Population structure and regeneration pattern of *Debregeasia salicifolia* (Roxb. ex D. Don) Rendle in degraded site of Nainital, Kumaun Himalayan

Bharat Giri Gosain

Department of Botany, DSB Campus, Kumaun University, Nainital, Uttarakhand 263002, India
E-mail: bharatgirigosain@rediffmail.com

Abstract: The present investigation is aimed to carry out population structure of *Debregeasia salicifolia* and dominated plant species in landslide degraded area of District, Nainital (Uttarakhand). Study was conducted during the year 2012-13, following stranded methodology. A total 5 studies site was selected between 1938-2200m asl. The dominant plant species is *Debregeasia salicifolia*. Canopy cover was recorded 50-70%. Samplings has maximum density 17840 (ind/ha) followed by trees 980 (ind/ha). The maximum average relative density (57.690) was for sampling followed by trees (37.83) and seedlings (4.47). The maximum diversity index (H) was 0.179 for sampling and minimum was 0.017 for trees. The maximum concentration of dominance (Cd) was 0.360 and minimum 0.004 was recorded for seedling.

Keywords: *Debregeasia salicifolia*; population structure; dominant; Nainial degraded site

1. Introduction

The Himalayan Mountain (27°38' N latitude 27°98' E longitude) is the youngest, largest and complex mountain system in the world covering about 300 km from east to west (Gupta, 1983). On the basis of altitude variation the Himalayan ranges are divided into sub-tropical temperate and alpine one representing a variety of forest types. These youngest and rising mountains are varying unstable and susceptible to anthropogenic disturbance particularly in the central Himalayan region. The Himalaya is a very diverse system sustaining a wide range of vegetation types. Most of the species extinctions occurred from 1000 AD to 2000 AD are due to human activity on particular destruction of plant and animal habitat. Elevation rates of extinctions are being driven by human consumptions of organic resources especially related to tropical forest distribution (Paul Anne, 1981). The genus *Debregeasia* belong to the family Ueticaceae commonly known as Tusyar or Tushiyari. Species comes under the huge shrubs grows to a height of 5 miters in the forest habitat in 1500 to 2400m. There are sixteen species of *Debregeasia* occurring in different parts of the world. *Debregeasia salicifolia* which occurs in the West Asia and Western Himalayan (Negi et at. 2002). Regeneration is a key process for the existence of species in the community and is also a critical part of forest management, because it can help forests to maintain the desired species composition. The tree regeneration can be predicted by the structure of their population Nazir et al. (2011).

The population is defined by Odum (1971) as a collective group of organisms of the same species (or other groups within individual may exchange genetic information) occupying a particular space. According to Benton and Werner (1976) a very high percentage of young individual and relatively low percentage of old individuals are indication of a growing population. A very few individuals in the lower age class indicate a decreasing population and if such a trend continues the population will be on the way to extinction (Benton and Werner 1976). Population structure can convey how a species in a forest is regenerating. The poor regeneration of a dominant species will indicate an imminent change in the composition of the community. In a few cases the absence of regenerating may also indicate that a species may soon disappear from the forest. In some temperate forests the species having smaller percentage of young individuals are not replace by other having greater young population (Mc Intosh (1958), Saxena (1979), Ralhan et al (1982), Singh and Singh (1989), Tewari and Singh (1981), Upreti (1982), Kumar (2000), khera et al. (2001), Srivastava (2002), Bisht and Lodiyal (2005) and Giri et al (2006) made some useful studies regarding the species composition and population structure of tree species occurred in

Central Himalayan forests.The presence of older tree is better for establishing young s eagling as they provide shade and microclimate (Taylor et al. 1988). The seedling, sampling and young trees make greater contribution to the total population in successful regeneration (khan et al. 1989). The future communication structure and regeneration potential of the species could be predicted from relative proportion of seedlings and samplings in various species in the forest. Natural regeneration and estimation of primary forest species are the crucial for most of species (Primach et al. 1992). In general, regeneration status of species is affected by anthropogenic factor (Barik et al. 1996). The present study was therefore, carried out in degraded site of Nainital to assess the population structure and regeneration of *Debregeasia salicifolia*.

