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Research Article

Macro-ecology and biogeography of soil nematodes in Pir Panjal range of Jammu and Kashmir Himalaya, India

Shahnaz Anjam
Nematode Biodiversity and Genomics Research Lab, BGSB University, Rajouri- 185234 (J&K), India
Nazia Kouser
Nematode Biodiversity and Genomics Research Lab, BGSB University, Rajouri- 185234 (J&K), India
Ali Asghar Shah*
Nematode Biodiversity and Genomics Research Lab, BGSB University, Rajouri- 185234 (J&K), India

*Corresponding author. E-mail: aashah@bgsbu.ac.in

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Abstract
The Himalayan region holds significant ecological importance and plays a crucial role in biomonitoring ecosystems. The present study to investigate the Effects of various factors, including latitude, climate, and vegetation, on the diversity and geographic distribution patterns of soil-inhabiting nematodes in the Pir Panjal range of the Jammu and Kashmir Himalayas, India. Soil Samples were collected from forests, agricultural fields, and grasslands in temperate and subtropical regions, along an altitude gradient (1000 to 2300m) and a latitudinal gradient (33º 32 'N to 33º 48' N). A Significant variation among different vegetation types and number of genera and abundance of nematodes was determined by Regression Analysis and A one-way ANOVA followed by T test. A Correlation Coefficient Analysis between various ecological indices like Maturity Index (MI), Diversity Indices (Shannon-Weaver, Simpson, Hills N1 and N2), Trophic structure Indices (Enrichment Index, Structure Index) and latitude were performed. The Maturity Index decreased (r= -0.645) in higher latitudes, accompanied by an increase in microbial activity, indicating a less disturbed environment. The higher values of the Enrichment Index (EI) and Structure Index (SI) at lower latitudes indicated higher opportunists and an indicator of food web state, respectively. The Linear regression model showed a significant relationship between soil nematode trophic guilds and latitude and precipitation. It reflects higher nutrient mineralization and productivity in areas with higher precipitation. The highest mean value of nematode abundance in temperate region and genera in subtropical areas explains the trophic guild status.

Keywords: Biogeography, Diversity indices, Enrichment index, Genera richness, Soil nematodes

INTRODUCTION

Studies on the biogeography and ecology of soil fauna have proven significant worldwide (Coleman *et al.,* 2024). The distribution pattern of soil inhabiting organisms along a latitudinal gradient helps to understand the diversity of soil fauna and their ecological functioning. The macroecological diversity and geographical pattern of soil-inhabiting organisms are an interesting debate in many Journals. Macroecological diversity, beyond the distribution pattern of species, explains abundance and diversity (Grilli, 2020), as well as body size, thereby correlating with environmental parameters (Hooper *et al*.,2005; Keshava *et al*., 2023). However, the geographic pattern of levantiinae moth (Omid and Hossein, 2015), birds (Jetz, 2006; David *et al.,* 2006), amphibians (Simon *et al.,*2004) and global pattern of the terrestrial vertebrates (Clinton *et al*., 2013) shows the research finding that are required for the protection and conservation of biodiversity. In Himalayan region, macroecology has been the most interesting and important discipline encompassing protection to both below and above ground organisms. The pattern and cause of spatial variation in species richness is a general simulation model that offers new insight for the macroecology (Nicholas *et al.,* 2009). There has been much progress in studying certain parameters of macroecology like taxonomic and functional groups of below ground organisms, type of habitats they occupy and geographic location (Shoemaker *et al*., 2025).

In terrestrial ecosystem soil is the most complex and poorly studied habitat for biological communities, that offers a wide range of ecological studies (Lavelle and Spain, 2001; Wagg *et al*., 2014). Due to large body size and easy identification, the distribution of above ground organisms is well documented (Tedersoo *et al.,* 2012) but due to microscopic size of below ground organisms, their identification and distribution has received relatively less attention. Nematodes are most diverse and numerically abundant metazoic group of organisms with body size varying from 0.3 mm to 5.0 mm counting 10^8 individuals found in 1 m^2 of soil (Chen *et al.,* 2014). They are inhabitants of almost all ecosystems ranging from forests to the agricultural soil and occupy wide range of life forms including parasitic and free living (Yeates *et al.,* 1993). Yeates (1979) have studied soil nematodes of terrestrial ecosystem which gives a comprehensive idea on abundance with reference to the various forest types. The abundance and species richness were also studied and the highest and lowest richness of species were found at different altitudes. Studies on genera richness and abundance by various ecologists thereby provided significant data for understanding geographic distribution pattern of soil nematodes and hence confirmed to be beneficial for conservation of soil micro fauna (Kharkwal and Rawat., 2010). Temperate rainforest has highest nematode species whereas lowest numbers are found in tropical soil (Porazinska *et al.,* 2012). In general, tropical rain forest becomes the hotspot for the richness and diversity of soil inhabiting nematodes.

