Table 1. Species found in Kurdi Angod sacred site

Endemic keystone species	*Rauvolfia serpentina* (L.) Benth. *ex* Kurz	*Habenaria multicaudata* Sedgw.
Chlorophytum nimmonii Dalzell	*Schleichera oleosa* (Lour.) Oken	*Holigarna arnottiana* Hook. *f.*
Euphorbia nana Royle	*Senna tora* (L.) Roxb.	*Hopea ponga* (Dennst.) Mabb.
Geissaspis tenella Benth.	*Sida rhombifolia* L.	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken
Impatiens minor (DC.) Bennet	*Stephania japonica* (Thunb.) Miers	*Impatiens diversifolia* B. Heyne *ex* Wight & Arn.
Jansenella griffithiana (C. Muell.) Bor	*Terminalia chebula* Retz.	*Impatiens tomentosa* B. Heyne *ex* Wight & Arn.
Senecio belgaumensis (Wight) C. B. Clarke	*Uvaria narum* (Dunal) Blume	*Iphigenia magnifica* Ansari & R. S. Rao
	Ziziphus oenoplia (L.) Mill.	*Jasminum malabaricum* Wight
Unique medicinal species	RET species	*Ligustrum perrottetii* A. DC.
Anamirta cocculus (L.) Wight & Arn.	*Caesalpinia spicata* Dalzell	*Meiogyne pannosa* (Dalzell) J. Sinclair
Asparagus gonoclados Baker	*Canscora decurrens* Dalzell	*Murdannia versicolor* (Dalzell) G. Brückn.
Asparagus racemosus Willd.	*Crotalaria filipes* Benth.	*Naregamia alata* Wight & Arn.
Biophytum sensitivum (L.) DC.	*Crotalaria lutescens* Dalzell	*Neanotis montholonii* (Hook. *f.*) W. H. Lewis
Casearia championii Thwaites	*Curcuma decipiens* Dalzell	*Neanotis rheedei* (Wight & Arn.) W. H. Lewis
Catunaregam spinosa (Thunb.) Tirveng.	*Curcuma pseudomontana* J. Graham	*Neanotis subtilis* (Miq.) Govaerts *ex* Punekar & Lakshmin.
Cocculus hirsutus (L.) Theob.	*Cynarospermum asperrimum* (Nees) Vollesen	*Osbeckia parvifolia* Arn.
Curculigo orchioides Gaertn.	*Dendrobium microbulbon* A. Rich.	*Pittosporum dasycaulon* Miq.
Cyclea peltata (Lam.) Hook. f. & Thomson	*Dendrobium ovatum* (L.) Kraenzl.	*Rotala malampuzhensis* R. V. Nair
Desmodium triflorum (L.) DC.	*Dimeria stapfiana* C. E. Hubb. *ex* Pilg.	*Smithia hirsuta* Dalzell
Ficus racemosa L.	*Eria dalzellii* (Hook. *ex* Dalzell) Lindl.	*Terminalia paniculata* Roth
Helicteres isora L.	*Erinocarpus nimmonii* J. Graham *ex* Dalzell	*Theriophonum dalzellii* Schott
Hemidesmus indicus (L.) R. Br.	*Eriocaulon eurypeplon* Körn.	*Typhonium bulbiferum* Dalzell
Iphigenia indica (L.) Kunth	*Eriocaulon lanceolatum* Miq. *ex* Körn.	
Mimosa pudica L.	*Euphorbia concanensis* Janarth. & S. R. Yadav	
Momordica dioica Roxb. *ex* Willd.	*Euphorbia notoptera* Boiss.	
Murraya koenigii (L.) Spreng.	*Garcinia indica* (Thou.) Choisy	
Nothapodytes nimmoniana (J. Graham) Mabb.		

evaded transformation, that are rare and under high pressure. In this scenario, sacred sites become repositories of rich plant biodiversity. In such undisturbed areas, virgin forests with climax vegetation are a common feature with many palaeo-endemic plant taxa within them. During studies on floristic diversity in the Netravali and Cotigao Wildlife Sanctuary on the rare, endemic and threatened (RET) species of Goa, this exclusive Kurdi Angod sacred site was uncovered which constituted a completely secluded small patch of lateritic plateau, covering *c.* 3 sq. km. The site has stood unexplored in terms of floral wealth and defied transformation. Table 1 gives a list of endemic keystone species, unique medicinal plant species and RET species of plants found in the area.

