



IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: VIII Month of publication: August 2019 DOI: http://doi.org/10.22214/ijraset.2019.8001

www.ijraset.com

Call: 🕥 08813907089 🔰 E-mail ID: ijraset@gmail.com



Species Diversity among Two Forests of Nainital, Kumaun Himalaya

Brij M. Upreti¹, Naveen Chandra Pandey², Neha Chopra³, Lalit M. Tewari⁴ ^{1, 4} Depatment of Botany D. S. B. Campus Kumaun University Nanital

Abstract: Biodiversity has recently emerged as an issue of both scientific and political concern primarily because of an increase in extinction rates caused by human activities. Species richness patterns in relation to the environment need to be understood before drawing conclusions on the effect of biodiversity in ecosystem processes. An attempt has been done to estimate species richness among two different forest types around Nainital. Two site were selected Kelakhan, Oak (Quercus leucotrichophora A. Camus.) and Pines, Pine (Pinus roxburghii Sarg.) in Nainital region. The collected plants specimens were indentified with the help of different floras and manuscripts, standard literature and to estimate the species richness Menhinick's index were used. After extensive field survey 70 species in Oak forest Kailakhan, Nainital were recorded, Out of which 15 species were trees, 13 shrubs, 40 herbs and 2 climbers and 55 species in pine forest, pines, Nainital were recorded out of which 08 species were trees, 15 shrubs, 29 herbs and 3 climbers Present study shows that Oak forest have high species richness of tree (1.79)and herbs (4.78) in comparison of Pine forest while in case of shrub (2.02) and climber (0.40) pine forest showing maximum species richness than oak forest.

Keywords: Kumaun Himalaya, Species richness, Forest types, Pine forest, oak forest

I. INTRODUCTION

Biodiversity has recently emerged as an issue of both scientific and political concern primarily because of an increase in extinction rates caused by human activities ^[1]. Species richness patterns in relation to the environment need to be understood before drawing conclusions on the effect of biodiversity in ecosystem processes. Numerous problems regarding the study of species richness need to be clarified, including the role of disturbance ^{[2][3][4]}, and the relative importance of biotic versus abiotic factors ^{[2][5][6][3]} reviewed species richness extensively, and regarded patterns of species richness as being determined by the interaction of disturbance with environmental gradients and competitive exclusion. Although over any large region the distribution of species richness is likely to be governed by two or more environmental gradients ^{[7][8][9][10][11][12]}, species richness studies in relation to environmental gradients have been mainly single-factor studies. Recently various studies have been done on forest vegetation of Kumaun region by ^{[13][14][15][16][17]}. Species richness is a measure of the number of species found in a sample. Since the larger the sample, the more species we would expect to find. The main Objective of this study was to estimate species Richness among two Different Forest Types around Nainital.

II. MATERIAL METHOD

Study Area: Two site were selected Kelakhan, Oak (Quercus leucotrichophora A. Camus.) (Altitude 1906 m asl, 29⁰22'37.26"N, 79⁰28'46.66"E) and Pines, Pine (Pinus roxburghii Sarg.) (Altitude 1821m asl, 29⁰23'06.52"N, 79⁰29'04.39"E) in Nainital region (fig 1).



Fig 1. Map of the studies site (Source: Google earth)



International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177

Volume 7 Issue VIII, Aug 2019- Available at www.ijraset.com

2) Data Collection and Sample Identification: Extensive field survey was conducted for the collection of data and plant samples. The collected plants specimens were indentified with the help of different floras and manuscripts, standard literature ^{[18][19][20][21].} The number of species is divided by the square root of the number of individuals in the sample. This particular measure of species richness is known as D, the Menhinick's index.

$D = s / \sqrt{N}$

Where s equals the number of different species represented in your sample, and N equals the total number of individual organisms in your sample.

III. RESULT AND DISCUSSION

After extensive field survey 70 species in Oak forest Kailakhan, Nainital were recorded, Out of which 15 species were trees, 13 shrubs, 40 herbs and 2 climbers and 55 species in pine forest, pines, Nainital were recorded out of which 08 species were trees, 15 shrubs, 29 herbs and 3 climbers (Table. II and Fig.2, 3). In both the studied sites Asteraceae family showing highest number of genus and species followed by Rosaceae. Soil properties of both forests were also analysed and results shows that Oak forests have better moisture content and water holding capacity in comparison of pine forest which is a positive sign for forest health and seed germination (Table I).

1) Species Richness: Present study shows that Oak forest have high species richness of tree (1.79)and herbs (4.78) in comparison of Pine forest while in case of shrub (2.02) and climber (0.40) pine forest showing maximum species richness than oak forest(Fig;3).