The main objective of present study was to determine abundance and richness of soil nematodes in Pir Panjal range of Jammu and Kashmir Himalaya and to determine the co-relation between soil nematode abundance and genera with ecological parameters like latitude gradient, temperature, precipitation and vegetation types. For macroecological diversity and distribution pattern of soil nematodes, effect of different parameters like latitude, vegetation type on abundance and number of genera were studied.

MATERIALS AND METHODS

Sampling site network

The sampling site network is located in Pir Panjal range of Jammu and Kashmir Himalaya (Fig.1), situated in the western part of the Jammu and Kashmir UT, in India between $33^{o}25'$ to 34^{o} 01′ North latitude and $73^{o}58'$ to $74^{o}35'$ East longitude at 1070 m above sea level. The study sites comprised of upper and lower riches oftehsil Thanamandi and Darhal. The Indian UT of Jammu and Kashmir as a whole and Pir Panjal region of district Rajouri in specific in the Western Himalayas is one such single sector which has been identified as under-explored by Zoological Survey of India. The climatic status of district is very mild and pleasant as the district experiences mild summer and winter and climatic variations are found from valleys to the hilly regions. The maximum and minimum temperature recorded in the district is around $40^{\circ}C$ and $-2^{\circ}C$. The average rainfall of Rajouri district is 1200-1400 mm per annum with 56 -73 average rainy days (Sharma *et al.,* 2020).

The study site network, comprise 72 monitoring sites, separated by 20 km distance from adjacent sampling sites. The primary land used for the collection purpose was forests, meadows, cropland and undisturbed natural sites. Because of its variability in geology, climate

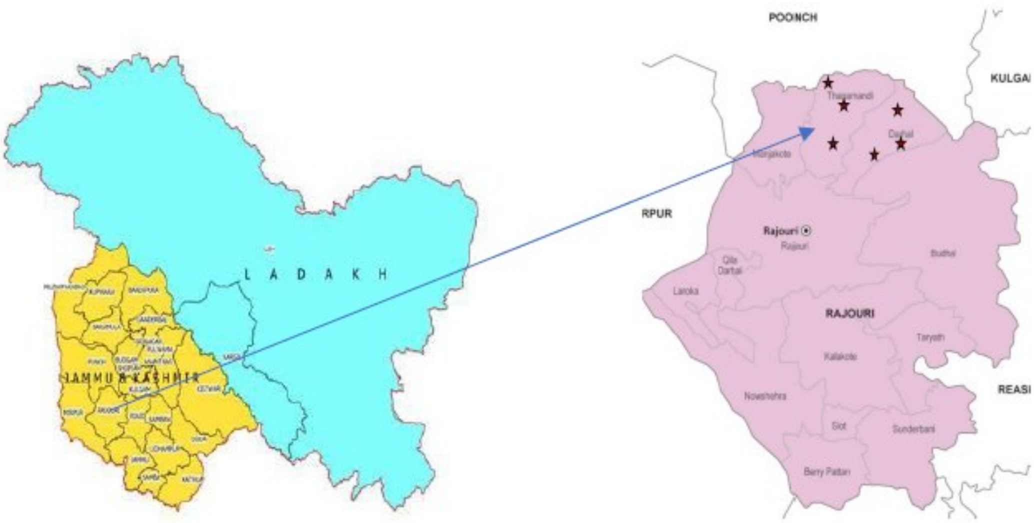

Fig.1. *Showing the sampling site (Darhal & Thannamandi) for the study of nematode diversity*

and land-use, this Himalayan region offers a large gradient of pedo climatic land use and management.

Sampling and extraction

Seventy-two samples, 12 samples from each site, were collected from 06 different sites from upper and lower reaches of Darhal and Thanamandi of district Rajouri from the surface soil layer (0 - 15 cm). Soil as well as sediment (10-15 cm deep) samples were randomly collected from each sampling site.