2. Material and methods

The study area was located between Thandi road, Raj Bhawan road and a landslide area near to DSB campus Kumaun University, Nainital in Central Himalaya of Uttarakhand, India. The altitude of those sites ranges from 1938m to 2200m asl. The climate of the area is monsoonic, which is divisible into summer, rainy and winter. The area receives heavy rainfall during rainy season. The phytosociological analysis of tree, sampling and seedling layers was carried out by randomly laying down 25 quadrates of 10×10m size. The size and number of samples were determined according to the method of Saxena and Singh (1982). For regeneration, each quadrat of 10×10m size individual having >31 cm CBH (Circumference at breast height i.e. 1.37 m above the ground) was calculated as trees, individual having < 10 cm CBH were consider as seedling and individual having CBH from 10-30 cm CBH were considered as samplings Curtis and Mc Intosh (1950).The vegetation data were quantitively analyzed for abundance, density and frequency (Curtis at al. 1950). The Important Value Index (IVI) for all the layers of vegetation was determined as the sum of relative frequency, relative density and relative dominance (Curtis, 1959).The distribution pattern of different species was studied using the ratio of abundance to frequency (Curtis at al, 1956). The index of general diversity was computed by using Shannon- Wiener information (H'), (Shannon-Wiener 1963). The concentration of dominance (Cd) was measured by Simpson's index (Simpson 1949). The density of seedlings and samplings is considered as

an indicator of the regeneration potential. The criteria for regeneration status in the present study were based on the number of seedlings and samplings of individual species. The regeneration status of the sampled species was based on phytosociological data (Uma Sankar 2001) in the following categories:

1. Good regeneration, number of seedlings > samplings > adults.
2. Fair regeneration, number of seedlings > or ≤ samplings ≤ adults.
3. more, less or equal that of adults).
4. No regeneration, individuals of species are present only in adult form.
5. Poor regeneration, if the species survive only at sampling stage, there are no seedlings (Number of saplings may be New regeneration, individuals of species have no adults but they show only seedling or sapling.

3. Results

The structure and function of forest ecosystem is determined by the plant component in the system (Richards 1996). A total of 5 sites were studied. The study area was dominated by *Debregeasia salicipholia*. The density, frequency and total basal area was calculated (Table 1). The maximum density (1740) was calculated for sapling while the total basal area (11.681) was calculated as maximum for trees. The maximum average relative density (57.690) was for sampling followed by trees (37.83) and seedlings (4.47). Relative density of *Debregeasia salicipholia* at different sub-site in landside area of Nainital was calculated (Table 2). The diversity index (H) and concentration of dominance (Cd) of *Debregeasia salicipholia* were given in (Table 3). The maximum diversity index (H) was (0.179) for sampling and minimum was 0.017 for trees. The maximum concentration of dominance (Cd) was (0.360) and minimum (0.004) was recorded for seedling. As far as the other species are concerned, the other species such as *Berberis asiatica, Rubus ellipticus and Deutzia* were also present in the studied sites. The population structure showed that the conversion of sampling into tree layer was poor which indicate poor regeneration of *Debregeasia salicipholia* in recent past at the studied site (Fig. 1). However, seedling were absent in sub-site 4 and 5.

Table 1. The analysis of *Debregeasia salicipholia* for different categories in landslide site of Nainital.

Size class of species	Density (ind/ha)	Frequency (%)	TBA (m^2/ha)
Seedling	180	100	0.038
Sampling	1740	100	7.314
Trees	980	100	11.681

Table 2. Relative density of *Debregeasia salicipholia* at different sub-site in landslide area of Nainital.

