

2.2 Soil

Soil is considered as a natural product and consists of various soil horizons, those are composed of minerals and mixed with other organic materials produced by animals and plants. Besides, it differs from the parent substances on the basis of colour, pH, texture, structure, consistency, chemical and biological composition and other characteristics. Generally, soil is formed by the particles of rock and altered by the influence of various factors including physical, chemical as well as biological and interaction of various spheres including lithosphere, hydrosphere, atmosphere and biosphere, most soils have a density between 1 and 2 g/cm³. The soils of Surguja district can be classified into four major categories including (1) Red and yellow soils, (2) Alluvial soils, (3) Laterite soils, and (4) Medium blue soils.

3. Material and Methods

In the present study, phytosociological diversity analysis was carried out by the quadrat method as suggested by Mishra (1968), Kershaw (1973), Cintron and Novelli (1984), Snedaker and Snedaker (1984). For this, Rajpur block was selected as the study site, and 67 quadrats of 15 m × 20 m size were laid out at the study sites. Each site was further divided into five sub-segments of 2 km along the road side of Ambikapur-Balrampur road. On the basis of the data obtained from the quadrat sampler, the structural distribution of forest trees was analyzed. The parameters such as Frequency, Abundance, and Density obtained during the study as suggested by Phillips (1959) and Mishra (1965), were calculated from the data, under as follows:

$$\text{Frequency} = \frac{\text{Number of samples in which species present}}{\text{Total number of samples studied}}$$

$$\text{Density} = \frac{\text{Number of individual species}}{\text{Total number of samples studied}}$$

$$\text{Abundance} = \frac{\text{Number of individuals of the species}}{\text{Total number of samples in which species present}}$$

4. Result and Discussion

The Rajpur block of Surguja district of Chhattisgarh contained good diversity of trees in contrast to other areas of Chhattisgarh. (Chatterjee, 2015; Jhariya and Oraon, 2012; Sinha and Sinha, 2013). It is located under the Sanjay national park area and covers the large area of forest. Due to nutrient-rich and fertile soil, enough average seasonal rainfall i.e. 1443 mm, favorable weather, temperature and climate, and availability of fresh water throughout the year, are the factors that help to grow naturally and develop the wide varieties of trees. Obviously, it also provides suitable niches to grow other plant species such as shrubs, herbs and climbers. The majority of the local inhabitants are mainly tribes and some are migrated marginalized groups, who use the forest trees and other forest products to fulfill their daily requirements such as fuel wood, medicinal purpose, timber wood to build their kachcha house and equipments that are used in agriculture practices and grazing their domestic animals. Overall, this area is considered as an undisturbed natural dry deciduous forest.

In the present study, at about 79 deciduous forest tree species belonging to 32 different families, were identified with their botanical names and their possible uses by the local tribes were recorded in table 1. According to Odum (1971) the contiguous distribution of species is found only in a very uniform environment and regular distribution occurs, where the severe competition happened between the individual species. From the data obtained through quadrat surveys of Rajpur forest trees, were recorded in table 1. It is observed that the family Fabaceae represents the maximum number i.e., seventeen species, followed by Moraceae with 7 species, Combretaceae with 6 species, Myrtaceae with 5 species, Rutaceae with 4 species, Anacardiaceae, Rubiaceae and Euphorbiaceae with 3 species, respectively. Besides, the families Annonaceae, Apocynaceae, Burseraceae, Ebenaceae, Lamiaceae and Meliaceae were found with two species of each in the surveyed area.

The species diversity always depends upon the adaptability and stability of the plant community, hence the Rajpur forest trees also showed mixed community. The data obtained during the survey indicates, nineteen other families are also shown to exist by appearing as single species of each. A total of 79 different plant species belongs to 32 different families are exhibited in the species composition, which complete to each other, prevent extinction and increase their diversity (Shankar, 2001).

Structural distribution analysis for each species was conducted, by using the parameters such as Frequency, Density and Abundance of each case (Curtis and McIntosh, 1950; Curtis and Cotton, 1956; Gour, 1999; Kadavul and Parthasarthy, 1999; Khurana and Kalpana, 2008; Khurana and Saxena, 2009; Mishra et al., 2008; Negi and Nautiyal, 2005; Pandey et al., 2002; Rastogi and Rastogi, 2007; Sagar and Singh, 1999; Sahu et al., 2008). On the basis of data analysis *Butea monosperma* showed their maximum frequency, density and abundance i.e., 0.507, 1.074 and 2.117 respectively, during the sampling, and then followed by *Cassia fistula* and *Shorea robusta* with 0.313 and 0.388, respectively. On the other hand, *Embilica officinalis*, *Ficus bengalensis*, *F. carica*, *F. glomerata*, *Pongamia pinnata* and *Pterocarpus marsupium* showed minimum distribution in the forest. Surprisingly, the species like *Santalum album*, *Mangifera indica* and *Annona reticulata*, *Terminalia arjuna* and *Tectona grandis* were appeared with high abundance. It is due to human interference in the forest (Sharma, 1996).