The medicinal and RET species surviving in the Kurdi Angod sacred site are unique representatives of the lateritic plateaus of the Western Ghats. Such places are ideal for *in situ* conservation of plants and an archive for wild strains of plant genetic material. In this context, the Kurdi Angod sacred site exists as a remarkable heritage of the Kadamba dynasty. Being an important component of lateritic plateau, the site also holds special significance in elevating soil fertility through biomass build-up and efficient nutrient cycling along with soil binding and conserving soil moisture content. Additionally, the dense forest vegetation also functions in regulating the climate which in turn helps counteract any fluctuations and changes due to global warming. Future research should focus on the role played by such sacred sites in carbon sequestration[2].

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Gregarious flowering in woody bamboos: does it mean end of life?

Of the nearly 1700 bamboo species (Poaceae: tribe Bambusae), gregarious nature of flowering is largely restricted to woody species, distributed in subtropical and temperate evergreen or deciduous forests[1]. India has one of the highest concentrations of gregariously flowering species[2], but such species are also found throughout Asia, Africa and the Americas[3]. Many bamboo species have a peculiar life cycle, with long vegetative periods followed by synchronized flowering and death of the entire population over extensive areas[4], at intervals ranging from 6 to 120 years. Such a single suicidal bout of reproduction[2] is followed by seed production[5–7] and subsequent seed germination. Post-fruiting mortality includes death of regenerative ability in belowground rhizomes, which is surprising in light of the extraordinary regenerative powers of these rhizomes[3,8], and their ability to survive repeated harvesting of culms[9]. Post-flowering culm survival[3,10] and regeneration from the sporadically flowering clumps[11] have been reported. Reports on shoot production from gregariously flowered clump are meagre. We therefore took the opportunity of studying gregarious flowering in *Schizostachyum dullooa* to explore whether the regenerative ability in belowground rhizomes is lost or not after three years of flowering. *S. dullooa* (Gamble) Majumder (dolu bamboo), a dominant forest bamboo species that has a long period of vegetative growth flowered gregariously during 2009–10 in the entire forest range of Innerline Reserve Forest (IRF), Cachar district, Assam[11]. This is a monocarpic species with an estimated lifespan of 37–48 years[11]. Whole population of the species in IRF set seed and died in 2009–10. One hundred such gregariously flowered clumps were monitored since 2010. During recent field visits it was observed that new shoots were emerging from three individuals of such gregariously flowered clumps from different locations of IRF (Figure 1). To evaluate the origin of the new culms, viz. rhizome or seeds produced during last flowering, different portions of rhizome of the three clumps were dug out. It was observed that rhizomes are alive and new culms emerged from the rhizome neck. Another five gregariously flowered clumps where there was no shoot emergence were also checked for their rhizome growth. In the latter case all the rhizomes were observed dead and there was no fresh rhizome neck. It seems interesting that 97 of the 100 clumps studied lost their regenerative ability in belowground rhizomes, while three clumps could activate their rhizome to produce new shoots. Loss of regenerative ability or death of clump after flowering is attributed to reproductive exhaustion caused by the movement of food reserves from the vegetative parts[12]. This suggests for the three clumps (in which rhizome activation occurred) food reserves in rhizome were not exhausted fully during flowering which in turn sustained the regenerative ability of the rhizome and subsequently triggered shoot production. Therefore, gregarious flowering in woody bamboos does not necessarily always mean end of life; rather opportunities exist for recovery of rhizome. We urge that bamboo forests also be managed even after gregarious flowering to facilitate the possibilities of rhizome activation and its subsequent role in regeneration. It is also important at this stage to strengthen research on genetic level of the population to establish the diversity within a flowering cohort that could help in the management of bamboo stands soon after flowering.

Figure 1. New shoot emergence from rhizome neck of a gregariously flowered clump.

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