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Biodiversity in Raj Mohini Devi College of Agriculture & Research Station Ambikapur (Surguja)

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ABSTRACT
Surguja district is considered as rural and tribal district of Chhattisgarh. The Surguja is covered with dense forest and rain based agriculture system, and most of the people are engaged in farming and agriculture labourer or depends upon forest and their products directly or indirectly for livelihood. The dynamics nature of vegetation in any specific ecological sites can be assess through having an idea and information of floristic composition and diversity. For the sake of social development especially in urban ecosystem and surrounding landscape the environment getting degraded due to felling of vegetation, injudiciously utilization of natural resources and ill management, over harvesting etc, which resulted into severe threats to local, regional and global biodiversity. The present study aims towards assessing and recording vegetation diversity and floral wealth at college campus, Ambikapur district Surguja (Chhattisgarh). A total 116 plant species were recorded during the present investigation which reflects enormous biodiversity. After documentation of species composition it was clear that the campus is rich with diverse plant species, and the next step can be made to conserve and maintained these biological resources for future.
Keywords: *Agriculture, biodiversity, conservation, floristic composition, livelihood*

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INTRODUCTION

India is recognized as one among the mega-diverse country in the world. The rise in the human population has put the higher pressure on the natural resources which depleting the biodiversity of the region [1-5]. The protected area of the country comprised of 4.93% of the total geographical area of the India which plays pivotal role in the conservation of these biological resources [6]. Besides the protected areas floral and faunal biodiversity are also presence in significant level both in government and private lands. The floral and faunal diversity outside forests or protected areas including urban landscapes needs to be conserve and managed judiciously. Presently the study on biodiversity and its conservation is a big issue in front of ecologist, environmentalist and conservationist due to various biotic perturbations in the natural environment [7-10].

Now various concepts have been developed regarding principles for biodiversity principles and management which including ecosystem health, integrity, sustainability and resilience. Biodiversity is an important aspect towards poverty alleviation because it facilitates diverse basic goods and ecosystem services [11-12]. It is integral to key development of various sectors like agriculture, forestry, tourism, fisheries etc., on which substantial population depends for livelihoods. Biodiversity plays principal role towards human welfare, livelihood and maintain the ecosystem balance [11]. The quantification and documentation of flora and fauna is the pioneer phases towards conservation practices of these biological resources. Without proper information and documentation of these biological entity there is no means of conservation affords. Good biodiversity is always making the good environments which are helpful for wellbeing of humans. The objective of the present survey is focussed on the assessment of floral biodiversity and conservation priorities in the study area. This aimed towards contributing to the plan of biodiversity conservation and restoration in the studied area and development of management strategies so as to ensure sustenance and ecosystem services derived from them.

MATERIAL AND METHODS

The northern hills zone of Chhattisgarh is situated in between 22° 23' N and 24° 60' N latitudes and 81°35' E and 84°05'E longitudes. The altitude ranges from 293-1200 m above mean sea level. The total geographical area of the northern hills zone is 19.25 lakh ha (Table 1). The area is bestowed with good forest cover and natural resources [13-15]. The region is primarily agrarian in character with about 47.76% (9.19 lakh ha) of its geographical area under cultivation. This zone receives precipitation through south-west monsoon from June to September. The average annual rainfall of this zone based on the normal data of 13 to 50 years, highest rainfall (1726.6 mm) has been recorded in Jashpur district and lowest (1248.3 mm.) in Manendragarh tehsil of Korea district; with an average of 1479.8 mm. annually in the entire zone. Normally, monsoon in the region starts by the second week of June and withdraws during third week of June and withdraws during third week of September in the entire zone. Major amount of rainfall is received during the months of July and August, which is helpful in establishment and early growth of *kharif* crops such as rice, maize, sorghum, Kodo-kutki, groundnut, pulses etc.