Experimental design

For soil nematode extraction samples were processed by the modified Cobb's (1918) sieving and decantation and modified Baermann's funnel techniques. The soil (400 gm) was placed in a bucket and added a small amount of water into it. To form homogenous soil suspension, it was manually stirred and kept undisturbed for three to four minutes allowing heavy particles to settle down at the base. Stones and debris were removed manually. The suspension was then transferred into another bucket through a coarse sieve (2mm pore size) which filtered large sized particles. The suspension in the second bucket was then filtered through a 300-mesh sieve (53μm pore size). Through tap water, remaining filtrate collected into the beaker from the mesh sieve. The filtrate collected in the beaker was transferred on a small coarse sieve lined with tissue paper. The sieve was then kept on a Baermann's funnel filled with water touching the bottom of the sieve. At the time of placing sieve, special care was taken to avoid trapping air bubbles at the bottom. The stem of the funnel was fitted with rubber tube which is tied with a stopper. The nematodes move from top of the sieve into the base of the funnel through water column and settled down. After 24 hours, few drops of water were taken from the funnel through the rubber tubing into a cavity block for further studies.

Nematode community analysis

Nematodes were identified at generic level by using Olympus Stereo Zoom research microscope (SZX 16). Morphological observations and species level identification was done by using Olympus BX51 DIC microscope.

For the characterization of soil nematode communities, abundance and diversity are the two main parameters studied (Nahmani and Lavelle, 2002; Sattler *et al.,* 2010). These two parameters may not involve in analyzing environmental pollution. However, anticipation of some parameters like:

a) Maturity Index (MI) (Bongers, 1990),

$X = \Sigma vi\times fi/n$ …….(i)

where vi= c-p value of the family, fi-frequency of family i in sample and n is the total number of individuals in a sample.

b) Structural Index (SI), (Ferris *et al*., 2001).

SI =100* s/s+ b ……. (ii)

where, s = Ban + Prn +Fun 270+ Omn, n = 3-5 and b = Ba2+ Fu2

c) Enrichment Index (EI) (Ferris *et al.,* 2001; Ferris and Matute, 2003)

EI= 100*e/(e+b) ....(iii)

where e= (Ba1* W_1) +(Fu2*W_2)

diversity indices,

d) Shannon-Weaver (Shannon-Wiener Index, which indicates the nematode species diversity in a community:

$H' = -\sum Pi \ln Pi$ ..…. (iv)

where pi is the proportion of each taxon in the total population (Shannon, 1949).,

e) Simpson; D = 1 - [∑n(n-1]/ N(N-1) ….(v)

where n= total number of soil nematodes of a particular species and N= total number of soil nematodes of all species, Hills N1 and N2 (Parisi *et al.,* 2005) facilitate nematode community analysis and comparison to environmental changes (Kalkhorana and Ahangar, 2014). Among these indices, Maturity Index is found to be the indicator of environmental issues and ecological succession and was proposed on the basis of colonizers and persisters (Bongers, 1990). The colonizers and persisters have certain important characteristic on which a cp scale was designed starting from 1 to 5. Colonizers are characterized by short life cycle, rapid reproduction rate, large number of populations, higher colonizing capacity and greater tolerability towards environmental disturbances whereas persisters have long life cycle, slower reproduction rate and small population, lower colonizing capacity and lesser tolerability towards environmental disturbances. However, higher and lower cp values help in determining the tolerance and sensitivity of nematodes towards environmental disturbances (Gomes *et al.,* 2003). Enrichment index (EI) provides the primary decomposers response towards accessible resource and the structural index (SI) provides the impact of stress or any disturbance on trophic chain (Ferris *et al.,* 2001).

Statistical analysis

Correlation and Regression analyses were used to check the relationships among different variables, such as the Maturity index (Bongers, 1990), Enrichment index, Structure index (Ferris *et al.,* 2001), Shannon-Wiener index (Shannon and Weaver, 1949) and several illustrative abiotic variables, including the latitude, mean annual temperature and mean annual precipitation. Survey at each sampling site was categorised on the basis of different types of vegetation: (1) Saj (Subtropical), (2) Thanamandi (Temperate), (3) Azmatabad (Temperate), (4) Dudaj (Temperate), (5) Nadian (Subtropical) and (6) Darhal (Subtropical). One-way ANOVA followed by T test was performed, R2 value represents the measure of the model's goodness of fit. Pearson Coefficients were calculated for investigating correlations between nematodes and environmental parameters (climatic factors- temperature and precipitation). The analysis was executed using the statistical packages like SPSS, Minitab and Excel. Linear regression selection and Pearson Coefficients were calculated for nematode variables and indices displaying a significant difference.

