CHAPTER 2

REVIEW OF LITERATURE
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Review of Literature

I. Phytosociological study of Vegetation:

Vegetational analysis is important as the structure of the vegetation expresses most relevant result and is a flexible tool in the analysis of complex system. European workers, who first used the term 'PHYTO-SOCIOLOGY' have long been interested in detailed structure, precise location, description and system of classifying communities. As a result, the term phytosociology as frequently been reserved for such studies (Oosting, 1956).


Recently, some phytosociological and floristic studies of herbaceous undergrowth in some forest habitats of India have been carried out viz.,

Some other related studies made on the herbaceous vegetation of forests are: Performance of ground flora under desertic communities of trees (Gupta, J.P. and Saxena, S.K. 1878); Herbaceous layer of Pathria forest in relation to tree cover, soil and topography at Sagar (Mail, L.P. and Khan, M.S. 1958). Comparative account of ground cover and undergrowth of 'Sal' forest and *Eucalyptus* plantation in different localities of Doon valley (Mathue, C.M. 1965; Mathur, H.N. Jain, N. and Sajwan, S.S. 1990; Rajvanshi, R., Kumar. V. Bajpai, W., Rajgopal, K. and Raj, S.F.H. 1987), herbaceous vegetation of Bundelkhand forest division of Jhansi (Trivedi, B.K., Deb Roy, R. and Pathak, P.S. 1979). etc.

Thus a thorough knowledge of the community can be helpful in understanding the ecological implications of the forest and thus can furnish needful information for their management. However, no significant contribution appears to have been made on the forest flora of Bundelkhand in general and Jhansi in particular.

Saxena and Tripathi (1987) has studied the vegetational layers of Bangawa
forest (Jhansi) and enumerated 148 plant species representing 117 genera covering 46 families.

Trees being the dominant organisms in tropical forest, their life forms affects the general physiognomy, primary production and overall life cycle of the community (Longman and Jenik, 1974). According to Braun Blanquet (1932) each plant community consists of definite group of life forms. Raunkiaer (1934) proposed a life form system for the classification of vegetation types on physiognomic basis.

In India, a number of worker have worked out biological spectra of different region viz., Bharucha and Ferreira (1941), Mishra et. al. (1980), Ali and Dixit (1980) and Meher Homji (1981) etc.

Saxena and Tripathi (1991) has reported biological spectrum of a mixed dry deciduous forest of Jhansi. Anand (1995) has studied biodiversity of some plants used by tribal communities of Indo-Nepal terai region.

Sinha (1990) studies the biological spectrum of Banda district in U.P. Verma and Shukla (1993) recorded the life forms and biological spectra of the flora of Jalaun district. Sikarwar (1996) studied the life forms and Biological spectrum of Morena district M.P.

II. Nutrients in forest floor:

Of geochemical, biogeochemical and biochemical mineral-flow pathways in terrestrial ecosystems, the third-named assumes importance in redistribution and conservation of nutrients within the standing crop and in determining quantity of nutrients in litter fall. Metabolically active leaves continue to drive nutrients up to a maximum till maturity; there after, in certain circumstances, depending upon the plant growth form and stature associated with age, not
with standing the site characteristics, nutrient contents often decline to a minimum as a result of senescence-caused retranslocations. (cf. Stachurski and Zimka. 1975 ; Charley and Richards. 1983).

Puri and Gupta (1954) studied seasonal variation in foliar composition of some Indian forest trees in the plantation at New forest Dehradun. Garg (1997) studied nutrient concentration under high density plantation in some fuelwood species grown on sodic soils.

The changing litter nutrient concentrations decisively affect plant nutrition and within stand nutrient cycling. In natural forests, cycling of nutrients is an important aspect as considerable amount of nutrients are returned to the soil through leaf fall and made available for reabsorption. This depends upon the amount, the composition of leaf litter which is usefull in interpreting the soil fertility status, and rate of decomposition etc.

In drier tropics, apart from competition for water, compeitition for nutrients may be very severe. Depending on the tree species ; pattern of litter fall and nutrient release and tree management ; recycling of nutrients is changed in a tree based agro-ecosystem (Anderson, 1984 ; Vitousek, 1984).