Table 1 Features/Characteristics of the Northern Hills Zone of Chhattisgarh

1. Geographical Area (ha)	19,25,025
	i) Hilly soils
2. Soils	ii) Tikra/Dand (Sandy loam)
	iii) Gadar Chawar (laterite)
	iv) Bahara (Silty loam)
3. Monsoon Onset	June 18-20
4. Annual Rainfall (mm)	1200-1400
5. Monsoon Rainfall (mm)	1197.1
6. Rainy Days	60-75
7. Winter Rainfall (mm)	110
8. Rainy days	08
9. Water Availability Periods (days)	
i) Humid	20 June -3 October (106)
ii) Moist-I	2 June -19 June (18)
iii) Moist-II	4 October- 14 October (11)
Total	2 June -14 October (13)

The climatic condition of this zone is sub-humid with mild temperature in September and moderate to severe cold in winter. The day temperature varies from 23°C (January) to 41°C (May) and the night temperature from 4°C (January) to 26°C (May). The hilly area of the zone like Mainpat, Jokapot, Samari and Jashpur remain cooler than the plains. The mean annual rainfall of the region varies from 1000-1400 mm, the mean maximum and minimum temperatures are 38.6°C and 8.8°C, respectively. The land topography is almost rolling with steep slope varying from 0.3% to 30%. The laterite to clay loamy soil has low pH, is poor in organic matter, low in nitrogen and phosphorus, medium in potassium and acidic in nature. Red and yellow soils are found in this area. These soils are derived from shale, limestone, sandstone and gneiss. The colour of the soils has a wide range, the reddish-brown soils occurring on most of the up level, dark grey soil in low-lying situations and yellowish-brown in intermediate position. The texture varies from gravelly to loamy sand to sandy loam in upland and sandy loam to clay in the lowland situation. In general, the soils are poor in fertility and moisture-retention capacity. These soils are low in nitrogen and phosphorus, medium in potassium content and acidic in reaction.

With the creation of the new state of Chhattisgarh on 1st of November 2000, agricultural development has gained the momentum with a visionary and emphasis of C.G. Govt. through encouragement and promotion of agricultural education, research and extension activities in the state. In view of this, the C.G. Govt. has established the college of agriculture at Ambikapur in name of prominent social reformist Padma Shri Late Raj Mohini Devi on 20th September 2001, as a constituent U.G. college of Indira Gandhi Krishi Vishwavidyalaya, Raipur. Before it, this institute was functioning as a Zonal Agricultural Research Station (ZARS), aimed to carry out need based research and extension activities for enhancing the agricultural productivity and socio-economic upliftment of the tribal farmers of this zone. Raj Mohini Devi college of agriculture and research station is situated about 6 km, away from Ambikapur city, towards the west on Manendragarh road (opposite of railway station). Ambikapur city is the district headquarter, which comes under Surguja district. Surguja means "*Gunjan of Sur*". This place is bestowed with bounty of nature, with dense forest, having beautiful rivers, waterfalls etc. This city is well-surrounded by the hills with green vegetation. The detail of RMD CARS area and distribution is given in Table 2.

Table 2 RMD CARS (Area and Distribution)

S.No.	Distribution	Area (ha)	S. No.	Distribution	Area (ha)
1.	Total area	45.83	7.	Rainfed area	13.80
2.	Cultivable land	36.03	8.	Horticulture & Agroforestry	08.70
3.	Road, Building & store	05.60	9.	Kharif seed production	17.00
4.	Nala and Playground	04.20	10.	Kharif Research	10.33
5.	Irrigated area	10.40	11.	Rabi seed production	13.50
6.	Semi Irrigated area	11.83	12.	Rabi Research	02.00

RESULTS AND DISCUSSION

Scenario of biodiversity in the Raj Mohini Devi college of agriculture and research station reflected a wide floral diversity presence in the study area (Table 3-10). A sum of 116 floral species was recorded in the study sites which reflect good biodiversity existing in the region. In case of tree layer a total of 20 species were recorded which distributed into 12 diverse families. The leguminoceae was most dominant family in case of tree layer which share 40.0% of the total species. Nearly half of the tree species were Indian origin or indigenous which showing greater ecological adaptability (Table 3). In case of horticultural fruit crop species total 18 species were recorded which representing 15 families (Table 4). The highest proportion of floral diversity was recorded for vegetable crops (31 species, 26.72% to the total). The dominant family among the vegetable crop (Table 5) was cucurbitaceae which comprised of 7 species (22.58% to the total) followed by leguminoceae (5 species) and solanaceae (4 species). The table 6 representing the details of medicinal plants found in the study area. Sums of 6 species with 6 diverse families were recorded in case of medicinal plant diversity. The diversity of flora which was present during the *Kharif* season reflected 12 different species of crops distributed into 4 families. The dominant family was graminae followed by leguminoceae (Table 7). Whereas during *Rabi* season total 9 different species were recorded which were distributed into 5 families and the leguminoceae family was found to be dominant (Table 8). A sum of 5 species with 2 families of fodder crop was found in the study site. Family graminae was recorded as dominant among the fodder species (Table 9). A sum of 15 flower crop was recorded in the study area which distributed into 9 families and the most dominant family was compositae (table 10).