RESULTS

Distribution of soil nematodes

In total 2,56,276 individual nematodes per kg dry soil and 42 genera were reported from various sampling sites (Table 1). According to current sampling data, abundance of soil nematodes gradually increased from lower (33°32 N) to medium (33°40 N) - higher latitudes (33°48 N) and soil nematodes were distributed with the greatest abundance in the high latitudes (Table 2). The highest number of individuals of soil nematodes as reported in Azmatabad of Tehsil Thanamandi, followed by Dudaj of Tehsil Darhal, and then Thanamandi Tehsil. In contrast, fewer individuals were reported in Nadian and Darhal of Tehsil, as well as in Saj of Tehsil Thanamandi. Soil nematode genera gradually decreased with the increase in latitudes. The highest number of soil nematode genera was reported in Nadian, followed by Darhal and Saj of Tehsil Darhal and Thanamandi, respectively. Few soil nematodes genera have been reported from Thanamandi, Azmatabad and Dudaj. The first three regions (Nadian, Darhal and Saj) fall in the subtropical zone with lower latitude, whereas the other three (Thanamandi, Azmatabad, and Dudaj) are in the temperate zone with medium to high latitude (Table S1).

Pearson's Correlation Coefficient Analyses showed that the abundance was positively correlated with latitude, while genera of soil-inhabiting nematodes were negatively correlated with latitude. Regression analysis showed that only nematode abundance had a highly significant relationship with latitude ($P<0.05$).

Effect of latitude on nematode abundance, genera and ecological index

Nematode abundance

Abundance of soil nematode gradually increased from lower to medium to higher latitude (Table 2) and soil nematodes were distributed with the greatest abundance in the high latitude of 33 º 48 N and lower at the latitudinal gradients of 33 º36 N and 33 º 32 N (Fig. 2a). The genera of soil nematode decrease on moving from low to high latitude showing negative Co-relation with latitude (Fig. 2b)

Ecological indices

Maturity index (MI): The Maturity Index of soil nematodes was higher in the lower latitude but gradually decreased with an increase in latitude gradient. This shows a less significant relationship with latitude ($p<0.004$) and a negative Pearson correlation ($r=0.645$) (Fig 3a).

Trophic structure indices: Correlation coefficient analyses reveal that the Enrichment index (EI) has a positive correlation with latitude, whereas the Structure index (SI) exhibits a negative correlation with latitude (Fig. 3a). One-way Anova analysis showed that EI have positive correlation while SI have negative correlation with latitude. Regression analyses revealed that the Enrichment index (EI) ($p<0.05$) exhibited a highly significant relationship with latitude, whereas the Structure index (SI) ($p<0.0001$) showed a less significant relation-

Table 1. Location and characteristics of sampling sites

Location	Altitude	Latitude	Vegetation	Soil
Thanamandi	1458 m	33 º 40 N	Temperate	Clayey and loamy soil
Darhal	1217 m	33 º34 N	Subtropical	Fine sandstone
Nadian	1315 m	33 º 36 N	Subtropical	Sandy and loamy
Azmatabad	1570 m	33 º 48 N	Temperate	Sub-mountainous
Saj	978 m	33 º 32 N	Subtropical	Sandy and loamy
Dudaj	1533 m	33 º 46 N	Temperate	Sub-mountainous

Table 2. Distribution & diversity of soil nematodes and genera in six different sampling locations. H', Shannon-Wiener index; λ, Shannon–Wiener index), Hill N1 & N2.

Location	Abundance (N)	Genera	H'	N1	λ	N2
Nadian	21053	42	1.06	2.88	0.41	2.41
Dudaj	41052	24	1.3	3.53	0.25	3.93
Darhal	11052	40	1.1	2.99	0.39	2.56
Saj	2516	36	0.9	2.44	0.51	1.96
Thanamandi	28302	35	1.6	4.34	0.42	2.38
Azmatabad	152301	26	1.3	3.53	0.27	3.70

