Conservation through cultivation: a promising opportunity for the critically endangered tree Gymnocladus assamicus

Extinction of species is considered as one of the greatest threats to humankind. Unfortunately, 99% of the species are threatened due to human activities such as habitat fragmentation, resource exploitation and global climate change. With the alarming increase of species extinction, scientists estimated the rate as high as 1,000–10,000 times higher than the natural extinction rate. If the process continues, we will be loosing as many as 30–50% of all species by mid-century. Therefore, effective conservation and management of the biological diversity is urgently needed to face the challenges of climate change, sustainable development and food security.

Plants are often being extinct due to over harvesting for foods, medicines, timber and similar uses to make other resources. Different approaches have been developed to conserve ‘species at risk’ in both in-situ and ex-situ conditions. Conservation through cultivation (CTC) is one of the successful approaches for conservation of endangered plant species which gained more popularity for several species. The CTC programme was developed by Limbe Botanic Garden in Mount Cameroon to conserve the rich and fragile biodiversity through reducing harvesting pressures and providing cultivated material. The story of Prunus africana in Limbe Botanic Garden showed the pathway for conservation to similar species at risk. American ginseng, Mahogany and many orchid species have also been recovered from the verge of extinction through cultivation for their economic and aesthetic values.

Another successful and perhaps the most popular CTC is the story of the oldest tree on Earth (Ginkgo biloba), popularly known as ‘living fossil’. Unchanged for more than 200 million years, the species have been extinct in the wild for centuries. The Ginkgo tree is adored in many parts of the world as a street tree and ornamental tree for its beauty and longevity, other than the medicinal values. In a recent interview, Peter Crane, Yale School of Forestry and Environmental Studies Professor and the author of Ginkgo agreed that humans have aided to ensure Ginkgo’s survival and CTC is an important toolkit for conserving plant diversity.

Gymnocladus assamicus is a critically endangered tree species endemic in Northeast India. Over-harvesting of mature pods for traditional uses and habitat degradation posed serious threat to the remnant populations in West Kameng and Tawang districts of Arunachal Pradesh, India. The CTC could be the most suitable approach for G. assamicus for two reasons. First, highly sapaneous pods are used for multiple purposes; for example religious activities, day-to-day cleansing, shampooing and expelling leeches from domestic animals. Mature pods are preserved by the local people and offered as a precious gift. Therefore, cultivation in homegardens is an ideal approach to increase the population locally. Secondly, G. assamicus leaves turn into elegant, bright yellow colour during autumn (September to

Figure 1. Early spring view of Chopta subalpine-timberline area with flowering Rhododendron sp. in Rudraprayag, Uttarakhand. This area remains under heavy pressures of tourists, pilgrims and grazing during summer-rainy months (Photo: C. P. Kuniyal).
November) and is distinctly visible from far distance (Figure 1 a). Trees with such attractive appearance are planted as ornamental tree along streets, parks and botanical gardens. *Gleditsia triacanthos*, a sister genus of *Gymnocladus*, is widely planted as street tree throughout North America for its colourful leaves during autumn and physiognomy (Figure 1 b). *G. triacanthos* is an Eastern Asian descendent which migrated to North America across the Bering land bridge⁶ and is a popular tree throughout the region.

*G. assamica* is a 15–20 m tall tree with moderate spread and upright silhouette. Light green young leaves provide filtered shade and turn bright yellow at the later stage. Though purple coloured flowers are not blazing, mature pods are used as soap substitute in rural areas of Arunachal Pradesh and adjoining areas in Northeast India. Local people also mentioned that mature pods are highly favoured by deer and wild boar. Therefore, increase in *G. assamica* population along the homesteads, agricultural land, pastures and roadsides in mountainous terrains of the region will be helpful in survival and growth of diminishing wildlife in the region.


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**Tracing the photographic plate of Comet Bappu–Bok–Newkirk**

This letter is with reference to the Historical Notes ‘Comet Bappu–Bok–Newkirk – the only comet with an Indian’s name to it’ by Kapoor⁷. I wish to share with the readers, the story of how the comet’s photographic plate given in the article was traced.

I am an amateur astronomer from Bangalore and have been fascinated with comets as long as I can remember. I am equally intrigued on historical aspects of comets and I do not remember exactly when, but the first seeds of excitement about Vainu Bappu finding a comet back in 1949, was implanted in me early on.

At that time, the existence of the photographic plate on which his discovery was recorded was virtually unknown to our community and I had very much wanted the photograph for inclusion on research that I had begun on Vainu Bappu’s comet C/1949 N1 (Bappu–Bok–Newkirk). Years passed with no profound insight on the missing link.

In 2012, I had started study on a larger piece of comet-related work. It was during this phase, that I contacted several amateur astronomers globally. By good fortune one among them happened to be a professional astronomer, a veteran, William Liller, who is a retired Harvard professor. I asked him a few questions about comets, and considering that he too is from Harvard, whether he could guide me to the right source in my quest for Vainu Bappu’s comet plate. I received a reply from Liller which was startling, as it revealed, he was a good friend of Vainu Bappu. In his e-mail, although 60 years had passed by, he was very fresh with nostalgia about his friendship with Bappu during the student days. To my question on the possible existence of the photographic plate of the Comet Bappu–Bok–Newkirk, he mentioned there are...