

QUANTITATIVE ANALYSIS OF TREE SPECIES IN MIXED FORESTS OF MANDAL CATCHMENTS, GARHWAL HIMALAYA

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Abstract

A total of 14 tree species were identified in the study sites, among which Quercus leucotrichophora Hook. F. (Banj oak), Rhododendron arboreum Smith (Burans), Lyonia ovalifolia Drude (Ayar) and Pyrus pashia Buch-Hemp (Mehal) are the predominant tree species. A quantitative analysis of tree species indicates that on the basis of their canopy cover, tree density and total base area, these study sites fall within the category of disturbed forest. The uncontrolled lopping for timber, firewood and leaf fodder and the absence of saplings and seedlings are some of the major factors responsible for the declining of forests in the Himalayan region.

Keywords: Tree species; Study sites; Tree density, Garhwal Himalaya.

Introduction

The Himalayan Mountains (27°38' N latitude and 72°98' longitude) are the youngest, largest, highest and most complex mountain system in the world, covering about 300 sq. km from east to west [1]. According to their altitudinal variation the Himalayan ranges are divided into sub-tropical, temperate and alpine zones representing a variety of forest types [2]. These forests are an important source of timber, fuel, food, fodder, agriculture and other domestic requirements for the hill communities in the area.

Garhwal Himalaya along with Kumaun and part of Himachal Pradesh are placed in Western Himalaya by almost all scholars in the field. Though the geographic boundary of the Western Himalayan biotic province itself has been variously identified by different authors. Thus, while some [3, 4] considered only Kumaun and Garhwal to belong to this biotic province, some have also added Himachal Pradesh and Jammu and Kashmir to it [5-7]. The Western Himalaya are further divided into two sub regions viz. north-west Himalaya and west Himalaya, including Kumaun, Garhwal and Himachal within the latter [8].

The Mandal Catchments of the Garhwal Himalaya are extremely rich in their biodiversity, and their climatic factors, temperature variations, rainfall patterns, soil support, strong fauna and flora. Vegetational analysis of the major forest types of Garhwal Himalaya was performed by some workers [9-14].

Material and Methods

The present study area is located within an altitudinal range of 1300-1800 m in the Mandal catchments forest (30°30'-30°40' latitude and 79°-79°32' longitude) of the Chamoli Garhwal district (Uttarakhand), and is divisible into three regions: north, west and south eastern.

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A phytosociological analysis of the forests in the study area (Mandal catchments) was carried out between January and March 2010, on 10 x 10 m square areas of trees. The squares were laid out randomly throughout the study area. The Vegetational data focused on density assessments [15]. Ten squares were randomly placed in each site of the study area, representing all the tree species and localities. In each square, trees were recorded with >31.5 cm cbh (circumference 1.37 m above the ground level) and individually measured. The vegetational data were quantitatively analyzed for abundance, density and frequency, according to the formula devised by Curtis and Mc Intosh [15] and Mishra [16]. The average values were summed up to represent an Importance Value Index (IVI) as indicated by Curtis [17].

Results and Discussion

The quantitative analysis of the tree species at three different sites of the Mandal catchments is presented in figures 1, 2 and 3. In total, 14 tree species were identified in the area. In site- I (north aspect) and site II (west aspect) there were 9 species and in the site III (south eastern aspect) only 6 species of trees. *Lyonia ovalifolia*, *Rhododendron arboreum*, *Quercus leucotrichophora* and *Pyrus pashia* were found in all the sites of the study area. Trees of the *Myrica esculenta* species were observed only in site III (south eastern aspect). Similarly, *Betula alnoides* was present at site I. Trees of the *Toona hexandra*, *Ficus palmate* and *Sapium insigne* species were found only in the site II.

Among the three sites, the maximum total tree density of 710 ind ha⁻¹ was recorded in site I. However, the minimum total tree density of 500 and 510 ind ha⁻¹ were, more or less similarly, recorded in site II and site III (Fig. 1, 2 and 3).

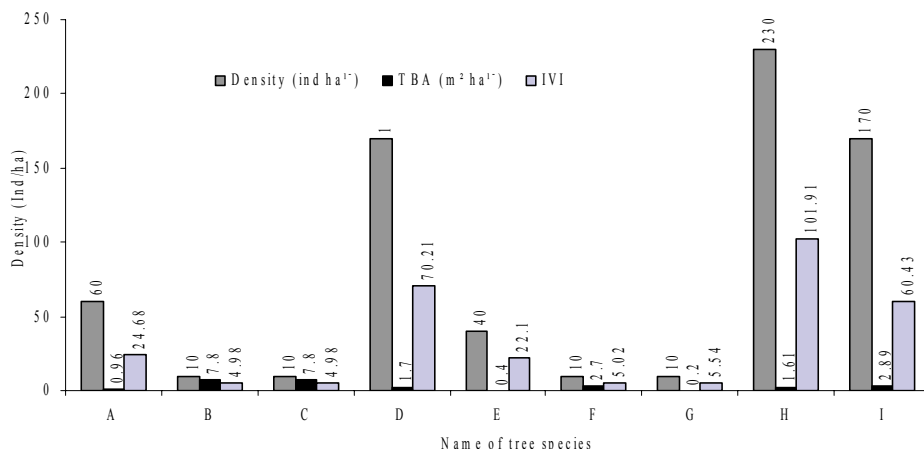


Fig. 1. Graphical representation of vegetational parameters for the trees in the northern aspect (Site I) (A = *Pinus roxburghii*, B = *Pyrus pashia*, C = *Symplocos chinensis*, D = *Rhododendron arboreum*, E = *Alnus nepalensis*, F = *Carpinus vimina*, G = *Betula alnoides*, H = *Lyonia ovalifolia* and I = *Quercus leucotrichophora*.)