Singh and Ambasht (1980) have studied the production and decomposition of litter in a poorly growing 13 year old teak plantaion at Chandraprabha Sanctuary, Chakia Hills, Varanasi. They have found an annual litter of 1.57 t/ha of which maximum litter was in winter (1.13 t/ha). Leaf accounted for most of the litter mass. Most of the litter remained on the ground during the summer and rapid decomposition took place in the rainy season (0.94 t/ha) followed by the summer season (0.35 t/ha). In one year period more than 90% litter disappeared and the rest was carried to the next
year as forest floor litter mass.

Neil and Angelis (1981) observed little difference in litter fall between evergreen and deciduous species. Depending upon the number of trees per ha and age, litter fall varied from 0.5 to 6.5 t/ha/yr. On the dry weight basis leaf litter contained 0.5 to 1.5% N, 0.05 to 0.15% P, 0.25 to 0.75% K, 0.25 to 1.0% Ca and 0.1 to 0.2% Mg. After decomposition a large proportion of these elements became available for plant growth.

A significant proportion of nutrient uptake by forest is transferred to the forest floor in litter fall and through fall. Heterotrophic activity in the forest floor leads to net release of nutrients from plant detritus although element such as N and P may become immobilized in microbial tissue or recalcitrant decomposition products (Swift et al., 1979).

The amounts and turn over of organic matter and nutrients in the forest floor depend on factors that input in litter fall and through fall and outputs resulting from decomposition and mineralization. These factors include forest management operations such as prescribed burning and fertilizer application (Maggs, J., 1988).

Nutrients differ in the extent of their translocation from senescing leaves (Ostman and Weaver 1982; Ralhan and Singh 1987). The concentration of nutrients in plant tissue can be of great ecological significance as it may influence the rate of tissue decomposition and concomitant release of nutrients in soil pool. The concentration of nutrients in plant indirectly affects the pattern of nutrient distribution in various ecosystem.
III. **Forest floor:**

The organic matter which forms the forest floor is of particular importance, since it contains considerable quantities of nutrient, influence the water content and physical condition of the underlying mineral soil (Ovington, 1954).

Some ecological studies of forest floor have earlier been done by some worker (Ovington, 1957; Nye, 1958; Heatwole, 1959; Bell and Sipp, 1975; John, 1973).

In India studies on forest floor have been done mostly in various coniferous forests of western Himalayas. Singh (1962) studied floor under coniferous forest of Bashahr Himalayas for its rate of decomposition and discussed the factors responsible for the accumulation of unincorporated humus over the mineral soil. Puri (1951) attempted the analysis of forest floor of Kulu Himalayas. Hoon and Dhawan (1941) studied floor in relation to development of soil profiles under different forest of conifers in western Himalayas.

Bhatnagar (1968) first attempted the analysis of forest floor of tropical deciduous forests of Sagar. Joseph (1977) also investigated forest floor of tropical deciduous forest of Sagar. They observed forest floor with two strata i.e. litter and fragment layer and three types of forest floor were recognised by him viz., multistratal, oligostratal and unistratal types.

IV. **Soil fertility changes in forest ecosystem:**

Soil fertility is concerned with the inherent capacity of soil to provide
nutrients, in adequate amounts and in proper balance, for the growth of specified plants when other growth factors such as light, water and temperature, and the physical condition of the soil are favourable. Soil fertility is an aspect of the soil-plant relationship viz., plant growth with reference to plant nutrients available in soil.


Singh et al., (1983) investigated soil characteristics as influenced by closure of forest of Bundelkhand Division and the native vegetation associated with it.

Different cover types effect downward movement of water in the soil in different ways (Megahan et al., 1962; Nazaror, 1969). hence different plantations may have their different effects on soil nutrients. The heterogeneous distribution in soil properties has been attributed to greater erosion of soil nutrients from different canopies and the uptake and sequestration of nutrients in accumulated litter and soil organic matter under different canopies. However, litter accumulation, nutrient sequestration and the vulnerability of a soil to erosion vary with soil texture and parent material (Woolridge, 1964; Willen. 1965) confounding the independent effects of soil and vegetation on individual soil properties. In addition, many soil properties of change resulting from
different management practices or biotic and abiotic influences on soil properties (Holland, 1969; Norris, 1970).