Size class of species	Sites					
	Sub-site 1	Sub-site 2	Sub-site 3	Sub-site 4	Sub-site 5	Average value
Seedling (<10 cm)	7.31	5.66	9.37	0	0	4.47
Sampling (10-30 cm)	58.53	62.26	56.25	71.42	40	57.69
Trees (>30 cm)	34.14	32.07	34.37	28.57	60	37.83

Table 3. Diversity index (H) and concentration of dominance (Cd) of *Debregeasia salicipholia* at different category in study sites.

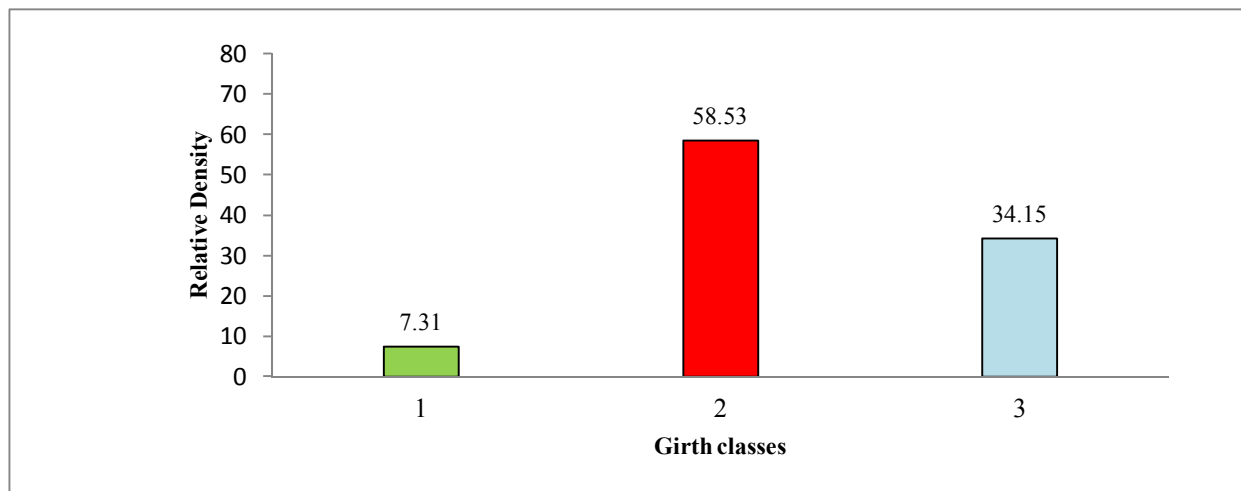| Size class of species	Diversity index (H)	concentration of dominance (Cd)
Seedling (<10 cm)	0.043	0.004
Sampling (10-30 cm)	0.179	0.360
Trees(>30 cm)	0.017	0.114

Figure 1. Population structure of *Debregeasia salicipholia* at sub site -1.

Figure 2. Population structure of *Debregeasia salicipholia* at sub site -2.

Figure 3. Population structure of *Debregeasia salicipholia* at sub site -3.

Figure 4. Population structure of *Debregeasia salicipholia* at sub site -4.

Figure 5. Population structure of *Debregeasia salicipholia* at sub site -5.

4. Conclusion:

The population structure showed that the conversion of sapling into tree layer was poor which indicate poor regeneration of *Debregeasia* species in recent past at the studied site.*Debregeasia* species naturally grown in wide habitats and can be propagated artificially for its various uses. The leaf of the species is used for fodder, litter for farm uses, wood for fuel and bark contain fiber that is making ropes. The fruits are sweet but insipid, however seed used as flower. *Debregeasia* sp bark paste is applied externally on forehead to relieve from headache (Negi et al. 2002). Apart from above uses, *Debregeasia* species are suitable for soil and water conservation particularly in landslides, landslips and other freshly degraded and damaged sites. The study revealed that this forest is rich in floral wealth and is worth for fulfilling the basis livelihood needs for local community in the form of fuel wood, fodder and small timber etc. however, if proper conservation strategies are not formulated in time, there will be some damage to plant diversity.