Lyonia ovalifolia, *Rhododendron arboreum* and *Quercus leucotrichophora* were the predominant tree species and were found in all three sites. The tree density of *Quercus leucotrichophora* is comparatively lower (10-170 ind ha⁻¹) than the value of 320-1560 ind ha⁻¹ reported by Giri, et al. [18]. In the present study, the total base area (12.03 to 26.06 m² ha⁻¹) was also below the values reported by earlier studies [19]. The quantitative analysis of tree species indicates that, according to the canopy cover, tree density and total base area complied with the previous scenario, as evident from other forests in the Himalayan region, that those study sites

fall within the category of disturbed forest. If the present trend continues the tree composition in those mixed forests will continue to decline.

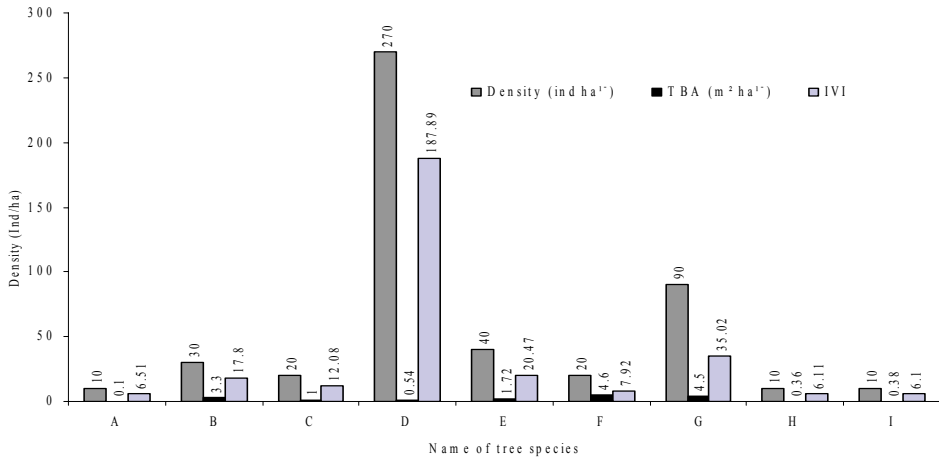


Fig. 2. Graphical representation of vegetational parameters for trees in the western aspect (Site II) (A = *Pinus roxburghii*, B = *Pyrus pashia*, C = *Rhododendron arboreum*, D = *Alnus nepalensis*, E = *Toona hexandra*, F = *Ficus palmate*, G = *Sapium insigne*, H = *Lyonia ovalifolia* and I = *Quercus leucotrichophora*)

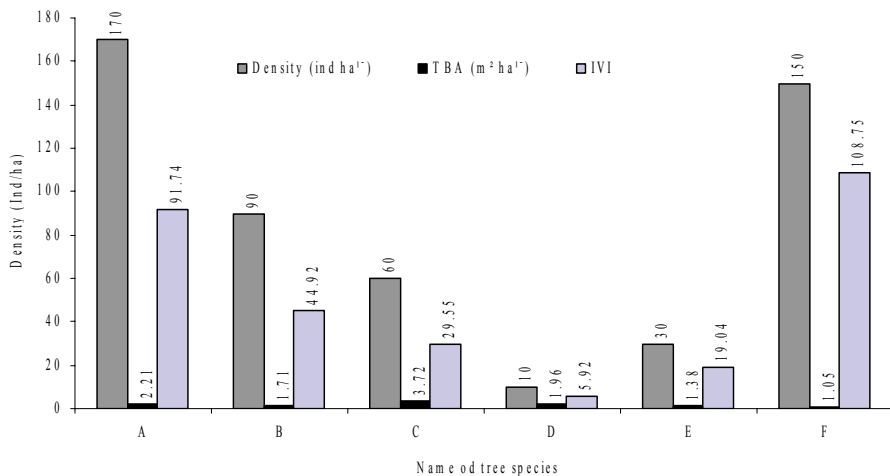


Fig. 3. Graphical representation of vegetational parameters for trees in the south eastern aspect (Site III) (A = *Myrica esculenta*, B = *Rhododendron arboreum*, C = *Pyrus pashia*, D = *Carpinus vimina*, E = *Lyonia ovalifolia* and F = *Quercus leucotrichophora*)

Conclusions

The unsupervised harvesting of forest trees (mostly oaks) for various purposes, such as firewood, fodder and timber are cause a decline in tree canopy, as well as forest canopy in the study area. The regeneration and growth of various seedlings and saplings is also influenced by various disturbance factors. There is an urgent need to create some awareness in regard to the conservation of flora and fauna among the local community and the people residing in the forest.

Acknowledgements

The author wishes to thank the Head of the Botany Department at Kumaun University, Almora Campus, for providing the necessary facilities and to the Department of Science and Technology (Govt. of India), New Delhi, for providing financial support.

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Received: December, 10, 2011

Accepted: May, 12, 2012