Similar to the present findings a study was done in IIT-M campus which reflected nearly 100 species of flowering plants, with genera belonging to nearly 40 families. The most dominant family was Fabaceae with 15 species (25%) of the medicinal trees. In addition, the dominant medicinal herbs belong to the families of Acanthaceae, Apocynaceae, Fabaceae and Rubiaceae containing 4 species (12%) each [16]. A work carried out in Indian Cardamom Research Institute campus, Myladumpara which showed higher diversity of total 515 taxa than present findings. Further, the indigenous or naturalized flora is represented by 392 taxa in 303 genera under 94 families. Dicotyledonous plants dominate with 335 species in 251 genera under 80 families. Monocotyledons are represented by 57 species in 52 genera under 14 families. Among the families, Fabaceae dominates with 29 species followed by Asteraceae (27 spp.) and Euphorbiaceae (22 spp.) and 40 families are represented by single species each [17]. Likewise, a floristic survey in South Travancore Hindu College reflected 238 taxa comprising 47 trees, 42 shrubs, 125 herbs and 24 climbers that are distributed in 192 genera, represented in 67 families, 9 super orders and 30 orders as per the APG III classification. The family Poaceae was the most species-diverse (29), followed by Acanthaceae (18), Apocynaceae and Euphorbiaceae (14), Malvaceae (12), Lamiaceae and Poaceae (11 each), the other families sharing the rest of the species [18]. A floristic assessment in Bharathiar university campus, India revealed higher diversity than the present findings as 335 vascular plant species represented by 222 genera belonging to 67 different families. The Poaceae, Fabaceae, Mimosaceae, Caesalpiniaceae and Amaranthaceae were the dominating families [10]. Similar work in CSKHPKV, Palampur reported 45 species of native plants and 50 species of introduced plants. However, 358 trees were found on the organic farm, out of which most were fodder trees and for green manuring [20].

Table 3 Details of forest tree/species

Common Name	Botanical Name	Family	Origin	Use	Propagation	Flowering	Part use
Eucalyptus, Nilgiri	*Eucalyptus spp.*	Myrtaceae	Australia	T, FW, MV	Seed	Sep-Nov	Leaf, Stem
Khamhar	*Gmelina arborea* Roxb.	Verbenaceae	India, Bangladesh, Sri Lanka, Myanmar	T, MV	Seed	Feb-April	Stem, Fruit
Siris	*Albizia procera* Roxb.	Leguminoceae	India, China, Philippines	T, AI	Seed	June-August	Stem
Shisham	*Delbergia sissoo Roxb.*	Leguminoceae	Indian Subcontinent and Southern Iran	T, MV	Seed	April-May	Stem, Leaves
Bamboo	*Bambusa bambos*	Poaceae	Southeast Asia & Africa	PI, BC, F, Fo, MV	Root, Seed	Gregarious flowering in every 30-50 years (Feb-May)	Stem, Leaves, Rhizomes
Pipal	*Ficus religiosa L.*	Moraceae	India, Nepal	Fr, R, MV	Seed	April	Stem, Fruit, Leaves
Mahua	*Madhuca indica* Gmel	Sapotaceae	India	L, Fl, MV	Seed	Feb-April	Flower, Seed
Neem	*Azadirachata indica* A.Juss	Meliaceae	India	MV, Ins, C,	Seed	Feb-May	Leaf, Stem
Babul	*Acacia nilotica*	Leguminoceae	Africa, India, Srilanka	FW, AI, G, Fo	Seed	Feb-May	Stem
Mulberry	*Morus alba*	Moraceae	China	Fr, S	Seed	Mar-April	Leaf, Fruit
Karanj	*Pongamia pinnata (L.)*	Leguminoceae	Tropical & temperate Africa	Oil, MV	Seed	Mar-April	Seed, branch
Bahera	*Terminalia bellerica*	Combretaceae	Southeast Asia	MV	Seed	April-May	Fruit
Tendu	*Diospyros melonoxylon Roxb.*	Ebenaceae	India, Sri Lanka	I, Fr, MV	Seed	April-June	Leaf, Fruit
Amaltas	*Cassia fistula*	Leguminoceae	Tropical Asia	FW	Seed	May-June	Stem
Gulmohar	*Delonix regia*	Leguminoceae	Philippines	OP, MV	Seed	May-June	Stem
Sal	*Shorea robusta*	Dipterocarpaceae	Indian subcontinent	T	Seed	Feb-April	Stem
Semal	*Bombax ceiba L.*	Malvaceae	Western Africa	T,	Seed	March	Stem
Sandal	*Santalum album*	Santalaceae	Europe	I, R, MV	Seed	Jan -March	Stem
Palas	*Butea monosperma*	Leguminoceae	India	FW	Seed	March	Stem, Root
Emli	*Terminadus indica*	Leguminoceae	Tropical Africa	FW, MV	Seed	May-June	Seed, Leaf, Stem

