ABSTRACT

The present investigation focuses on dendrochronological studies of various pine forests of Azad Jammu and Kashmir (AJK). Their quantitative survey, population structure and multivariate analyses are also presented.

Wood samples of five conifers from different sites of Azad Jammu and Kashmir were taken. These species were *Abies pindrow* Royle, *Cedrus deodara* (Roxb. ex Lamb.), *Picea smithiana* (Wall) Boiss, *Pinus roxburghii* Sargent and *Pinus wallichiana* A.B. Jackson respectively. Crossdating of all samples was done by using skeleton plot technique. Among these, two species (*Abies pindrow* and *Cedrus deodara*) from four sites (Pir Chinasi, Sudhan Gali, Kail and Keran) gave long series with sensitive ring sequences which were cross matched successfully. The remaining sites and species were not included as they had short series with almost similar ring sequences (complacent rings). The two above mentioned species showed some signs like scars, wounds, cracks and sensitive rings due to various past disturbance events like earthquakes, landslides, fire etc. Raw and standardized versions of tree ring chronologies of two sensitive species from four sites were developed. A maximum dated chronology of *Abies pindrow* extended back to 1697-2009 A.D. for 312 years was obtained from Sudhan Gali. Years with slow radial growth (narrow rings) and with rapid radial growth (wide rings) were also recorded.

The estimation of age and growth rate of each species was also done. Among all the sampled species, the maximum age of 336 years was observed in both *Abies pindrow* and *Pinus wallichiana*. However, other species attained more than hundred years of age. The maximum radial growth was seen in *Pinus wallichiana* and *Abies pindrow* with the values of 0.92 and 0.47cm per year respectively. On the other hand the growth rate of *Picea smithiana* and *Cedrus deodara* was slow with the values of about 0.22 and 0.30 cm per year respectively. The dbh and growth rate of most of the trees from sampled forests were negatively while dbh and age were positively correlated.

Quantitative sampling from thirty one stands was carried out in different coniferous forests of Azad Jammu and Kashmir. For ecological studies, trees were sampled using Point Centered Quarter (PCQ) method. Though coniferous forests were highly disturbed either naturally or due to anthropogenic activities, therefore sampling was preferred to those forests

which were near fault line in order to analyze the effects of past earthquakes and landslides on vegetation of these areas. On the basis of phytosociological studies, nine communities of six conifer species and one associated broad leaved tree species were defined depending on their importance value. *Pinus wallichiana* and Abies *pindrow* were the dominant species found in twenty one and fourteen sampled forests respectively. *Picea smithiana* and *Cedrus deodara* were present infrequently in eight and seven stands respectively. *Pinus roxburghii* was growing on lower elevations as compared to other conifer species. *Pinus roxburghii* and *Aesculus indica* were found as co-dominant species in few stands. *Taxus fuana*, *Morus alba* and *Betula utilis* were rarely present. Frequency size class distribution of trees diameter of all forests was presented. Similarly, for seedlings and saplings, regeneration status of all the sampled forests was done.

A total of sixty six understorey plant species were recorded in 1.5 meter radius circular plots. Among these thirty seven were common while twenty eight species occurred infrequently in the sampled forests. This study revealed that these forests have diverse and asymmetric structure due to anthropogenic disturbances and overgrazing, which are key factors in addition to natural disturbances. However, some of the forests showed considerably stable structure due to less human interference.

Multivariate analysis was applied on sampled tree species from thirty one different forests of Azad Jammu and Kashmir. Results of cluster analysis (using Ward's method) yielded six groups. Both the cluster analysis and ordination techniques (by two dimensional non-metric multidimensional scaling) were used to classify structure of various groups and interrelationship among different species. The groups of trees were superimposed on NMS ordination; they were well classified and well separated out in ordination.