Ethnobotany of Mountain Regions
Series Editors:
R. W. Bussmann · N. Y. Paniagua-Zambrana

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Ethnobotany of the Mountain Regions of Southeast Asia

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La Paz, Bolivia

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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.

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Editor

Ethnobotany of the Mountain Regions of Southeast Asia

With 418 Figures and 1 Table

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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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Nothofagus brassii Steenis
Nothofagaceae

Ary Prihardhyanto Keim and Wawan Sujarwo

Synonyms

Nothofagus recurva Steenis; *Trisyngyne brassii* (Steenis) Heenan & Smissen; *Trisyngyne recurva* (Steenis) Heenan & Smissen

Local Names

Indonesia: *Sagé, sagé hitam* (Wamena, Papua, Indonesian New Guinea), *sahé* (Yali, Papua, Indonesian New Guinea), *kayu sagé, kayu sagé hitam* (Indonesian).

Botany and Ecology

Description: *Nothofagus brassii* is a monoecious tree up to 40 m in height, and over 1 m diameter; twigs coarse, faintly zigzag, internodes slightly flattened (Fig. 1). Perules ovate, ca. 4 mm. Leaves elliptic-oblong, 3.5–5.5 by 1.5–2.25 cm, entire hard-coriaceous, the margin strongly recurved, upper surface glossy, apex somewhat acutish; midrib strongly prominent underneath, terete, on the upper surface sulcate with a prominent ridge; primary nerves 7 or 8 pairs, slightly sunken on the upper surface, distinct but faintly prominent underneath; reticulations on the upper surface absent, indistinct underneath; glands distinct on the lower surface, 0.5–0.75 mm spaced. Petiole stout, ca. 0.5 cm. Stipules peltate, acute-oblong, 5–6 by 2.5 mm, early caducous, attached in the lower part. Male flowers in triads, orange, rather

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Fig. 1 *Nothofagus brassii.* (© Ary P. Keim)

tubular, more or less sessile, limb truncate 3-toothed; anthers about 15. Pistillate inflorescence erect, peduncled; flowers 3 (1 or 2 laterals sometimes abortive and sterile), ovate, wings surrounding the style-base; style 1–2.5 mm. Cupule about as large as the pistillate flowers, roundish, split halfway down, when young about 1 cm peduncled, and 1 cm broad, later when ripe ca. 1.25 cm peduncled, ca. 1.5 cm through, distinctly 4–5 lamellate, thick woody. Nuts very different in shape by mutual pressure, often partly abortive, ovate to broad-ovate or suborbicular, distinctly winged towards the apex, averaging 6 by 6–9 by 6 mm, the largest ones ovate, 10 by 6 mm inclusive of apical wings.

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 brassii* is as an endemic species of highland New Guinea, particularly the Jayawijaya Range in the Indonesian part of mainland New Guinea (Van Steenis 1952, 1953). The species is one of the two species (the other is *N. starkenborghiorum*) of the genus found in the upper montane forest around Lake Habbema in the Jayawijaya Range at about 2000–3000 m above sea level altitude, and in the mossy forest at around 3000–3500 m above sea level altitude (Fig. 2) (Van Steenis 1953; Van Royen 1980; Keim et al. 2018). *Nothofagus*

Fig. 2 *Nothofagus brassii* is found in the upper montane forest around Lake Habbema in the Jayawijaya Range. (© Ary P. Keim)

brassii is more commonly found in higher altitudes than *N. starkenborghiorum* and dominates the mossy forest (Van Steenis 1953; Read and Hope 1996).

Local Medicinal Uses

Indonesia: Keim et al. (2018) recorded that the Dani of Baliem Valley in Jayawijaya believe use the leaves and barks of *N. brassii* to cure many illnesses that are difficult to be cured by other traditional medicines. The symptoms of such illnesses clinically resemble cancer and degenerative sicknesses. Perhaps, this is the reason behind the sacred notions attached to Lake Habbema by the Dhani people, and it is the only part in New Guinea that is not culturally claimed by any tribes in Jayawijaya.

Phytochemistry

Nothofagus brassii may contain the same chemical constituent found in *N. fusca* from New Zealand, Nothofagin (see Hills and Inoue 1967). Nothofagin is a dihydrochalcone, which is a C-linked phloretin glucoside and a phenolic antioxidant

(Hills and Inoue 1967). This possibly forms the basis for its use in traditional medicine by the Dhani of the Baliem Valley (see Keim et al. 2018). *N. brassii* is a promising source of antioxidant from the highlands of New Guinea.

