Assessing ethnobotanical value and threat status of *Tetrastigma rumicispermum* (Lawson) Planch., a lesser known liana species of Khangchendzonga Biosphere Reserve, Sikkim

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The paper presents taxonomy, habitat, distribution, threat status and usage pattern of *T. rumicispermum* (Lawson) Planch., a lesser known liana species. The study was conducted in Khangchendzonga Biosphere Reserve (KBR). The traditional technique of constructing bamboo bridges using this liana has been reported. The fruit of liana is an important human and wildlife food supplement, and has the potential to feed local people during famine and other natural disasters. The traditional knowledge associated with the use of species can help the local people in better adapting to the natural disasters at local level.

Keywords: *Tetrastigma rumicispermum*, Bamboo bridges, Sikkim, Natural disaster

IPC Int. Cl.: A61K 36/00, B27J, E01D, C06, G01W 1/02, G01W 1/11, E04B 1/62, E04D

*Tetrastigma rumicispermum* (Lawson) Planch., (Vitaceae) is a wild edible liana that grows in the buffer zone of Khangchendzonga Biosphere Reserve (KBR) in the Eastern Himalayas. The species is found all along the Himalayas from Nepal to Myanmar through India¹. Although the species has been playing important role in the life of local people of Sikkim, no record is available describing its uses and associated traditional knowledge. Since the species is not known in the ethnobotanical and traditional knowledge literature, the taxonomy and use of the species have been reported in this paper.

Vern. names: *Thulocharchare* (Nepali), *Toludorrik* (Lepcha).

Woody lianas; stems densely warty. Branchlets terete, taberculate with maturity; tendrils bifurcate; petiole 4-15 cm long. Leaves pedately 5-foliolate; petiole 3-14 cm long; central petiolule 1-3 cm, petiolules of lateral leaflet complex 0.5-2 cm, lateral petiolules 0.5-2 cm long, glabrous; central leaflet obovate-elliptic, 4-17 × 3-8 cm, glabrous or pilose on midvein when young, lateral veins 7-19 pairs, veinlets inconspicuous, base cuneate, base of lateral leaflets asymmetric, margin with 7-16 denticles on each side, apex acute or mucronate. Flowers in subcorymbose cymes; berries 0.5 to 1 cm in diameter, 2-3 seeded. Seeds globose, turbinate, reddish black (Figs. 1, 2 & 3).

**Phenology:** Flowering: April-May; Fruiting: September-October.

**Geographic distribution:** National-Himalaya; West Bengal, Meghalaya, Assam; Topung (N27°19.731 & E088°09.797), Rimbi (N27°19.733 & E088°09.077) West Sikkim); Chungthang, Naga RF, Toong (North Sikkim); Global-Nepal, Bhutan and Myanmar.

**Specimens examined:** Sikkim, Topung in KBR 17.07.2009, A. Chettri 11902 (NEHU); West Sikkim, Narkhola, 17.12.1994, Sinha and Pradhan 16771(BSHC).

**Elevation range in KBR:** 1000-2400 m.

**Forest type in which the species occur in KBR:** Montane subtropical forests/ Lower montane forest.

**Habitat characteristics:** A common liana in the understorey region in the subtropical zone of KBR.

**Edapho-climatic range in KBR:** Relative Humidity: 65-97%, Edaphic: pH-4.12-5.16, Carbon: 3.55-5.30%, Phosphorus: 9.90-11.20µg/g, Potassium: 5.75-15.46µg/g.
**Successional status:** Mid-successional species.

**Functional group:** Liana.

**Associated species:** It is found in association with other liana species like *Hedera nepalensis* K. Koch, *Clematis buchananiana* DC, *Toddalia asiatica* (L.) Lam., and tree species such as *Alnus nepalensis* D. Don, *Castanopsis tribuloides* DC., *Engelhardtia spicata* Bl., *Ficus semicordata* Sm., and *Lyonia ovalifolia* Drude.

**Threat status:** Least Concern ‘LC’

**Ethnobotanical importance:** Fruit is edible to humans, primates and terrestrial wild fauna.

**Less known ethnic uses:** Stems are used as rope to construct bamboo bridges, and bamboo cattle sheds. It has high potential for use in landslide control measures.