Table 1. Son Hopefules of Oak Forest (OF) And The Forest (TF), Nanitar								
Properties -	Sand	Silt	Clay	Moisture	WHC	pН		
Site				content				
OF	43.72%	35.22%	21.06%	16.28 %	18.29	5.4		
PF	52.96%	34.87%	12.17%	8.15%	9.23	6.6		

Table I. Soil Properties Of Oak Forest (OF) And Pine Forest (PF), Nainital

Local Name	Botanical Name	Family	OF	PF
Kawgori (H)	Dicliptera bupleuroides Nees.	Acanthaceae	✓	\checkmark
Jimla (H)	Strobilanthus atropurpureus Nees	Acanthaceae		~
Jhinti (H)	Barleria cristata L.	Acanthaceae		\checkmark
Putli (T)	Acer oblongum Wall. ex DC.	Aceraceae	~	
Apamarg (H)	Achyranthess bidentata Blume.	Amaranthaceae	√	~
Kariu (S)	Asparagus curillus BuchHam.ex Roxb.	Asparagaceae	~	\checkmark
Kach (H)	Solidago virgaurea L.	Asteraceae	√	
Kala Basinga (H)	Eupatorium adenophrum Spreng.	Asteraceae	√	~
Jhuri (S)	Inula cuspidata (DC.) Clarke.	Asteraceae	~	
Kapasi (H)	Gerbera gossypina (Royle) Beauv.	Asteraceae	√	~
Jhar (H)	Erigeron karvinskianus DC.	Asteraceae	✓	\checkmark
Kandaya (H)	Cirsium wallichii DC.	Asteraceae	√	
Kan Phool (H)	Taraxacum officinale Weber.	Asteraceae	✓	
Neel kanthi (H)	Senecio nudicaulis BuchHam. ex D.Don	Asteraceae		\checkmark
Marchia Ghas (H)	Galinsoga parviflora Cav.	Asteraceae	✓	
Arka-Jhar (H)	Bidens bipinnata L.	Asteraceae	✓	
Karubuti (H)	Ainsliaea aptera DC.	Asteraceae	✓	~
Gualsi (H)	Tragopogon gracilis D. Don	Asteraceae	✓	~
Bakol (H)	Anaphalis adnata DC.	Asteraceae	√	
Kilmora (S)	Berberis asiatica Roxb. ex DC.	Berberidaceae	√	~
Utis (T)	Alnus nepalensis D. Don	Betulaceae		~
Ban- laiyya (H)	Cardemine impatiens L.	Brassicaceae	√	~
Satpura (S)	Sarcococca saligna (D. Don) MuellArg.	Buxaceae	√	
- (H)	Campanula colorata Wall.	Campanulaceae	√	
Tirmuya (S)	Viburnum continifolium D.Don	Caprifoliaceae	√	
Tirmu (S)	Viburnum mullaha BuchHam. ex D.Don	Caprifoliaceae		~
Badyau (H)	Stellaria media (L.) Vill.	Caryophyllaceae	√	
- (H)	Stellaria monosperma BuchHam. ex D.Don	Caryophyllaceae		~
- (H)	Stellaria patens D. Don	Caryophyllaceae		~
Makhol (S)	Coriaria nepalensis Wall.	Coriariaceae	✓	✓
Khagsi (T)	Cornus macrophylla Wall.	Cornaceae	✓	
Gauntia (T)	Cornus oblonga Wall.	Cornaceae	~	

Table: II. Species Found In Oak Forest (OF) Kailakhan And Pine Forest (PF) Pines, Nainital



International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue VIII, Aug 2019- Available at www.ijraset.com

