

formed fortuitously may have acquired the capability to self-replicate, get encapsulated with the protein and in certain cases, envelope themselves by budding-off the host cell membrane and infect new cells. Viruses that evolved in this manner have restricted modes of transmission, as observed in HCV. Transmission through the respiratory route perhaps represents the most evolved among viruses, e.g. influenza viruses. Thus, by this explanation, HCV and other viruses that require help for transmission, represent the most primitive of all, while those that do not (as in influenza viruses), the most advanced.

Partial scientific evidence for the latter hypothesis of origin of HCV comes from the findings of Weber *et al.*⁶, wherein unexplained sequence similarities between a number of viruses, including HCV, and human ESTs were documented.

More recently, molecular mimicry and sequence similarity with the human genome was documented by Yu-wen Hu *et al.*⁷, which might also explain the autoimmunity observed in some cases of this viral infection. Perhaps from the pathogen perspective, such autoimmunity, apart from serving as a survival strategy, is also possibly: (i) a step in the process of adapting to the new host (when considered along with the first hypothesis of host jumping) and (ii) a better proof of the fact that the virus is endogenously evolved. Additionally, the possibility of HCV being a bio-warfare agent cannot be ruled out completely.

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Rediscovery of an endemic and endangered plant (*Begonia tessaricarpa* C.B. Clarke) from Arunachal Pradesh, India, after a century

Arunachal Pradesh is considered to be luxuriant in floral diversity and has been recognized as the 25th biodiversity hotspot in the world¹. During floristic exploration under Flora of Upper Subansiri District, an interesting *Begonia* species (Figure 1) was collected. After a critical examination and comparison with the original description and the type specimen available at the BSI herbarium, CAL, its identity has been confirmed as *Begonia tessaricarpa* C. B. Clarke² and the voucher specimen is deposited in the BSI herbarium, ARUN. The plant was first described by C. B. Clarke³ in 1879 and again in 1890 on the basis of a single specimen collected by Griffith (Kew Distrib. No. 2586). The described holotype was from 'Assam', without giving precise locality. Since then, it has not been reported so far throughout the last century and no specimen is found deposited in the major BSI herbaria, viz. CAL, ASSAM and ARUN. The species is treated under intermediate category in the *Red Data Book*⁴ and IUCN 1997 publication of threatened plants⁵. Relocation of the habitat has been a necessary task for the protection of this plant from extinction.

Begonia tessaricarpa C. B. Clarke in Hook, f. *Flora of British India*, **2**, 636.

1879; *J. Linn. Soc.*, **18**, 115.t.2. 1880. Kumar & Bhattacharya in Nair & Sastry (eds), *Red Data Book*, **3**, 85. 1990.

Acaulescent herb, 15–30 cm high, succulent; rootstock tuberous; rhizome creeping, abbreviated. Leaves 7.5–13.5 × 3.7 to 7.8 cm, pubescent on the nerves beneath, base oblique, ovate-cordate, apex acute-acuminate, margin sinuate-denticulate; stipules 0.6–0.8 × 0.3–0.5 cm

ovate, pubescent, persistent. Inflorescence biparous cymes; scape 10–13.5 cm. Male flowers: sepals two obovate, glabrous; petals two, much smaller than the petals, lanceolate; stamens numerous, monoadelphous, anthers obovoid, connective slightly produced, obtuse. Female flower: ovary four-celled, pubescent, placentae bifid, styles four, joined half way up and divided and contorted at the apex, stigmas



Figure 1. *Begonia tessaricarpa* in natural habitat.

CORRESPONDENCE

Table 1. Differences between *Begonia roxburghii* A.DC and *B. tessaricarpa* C. B. Clarke

<i>Begonia roxburghii</i> A.DC	<i>Begonia tessaricarpa</i> C. B. Clarke
Caulescent	Acaulescent
Herbs or sub-shrub, 50–150 cm high	Herbs, 15–30 cm high
Stem and petioles highly succulent	Stem less succulent
Leaves 15–23 × 12–20 cm	Leaves 7.5–13.5 × 3.7–7.8 cm
Inflorescence axillary	Inflorescence radical
Peduncle 0.5–1.2 cm long	Peduncle 10–13.5 cm long
Mature fruit pendulous	Mature fruit stout, erect on the scape
Fruit highly fleshy, 2.1–2.5 cm in dia	Fruit less fleshy, 1.0–1.5 cm in dia

lunate, persistent. Capsules sub-pyramidal, 1.0–1.5 cm in dia, four-celled, fleshy with four-tapering end, indehiscent. Seeds ellipsoid, brown.

