

Research paper

Alnus nepalensis D. Don (Betulaceae), a Newly Naturalized Tree in Taiwan

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【Abstract】 We document the naturalization of *Alnus nepalensis* D. Don (Betulaceae), native to southern Himalaya from Pakistan to southwest China, has been found at middle altitude in central Taiwan. A taxonomic treatment, line drawings, color photographs, and distributions are provided to aid in identification of this alien tree. A detailed comparison table between *A. nepalensis* D. Don and *A. formosana* (Burkill ex Forbes & Hemsl.) Makino are also provided.

【Key words】 Betulaceae, *Alnus nepalensis*, Taxonomy, Naturalized plant, Taiwan.

研究報告

臺灣新歸化樺木科植物—尼泊爾赤楊

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【摘要】 本文首次報導原產亞洲喜馬拉雅山脈南部及中國大陸西南部的尼泊爾赤楊 (*Alnus nepalensis* D. Don)，目前已歸化於台灣中部南投中海拔山區。本文描述其形態特徵、地理分布及生育地環境，並提供彩色圖片與線繪圖以資辨識。本種與台灣原生種台灣赤楊 (*A. formosana* (Burkill ex Forbes & Hemsl.) Makino) 近似，但與後者主要的區別在於前者具大型葉片、8-16對側脈及圓錐花序。近年來進行調查時，發現其野外族群穩定成長、更新良好。

【關鍵詞】 樺木科、尼泊爾赤楊、歸化植物、臺灣

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INTRODUCTION

Plant naturalizations are more and more common in Taiwan. In the past 6 years (2002-2008), 77 species naturalized to Taiwan have been published, the naturalization rate of 12.8 is an 3.47-fold increase over the pre-2002 period (3.68 species/year) (Wu *et al.*, 2010). In this study we report yet another alien plant, *Alnus nepalensis* D. Don on this island. This tropical tree is native to South Asia from Pakistan, through Nepal, northern India, Bhutan, Burma to southwest China (Neil, 1970; Li & Cheng, 1979; Lamichhane, 1984). There wasn't any *information* about *A. nepalensis* before (Liao, 1996; Lu *et al.*, 2006), but now we can find wild populations of this tree has regenerated at 1,600 m elevation on the open areas in central Taiwan.

The genus *Alnus* Miller (Betulaceae) comprises 40 species that are mainly distributed in Asia, Europe, North and South America. A total of 10 species has been found in China (Li & Cheng, 1979; Li & Skvortsov, 1999). One species, *A. formosana* (Burkill ex Forbes & Hemsl.) Makino, is previously recognized in the second edition of Flora of Taiwan (Liao, 1996). This represented the first confirmed report of the naturalized species in Taiwan.

TAXONOMIC TREATMENT

Alnus nepalensis D. Don. Prodr. Fl. Nepal. 58. 1825

尼泊爾赤楊 Fig. 1. 2. & 3.

Deciduous trees, 40 m tall; bark gray or dark gray, smooth. Branchlets dark brown, sparsely yellow pubescent when young, glabrescent. Buds stipitate, with 2 glabrous, ribbed scales. Petiole

robust, 1-2.5 cm, subglabrous; leaf blade obovate-lanceolate, obovate-oblong, ovate, or elliptic, 4-16 × 2.5-10 cm, abaxially with dense, resinous glands, yellow pubescent along veins, bearded in axils of lateral veins, adaxially glabrous, base cuneate or broadly cuneate, rarely subrounded, margin entire or remotely minutely serrate, apex abrupt or acute, rarely acuminate; lateral veins 8-16 on each side of midvein. Female inflorescences numerous, in a panicle, ellipsoid, 2-2.2 cm × 7-8 mm; peduncle robust, 2-8 mm, glabrous; bracts ca. 4 mm, woody, persistent, base cuneate, apex rounded, 5-lobed. Nutlet oblong, ca. 2 mm, with membranous wings ca. 1/2 as wide as nutlet. Fl. May-Jun, fr. Jul-Sep. (Li & Skvortsov, 1999).

Specimens examined: Taiwan. Nantou County (南投縣). Hsinyi Township (信義鄉), Suanglong Forest Road (雙龍林道) 15Km. 11 Oct. 2010, Tseng 5097 (TCF).

