

Economic Importance

Indonesia: The wood of *N. starckenborghiorum* have been harvested for timber. It is an extraordinarily good building material (Fig. 3), and in the past 10 years, the species have experienced massive illegal logging (Keim et al. 2018). Hence, the population of the species is rapidly declining; the “Near Threatened” status accorded to it in the IUCN Red List (see Baldwin et al. 2018) might have to revised to “Threatened”.

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