

Life Forms and Biological Spectrum of the Flora of Tons Valley, Garhwal Himalaya (Uttaranchal), India

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ABSTRACT: The present paper deals with the different life form categories and biological spectrum of the flora of Tons Valley in Garhwal Himalaya. It includes Phanerophytes (29.06%), Nanophanerophytes (6.47%), Chamaephytes (22.19%), Hemicryptophytes (2.11%), Geophytes (2.64%), Hydrophytes and Helophytes (8.58%), Therophytes (17.83%), Lianas (10.43%), and Epiphytes (0.66%). The comparison with Raunkiaer's normal spectrum depicts "Hydro- Chamaephytic Phytoclimate."

KEY WORDS: Tons Valley, Garhwal Himalaya, Life forms, Biological spectrum.

INTRODUCTION

Since Humbolt's different systems have been devised by many ecologists for the description and classification of plant life forms (Warming, 1909; Raunkiaer, 1934; Dansereau, 1957; Ellenberg and Muller-Dombois, 1974; Box, 1981). However, the system of Raunkiaer is the most accepted which is based upon the principle of position and degree of protection of the buds during the unfavourable or adverse seasons. A biological spectrum is formed when all the species of higher plants of a community are classified into life forms and their ratio expressed in numbers or percentage. Biological spectra are useful in comparing geographically widely separated plant communities and are also regarded as indicators of prevailing environment. Occurrence of similar biological spectra in different regions indicates similar climatic conditions. Biological spectrum may be materially changed due to introduction of Therophytes like annual weeds or due to biotic influences like agriculture practices, grazing and other biotic disturbances. Raunkiaer prepared a normal spectrum for the phanerogamic flora of the whole world, which is still widely used for comparing biological spectra of different regions.

The biological spectra of different regions of India have been determined by several workers (Meher-Homji, 1964, 1981; Sinha 1990; Kumar and Krishnamurthy, 1993; Pandey and Parmar, 1993; Singh and Arora, 1994). Meher-Homji (1964) compared the biological spectra of various regions of India to bring out the value of life forms as indicators of degrees of aridity and humidity in a tropical country. The rich and varied flora of Tons Valley has not been studied so far from this perspective and, therefore, the present study was carried out during 1994 to 1998 which resulted in 761 species of higher plants. These species are grouped into different life form categories based on Raunkiaer's systems as modified by Ellenberg and Mueller-Dombois (1974) and a biological spectrum is drawn. It is also compared with Raunkiaer's normal spectrum.

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The study area: The Tons Valley lies between 30° 35' and 30° 18' north latitudes and 77° 49' and 78° 37' east longitudes in the Garhwal Himalaya. The valley is bounded on the north and north-east by Shimla district of Himachal Pradesh, on the south-west by Chakrata forest division of Dehra Dun district, on the east by Yamuna forest division of Uttarkashi district. The total area of the Tons Valley is ca. 4500 sq. km. Due to great variations in elevation from the sea level, the Tons Valley presents a great diversity in climatic conditions. The lower parts of valley, supporting pure patches of pine forests, have sub-tropical climate, with a hot and more or less dry season from July to September, pleasant autumn and spring and a cold but bracing with clear and bright weather, alternating with occasional winter rains. The maximum rainfall is experienced in the months of July and August, 406.30 mm and minimum rainfall during the months of January and October 5.10 mm. In summer, maximum temperature reaches 40°C-42°C in valleys, below 1600 m, and 30°C-32°C at 2000 m elevation. However, minimum temperature goes down as low as -5°C in January.

MATERIALS AND METHODS

This work is based on the results of four years (1994-1998) of intensive study of the flowering plants of the Tons Valley. In order to explore the entire area and also to note the seasonal changes in vegetation, different seasons of the year covering all ecological habitats, were thoroughly studied. Sampling was done to prepare a complete herbarium for future reference. Relevant field notes were made on spot, noting down interesting and diagnostic features of plants; phenological data was also collected. Distribution status of each species in terms of abundance or otherwise was also carefully noted. All the collected specimens have been properly processed. Specimens of all plants were critically identified in different herbaria with the help of relevant floras and available revisions and monographs as well as comparing them with earlier authentic specimens. All the specimens were housed in the Herbarium of National Botanical Research Institute, Lucknow (LWG). A detailed upto-date inventory of all available flowering plants was made. All the species were categorized into various life form categories, and a biological spectrum was prepared for the Tons Valley, which was subsequently compared with the Raunkiaer's normal spectrum to determine the phytoclimate of the area.

Table 1. Biological spectrum of Tons Valley, compared with Raunkiaer's normal spectrum.