Table 1: Occurrence of various tree species in the study site

S. No.	Name of species	Family	Local name	Uses
01.	<i>Acacia arabica</i>	Fabaceae	Kikar/ abul	Timber wood, medicinal value
02.	<i>Acacia caesia</i>	Fabaceae	Goriar	Timber wood, medicinal value
03.	<i>Acacia catechu</i>	Fabaceae	Khair	Katha production
04.	<i>Adina cordifolia</i>	Rubiaceae	Haldu	Antiseptic, Timber wood
05.	<i>Aegle marmelos</i>	Rutaceae	Bel	Medicinal value, Fruit
06.	<i>Ailangium salvifolium</i>	Cornaceae	Akol	Making kachha house
07.	<i>Albizia lebbek</i>	Fabaceae	Siris	Medicinal value, Timber wood
08.	<i>Alstonia scholaris</i>	Apocynaceae	Chhatrak	Medicinal value
09.	<i>Anogeissus latifolia</i>	Combrataceae	Dhawada	Timber and fuel wood
10.	<i>Annona squamosa</i>	Annonaceae	Sheetaphal	Edible fruit, medicinal value
11.	<i>Annona reticulata</i>	Annonaceae	Ramphal	Edible fruit, medicinal value
12.	<i>Anthocephalus cadamba</i>	Rubiaceae	Kadamb	Medicinal value, timber wood
13.	<i>Azadirachta indica</i>	Meliaceae	Neem	Medicinal value, timber wood
14.	<i>Bambusa arundinaceae</i>	Gramineaceae	Bamboo	Medicinal value
15.	<i>Bauhinia variegata</i>	Fabaceae	Kachnar	Medicinal value, timber wood
16.	<i>Bombax ceiba</i>	Bombaceae	Samel	Fuel wood
17.	<i>Boswellia serrata</i>	Burseraceae	Salai	Fuel wood
18.	<i>Buchania lanzan</i>	Anacardiaceae	Chironjee	Medicinal value, edible fruit
19.	<i>Butea monosperma</i>	Fabaceae	chhoela	Medicinal value
20.	<i>Careya arborea</i>	Myrtaceae	Kumahi	Fuel wood
21.	<i>Caesalpinia bonducella</i>	Fabaceae	Flem	Fuel wood
22.	<i>Carthamus tinctorius</i>	Compositae	Kusum	Fuel wood, edible fruit
23.	<i>Cassia fistula</i>	Fabaceae	Amaltas	Fuel wood
24.	<i>Citrus medica</i>	Rutaceae	Nimbu	Medicinal value, edible fruit
25.	<i>Cordia mixa</i>	Rutaceae	Lasoda	Fuel wood
26.	<i>Celastrus peniculata</i>	Celastraceae	Unjain	Fuel wood
27.	<i>Dalbergia sisso</i>	Fabaceae	Sisham	Timber, medicinal value
28.	<i>Dalbergia paniculata</i>	Fabaceae	Dhobin	Timber, medicinal value
29.	<i>Delonix regia</i>	Fabaceae	Gulmohar	Medicinal value, edible fruit
30.	<i>Diospyrus melanoxylon</i>	Ebenaceae	Tendu	Edible fruit, timber wood
31.	<i>Diospyrus ebenum</i>	Ebenaceae	Makar tendu	Edible fruit, timber wood
32.	<i>Embilica officinalis</i>	Euphorbiaceae	Amla	Edible fruit, timber wood
33.	<i>Erythrina indica</i>	Fabaceae	Munga	Medicinal value, edible fruit
34.	<i>Eucalyptus grandis</i>	Myrtaceae	Neilgiri	Timber wood medicinal value
35.	<i>Eugenia jombolana</i>	Myrtaceae	Jamun	Edible Fruit, medicinal value
36.	<i>Eugenia heyneana</i>	Myrtaceae	Jamti	Fuel wood
37.	<i>Ficus bengalensis</i>	Moraceae	Bargad	Religious tree
38.	<i>Ficus religiosa</i>	Moraceae	Pipal	Religious tree
39.	<i>Ficus carica</i>	Moraceae	Anjeer	Medicinal value
40.	<i>Ficus elastic</i>	Moraceae	Rubber	Economic value
41.	<i>Ficus infectoria</i>	Moraceae	Pakri	Fuel wood