Notes: *Alnus nepalensis* D. Don closely resembles *A. formosana* (Burkill ex Forbes & Hemsl.) Makino, but it is distinguished from the latter by its female inflorescences in a panicle and lateral veins 8-16 pairs (vs. female inflorescences in a raceme and lateral veins 6-7 pairs). (Table 1). *A. nepalensis* D. Don is native to South Asia from Pakistan, through Nepal, northern India, Bhutan, Burma to southwest China (Neil, 1970; Li & Cheng, 1979; Lamichhane, 1984). In Taiwan it has naturalized for many years at open collapse areas, forming wild populations has been adapted and regenerated stably to the central mountainous regions about 1,600 m in elevation (Fig. 3). It flowers from May to June and sets fruits from July to September.

Table 1. Comparison of *Alnus nepalensis* D. Don and *A. formosana* (Burkill ex Forbes & Hemsl.) Makino

	<i>Alnus nepalensis</i>	<i>A. formosana</i>
Leaves		
Size (cm)	10-16 × 5-10	6-12 × 2-5
Shape	obovate to elliptic	lanceolate-oblong
Margin	entire or minutely serrate	serrate
Lateral veins	8-16 pairs	6-7 pairs
Female inflorescences	panicle	raceme
Peduncle	2-8 mm	3-5 mm

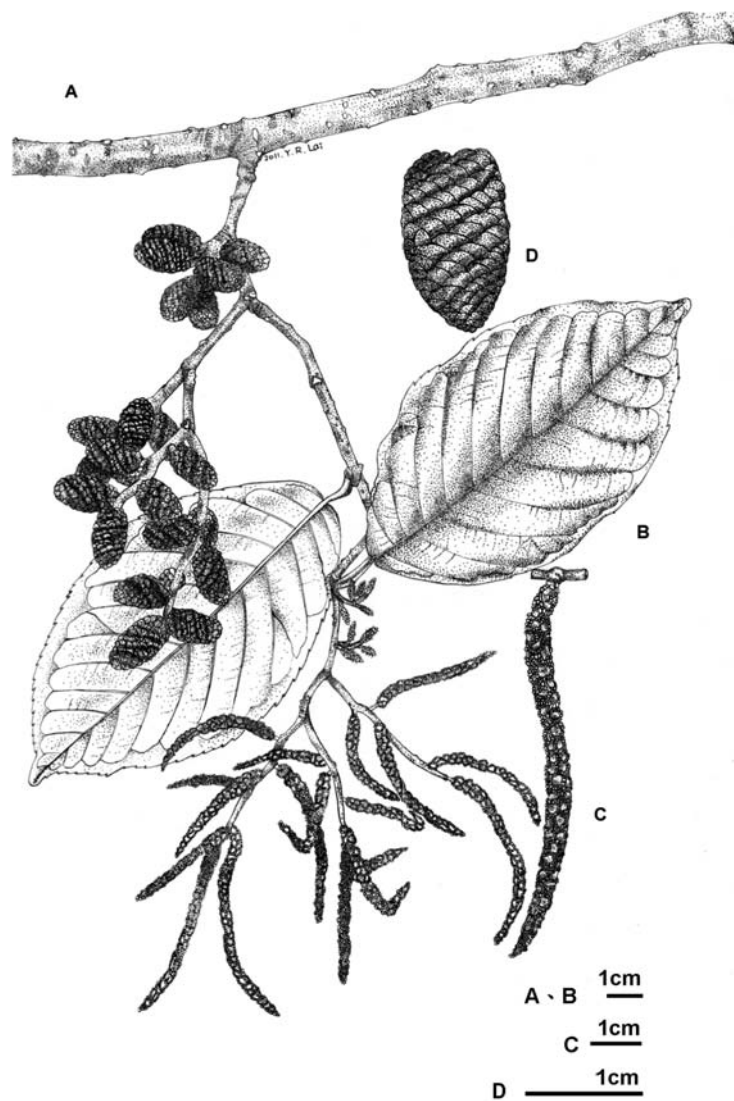


Fig. 1. *Alnus nepalensis* D. Don A: Habit. B: Leaf. C: Inflorescence, male. D: Fruiting spike.

