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The Western Himalayas have been recognised as a distinct botanical region by Chatterjee (1939) and Puri (1960), comprising of Himalayan mountains from Kumaon to Kashmir. The entire area is hilly to mountanous and has a rugged topography, extending from about 303 m. above sea level (Siwaliks) to about 8181 m. (Nanga Parbat). Western Himalayas form a narrow angular belt between approximately 29° to 36°N latitudes and 72°·7′ to 81°E longitudes.

Geologically Western Himalayas have been divided into three distinct entities, *viz.*, outer, middle and inner Himalayas (Wadia 1916).

Ecological Problems :

The following important problems that need special attention of the ecologists and foresters interested in the ecology of the Western Himalayas have been selected :

(1) the study of forest types and undergrowth in relation to climate, geology and soil,

(2) successional studies in different forest types,

(3) autecological studies of some important species,

(4) studies on the natural regeneration of forest trees,

(5) ecology of erosion, landslips, afforestation, proper land use and flood control,

(6) ecological relationship of agriculture, grasslands and forests with particular reference to fire, grazing and other human interferences,

(7) the effect of the introduction of exotic plants on the natural vegetation, and

(8) general ecological survey of forest growth and forest soils with particular reference to raising plantations of valuable endemic species and regeneration of desired species in place of existing uneconomical and inferior ones.

The study of the forest types and successional trends of various communities will greatly help in the determination and confirmation of climatic climax of the area. The climax vegetation of an area is usually the best to check soil erosion (Lutz and Chandler 1946). Knowledge of successional trends of forest vegetation could be of great practical value in determining the species for afforestation and reclamation of land.

Autecological studies of the important trees, attain great significance as they help in understanding the environmental and nutritional requirements of the given species. This would greatly help in selecting suitable species for afforestation in a particular area. Extensive experimental studies on the regeneration of important trees like silver fir, spruce and deodar are also required.

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The problem of soil erosion is as acute as ever. In order to check it we need an extensive survey for the accomplishment of planting suitable species, for we know that afforestation of an area can greatly reduce the extent of erosion (Singh and Wali 1962). We also need a check on excessive felling and cutting of trees. Besides the natural factors affecting erosion such as surface geology, formation of rocks, excessive rainfall, etc., the indiscriminate felling of forests, the socio-economic conditions of the hilly tribesmen and grazing are the important factors responsible for the initiation and stimulation of soil erosion. These factors along with the methods to check soil erosion in the Himalayas have been discussed some where else (Singh and Wali 1962).

Another problem of great significance is the study of mineral circulation in the forest ecosystem. It is known that minerals absorbed from soils by trees are returned in a good proportion to the soil by way of litter fall and death and decay of root system. The decomposition of litter to form humus and release minerals in available form is governed by many factors like type of vegetation, soil conditions, and environmental conditions like temperature and light.

It has been stated that in a normal developing forest the decomposition of organic debris must keep pace with the addition of fresh material from the forest vegetation. If the first process becomes slower than the second, incompletely decomposed residues are accumulated at the surface of the soil, hindering the growth and regeneration of species. This incompletely decomposed residue forms a thick mat on the soil surface under pure conifer communities while in mixed broad leaved conifer communities the decomposition appears to be quicker. Quantitative studies on the humus status under different forest communities of Bashahr Himalayas support the above view (Singh 1962).

The data collected by Singh (1962) shows that the ratio of total fresh litter/unincorporated humus and the humus content of surface soil are highest under *Quercus semecarpifolia* community. This may show the higher speed of litter decomposition under this community than under pure coniferous ones. The ratio of leaf/twig amongst fresh litter is also highest under *Quercus semecarpifolia* community. The presence of broad-leaved species like *Quercus semecarpifolia* and *Rhododendron arboreum* and the abundance of shrubs of *Indigofera gerardiana* and *Rosa macrophylla* in conifer communities seems to favour the decomposition of coniferous litter.

Singh (1962) has also discussed the factors possibly responsible for the slowness in decomposition of litter causing, thereby, accumulation of the unincorporated humus under coniferous communities of Bashahr Himalayas. It has also been found that mineral status of soils has got a profound influence on the rate of decomposition. Waksman (1938) and Lutz and Chandler (1946) have shown that the decomposition of plant material is most rapid in soils rich in calcium. This has been confirmed by Puri and Gupta (1951). Thus detailed analysis of the soils of the whole area is extremely necessary. Among the environmental factors, light and temperature of the soil surface, micro fauna and flora inhabiting the soil layers are most important to be sudied.

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REFERENCES

Chatterjee, D. 1939. Studies on the endemic flora of India and Burma. *Jour. Roy. As. Soc. Bengal Sci.*, **5** : 19–67.

Lutz, H. J. and Chandler, R. F. 1946. *Forest soils.* John Wiley & Sons, Inc. N. Y.

Puri, G. S. 1960. *Indian Forest Ecology.* Oxford Printing Press, New Delhi.

——— and Gupta, A. C. 1951. Himalayan Conifers II. The ecology of humus in conifer forests of Kulu Himalayas. *Indian For.*, **77** : 55–63 ; 124–129.

Singh, J. S. 1962. Preliminary studies on the Humus status of some forest communities of Bashahr Himalayas. *Proc. Nat. Acad. Sci., India, Sec. B*, **32** : 403–40 .

——— and Wali, M. K. 1962. The problem of soil erosion in some parts of Kashmir Himalayas. *Pro. Nat. Acad. Sci. India, Sec. B*, **32** : 118–124.

Wadia, D. N. 1916. *Geology of India.* McMillan & Co., London & Calcutta.

Waksman, S. A. 1938. *Humus—origin, chemical composition and importance in nature.* Williams & Williams Co., London.