Blanford (1933) had reported that teak cropping leads to serious soil erosion. Yadav and Singh (1970) studies effect of forest plantation on an alkali soil near Aligarh. They observed a decrease in the pH value and soluble salt content and an increase in the amount of organic matter and nitrogen in the upper 15 cm layer under Prosopis juliflora. The soluble salts increased to some extent below 15 cm depth which was presumably due to their downward translocation through leaching as a result of improved soil permeability.

The studies conducted by Aggarwal et al. (1975) on soil physico-chemical changes under 12 year old tree plantation in western Rajasthan showed that organic matter, total nitrogen and P<sub>2</sub>O<sub>5</sub> was highest under Prosopis cineraria at 0-15 cm depth compared to the other trees such as Acacia senegal, Albizia lebbek, Prosopis juliflora and Tecoma undulata on bare site. This was also reflected in the higher number of hebeaceous plant species (/m<sup>2</sup>), mean plant density (/m<sup>2</sup>) and mean above ground phytomass (g/m<sup>2</sup>) under P.cineraria when compared to other species. Alexander et al. (1981) have reported significant changes in physical and chemical properties of soil as a result of teak tree planting.

In a study on the ameliorative role of mesquite (Prosopis juliflora) plantation, Virginia and Jarrel (1983) found that N (both nitrate and ammonical), organic carbon, NaHCO<sub>3</sub> extractable P and saturation extract K were significantly higher in the soil beneath mesquite. However, the differences in pH, osmotic potential, saturation per cent and sulphate content were not
significant. They concluded that woody legumes can fix nitrogen symbiotically and also add other nutrients in the surface beneath their canopies which may be important in maintaining the long term productivity of desert ecosystem. Considerable increase in organic carbon and available nitrogen content under mesquite plantations in highly alkaline soils in India has also been reported by Gill (1985).

Prasad and Mishra (1985) have reported that in a mixed forest, teak alone produce \( \frac{1}{3} \) of the total production of litter which adds to the forest floor and enrich the organic content of the soil. An increase in soil organic matter status in any teak plantation occur in general which is also confirmed by Banerjee et al., (1986), who observed an increase in soil organic matter status in the teak plantation of natural sal zone of West Bengal.

Pathak and Gupta (1987) reported that, organic matter addition through leaf litter in a two year old plantation of Leucaena leucocephala was in the range of 5.6 t/ha which improved soil tilth, cation exchange capacity, water holding capacity, bulk density besides reducing soil pH from alkaline to normal.

Chakraborty and Chakraborty (1989) reported increase in organic carbon, nitrogen, potassium, electrical conductivity and water holding capacity under the canopy of Acacia auriculiformis when compared to than in the open.

Jha (1995) studied soil productivity of silvopastoral system with napier grass in association with Leucaena leucocephala at Ranchi. Increase in organic carbon (0.4 to 0.49%) available phosphorus (29 kg/ha to 46 kg/ha), available potassium (152 kg/ha to 179 kg/ha) and pH (5.8 to 6.5) of soil were reported.

The soil properties, in general, improves with tree cropping as compared
to non-tree situation, Hazra (1990) found that field capacity, wilting point, organic carbon, cation exchange capacity and available N and P contents of soils were greatly improved, where as bulk density, pH and EC values were appreciably decreased under *Albizia lebbek* plantation as compared to normal cropping. The leguminous shrubs and trees had great influence in building up soil organic matter (0.32 to 0.91%), available soil nitrogen (131 to 293 kg/ha), available phosphorus (6.2 to 18.5 kg/hr) and field capacity (11 to 15.8%).