Flowering and fruiting: July–October.

Specimens examined: K. Ambrish 17304 (ARUN); Amad 107306 (ASSAM).

Note: Clarke in his original description of the plant doubted it to be stunted example of *Begonia roxburghii* A.DC. However, critical examination of both the species showed striking differences (Table 1).

Apart from Upper Subansiri District, the plant has also been collected from Changlang District (Namdapha National Park), Arunachal Pradesh. It shows that this species is still surviving in a few pockets of Arunachal Pradesh. It is found growing in damp, rocky crevices in association with *Selaginella*, *Funaria*, *Polypodium*, *Impatiens*, *Alocasia*, etc. The species is endemic to Arunachal Pradesh⁶. It is in danger of extinction in the near

future because of destruction of the habitat due to various biotic and abiotic factors.

The plant is eaten raw as well as cooked for its delicious, sour taste. It is also consumed as ‘chatni’ by the Tagin tribe. The juice of the plant is used as leech guard by local tribes. Beautiful flowers and attractive leaves also suggest the horticultural potential of the plant.

The Botanical Survey of India, Eastern Circle, Shillong maintains many rare and endemic plants of Northeast India in the Experimental Botanical Garden, Barapani as part of its Germplasm Conservation Programme. Among the plants, about 25 species of *Begonia* are also under cultivation, including *Begonia tessaricarpa*. However, adequate measures should be taken towards protection of the habitat for natural growth of the still surviving population of this species along with its *ex situ* conservation. Mass propagation using modern techniques like tissue culture is also suggested.

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ACKNOWLEDGEMENTS. We thank the Director, Botanical Survey of India, Kolkata for providing necessary facilities. Thanks are also due to the Joint Director, BSI, AFS, Itanagar and the Deputy Director, BSI, EC, Shillong for invaluable suggestions.

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Compulsory licensing – To what extent is it practicable?

Right of access to affordable medicines by people in developing and underdeveloped countries is recognized by WTO in its Doha declaration; further it is reiterated in its 30 August decision. Compulsory licensing is one of the aspects of the TRIPS agreement that allows developing and underdeveloped countries to use flexibilities accorded under the agreement. TRIPS does not use the word compulsory licensing, instead it refers to it as ‘Other Use Without Authorization of the Right Holder’¹. Use of compulsory licensing is of utmost importance for pharmaceutical products as medicines are not available to the poorer section in various countries due to patent protection enjoyed by MNCs. This is especially true in case of anti-AIDS drugs. The provision of compulsory

licensing allows any national government or third party to avail of the flexibility in certain circumstances, such as in the case of national emergency to deal with public health emergency or public non-commercial use by the patent holder, as laid down in the TRIPS agreement. It is a common fallacy that a country can issue compulsory license only in the case of an emergency, but the Doha declaration on public health confirms that countries are free to determine the grounds for issuing compulsory license². To use this flexibility of compulsory license, the proposed user of this flexibility has to make necessary efforts to avail voluntary license from the patent holder on reasonable commercial terms. Here again, ambiguity arises as TRIPS uses words like ‘reasonable commercial

terms’. Nothing is specified or clarified as to what constitutes ‘reasonable commercial terms’. But in case of ‘national emergency’, ‘public non-commercial use’ or ‘anti-competitive practices’, there is no need to try for voluntary license first². Although compulsory licensing provides member countries to use this flexibility, it is seen that hardly any country has implemented this provision or issued any compulsory license to any third party since the implementation of the TRIPS agreement. The reason is due to the tedious and cumbersome procedure to obtain compulsory license. It is estimated that if a country wants to avail the flexibility of compulsory license, the procedure to obtain the license would take nearly three years due to judicial and administrative procedures