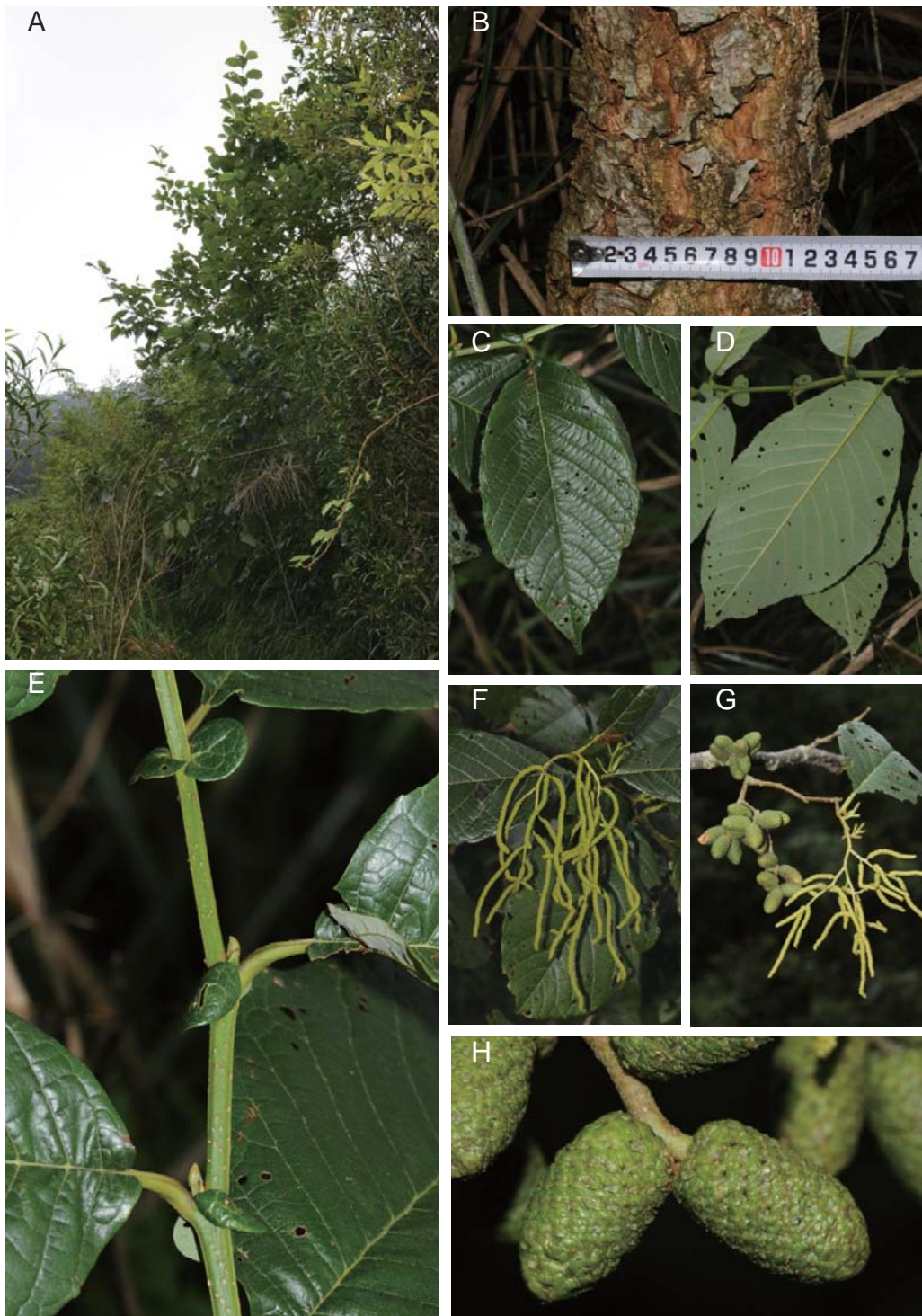


Fig. 2. *Alnus nepalensis* D. Don A: Habitat. B: Stem. C: Leaf, adaxial surface. D: Leaf, abaxial surface. E: Stipule. F: Inflorescence, male. G: Inflorescence, monoecious. H. Fruiting spike.