Life form categories	Tons Valley		Raunkiaer's normal spectrum
	No. of species	% of species	% of species
Phanerophytes	222	29.06	28
Nanophanerophytes	51	6.47	15
Chamaephytes	168	22.19	9
Hemicryptophytes	16	2.11	26
Hydrophytes & Helophytes	65	8.58	2
Geophytes	20	2.64	4
Therophytes	135	17.83	13
Lianas	79	10.43	-
Epiphytes	5	0.66	3
Total species	761	100.00	100

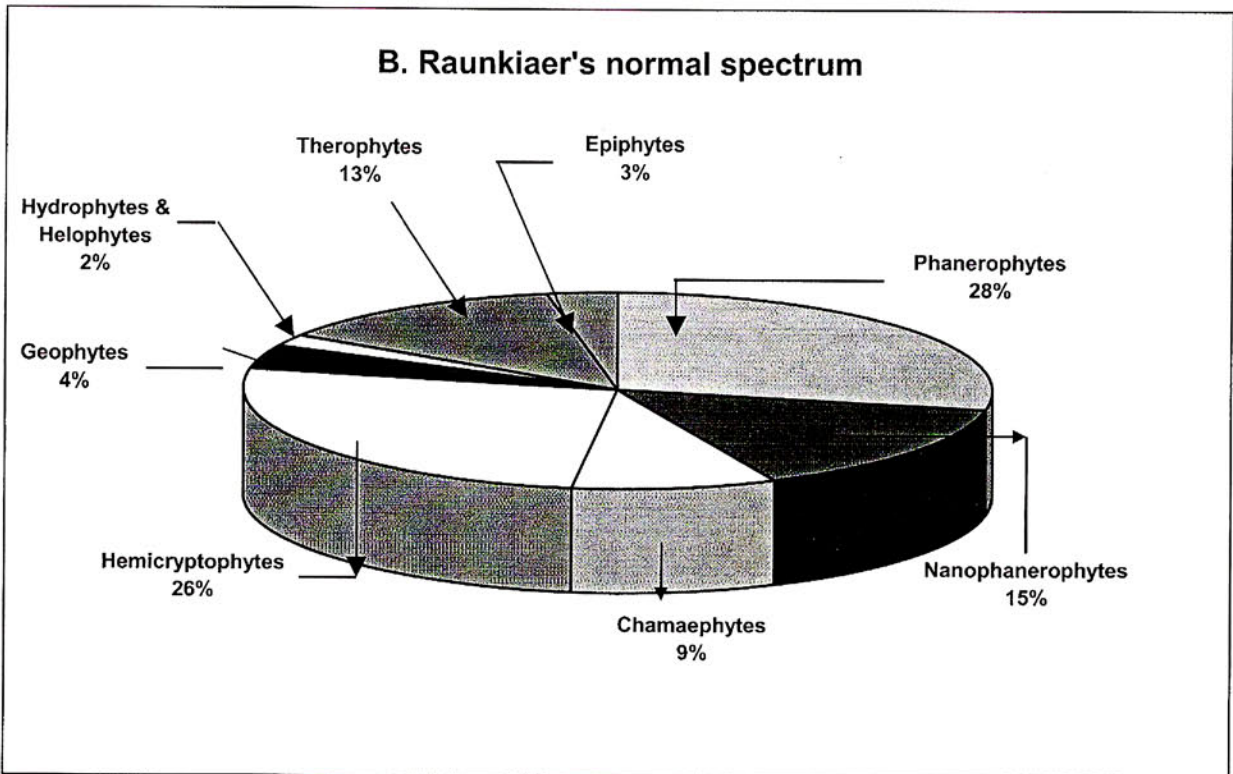
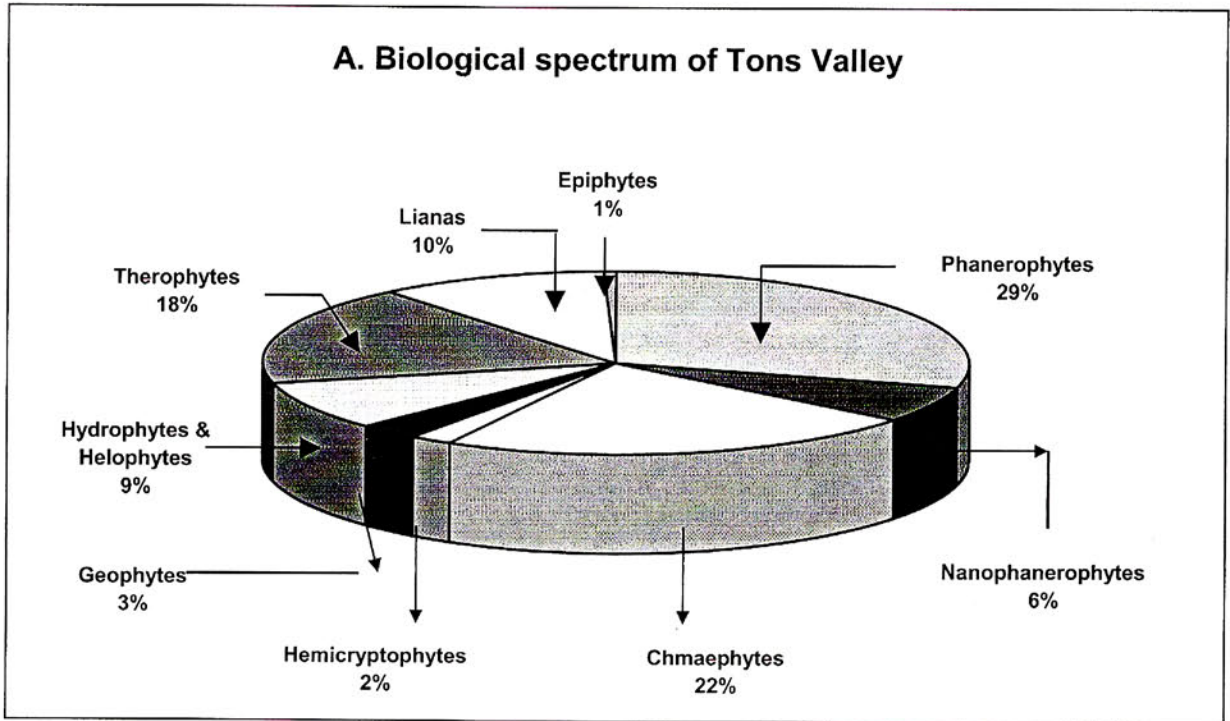