**Methodology**

The study site was in the Khangchendzonga Biosphere Reserve in (27°06′-28°05′N, 88°02′-88°47′E) in the Eastern Himalayan state of Sikkim in northeastern India. During a floristic survey, this liana was found in the lower montane forest of KBR at an elevation of 1200–1900 m above sea level (a.s.l.). The study site was in the lower montane forest or subtropical wet-hill forest as classified by Champion and Seth. Local communities mainly *Nepalese* and *Bhutia* make use of this species for various purposes. The data on uses of the species were collected based on group discussions arranged in five villages surrounding the area of occurrence of the species in KBR.

**Results and discussion**

The preferred habitats of the species are hill slopes, riverine valleys and the secondary forests in the buffer zone of KBR. The density of the liana was 2 individuals ha⁻¹, which was 11th liana species in the KBR in terms of importance value Index². The density of the species decreased from 2 stems ha⁻¹ at 1200 m a.s.l. to 1 stem ha⁻¹ at 1900 m a.s.l., indicating that the distribution of the species has a negative correlation with elevation.

**Ethnobotanical uses**

The local people belonging to the *Nepalese* and *Bhutia* community make use of this species as fastening material. Bamboos are joined through the whole liana stem, and the liana is woven into a net like structure that provides strength and support to the bamboo bridge very similar to the iron structure and architecture of the modern day hanging bridges. Bridges with such structure using only bamboo and liana are constructed by the villagers for crossing the rivers in the remotest part of the KBR. During construction of bamboo bridges in the village, the local people make use of common species of bamboos such as, *Dendrocalamus hookeri* Munro, *Dendrocalamus strictus* (Roxb.) Nees, *Bambusa tulda* Roxb. In order to construct these bridges, matured liana stems are cut selectively from nearby forests and soaked in water for 7-10 days, to make it more flexible and durable. Flexible stems are then coiled in a wooden pole and carried to the sites of bamboo bridge construction. The bamboo bridge with *T. rumicispermum* lasts for more than two years. Well-seasoned stems are stored for future use. The bamboo bridge fastened in this manner is quite resilient, inexpensive and easily affordable by the local people. The construction architecture of the bridge is purely based on traditional knowledge being practised by *Nepalese* and *Bhutia* communities since time immemorial. The liana is also used as a roping material for creating wall against landslide thus indicating its potential application in natural disaster mitigation especially against landslides.
and cloud burst which are common features in the Eastern Himalayas. Fruits are edible and are consumed by primates, birds and terrestrial faunal species. The fruits are eaten raw by the local people and have high potential to work as important food source during famine and natural disasters.

**Threat assessment**
IUCN 2010 Version 8.0 has been followed to evaluate the threat status of the species in KBR (downloaded from http://intranet.iucn.org/webfiles/doc/ssc/Red list/Red list Guidelines.pdf). Out of the five criteria data on two criteria could be collected and these data were used to evaluate the threat category of the species. The two criteria used are: A. Declining population (past, present and/or projected); B. Geographic range size, and fragmentation, decline or fluctuations. Considering the population status and the geographic range of the species (Table 1), it was classified as “Least Concern” (A1abcd; B2ab (ii, iv)).

**Acknowledgement**
The authors are thankful to the local people for their Prior Informed Consent and for providing valuable information on the use of the species. The herbarium support received from the Joint Director, Botanical Survey of India, Sikkim Himalayan Circle, Gangtok for identifying the species is gratefully acknowledged.

**References**

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**Table 1—Population data of* T. rumicispermum* used for classification of threatened category under IUCN, version 8.0**

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<tr>
<th>Criteria</th>
<th>Threshold</th>
<th>Data Source</th>
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<tr>
<td>A. Population reduction</td>
<td>A1. &lt;30% decline per generation</td>
<td>a. Direct observation: Many occurrences</td>
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<td>b. Average density per m²: 2-3 individuals</td>
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<td>c. Quality of habitat: disturbed, secondary forest</td>
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<td>d. Exploitation: Extraction of fruits, making rope</td>
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<td>B. Geographic range</td>
<td>B2. Area of occupancy (&gt;2,000 km²)</td>
<td>a. Known to exist at more than 10 locations</td>
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<td>b. Continuing decline</td>
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<td>(ii) Area of occupancy: &gt; 2,000 km²</td>
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<td>(iv) Number of locations or subpopulations: ≥ 10 locations</td>
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