V. Phenology of tree species:

The term phenology was first used by Shelford (1929) to correlate the appearance of certain events. The main phenophases in plants are *viz.*., seed germination, bud bursting, leaf development, flowering time, fruit and seed dispersal, senescence and litter fall (Leith, 1970). The phenological studies are useful in determining the character of forest floor, sampling plant for the litter layer of forest (Bhatnagar, 1968).

The phenological investigations in temperate forests were done by Holttum (1931), Gill (1955) and Ahlgren (1557). Herman (1956) had made a good study on phenological events for the species of *Juniper* of arctic vegetation. Holway and ward (1965) examined the phenologic response of many tree species in a variety of alpine habitat.

The phenological behaviour of forest trees in India has been studied by many workers. Krishnaswamy and Mathuda (1954) investigated phenological responses of tree species of the New forest Dehradun. Gupta (1960) observed certain phenological studies on the flora of Nainital and Mussorii hills. Bhatnagar (1968) studied phenological events in dry deciduous forest of Sagar.
Some workers emphasize that the climatic conditions effect phenological events to a certain extent. Blatter (1906) found a correlation of flowering period with climate. Ahlgren (1957) observed an obvious relationship between flowering and leafing response at temperate forest of Minnetia.

Sagreiya (1942) has highlighted the technique for collecting of phenological record of shrubs and ornamentals. Khan (1999) studied periodicity of major phenophases in woody species in dry deciduous forests of Gir, India. Van Schaik et al., (1993) showed that community peaks of leaf flushing and flowering in tropical forests are closely linked to the movement of sun and are therefore correlated to the peaks in solar irradiance unless the water stress prevents the plant from doing so.

Arjunan et al., (1995) studied phenology of some woody Angiosperms of coimbatore district. Investigation on phenology, population, population structure and dynamics of *Arundinaria falcata* from April 1984 to April 1985 in Kumaon Himalaya was carried out by Lodhiyal et al., (1998). The relationship between leafing and flowering events in some tree species of Sagar forests was studied by Bhatnagar (1968).

Tripathi, (1987) have expressed the phenological events of *Anogeissus pendula*. Rathore (1970) and Srivastava (1982) have also made studies on the phenological events of *Diospyros melanoxylon* and *Aegle marmelos* in term of their phenobiogram respectively.

**VI. Ethnobotany :**

'Ethnobotany' commonly refers to the inter-relationships between primitive people and plants, the relationship being extended to the entire range
of influences of each on the other and not merely confined to the uses (De, 1968).

The study about the traditional medicines of the aboriginals is therefore an aspect of the 'ethnobotany' as these people still prefer to live in perfect dependence on nature in areas far off from civilization. The term 'ethnobotany' was first coined by Harshberger (1896). One of the pioncers of economic botany in America. According to De (1968) Francisco Hernandez, personal physician of king phillip II of spain, has however been recognised to be the earliest worker on this aspect. He (1570-1575) extensively surveyed the flora, fauna and minerals of Mexico and wrote a comprehensive account in 16 folio volumes.

The papers on ethno-narcotics, (Schultes, 1965) and ethnopediatrics and ethnogynecology were contributed by Schultes (1963) and Altschul (1970 a,b) respectively. Further Schultes (1962) narrated the role of ethnobotany in search of new drug yielding plants. Turner and Bell (1971) worked on the ethnobotany of the Coast Salish Indians of vancouver Islands. Barrau (1958, 1961) published the information related with the subsistance agriculture in Honolulu. Vidal (1959, 1960, 1961 a, b; 1962) contributed a series of papers on the uses of various plants in France. Hartwell (1967-71) provided a large compilation of antitumour plants, from old texts and local folk medicines from all over the World.

According to Kirtikar and Basu (1935) in India the ancient Hindus should be given the credit for cultivating what is now called 'Ethnobotany'. Recently, Checklists of Aurvedic and Unani treatises have also been published (Anonymous, 1965 a, b). Sharma (1968-69) established 248 botanical drugs
which were mainly mentioned in Atharvaveda and Rigveda. Sharma (1971, 1972 and 1973) also reviewed the Nighantu and other treatises and listed various plants of medicinal importance.