Note: T= Timber, FW= Fuel wood, MV= Medicinal value, PI= Paper industry, BC= Bamboo craft, F= Food, Fo= Fodder, L= Lequor, AI= Agricultural implements, Fr= Fruits, R= Religious, OP= Ornamental plants, I= Industries, S= Sericulture, Ins= Insecticides, C= Cosmetics, G= Gum,

Table 4 Details of horticultural (fruit) crop in the study area

S.N.	Common Name	Botanical Name	Family	Origin	Propagation	Flowering time
1.	Mango	*Mangifera indica*	Anacardiaceae	Indo Burma Region	Veneer grafting/Air layering	March
2.	Litchi	*Litchi chinensis*	Sapindaceae	China	Air layering/Seed	March
3.	Jack fruit	*Artocarpus heterophyllus*	Moraceae	India	Inarching/Seed	March-April
4.	Ber	*Zizyphus mauritiana*	Rhamnaceae	China	Ring & T-Budding/Seed	Nov-Dec
5.	Karonda	*Carrisa carandas*	Apocyanaceae	India	Seed, hard wood cutting	Nov-Dec
6.	Coconut	*Cocus nucifera*	Arecaceae	South East Asia	Seed	
7.	Guava	*Psidium guajava*	Myrtaceae	Peru	Stooling/Seed	Feb-Mar
8.	Banana	*Musa Paradisica*	Musaceae	South East Asia	Sucker	Nov-May
9.	Papaya	*Carica Papaya*	Caricaceae	Tropical America	Seed	April
10.	Lemon	*Citrus limon*	Rutaceae	Meyer	Air layering seed	-
11.	Aonla	*Phyllanthus emblica*	Phyllanthaceae	India	T-budding/ patch/Seed	Mar-April
12.	Fig	*Ficus carica*	Moraceae	Southwest Asia	Hardwood cutting	-
13.	Bael	*Aegle marmelos*	Rutaceae	India	Patch budding/Seed	June-July
14.	Pomegranate	*Punica granatum*	Lythraceae	Europe	Hardwood cutting/Seed	Sept-Oct
15.	Jamun	*Syzygium cumunii*	Myrtaceae	Indomalaya	Shield & patch budding/Seed	May
16.	Sitafal	*Annona scabemosa*	Anonaceae	United States	Seed	Oct-Nov
17.	Strawberry	*Fragaria ananasa*	Rosaceae	Europe	Runner	March
18.	Betal vine	*Piper petle*	Piperaceae	South East Asia	Runner	April