Local Food Uses

Indonesia: The fruits are not eaten by humans although the Dhani mention that the fruits are eaten by wild mammals most likely species of kangaroo, which are also found in highlands of New Guinea (Hope 1976). Keim et al. (2018) spotted a taxon of small kangaroo identified as a possible individual of *Thylogale browni* (Macropodidae). The people of Ndumba, Papua New Guinea, harvest the large white edible grubs living in the rotting trunks, and edible fungi at the base of a species of *Nothofagus*, presumably also from *N. brassii* (see Hays 1980; Milliken 2006).

Biocultural Importance

Indonesia: *Nothofagus brassii* is massive-robust tall tree with the distinctive bright reddish brown young leaves, outer wood brown, dark brown to blackish brown. Hence the origin of the vernacular name *sagé hitam* (*hitam* = black; thus Black Sagé). The Dani people regard the wood of *N. brassii* (known to them as sage or black sage) as exceptionally important and use it for building houses and fences. The Dani regard the wood as a sacred link between their people and their ancestors (personal observation). The wood of *N. brassii* has never been used for building livestock fences, even for pigs despite the fact that pigs are extremely important for the people of New Guinea, including the Dani (Rappaport 1968).

Economic Importance

Indonesia: The timbers of *N. brassii* have been harvested for woods (Fig. 3). The wood is regarded as a good building material. In the past decade, the species has experienced massive logging (mostly illegal) including the populations in the Lorentz National Park (Keim et al. 2018). The threat has turned even bigger in recent years as Wamena has developed into a cosmopolitan town, and the District of Jayawijaya has been divided into several new districts, increasing demand for wood. The Trans New Guinea highway that connects Wamena to Nduga in the south through the National Park including the Lake Habbema is nearing completion, which would make access to the park easier. Thus, the possibility of exporting the wood outside Jayawijaya in the near future looms large. The recent developments warrant a revision of the Near Threatened status, accorded to it in the IUCN Red List (Baldwin et al. 2018), to Threatened.

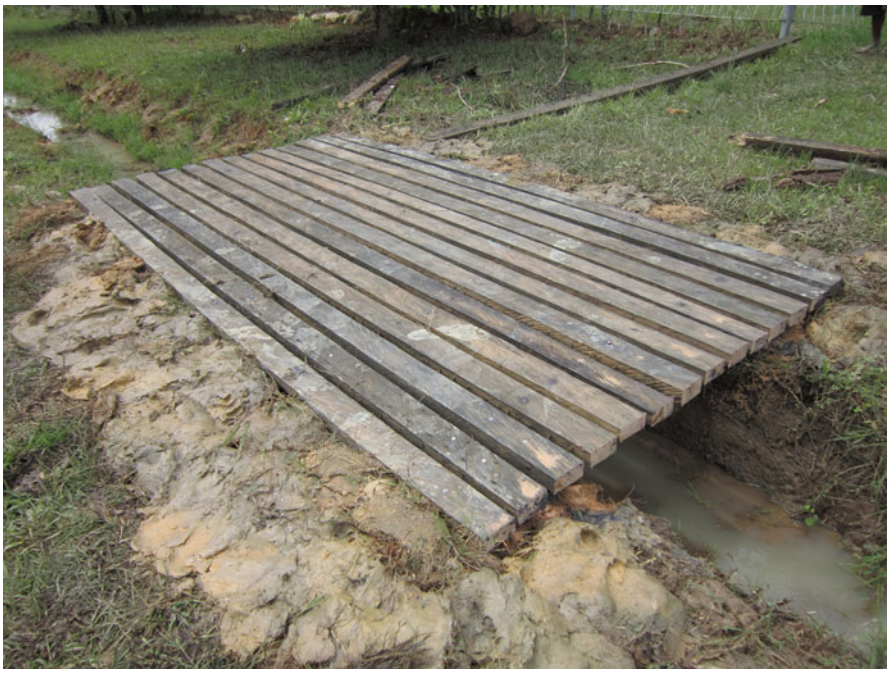

Fig. 3 Wood used in bridge construction. (© Ary P. Keim)

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