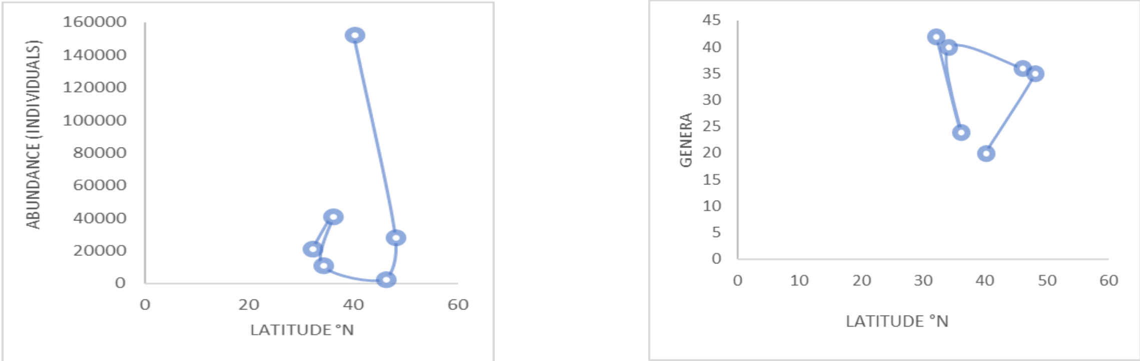

Fig.2(a-b). *Effect of latitude on nematodes abundance and genera distribution*

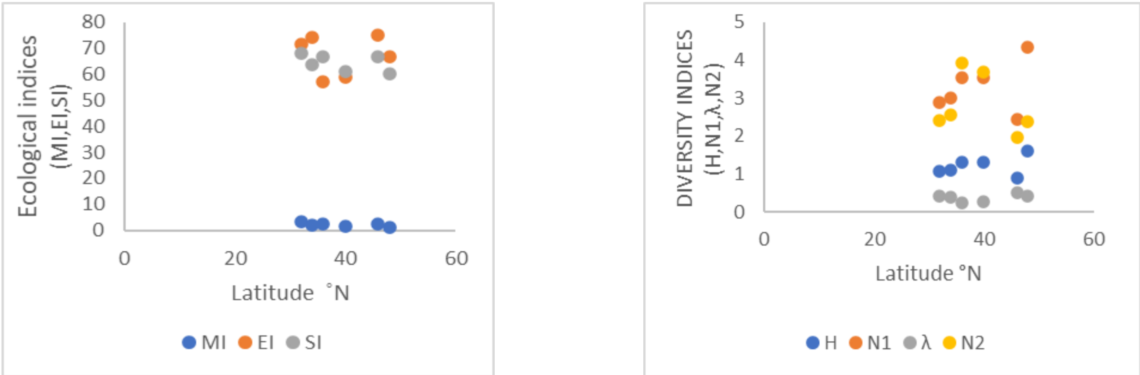

Fig.3 (a-b). *Effect of latitude on a) ecological indices (MI, EI, SI) and b) diversity indices (H, N1, λ, N2)*

ship (Fig. 3a).

Diversity indices: All the diversity indices showed a positive correlation with latitude, except for Hills N2 (Fig. 3b), but Regression analysis showed that all the diversity indices had a less significant relationship with latitude (Table 3).

Effect of precipitation and latitude on soil nematode trophic groups

A significant relationship was reported between precipitation and soil nematode trophic guilds by using linear regression model. One-way ANOVA analysis revealed that only bacterivore nematodes exhibited a positive correlation, whereas other trophic groups showed a negative correlation with precipitation (Fig. 4b). Similarly, latitude had a significant relationship with soil nematode trophic guilds (Fig 4a). Correlation Coefficient Analyses showed that only bacterivore nematodes were positively correlated with the latitude (r=0.080) while Fungivores (r=-0.305), Omnivores (r=-0.463) and Predatory Nematodes (r=-0.203) were negatively correlated (Table 3).

Effect of vegetation types on nematode abundance and genera

Observations revealed that temperate regions with fir and pine forests (TFPF), as well as those with pine and oak forests (TPOF), have the highest number of nematode individuals. In contrast, subtropical evergreen forests (SEF), subtropical poplar and willow forests (SPWF), and subtropical forests (SF) have a smaller number of nematode individuals (Fig. 5). Nematode