Fig. 3. Voucher specimen of *Alnus nepalensis* D. Don (Tseng 5097, TCF).

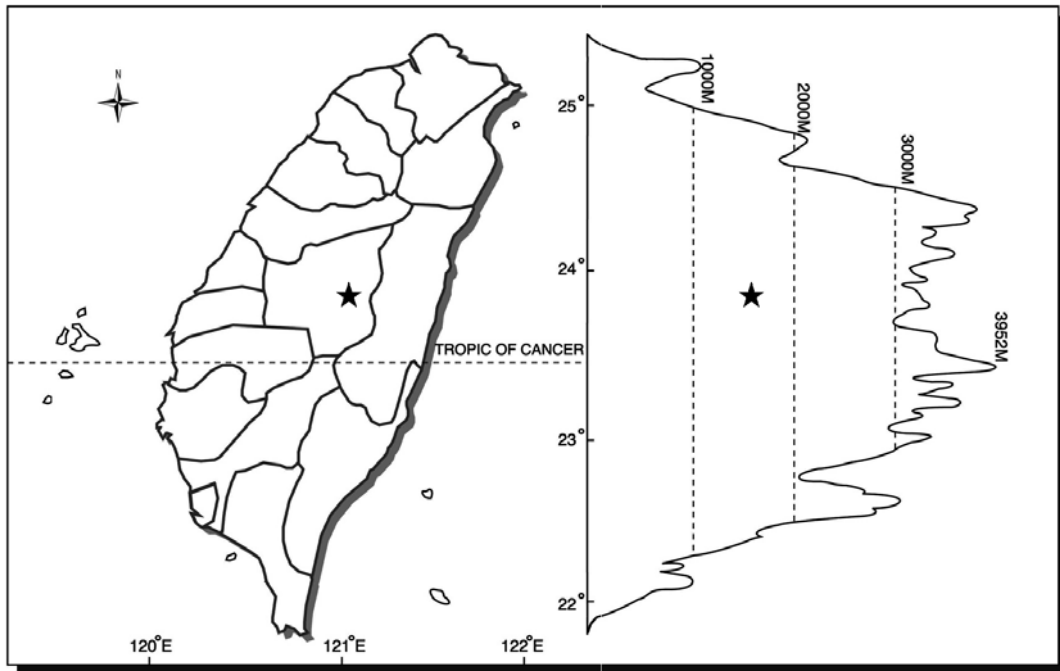


Fig. 4. Distribution of *Alnus nepalensis* D. Don in Taiwan.

LITERATURE CITED

- Lamichhane, B.P. 1984. Variation of *Alnus nepalensis* D. Don in Nepal. Unpublished M.Sc. thesis, Oxford University, UK.
- Li, P.C. & S.H. Cheng. 1979. Betulaceae. In: Kuang, K.Z. & Li, P.C., eds., *Fl. Reipubl. Popularis Sin.* 21: 44-137.
- Li, P.C. & A. K. Skvortsov. 1999. Betulaceae. *Flora of China* 4: 286-313.
- Liao, J. C. 1996. Betulaceae. In: Huang, T. C. et al. (eds.), *Flora of Taiwan*, 2nd ed. 2: 44-50. Editorial Committee, Department of Botany, National Taiwan University, Taipei.
- Lu, F. Y., C. H. Ou, Y. C. Chen, Y. S. Chi, K. C. Lu, and Y. H. Tseng. 2006. Betulaceae. *Trees of Taiwan*. 2: 59-62.
- Neil, P. E. 1970. *Alnus nepalensis* - A Multipurpose Tree for the Tropical Highlands. Nepal-United Kingdom Forestry Research Project, Department of Forestry and Plant Research, Kathmandu, Nepal.
- Wu, S. H., T. Y. Aleck Yang, Y. C. Teng, C. Y. Chang, K. C. Yang & C. F. Hsieh. 2010. Insights of the Latest Naturalized Flora of Taiwan: Change in the Past Eight Years. *Taiwania*. 55(2): 139-159.