42.	<i>Ficus glomerata</i>	Moraceae	Gular	Medicinal value
43.	<i>Gardenia latifolia</i>	Rubiaceae	Piprol	Medicinal value
44.	<i>Garur pinnata</i>	Burseraceae	Khenkara	Fuel wood
45.	<i>Gmelina arborea</i>	Lamiaceae	Khamer	Timber and fuel wood
46.	<i>Holarrhena hantidysenerica</i>	Apocynaceae	Koriya	Fuel wood
47.	<i>Hardwickia binata</i>	Fabaceae	Anjan	Medicinal value
48.	<i>Jatropha curcus</i>	Euphorbiaceae	Rattanjote	Making biofuel
49.	<i>Lagestromea lanciota</i>	Malvaceae	Nana	Fuel wood
50.	<i>Laucaenea leucocephala</i>	Fabaceae	Subabul	Medicinal value and fuel wood
51.	<i>Litchi chinensis</i>	Sapindaceae	Litchi	Medicinal value, edible fruit
52.	<i>Litsea chinensis</i>	Lauraceae	Maida	Fuel wood
53.	<i>Maduca indica</i>	Sapotaceae	Mahua	Economic value
54.	<i>Mangifera indica</i>	Anacardiaceae	Aam	Economic value, fuel wood
55.	<i>Morus alba</i>	Moraceae	Mulberry	Medicinal value
56.	<i>Moringa oleifera</i>	Mongiaceae	Senjhra	Medicinal value
57.	<i>Melia azadirachta</i>	Meliaceae	Bachain	Medicinal value
58.	<i>Murraya koenigii</i>	Rutaceae	Mithineem	Timber wood
59.	<i>Ougenia dalbergia</i>	Leguminosae	Tilsa	Fuel wood
60.	<i>Plantanus orientalis</i>	Plantaceae	Chinar	Fuel wood
61.	<i>Pongamia pinnata</i>	Fabaceae	Karanj	Medicinal value
62.	<i>Prunus amygdalus</i>	Rosaceae	Almond	Medicinal value
63.	<i>Psidium gujava</i>	Myrtaceae	Guava	Fruit & fuel wood
64.	<i>Pterocarpus marsupium</i>	Euphorbiaceae	Bija	Timber wood
65.	<i>Randia dumetorum</i>	Rubiaceae	Menda	Fuel wood
66.	<i>Santalum album</i>	Santalaceae	Chandan	Medicinal value
67.	<i>Saraca indica</i>	Fabaceae	Ashoka	Medicinal value
68.	<i>Semecarpus anacardium</i>	Anacardiaceae	Bhelwa	Medicinal value
69.	<i>Shorea robusta</i>	Dipterocarpaceae	Sarai	Timber wood
70.	<i>Soymida febrifuge</i>	Meliaceae	Rohina	Medicinal value, timber wood
71.	<i>Symplocos racemosa</i>	Symplocaceae	Lodh	Fodder, Timber wood
72.	<i>Tamarindus indica</i>	Fabaceae	Imali	Fuel wood
73.	<i>Terminalia arjuna</i>	Combretaceae	Kahua	Timber wood
74.	<i>Terminalia bellerica</i>	Combretaceae	Baihra	Medicinal value
75.	<i>Terminalia chebula</i>	Combretaceae	Harra	Medicine value
76.	<i>Terminalia tomentosa</i>	Combretaceae	Saj	Timber wood
77.	<i>Terminalia eliptica</i>	Combretaceae	asan	Timber wood
78.	<i>Tectona grandis</i>	Verbenaceae	Sagwan	Timber wood, Medicinal value
79.	<i>Zizyphus mauritiana</i>	Rhamnaceae	Ber	Medicinal value & fruit

Table 2: Frequency, density and abundance of the forest tree species during the sampling