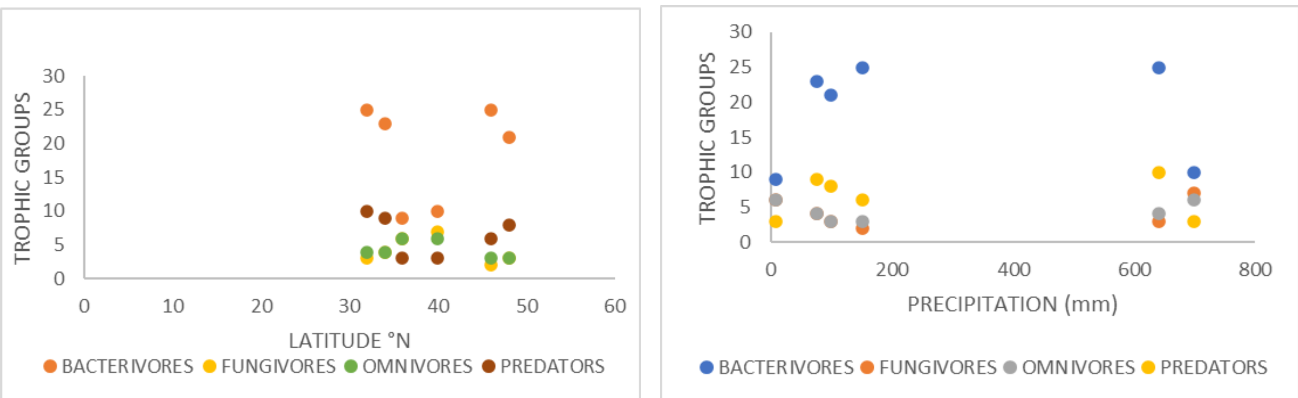

Fig.4 (a-b). *Effect of a) latitude and b) precipitation on nematode trophic guilds (bacterivores, fungivores, omnivores, predators)*

Table 3. *Correlation coefficient using Linear Regression model & Anova. H', Shannon-Wiener index; λ, Shannon–Wiener index; Hill N1 & N2, Total number of individuals; EI, Enrichment Index; SI, Structural Index; MI, Maturity index*

Regression Statistics	Abundance	Genera	Diversity Indices				Ecological Indices			Trophic Guilds			
			H	N1	λ	N2	EI	SI	MI	Bacterivores	Fungivores	Omnivores	Predator
Multiple R	0.636	0.963	0.981	0.981	0.975	0.945	0.983	0.984	0.981	0.934	0.891	0.930	0.898
R Square	0.406	0.931	0.963	0.963	0.951	0.894	0.967	0.968	0.963	0.874	0.795	0.866	0.807
Adjusted R Square	0.202	0.731	0.763	0.763	0.751	0.694	0.767	0.768	0.763	0.674	0.595	0.666	0.607
Standard Error	55722.07	9.913	0.256	0.698	0.092	1.039	13.278	12.545	0.256	7.778	2.242	1.803	3.394
P values	0.122	0.178	5.04	8.70	4.23	7.53	0.0005	7.12	6.14	0.0004	1.79	1.53	5.68

genera found to be highest in subtropical forests while comparatively low in temperate regions (Fig. 6).

DISCUSSION

Distribution and diversity of soil nematodes

Complete knowledge of nematode distribution along latitudinal gradients worldwide requires a brief study on the taxonomy and molecular genetics of nematodes (Wu *et al.,* 2011). Elevation is one of the most significant factor that affect the diversity and abundance of soil nematode communities because of change in climatic conditions like temperature, precipitation and vegetation types (Afzal *et al.,*2021). In this study a general decreasing trend was observed in soil nematode numbers, diversity (H) and abundance (N) along the elevational gradient and soil depth (Table 2). These results are in consistent with the studies conducted by Oakley in the northern of Greater Khingan Mountains, China (Shen *et al.,* 2023) and in the Pir-Panjal Himalayan mountains (Kashyap *et al.,* 2022; Afzal *et al.,* 2021; Choudhary *et al.,* 2023). At higher altitude the density of vegetation reduced due to higher soil surface temperature because the sunlight falls directly, thus leading to more water-soluble nutrients (DON and DOC) and higher nutrients availability (NH_4^+-N and NO_3^--N). As a result, the relative abundance of all soil nematodes decreased except plant–parasites; perhaps nematodes that can be due to movement of nematodes into the deeper soil layer to avoid relatively higher surface temperatures (Oka, 2019), however the results from the study conducted in Mount Ararat in Turkey were different where the maximum number of soil nematode species was found at medium elevation, indicating a"single peak pattern"(Taylan *et al.,*2021). This can be due to the changes in temperature, moisture, precepitation and elevations (Afzal *et al.,* 2021; Albright *et al.,*2020).

Other studies showed that abundance of nematodes was high in moist soil as precipitation affects nematode density (Landesman *et al.,* 2011; Ruan *et al.,* 2012). But higher moisture level reduces the growth and development of nematodes in soil due to less availability of oxygen (Liu *et al.,* 2019*; Afzal et al.,* 2021).

However, as the soil layer deepens and moisture content of soil decreases, the activities of soil nematode abundance show a declining trend and diversity at higher elevations also decreases (Tong *et al., 2010;* Chen *et al.,2024).* Kashyap *et al., (*2022) found that at higher elevation more hostile environments with relatively less resilient and sustainable ecosystems compared to lower elevations. Our results are in tandem with these findings.