Table 5 Details of horticultural (vegetables) crop in the study area

S. N.	Common Name	Botanical Name	Family	Origin	Edible Part
1.	Chilli	*Capsicum annum*	Solanaceae	Mexico	Fruit
2.	Tomato	*Lycopersicon esculentum*	Solanaceae	South America	Fruit
3.	Brinjal	*Solanum melongena*	Solanaceae	Indo-Burma	Fruit
4.	Okra	*Abelmoschus esculantus*	Malvaceae	Africa	Fruits
5.	Onion	*Allium cepa*	Amaryllidaceae	Central Asia	Bulb
6.	Cabbage	*Brassica oleracea*	Cruciferare	Mediterranean region	Head
7.	Cauliflower	*Brassica botrytis*	Cruciferare	Mediterranean region	Curd
8.	Sponge gourd	*Luffa cylindrical*	Cucurbitaceae	Asia	Fruit
9.	Bottle gourd	*Lagenaria siceraria*	Cucurbitaceae	South Africa, India	Fruit
10.	Bean	*Phaseolus lunatus*	Leguminoceae	Guate mala	Pod
11.	Pumpkin	*Cucurbita moschata*	Cucurbitaceae	Mexico	Fruit
12.	Corinder	*Coriandrum sativum*	Umbeliferae	Afghanistan	Leaves
13.	Taro	*Colocasia esculenta*	Araceae	Srilanka	Corms
14.	Cow pea	*Vigna unguiculata*	Leguminoceae	Africa	Pod
15.	Bitter gourd	*Momordica charantia*	Cucurbitaceae	Indo-Burma	Fruit
16.	Garlic	*Allium sativum*	Amaryllidaceae	Central Asia	Cloves
17.	Ivy gourd	*Coccinia indica*	Cucurbitaceae	India	Fruit
18	Pointed gourd	*Trichosanthus dioca*	Cucurbitaceae	India	Fruit
19.	Raddish	*Raphanus sativus*	Cruciferare	Europe	Root & leaves
20.	Carrot	*Daucus carota*	Umbeliferae	Afghanistan	Root
21.	Clustrer Bean	*Cyamopsis tetragonolodus*	Leguminoceae	India	Pod ,seed
22.	Sweet Potato	*Ipomea batatas*	Convolaceae	South America	Tuber
23.	Cucumber	*Cucumis sativus*	Cucurbitaceae	India	Fruit
24.	Potato	*Solanum tuberosum*	Solanaceae	South America	Stem ,tuber
25.	Ginger	*Ginger officinalis*	Zingieraceae	South east Asia	Rhizome
26.	Turmeric	*Curcuma longa*	Zingieraceae	South east Asia	Rhizome
27.	Amaranthus	*Amaranthus spp.*	Amaranthaceae	India	Leaves ,stem
28.	Palak	*Beta Vulgaris*	Chenopodiaceae	Region Indo-china	Leaves
29.	Fenugreek	*Trigonella foenugraceum*	Leguminoceae	Africa	Pod
30.	Peas	*Pisum sativum*	Leguminoceae	Central Asia	Tender seeds
31.	Drum stick	*Moringa Oleifera*	Moringaceae	Africa, India	Green pods

Table 6 Details of medicinal plants of the study area

S.N.	Common Name	Botanical Name	Family	Origin	Propagation	Part use
1.	Lemon grass	*Cymbopogan flexuasus*	Graminae	India	Tuber	Leaves
2.	Safed musli	*Chlorophytum borivilianum*	Asparagaceae	Africa	Root	Roots
3.	Sarpagandha	*Rouvolfia serpentine*	Apocynaceae	India	Tuber	Roots
4.	Ashwagandha	*Withania somnifera*	Solanaceae	Africa	Tuber	Roots
5.	Bergamot mint	*Mentha citrate*	Labiatae	China	Tuber	Leaves
6.	Tulsi	*Ocimum sanctum*	Lamiaceae	South Africa	Seed	Leaves

