University of Jammu were used besides consulting taxonomic experts of the region. The form and nature of perennating buds of plant species were recorded and worked out according to the life-forms system of Raunkiaer [3]. The percentage distribution of these species in different life-forms was calculated for construction of biological spectrum of the area. The values, thus determined, were compared with the normal spectrum given by Raunkiaer [3]. The percentage life-form was calculated as follows;

$$\% \text{ Lifeform} = \frac{\text{Number of species in any life form}}{\text{Total number of species of all life foms}} \times 100$$

3. Results and Discussion

The forest of the Ramnagar wildlife Sanctuary represents typical subtropical vegetation, dominated mainly by broad leaved trees inter-spread with few scattered patches of shrubs. The forest has been classified as Northern dry-mixed deciduous forest (Type 5B/C2) as described by Champion and Seth [16]. *Acacia modesta* has been observed to be the most prominent tree species. Other dominant tree species include *Grewia optiva*, *Mallotus phillipensis*, *Cassia fistula*, *Dalbergia sissoo*, *Flacourtia indica*, *Lannea coromendalica*, *Crataeva adansonii*, *Aegle marmelos*, *Phyllanthus emblica*, *Acacia catechu*, *Leucaena leucocephala* and *Mitragyna parviflora*. *Justicia adhatoda* and *Lantana camara* have found to be the most conspicuous shrub species covering large area of ground in certain places. Other important shrub species include *Carissa opaca*, *Woodfordia fruticosa*, *Murraya koiengii*, *Capparis sepiaria*, *Solanum erianthum*, *Gymnosporia royleana*, *Helicteres isora* and *Abutilon ramosum*. *Fluggea virosa*, *Ricinus communis* and *Ziziphus nummularia* were found abundant along the road passing through the Sanctuary. The herbaceous layer, structurally and numerically most prominent during monsoon season, is represented by *Anagalis arvensis*, *Argemone mexicana*, *Oxalis corniculata*, *Stellaria media*, *Malvastrum coromendellianum*, *Bidens bipinnata*, *Achyranthes aspera*, *Sonchus asper*, *Euphorbia hirta*, *Martynia annua*, *Cleome viscose*, *Medicago denticulate*, *Chenopodium album*, *Pupalia lappacea*, *Cynodon dactylon*, etc. Climbers, typical of these hills and slopes have been represented by *Tinospora cordifolia*, *Abrus precatorius*, *Cuscuta reflexa*, *Ipomoea carica*, *Diplocyclos palmatus*, *Dioscorea belophylla*, *Macfadyena unguis-cati*, *Merremia aegyptia*, *Luffa acutangula*, *Pergularia extensa*, *Vallaris solanacea* and *Trichosanthes cucumerina*.

A total of 259 tracheophytes (belonging to 72 families) collected from the study area have been classified into various life-forms as per the classification proposed by Raunkiaer [3]. Number of species and percentage of different life-form have been depicted in Table [1].

Table 1: Total number of species and percentage of different life form classes

Life form classes	*Abbreviation*	*Number*	*Percentage (%)*
Macro-phaneophytes	Mp	60	23.16
Nano-phanerophytes	Np	30	11.58
Chamaephytes	Ch	28	10.81
Hemi-cryptophytes	H	23	8.88
Therophytes	Th	89	34.36
Cryptophytes	Cr	6	2.31
Lianas	L	21	8.11
Epiphytes	E	2	0.77
Hydrophytes	Hh	0	0
Total		259	100

Perusal of the table revealed therophytes (89 spp., 34.36%) to be the most dominating life-form followed by Macrophaneophytes (60 spp., 23.16%), Nanophanerophytes (30 spp., 11.58%), Chamaephytes (28 spp., 10.81%), Hemicryptophytes (23 spp., 8.88), Lianas (21 spp., 8.11%), Cryptophytes (6 spp., 2.31%) and Epiphytes (2 spp., 0.77%). The biological spectrum of the present study showed variation from the normal biological spectrum of Raunkiaer [3] (Fig. 1).