Effect of vegetation on nematodes

Nematode community composition is affected by the types of vegetation (Nielsen *et al.,* 2014). In present

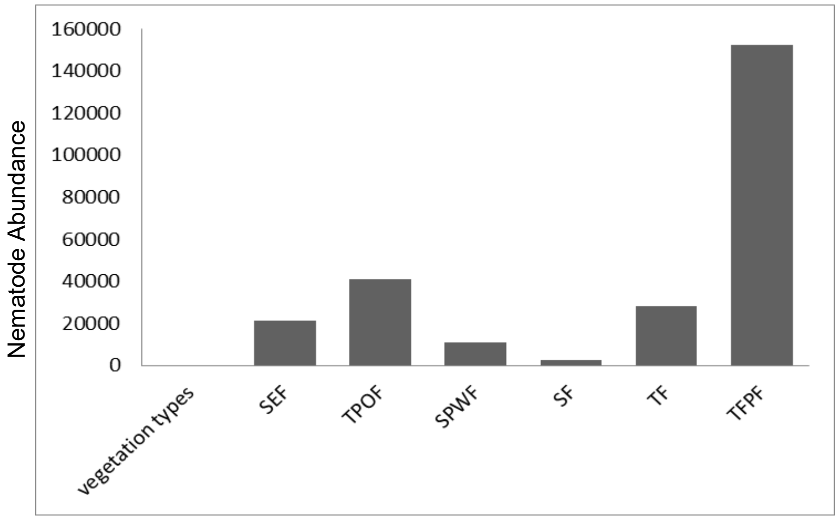

Fig.5. *Relationship of different vegetation types with mean abundance of soil nematodes- SEF-Subtropical evergreen forests, TPOF-Tropical Pine and Oak forests, SPWF- Subtropical Poplar & Willow forests, SF- Subtropical forests, TF-Temperate forests, TFPF- Temperate with Fir & Pine forests*

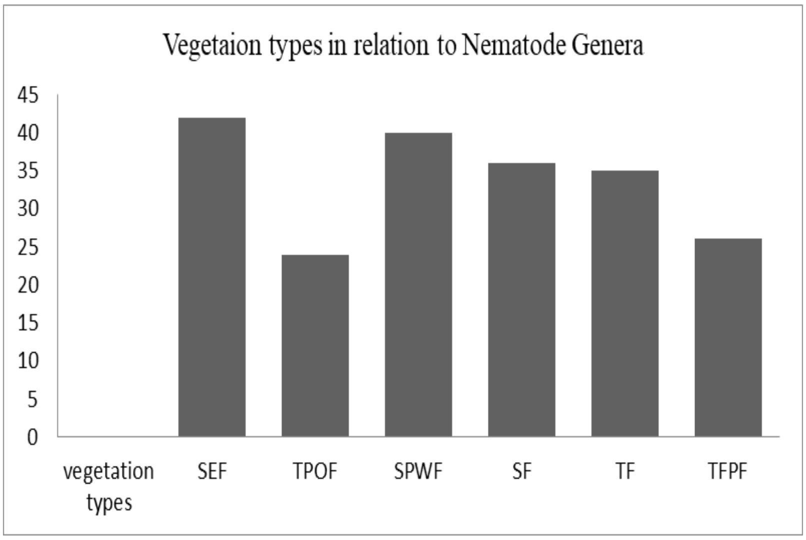

Fig.6. *Effect of Vegetation types on number of soil nematodes Genera; - SEF-Subtropical evergreen forests, TPOF-Tropical Pine and Oak forests, SPWF- Subtropical Poplar & Willow forests, SF- Subtropical forests, TF- Temperate forests, TFPF- Temperate with Fir & Pine forests*

study, the abundance of nematodes was higher in temperate with fir (*Abies alba*) and pine (*Pinus roxburghii*), temperate with pine and oak (*Quercus robur*) and temperate with pine forests probably because low temperature and low precipitation favors less return of organic content, less nutrient erosion and soil respiration in temperate regions that in turn elevates organic matter accumulation (Wu *et al.,* 2004). Similarly, the vegetation in subtropical regions differed from that in temperate regions in several key aspects: higher plant productivity, higher organic return, and higher nutrient mineralization, along with less accumulation of organic matter in the soil (Yu *et al.,* 2023). This is due to the subtropics' higher temperatures and moisture levels, which enhance decomposition processes. In general, soil nematode communities have less diversity in disturbed ecosystems (Yumei *et al.,* 2025; Kandji *et al.,* 2001). In present study abundance of soil nematode gradually decreased from temperate coniferous forests to subtropical regions while number of genera was found to be higher in subtropical region (Table S1) and these results do not match with the findings of Woodford (2003) as the polar regions have unfavorable conditions, cover up very less vegetation and less fertility in soil that results in lower abundance of soil nematodes.