Crown (TT)	Commente of the D. Don	Commence	1	1
Surai (1)	Cupressus torulosa D. Don	Cupressaceae	v	
Gewal (S)	Lacagnus parvitona wan ex Royle	Elaeagnaceae	•	
Allyar (1)	Lyonia ovaniona (w an.) Diude.	Ericaceae	•	*
	Shutaria involuarata (Wall) Wt. & Arn	Encaceae		•
- (II) Tipatiya (H)	Trifolium repens I	Fabaceae	· ·	
Salprani (H)	Flemingia bracteata (Royb) ex Aiton	Fabaceae	· ✓	 ✓
Bani (T)	Ouercus leucotrichophora A. Camus	Fagaceae	· •	· ·
Bhil- ihari (H)	Geranium ocellatum Boiss	Geraniaceae		· •
Jandi Pangar (T)	Aesulus indica (Wall ex Cambess)	Hippocastanaceae	~	
Obani (S)	Hypericum oblongifolium Choisy	Hypericaceae	~	✓
Birchi (H)	Clinopodium umbrosum (M. Bieb.) C. Koch.	Lamiaceae	✓	
Garur buti (H)	Micromeria biflora (BuchHam. ex D. Don.)	Lamiaceae	✓	
Kappu (H)	Scutellaria scandense Buch Ham.ex D. Don	Lamiaceae	✓	
Kaul (T)	Machilus duthiei King.	Lauraceae		~
Piuli (H)	Reinwardtia indica Dumort.	Linaceae	✓	~
- (H)	Disporum cantoniensis (Lour.) Merill.	Liliaceae		✓
Beduli Bel (C)	Ficus hederacea Roxb.	Moraceae	✓	
Kaphal (T)	Myrica esculenta BuchHam. ex D. Don	Myricaceae	✓	✓
Ghingne (S)	Myrsine africana L.	Myrisinaceae	✓	
Angu (T)	Fraxinus micrantha Lingelsh.	Oleaceae	√	✓
Lal Phuliya (H)	Oenothera roesa L' Herit. ex Aiton	Onagraceae	✓	
Chalmori (H)	Oxalis latifolia Kunth.	Oxalidaceae	✓	~
Deodar (T)	Cedrus deodara (Roxb. ex D.Don) G.Don	Pinaceae	√	
Chir (T)	Pinus rouxburghii Sarg.	Pinaceae		~
- (H)	Peperomia reflexa (L.f.) A. Dietr.	Piperaceae		~
Babil Ghas (H)	Eulaliopsis binata (Retz.) Hubb.	Poaceae	\checkmark	
Ringal (H)	Arundinaria falcata Nees.	Poaceae	✓	
Ghas (H)	Oplismenus undulatifolius (Ard.) P. Beauv.	Poaceae	✓	
Pathar Phool (H)	Polygonum capitatum BuchHam. ex D.Don	Polygonaceae		~
Bhilmora (H)	Rumex hastatus D. Don	Polygonaceae	\checkmark	~
Jangli Palak (H)	Rumex nepalensis Spr.	Polygonaceae	\checkmark	
Silver oak (T)	Grevillea robusta A. Cunn. ex R. Br.	Proteaceae	\checkmark	
Kawali Bel (C)	Clematis buchananiana DC.	Ranunculaceae	✓	~
Makar Ghas (H)	Thalictrum foliolosum DC.	Ranunculaceae	✓	~
Hisalu (S)	Rubus ellipticus Sm.	Rosaceae		~
Kala Hisalu (S)	Rubus niveus Thunb.	Rosaceae	~	~
Kall- Hinsar (S)	Rubus paniculatus Sm	Rosaceae	~	
- (H)	A grimonia eupatoria I	Rosaceae	~	<u> </u>
Bhekal (S)	Princenia utilis Royle	Rosaceae		1
		Rosaccac		
Jangli Mehal (1)	Pyrus pasnia Buch-Ham.ex D. Don	Rosaceae		•
Majethi (C)	Rubia cordifolia L.	Rubiaceae		~
Kuri (H)	Galium aparine L.	Rubiaceae	\checkmark	
Ghari (S)	Randia tetrasperma (Wall. ex Roxb.)	Rubiaceae		~
Pisumar (H)	Boenninghausenia albiflora (HK) Reichb.	Rutaceae	✓	✓
Timur (S)	Zanthoxylum armatum DC.	Rutaceae		~
Silphora (H)	Bergenia ciliata (Haworth) Sternb.	Saxifragaceae	✓	~
Sitberu (S)	Daphne papyracea Wall. ex Steud.	Thymelaeaceae	✓	~
Siar (S)	Boehmeria platyphylla D. Don	Urticaceae	✓	
Tusiara (S)	Debregeasia longifolia (Brum.f.) Wedd.	Urticaceae	✓	✓
Challu (H)	Pilea umbrosa Blume	Urticaceae		~
Bichhu-ghas (S)	Urtica parviflora Roxb.	Urticaceae	✓	✓
Sameo (H)	Valeriana wallichii DC.	Valerianaceae	√	✓
Karwi (S)	Caryopteris foetida (D.Don) Thellung	Verbenaceae		~
Banafsa (H)	Viola canescens Wall.ex Roxb.	Violaceae	~	
Banafsa (H)	Viola serpens Wall.	Violaceae	✓	~
- (C)	Vitis capriolata D. Don Royle	Vitaceae	✓	√
Ban Haldi (H)	Hedychium spicatum BuchHam. ex J.E. Sm.	Zingiberaceae	✓	✓
· · · · · · · · · · · · · · · · · · ·		·		1

(H=Herb, S= Shrub, T= Tree, C= Climber, OF= Oak Forest, PF= Pine Forest)



Volume 7 Issue VIII, Aug 2019- Available at www.ijraset.com



Fig: 2. Habit Distribution in Oak and Pine Forest

Fig 3: Species richness in Oak and Pine Forest

IV. ACKNOWLEDGEMENT

The authors are thankful Head, Department of Botany D. S. B. Campus, Nainital for necessary research facilities.