S No	Name of species	Number of samples in which species present	Total number of individual species present	Frequency	Density	Abundance
01.	<i>Acacia arabica</i>	07	07	0.104	0.104	1.000
02.	<i>Acacia catechu</i>	11	12	0.164	0.197	1.090
03.	<i>Albizia lebbek</i>	09	12	0.134	0.197	1.333
04.	<i>Anogeissus latifolia</i>	12	16	0.179	0.238	1.333
05.	<i>Azadirachta indica</i>	15	18	0.223	0.268	1.200
06.	<i>Annona reticulata</i>	08	17	0.119	0.253	2.125
07.	<i>Anthocephalus cadamba</i>	07	10	0.104	0.149	1.428
08.	<i>Bambusa arundinaceae</i>	08	14	0.119	0.208	1.750
09.	<i>Bauhinia variegata</i>	16	21	0.238	0.313	1.312
10.	<i>Bombax ceiba</i>	07	11	0.104	0.164	1.571
11.	<i>Buchania lanzan</i>	13	17	0.194	0.253	1.307
12.	<i>Butea monosperma</i>	34	72	0.507	1.074	2.117
13.	<i>Cassia fistula</i>	21	32	0.313	0.477	1.523
14.	<i>Dalbergia sisso</i>	18	29	0.268	0.432	1.611
15.	<i>Delonix regia</i>	13	15	0.194	0.223	1.153
16.	<i>Diospyrus melanoxylon</i>	08	13	0.119	0.194	1.625
17.	<i>Emblia officinalis</i>	05	08	0.074	0.119	1.600
18.	<i>Eucalyptus grandis</i>	17	21	0.253	0.313	1.235
19.	<i>Eugenia jombolana</i>	18	23	0.268	0.343	1.277
20.	<i>Ficus bengalensis</i>	06	08	0.089	0.119	1.333
21.	<i>Ficus religiosa</i>	07	07	0.104	0.104	1.000
22.	<i>Ficus carica</i>	06	06	0.089	0.089	1.000
23.	<i>Ficus glomerata</i>	06	07	0.089	0.104	1.166
24.	<i>Jatropha curcus</i>	20	37	0.298	0.552	1.850
25.	<i>Laucaenea leucocephala</i>	16	22	0.238	0.328	1.375
26.	<i>Maduca indica</i>	18	33	0.268	0.492	1.833
27.	<i>Mangifera indica</i>	17	35	0.253	0.522	2.058
28.	<i>Melia azadirachta</i>	11	17	0.164	0.253	1.545
29.	<i>Ougeinia oujeinensis</i>	16	18	0.238	0.731	1.125
30.	<i>Pongamia pinnata</i>	06	08	0.089	0.119	1.333
31.	<i>Pterocarpus marsupium</i>	06	07	0.089	0.104	1.166
32.	<i>Santalum album</i>	07	27	0.104	0.402	3.857
33.	<i>Semecarpus anacardium</i>	08	11	0.119	0.164	1.357
34.	<i>Shorea robusta</i>	26	46	0.388	0.686	1.769
35.	<i>Soymida febrifuge</i>	10	13	0.149	0.194	1.300
36.	<i>Tamarindus indica</i>	13	23	0.194	0.343	1.769
37.	<i>Terminalia arjuna</i>	21	44	0.313	0.656	2.095
38.	<i>Terminalia bellerica</i>	16	18	0.238	0.268	1.125
39.	<i>Terminalia chebula</i>	08	11	0.119	0.164	1.375
40.	<i>Terminalia tomentosa</i>	18	34	0.268	0.507	1.888
41.	<i>Tectona grandis</i>	23	49	0.238	0.268	2.130
	Total	532	849			

5. Conclusion

Forests are the safeguard for our future generations but, due to the anthropogenic pressure, the most serious threat has been changed in the land use. Extensive forest areas have been cleared for human settlements, road and railway track network, and industrial units. On the other hand, sizeable-forest land has been diverted to agricultural land or land for building colonies and factories. The present condition of forest is very poor and many species of this region have been disappeared and many other species are endangered and rare. The local pressure including timber wood and fuel wood are cut by villagers and collection of non timber products such as fruits, gum, seeds and leaf, grazing their animals, forest fire and animal hunting make situation more worst since such extraction is not legally permitted, because quantitative estimation of the extraction is not possible. Hence, the distribution and Phytosociological studies clearly indicate that Rajpur forest is an extremely important ecosystem by the virtue of richness of forest wealth and diversity of tree species with mixed dominance and favourable regeneration. However, controlled quantities of fuel wood can be removed from the forest. The species those are threaten rare need more attention and care.

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