Corresponding Author:
Bharat Giri Gosain
Department of Botany
DSB Campus, Kumaun University
Nainital, Uttarakhand 263002, India
E-mail: bharatgirigosain@rediffmail.com

References

[1]. Benton A.H and Werner W. E. Field biology and ecology, Mc Graw Hill, Inc, New York 1976:(562).

[2]. Bisht S. and Lodhiyal L.S. Various aspects of soils and tree layer vegetation analysis in reserve forests of Kumaun in Central Himalaya. *Indian journal of Forestry*, 2005:28(10): 37-50.

[3]. Curtis J.T. and Mc Intosh R.P. The interrelation of certain analytic and synthetic phytosociology characters. Ecology 1950:(31).434-455.

[4]. Curtis J.T. The vegetation of Wisconsin. An ordination of plant communities. University Wisconsin Press, Madison, Wisconsin 1959.

[5]. Giri D. Tewari A. and rawat Y.S. Vegetation Analysis in mixed Banj (Q.*leucotricophora*, A.Camus) Tilonj Oak (Q.*floribinda*, Lindl) forests in Nainital catchment. *Indian journal of forestry* 2006.

[6]. Gupta A.C. Annual prescription and the vegetation of the dry temperate coniferous region of North-West Himalaya. *Jour-inl*.Bot.Soc. 1963:42(2).

[7]. Khera N., Kumar A., Ram J. And Tewari A. Plant biodiversity assessment in relation to disturbances in mid elevational forest of central Himalaya. India. *Tropical Ecology* 2001:(4):.83-95.

[8]. Kumar A. Growth and development of, trees. Academic Press, New York 2000:(1).

[9]. MC Intosh R.P. Plants communities, *Screnco* 1958(128):115-120.

[10]. Negi C.S ., Nautiyal S., Dasila L., Rao K.S and Maikhuri R.K.. Ethnomedicinal plant uses in a small Tribal community in a part of Central Himalaya, India. J. Hum. Ecol.,2002: 14(1): 23-31.

[11]. Odum E.P. (1971). Fundamentals of Ecology W.B Sounders.co.Philadelphia.1971;(574).

[12]. Paul E and Anne E. Exinction, Random House, New York, 1981:(ISBN. 0-394-51312).

[13]. Ralhan P.K., Saxena A.K and Singh J.S. Analysis of forest vegetation at around Nainital in Kumaun Himalaya Proc. Indian Natl. Science Academy: 1982 (1):121-137.

[14]. Saxena A.K and Singh J.S. A phytosociological analysis of woody species in forest communities of a part of Kumaun Himalaya. *Vegetatio*, 1982:(50):3-22.

[15]. Saxena A.K. Ecology of Vegetation Complex of north-Western Catchment of river Gola Ph.D thesis, Kumaun University Nainital 1979.

[16]. Shannon, C.E. and Weaver. The mathematical theory of communication. University of lllinois Press Urbana 1963.

[17]. Simpson E.H. Measurement of diversity. Nature 1949:163-688.

[18]. Singh, J.S and Singh S.P. Forest vegetation of Himalaya. Botanical Review.1987: (52):80-192.

[19]. Srivastava A.K. Forest vegetation analysis of a forest in a species rich sub montance tranect of Central Himalaya, Ph.D. Thesis, Kumaun University Nainital 2002.

[20]. Tewari J.C and Singh S.P. Vegetation analysis of a forest lying in transitional one between lower and upper Himalayan moist temperate forests.1981:104-119. In . G.S Paliwal (ed.). The Vegetation of Himalaya. Puja publishers, New Delhi.

[21]. Uperti N.A. study on phytosociology and state of Regeneration of Oak Forest at Nainital, Ph.D. thesis, Kumaun University Nainital, India 1982.

[22]. Nazir A. pala, A. K. Negi, Yogesh Gokhale, Jahangeer A. Bhat, Todaria N.P. Diversity and regeneration status of Sarkot Van Penchyat in Garwal Himalaya, india Jouranal of Forestry Research 2011:23(3): 399-404.

2/15/2022