REFERENCES

- [1] Ehrlich PR & Wilson EO, Biodiversity studies: science and policy, Science, 253. 758-762, 1991.
- [2] Grime JP, Plant Strategies and Vegetation process, John Wiley, New York; 1979.
- [3] Huston M.A, A general hypothesis of species diversity, American naturalist. 13.81-11, 1979.
- [4] Austin MP, Pausas J G and Nicholls A O, Patterns of tree species richness in relation to environment in Sourtheastern New South Wales, Australia. 21.154-164, 1996.
- [5] Cornell HV & Lawton JH, Species interactions, local and regional processes, and limits to the richness of ecological communities: a theoretical perspective. J. Anim. Ecol, 61.1-12, 1992
- [6] Austin MP & Gaywood M, Current problems of environmental gradients and species response curves in relation to continuum theory. J. Veg. Sci, 5. 473-482, 1994
- [7] Margules CR, Nicholls AO & Austin MP, Diversity of Eucalytus species predicted by multi-variable environmental gradient. Oecologia (Berl.) 71. 229-232, 1987
- [8] Pausas JG, Species richness patterns in the understorey of Pyrenean Pinus sylvestris forest, J. Veg. Sci, 5. 517524, 1994
- [9] William K, Cornwell and Peter J G, Regional and local patterns in plant species richness with respect to resource availability, OIKOS 100. 417–428, 2003.
- [10] Dufour A, Gadallah F, Wagner H H., Guisan A and Buttler A, Plant species richness and environmental heterogeneity in a mountain landscape: effects of variability and spatial configuration, ECOGRAPHY , 29. 573-584, 2006.
- [11] Marquard E, Weigelt A, Temperton V M, Roscher C, Schumacher J, Buchmann N, Fischer M, Weisser W W, And Schmid B, Plant species richness and functional composition drive overyielding in a six-year grassland experiment, Ecology, 90(12). 3290–3302, 2009.
- [12] Wilson J B, Peet R K., Dengler J & Partel M, Plant species richness: the world records, Journal of Vegetation Science, 23.796–802, 2012.
- [13] Pandey NC, Joshi GC, Tewari LM, Ethnobotanical plant diversity of Betalghat region of Kumaun Himalaya. Biolife, 4(4). 629-649, 2016.
- [14] Upreti BM, Tewari L, Tewari A and Joshi N, Physiochemical Characterization of Soil Collected from Sacred and Non Sacred Forests of Uttarakhand: A Comparative Study; J. Chem. Eng. Chem. Res, 3(11). 989-992, 2016.
- [15] Upreti BM, Tewari L, Tewari A, Role of Plants Used in Religious and Cultural System by Local Inhabitants of Sacred Forests of district Pithoragarh, Kumaun Himalaya, Biolife, 5(1).7-11, 2017.
- [16] Upreti BM, Eco –taxonomical exploration of major sacred forests in Pithoragarh district of Kumaun Himalaya and their significance in phytodiversity conservation. Ph.D Thesis submitted to Kumaun University, Nainital, Uttatakhand, 2018.
- [17] Upreti BM, Pandey N C and Tewari L M, Perceptions of Local Communities Towards Sacred Forests In Pithoragarh District of Kumaun Himalaya, India. wjpls, 5(2). 169 – 173, 2019.
- [18] Osmaston AE, A forest flora for Kumaun. International Book Distributors, Dehradun, 1927.
- [19] Gupta RK, Flora Nainitalensis: A Handbook of the flowering plants of Nainital. Navayug Traders, New Delhi, 1968
- [20] Gaur RD, Flora of the District Garhwal Northwest Himalayas (With Ethnobotanical Notes). Transmedia: Srinagar, Garhwal, 1999.
- [21] Upreti Brij Mohan, Tewari Lalit M, Tewari Ahish, Pandey Naveen, Sacred Forests of Pithoragarh, Western Himalaya, India, (INDU BOOK SERVICES PVT. LTD.), 2019.











45.98



IMPACT FACTOR: 7.129







INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 🕓 (24*7 Support on Whatsapp)