Nematode ecological index

Various soil organisms like springtails, oribatid mites, termites (Lavelle and Spain, 2001; Maraun *et al.,* 2007) and other aboveground fauna (Nico *et al.,* 2015) were found to be higher in tropical regions near the equator. In present study, positive correlation of all the diversity indices except Hills N2 with latitude has been found (Fig 3b). Highest value of Shannon wiener and Hills N1 diversity index was found at highest latitude 33˚48N, as human disturbance at lower latitude decreases the diversity of soil nematodes (Guo *et al.,* 2021; Zhang *et al.,* 2017). Therefore, diversity of soil nematodes was seemed to be greatly affected by the human disturbance. The maturity index becomes another baseline for the assessment of soil quality and a bioassay providing information on soil biological/ non biological pollutants (Ma *et al.,* 2023; Homet *et al.,* 2023) with smaller values being indicative of highly disturbed environment and larger values indicate less disturbed environment (Pothula *et al.,* 2019; Yumei *et al.,* 2025).

In the present study Maturity Index of soil nematodes was higher in the lower latitude but gradually decreases with increase in latitude gradient as MI decreases with increasing microbial activity (Preez *et al.,* 2022) at higher latitude (Table 3a). Meanwhile it becomes a valuable index for determining nematode response towards any external intrusion (Pothula *et al.,* 2019). Various human activities may reduce the abundance of soil nematodes because of degradation and deterioration of soil environmental conditions (Guo *et al.,* 2021; Zhang *et al.,* 2017). The present study results showed that the distribution pattern of soil nematode abundance and diversity along latitude changed due to hydrothermal conditions, plant growth and human activities. Some other ecological indices like Enrichment Index (EI) (a measure of opportunistic bacterivore and fungivore nematodes) and the Structure Index (SI) (indicator of food web state) affected by stress or disturbance (Li *et al.,* 2024). The findings suggest that higher values of EI at lower latitude indicate higher opportunist's bacterivores and fungivores nematodes while higher values of SI at lower latitude may be because of certain environmental disturbance.

Nematode functional guilds

Functional grouping of nematodes gives important information to mainly detect changes in soil processes by considering distinct feeding strategies. For measurement of soil nematode diversity and abundance, number of soil nematode trophic groups becomes an important aspect in soil ecosystems (Bongers and Bongers, 1998; Ferris *et al.,* 2001). Based on feeding types, nematodes are categorized as bacterial feeders, fungal feeders, plant feeders, omnivores, and predators (Li *et al*., 2020).

Studies on trophic group of nematodes in relation to latitude have suggested that abundance of herbivores, fungivores and omnivores declined significantly along altitude which is in line with Veen *et al.* (2017)*,* while bacterivore nematodes may become the dominating group at higher latitudes because of enormous disturbance in soil ecosystems (Nielsen *et al.,* 2014). The present results are not matching with the reports of Nielsen *et al.,* 2014 because it is observed that at lower latitude higher bacterivores were found as they feed mainly on useful saprophytic and plant pathogenic bacteria, further at higher latitude climate may becomes more adverse and harsher leading to decline in bacterivores number.

Conclusion

The present study is the first of its kind undertaken in Himalayan region of Jammu and Kashmir. Since the area is completely neglected due to many reasons like militancy, difficult terrain, extreme climatic conditions etc. The present piece of work is the first comprehensive study on correlation of latitude transect with nematodes diversity as well as impact of climatic conditions on abundance and genera richness in soil ecosystems in J&K Himalaya. The present results show that abundance has positive correlation with latitude and precipitation. Among the trophic groups only bacterivores nematodes were found to be positively correlated with precipitation and latitude while other group shows negative correlation with precipitation and latitude. Highest level of nematode abundance was found in temperate regions and lowest in subtropical regions. All diversity indices show positive correlation with latitude except Hills N2. The present study depicts that strong interaction of climatic factors with the soil organisms might be the reason for unfavorable conditions for the soil microorganisms to survive. The present study of the dominance and distribution of the species representing different trophic groups in Himalayan region of Jammu & Kashmir will be highly significant in the biomonitoring of the ecological changes in the area and to analyze the functional and biotic status of the soil. Consequently, nematode trophic guilds determine the status of other soil micro-fauna on which they survive and regulate their population.

Supplementary information

The author(s) is responsible for the content or functionality of any supplementary information. Any queries regarding the same should be directed to the corresponding author. The supplementary information is available for download from the article's webpage and will not be included in the print copy.

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Conflict of interest

The authors declare that they have no conflict of interest.

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