Fig. 1: Biological spectrum of Tons Valley and Raunkier's normal spectrum.

RESULTS AND DISCUSSIONS

It is evident from the Table 1 and Fig. 1 that Phanerophytes, Chamaephytes and Therophytes are most dominant life forms in Tons Valley represented by 29.06%, 22.19% and 17.83% respectively. However, percentage of phanerophytes only slightly exceeds the corresponding figure in the normal spectrum. The phanerophytes exceeds that of normal spectrum several times in humid tropics (Meher-Homji, 1964). The Chamaephytes are more than two times higher than that of the normal spectrum (9%). Similarly Hydrophytes (8.58%) are more than 4 times higher than that of normal spectrum (2%). According to Raunkiaer's (1934) terminology, the phytoclimate or plant-climatic of the Tons Valley is 'Hydro-Chamaephytic'. This is due to the reason that the area is drained by several perennial rivers, hill streams, ponds and canals which provide sufficient aquatic and semi-aquatic habitats to the plants. However, being a hilly and mountainous terrain much of area receives less water causing a higher percentage of Chamaephytes, which are characteristics of semi-arid regions. The Therophytes which are characteristics of desert are constituting 17.83% in Tons Valley, comparatively higher than that of normal spectrum (13%). The Hemicryptophytes (2.11%), Nanophanerophytes (6.47%), Geophytes (2.64%) and Epiphytes (0.66%) show smaller percentage than the normal spectrum. This indicates the effects of biotic operations on the vegetation. Lianas constitute 10.43% of the species indicating to some extent that the forests of Tons Valley are open.

CONCLUSION

The description of vegetation is necessary to show the inter-relationship between topography, climate and flora and the general ecological distribution of the species. The vegetation of Tons Valley is predominantly evergreen type, intermixed with the deciduous species, particularly at lower elevation. The present study revealed that Hydrophytes-Helophytes (8.58%) and Chamaephytes (22.19%) constitute the higher percentage than the normal spectrum (Fig.1) exhibiting 'Hydro-Chamaephytic' phytoclimate. Further the number of Nanophanerophytes, Hemicryptophytes and Geophytes have comparatively smaller percentage than the normal spectrum. It clearly indicates that anthropogenic (over-exploitation, over-grazing, developmental activities and monoculture) and natural factors (landslides, earthquakes, glaciation etc.) are operating together and reducing the chances of formation of new life forms.

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印度 Garhwal 喜馬拉雅 Tons 河谷地區植物相的生活型及生物譜

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摘 要

本文以印度 Garhwal 喜馬拉雅 Tons 河谷為研究地區，探討該區所有植物的生活型。結果顯示各類型所佔有的比率分別為高位芽植物 (29.06%)、矮高位芽植物 (6.47%)、地上芽植物 (22.19%)、地表芽植物 (2.11%)、地下芽植物 (2.64%)、水生植物及沼生植物 (8.58%)、一年生植物 (17.83%)、木質藤本 (10.43%) 和附生植物 (0.66%)。將此種組成與 Raunkiaer 的常態生物譜比較後，可將本區之植物相歸入『水生-地上芽植物的植物氣候區』。

關鍵詞：Tons 河谷、Garhwal 喜馬拉雅、生活型、生物譜。

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