The considerable amount of work has been done on medico-botanical aspects (Shah, 1979) but exclusive ethnobotanical research are very scanty and sporadic.

Recently, the central council for Research in Indian Medicine and Homeopathy conducted several medico-botanical survey in some important ethnic and tribal region of the country. Raghunathan recorded various medicinal plants used by Nicobaris (1976 a) and by herbal doctors in Ladakh (1976 b) and from six tribal communities of the Nigiris (1976 c).

Kapahi and Atal (1987) reported the use of 54 plants by the Lepcha, Bhutia and Nepalese tribals of Sikkim. Rawat and Pangtey (1987) reported 148 plant species used by the Bhotiyas of Alpine regions of Kumaon.

In Arunanchal Pradesh Tiwari et. al. (1980 a) collected the information on the tribal medicines for the treatment of about 15 common ailments from district Siang. Dam and Hajra (1981) reported 76 species of plants used by Monpas - a tribal population of Kameng district for their food and medicine etc. Baruah and Sarma (1987) reported the uses of 51 plants by the Boro and Rava tribals of Arunachal Pradesh.

The North-Eastern region of India have been surveyed by Rao and Neogi (1980) who reported about 30 plants of medicinal importance from tribal areas of Meghalaya. Bhattacharjee et. al. (1980) gathered the folk medicinal claims from different area of Assam.

In eastern India Rai Chaudhari and Pal (1978) reported uses of about 25 plants for medicinal purposes by Lodhs of Midnapore district (West Bengal).

The ethnobotanical surveys in Western India were carried out by Joshi et. al. (1980) who recorded medicinal uses of about 82 plants species by the tribal of Dangs in Dangs district (Gujrat). Patel et. al. (1981) collected the folklore data from Vaidayas, farmers and villagers etc. of Bhavnagar district (Gujrat) and reported 62 important medicinal plants having laxative properties. Vora et. al. (1982) reported about 42 species of plants being used for the treatment of Jaundice by the Vaidyas, farmers, Villagers and experienced foresters of Bhavnagar district (Gujrat).
Pal (1981) enumerated about 25 plant species used for the treatment of various diseases of domestic animal by the tribals (Munda, Oraon, Santhal, Lodh, Kondh, Bhumij, Ho and Mech) of Bihar, Orissa and West Bengal.

Central India however is one of those important regions in India where the tribal populations and forest dwellers form a considerable part of the population (Jain, 1981). Use of plants in folk medicine is said to be very prevalent in this region (Jain and Tarafder, 1963). Rath (1979) observed that 25 species of plants were being used by the tribals for medicinal purpose in Sukhinda region of Orissa. Tarafder and Chaudhuri (1981) carried out ethnobotanical studies in Hazaribagh district of Bihar. The tribals (Oraon, Behor, Santhal, Munda, Khond, Bedia, Karmali and Mahali) of this district were found using a large number of wild plants for food and medicine. Mishra and Shukla (1981) collected information from villagers about the medicinal and other ethnobotanical uses of 196 plant species from Allahabad district. Singh and Maheshwari (1983) given therapeutic uses of fifty three medicinal plants in various ailments by the Kol, Kharwar, Chero and Mushar Tribes of Varanasi district. Singh (1984) given information about uses of 15 plants species in home remedies used by the people of eastern Uttar Pradesh.

As evident from the perusal of the foregoing literature there appears to be no published records of any ethnobotanical survey of Bundelkhand region except for some preliminary observations earlier region made by Saxena, 1978, Saxena and Vyas, 1981 a, b, c, 1983. Many area of this region are inhabited by certain aboriginal tribes including mainly Kols.
Gonds and Lodhis (Banda, Hamirpur, Jhansi, Jalaun and Lalitpur district) etc. who more often use many common local plants for the treatment of their ailments including various infectious diseases. These primitive communities living in far remote areas of the region on Vidhyan plateau, in deep forests and other localities, provide good scope for the study of their folk lores. As such, therefore, considering the importance and the urgent need of ethnobotanical study of this region, the present investigation was carried out with a view to collect valuable information on the use of plants by the tribes and the local inhabitants living in the area under study.