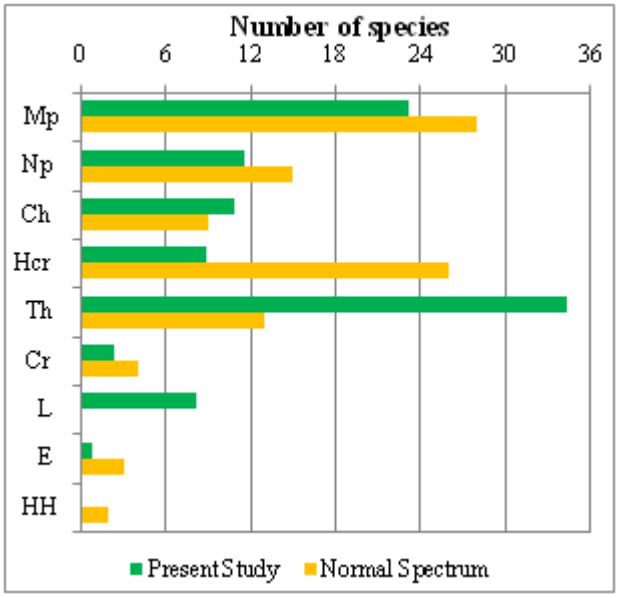

Figure 1: Comparison of Biological spectrum of present area with Normal biological spectrum

From the analysis of the relative proportion of various life-forms present in the study area, the phyto-climate of the study area has been classified as Thero-Phanerophytic. The dominance of therophytes (89 spp., 34.36%) is the characteristic of tropics and often related to soil conditions and climate [17]. Moreover, the predominance of therophytes is also attributed to introduction of annual weeds and biotic influences [18] and indicates a disturbed environmental condition [19]. Biotic influences can be a major factor for increased therophytic percentage owing to the fact that the sanctuary is located in vicinity of Jammu city. Peaking developmental activities and expanding urban sprawl has been a major cause of increased biotic interferences in the area. Since the Sanctuary is intersected by national highway the effect of biotic influences is further magnified.

Higher percentage of Macrophaneophytes (60 spp., 23.16%) reveals the predominance of trees as the area falls in Shivaliks which provides congenial edaphic and climatic conditions for growth of over-story [14]. The climate of the study area is warm in general and dry during summers and warm and moist during rainy season, thus confirming the preponderance of Therophytes (plants of warm and dry climate) and Phanerophytes (plants of warm and moist climate). The comparison of life forms of study area with the

Normal biological spectrum [3] and with adjoining areas like Jammu [14], Trikuta Hills [20], Kathua [21], Mahamaya [22] and Renuka wildlife sanctuary [17] having similar climatic conditions in North western Himalayas is represented in Table [2]. Perusal of the table reveals a similar type of phytoclimate in most of the areas except for Trikuta Hills where a Thero-chamaephytic phytoclimate has been reported which may be because of the varied amount of disturbances and latitudinal and longitudinal difference. Occurrence of similar biological spectrum in different regions indicates similar climatic conditions [23].

Table 2: Comparison of life forms of study area with different areas of North-west Himalayas

Region	*Mp*	*Np*	*Ch*	*H*	*Th*	*E*	*Cr*	*L*	*Phytoclimate*
NBS	28	15	9	26	13	3	4	-	Phanerophytic
Trikuta Hills	9.44	14.45	22.94	13.87	31.02	0.19	4.62	1.55	Thero-chamaephytic
Kathua district	16.63	12.79	12.36	15.77	32.89	0.63	2.55	5.11	Thero-phanerophytic
Mahamaya	19.5	10.99	13.82	7.44	38.29	0.70	1.06	7.08	Thero-phanerophytic
RenukaWLS	29.4	19.16	7.61	5.51	31.24	0.78	2.10	0.79	Thero-phanerophytic
Jammu	19.49	9.37	11.9	8.35	38.23	5.06	1.78	3.8	Thero-phanerophytic
Present study	23.16	11.58	10.81	8.88	34.36	0.77	2.31	8.11	Thero-phanerophytic
NBS= Normal Biological Spectrum, WLS= Wildlife Sanctuary, Mp= Macrophanerophyte, Np= Nanophanerophyte, Ch= Chamaephytes, Cr=Criptophyte, H=Hemicryptophyte, Th=Therophyte, E= Epiphytes, L=Linanas.									

4. Conclusion

Present study revealed the vegetation to be predominantly sub-tropical in nature having a higher percentage of therophytes followed by phanerophytes as compared to normal biological spectrum. On the basis of this study the phytoclimate of the area, as per Raunkiaer's terminology has been described as thero-phanerophytic. This indicates influence of anthropogenic activities in the area which favours the chances of growth of short lived annuals. The study is also significant because information related to life-forms gives an account of prevailing phytoclimatic conditions which can further be used to infer microclimatic conditions in an area. The study further gains significance as the life-forms suggest increased biotic interference in the wildlife sanctuary which in real terms is meant for protection and conservation of natural environment.

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