Relevance of voucher specimens in palynological publications

Palynological studies encompass an array of disciplines, mainly palynotaxonomy, palaeopalynology, pollen chemistry and histochemistry, ontogeny, aerobiology, melittopalynology, etc. All these studies are based on pollen extracted either from living plants or herbarium specimens, for processing and mounting on glass slides for light microscopic studies and on specimen stubs for observations on a scanning electron microscope and often ultramicrotome preparations for transmission electron microscope studies. The entire data generated are finally ascribed to an identified plant species, from where pollen grains were procured. Essentially, the pollen must be procured from a correctly identified/authenticated specimen, to ascertain acceptable interpretations; else the data generated may lead to ambiguity and chaos. This may be realized from the fact that the pollen morphological features are genetically determined and are highly stable, which remain unaltered by environmental perturbations or pressures. Hence they are species-specific and constitute the key to identification of their mother plants. Any study – palaeopalynological, based on matching pollen fossil records with pollen from living species, palynotaxonomical derivations leading to resolving species or species complexes, aeropalynological and melittopalynological studies based on matching of pollen in air flora and in honey/honey bee pollen loads (in the latter case), with reference pollen slides, rests on the accuracy of the pollen parent-species identification and requires utmost accuracy. It is therefore urged that for authenticity of the polliniferous material used, the 'voucher specimen' with field/accession number, precise locality, phenological period, collector's name and acronym of the herbarium where it is deposited, must be cited in all publications without being ignored or felt redundant.

However, if pollen material is obtained from live plants, a correctly identified voucher plant specimen may be used along with citing the authentication certificate number, date of issue and issuing authority in place of the 'voucher specimen'. Cooperation and support from taxonomists and herbarium curators is also expected by the palynologists, while appreciating the importance of authentic pollen material, to offer spare pollen material from specimens housed in their herbaria, preferably duplicates when available, in the form of a small bud, or even few anthers.

In return, this cooperation must be properly acknowledged in the subsequent publications produced, and possibly a photograph of the pollen and/or a reprint of it may be provided to the concerned herbaria. This would augment the value of voucher specimen as also the scientific findings based upon this. Stringent reviewing during publication of pollen papers to mention the list of 'voucher specimens of polliniferous material' would add to this endeavour, while restoring the significance, quality and authenticity of palynological findings.

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Sacred groves from Kumaon Himalaya

Sacred groves are small patches of virgin forests preserved due to religious beliefs since time immemorial, even before human awareness about the ecosystem and biodiversity. These groves serve as refugia for a large number of endemic and rare plants[1–3] and contain relict vegetation either already found in the area or planted at the time of developing the sacred groves[4,5]. These intentional or coincidental sacred groves are preserved due to religious beliefs, and the importance of indigenous means of conservation cannot be denied when biodiversity conservation is a global challenge.

The importance of sacred groves in biodiversity conservation has been widely accepted. Several studies on sacred groves have been carried out in the country[6–9]. However, studies on sacred groves and their phytodiversity in Uttarakhand are meagre, with only some preliminary studies[10–12]. Today when there is anthropogenic pressure on the forests, the restoration and maintenance of sacred groves by the local community is commendable. Here we report about two important sacred groves and their vegetation from the Kumaon Himalaya. During a biodiversity survey in June 2010 in the region, we observed relict vegetation and dense forests in Pithoragarh District, maintained by the local communities with the belief that their deity resides in these forests. Grazing, cutting, poaching and collection of non-timber forest products are completely restricted. A detailed study was conducted in two sacred groves: The Vaishno Devi Sacred Grove (Figure 1 *a*) at Jakhani along the Pithoragarh–Gangolihat roadway is located at an altitude of 1938 m (29°37.801′N, 080°03.410′E) and is more than 100 years old and spread over 30 ha of land. It houses a small temple of Goddess Vaishno. The local community of the grove is known as 'Gangola' of Gangolihat. The Chandika Devi Sacred Grove (Figure 1 *b*) is located at Chandak about 5 km from Pithoragarh town, at an altitude of 1910 m (29°37.761′N, 080°12.586′E). The village is named after Goddess Chandika, whose temple is located at the centre of the grove and associated with tantrik rituals and animal sacrifices. The vegetation of these groves may be classified under sub-tropical evergreen forest. Apart from this, a number of sub-temparate and temperate elements are also present in the groves. The forest canopy is composed of mainly tree species such as *Quercus* sp., *Cedrus deodara*, *Aesculus indica*, *Bauhinia*

Figure 1. ***a***, Vaishno Devi Sacred Grove, Jakhani; ***b***, Chandika Devi Sacred Grove, Chandak.

variegata and *Rhododendron arboreum*. These are considered as sacred species and folk music, dance and poetry are associated with these plants. These species also form good fodder, fuel wood, timber and play a key role in nutrient cycling and conservation as well as in ensuring water balance in the soil. The floristic diversity is high at the generic level as 112 species belonging to 86 genera and 39 families are found in the sacred groves. Of these, 56 species are of aromatic and medicinal importance, 14 wild edible plants species, 12 fodder and forage plants, 6 oil-yielding plants and 4 timber-yielding plants. The dense canopy of tree species supports profuse growth of mosses and other bryophytes, and tree trunks and branches are covered with epiphytic angiosperms and pteridophytes. These groves ensure the growth of several endangered taxa (*Valeriana jatamansi*, *Delphinium denudatum* and *Thalictrum foliolosum*) and taxa of microhabitat such as orchids (*Satyrium nepalense*, *Eulophia herbacea* and *Malaxis cylindrostachya*), climbers (*Rubia cordifolia*, *Rubus paniculatus*, *Smilax aspera* and *Stephania gracilenta*), lianas (*Bauhinia vahlii*) and succulent plants (*Agave* sp., *Aloe* sp. and *Impatiens* sp.). Although these groves are protected and conserved due to religious beliefs of the local communities, they need to be strengthened by the establishment of a buffer zone, economic incentives, and legal, government and environmental protection schemes. Recognition and protection of sacred places by scientific, environmental and governmental organizations can simultaneously promote their conservation as well as that of the associated biodiversity and culture.

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