Table 7 Details of kharif crop in the study area

S.N.	Common Name	Botanical Name	Family	Origin	Propagation	Flowering
1.	Rice	*Oryza sativa*	Graminae	South East Asia	Seed	Sep to Oct
2.	Maize	*Zea mays*	Graminae	Mexico	Seed	Aug to Sep
3.	Sweet corn	*Zea mays*	Graminae	Indo-Burma	Seed	Aug to Sep
4.	Bebby corn	*Zea mays*	Graminae	Mexico	Seed	Aug to Sep
5.	Arhar	*Cajanus cajan*	Leguminoceae	India	Seed	Nov to Dec
6.	Moong	*Phaseolus aureus*	Leguminoceae	India	Seed	Aug to Sep
7.	Urdbean	*Phaseolus mungo*	Leguminoceae	India	Seed	Aug to Sep
8.	Til	*Sesamum indicum*	Pedaliaceae	Africa	Seed	Sep to Oct
9.	Kulthi	*Macrotyloma uniflorum*	Leguminaceae	India	Seed	Aug to Sep
10.	Sunflower	*Helianthus annus*	Asteraceae	USA	Seed	Aug to Sep
11.	Ragi	*Eleusine coracana*	Graminae	Africa	Seed	Sep to Oct
12.	Little millet	*Panicum sumatrense*	Graminae	India	Seed	Sep to Oct

Table 8 Details of rabi crop in the study area

S.N.	Common Name	Botanical Name	Family	Origin	Propagation
1.	Wheat	*Triticum aestivum*	Graminae	South West Asia	Seed
2.	Mustard	*Brassica*	Crucifereae	China	Seed
3.	Gram	*Cicer arietinum*	Leguminaceae	Syria	Seed
4.	Sugarcane	*Saccharum officinarum*	Graminae	South East Asia	Vegetative part
5.	Lentil	*Lens esculanta*	Leguminaceae	India	Seed
6.	Lathyrus	*Lathyrus sativus*	Leguminaceae	Eurasia	Seed
7.	Linseed	*Linnum usitatissimum*	Linaceae	Afghanistan	Seed
8.	Field Pea	*Pisum sativum*	Leguminaceae	South East Asia	Seed
9.	Safflower	*Carthamus tinctorius*	Asteraceae	North America	Seed

Table 9 Details of fodder crop in the study area

S.N.	Common Name	Botanical Name	Family	Origin	Uses	Propagation
1.	Napier grass	*Pennisetum purpureum*	Graminae	Rhodesia	Fodder	Seed
2.	Berseem	*Trifolium alexandrinum*	Leguminaceae	Egypt	Fodder	Seed
3.	Maize	*Zea mays*	Graminae	Mexico	Fodder/Grain	Seed
4.	Jowar	*Sorghum bicolour*	Graminae	Northern Africa	Fodder/Grain	Seed
5.	Bajra	*Pennisetum thphoides*	Graminae	Africa	Fodder/Grain	Seed

Table 10 Details of horticultural (flower) crop in the study area

S.N.	Common Name	Botanical Name	Family	Origin	Propagation
1.	Cocks comb	*Celosia spp.*	Amaranthaceac	-	Seed
2.	Rose	*Rosa spp.*	Rosaceae	India	Budding
3.	Marigold	*Tagetes erecta*	Compositae	Mexico	Seed
4.	Chrysanthemum	*Chrysanthemum indicum*	Compositae	China	Seed
5.	Glaiolus	*Gladiolus grandifloras*	Iridaceae	Africa and Asia	Seed
6.	Lily	*Lilium candidum*	Liliaceae	Africa and Asia	Seed
7.	Jasmine	*Jasminum officinale*	Oleaceae	Arabic origin	Cutting
8.	Petunia	*Petunia hybrid*	Solanaceae	South America	Seed
9.	Night Queen	*Cestrum nocturnum*	Solanaceae	Japan	Seed
10.	Balsam	*Impatiens balsamina*	Balsaminaceae	India, China	Seed
11.	Zinia	*Zinia elegans*	Compositae	Mexico	Seed
12.	Cosmos	*Cosmos bipinnatus*	Compositae	Mexico, Southern US	Seed
13.	Dahlia	*Dahlia variabilis*	Compositae	-	Seed
14.	Mogra	*Jasmin sambac*	Olelaceae	China	Cutting
15.	Rajnigandha	*Polianthes tuberosa*	Asparagaceae	Mexico	Seed

CONCLUSION

In the present context of development now time to emphasized conservation of forest resources through proper assessment of flora which are essential for human wellbeing. Furthermore, facts and ideas on floral diversity are essential requisite to understand the dynamic nature of plants under precise environmental setup. The present work highlighted and underlined the institutional role towards biodiversity conservation as an ideal habitat. The careful planning and management implication are prerequisite to maintain this landscape and obtaining sustainable ecosystem services.

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