

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Anthropogenic Impact on Biodiversity of Rural Hilly Areas: Gwalior (Madhya Pradesh) India.

Hina Upadhyay<sup>1\*</sup>, Arun Kumar<sup>1</sup>, Balkrishna Sopan Bhople<sup>1</sup>, Kunal Singh<sup>2</sup>, and Amresh Kumar Nayak<sup>2</sup>.

<sup>1</sup>School of Agriculture Lovely Professional University, Phagwada, Punjab, India.

<sup>2</sup>Boston College, Gwalior, Madhya Pradesh, India.

### ABSTRACT

Expanding human population resulted into expanding needs of man. With scientific progress and technological development man started utilizing natural resources at a much larger scale. Rapid Industrialization, Urbanization and population explosion have brought changes and fluctuations in the environment, which is a complex of climate, edaphic and biotic factors including man. The growth of human population, over exploitation of resources and ecological unawareness has adverse impact on biodiversity. The present study is aimed to notify effects of exurban developments on threatening the bio-diversity of rural hilly areas around Sirol and Ohadpur villages near new collectorate, Gwalior (M.P.) India. An observation of the mentioned site showed the gradual depletion of natural resources including valuable plant species among which certain species like *Abrusprecatorius*, *With aniasominifera*, *Indigoferapendula* and *Aristolochiabracteolata* are endangered ones.

**Keywords:** Biodiversity, Ecosystem, endangered species, Urbanization

*\*Corresponding author*

## INTRODUCTION

Ecosystems drives the natural cycles that make earth habitable for all organisms; however the pressure of urbanization have potential negative impact on biodiversity. Urbanization is spreading without proper monitoring and biodiversity conservation. Major challenge is to predict the impact of urbanization on biodiversity [1]. Landscaping and maintainance of residential and commercial area typically invovles removal of plant species [2]. Urban development are the major cause for local extinction and generally eliminates

majority of native species [3]. The severity of the problem is not only species extinction but also genetic diversity loss. Right now the world is losing huge numbers of plant and animal species and this loss is accelerating and most of this loss is due to intensive urbanization. As a result of unplanned urbanization in cities and villages, various environmental problems appeared. Gwalior, the city known for its great historical past and rich cultural heritage is one of the most advanced civilized towns in Central India along the ranges of Vindhyanchal. Owing to geography the city falls in the rain shadow zone of India, between 26°14" N & 78°15" E of Greenwich and has an elevation of 697 ft above the sea level. As a result it receives an average of only 700 mm rainfall per annum. The climate being extreme type, the summers are hot with an avg. temp of 33°C and the winters are very cold, sometimes steeping down to the chilling temperature as low as 1-2°C.

New collectorate, Gwalior , present about 5-6 km from Gwalior railway station near the Sirol and Ohadpur Villages. Few small hills about 1.5 km, towards west from the collectorate was selected as the site of study. The hills are having a maximum altitude of about 100 ft and covers a total area about 4-6 sq.m with good vegetation including grasses, herbs, shrubs & trees.

- After a few years of study a marked change in its biodiversity was noticed due to the involvement of various biotic factors.
- Agricultural lands are most affected by rapid urbanization and its functions of demand. These changes and their consequences are the main subject of matter of the present study.

## MATERIALS AND METHOD

The methodology applied in this research is a field work. This research was conducted over a long time period beginning from 2000 and ending 2010. This research paper is composed of different sections, direct observation of the mentioned rural hilly area and collection and preservation of vegetation and impact of urban development on biodiversity.

Vegetation occurring on the top as well as on the slopes upto ground level was studied. The more common plant species were identified on the spot. Some plant specimen was examined in the laboratory by dissecting their floral parts & studying morphological characters. For identification purposes "Flora of Greater Gwalior [4] and a few other literature were used. The identified plant species were preserved in the Herbarium sheets.

## RESULTS

Previously, around five & half years before (2012), the site of our observation was full of natural greenery. The hills were full of dense vegetation bearing a wide varieties of herbs, shrubs & some rare plants which were of great medicinal use. Even the plane sides adjacent to the hill slopes were covered with massive vegetation. Due to denseness it has been converted into a natural habitat for some creatures like little birds, peacocks & snakes etc. Then it was very common to have a glance of a dancing peacock very often for a passerby. Different colorful flowers on the flowering plants were adding extra advantage to the beauty of the hills. Some common medicinal plants like *Withaniasominifera* (Aswagandha) & *Ocimum sanctum* (tulsi) were frequently used by the local inhabitants.

Overall vegetation of the hills were of shrub type with most of the species, xerophytic shrubs. The entire flora covers trees, although few in no. followed by shrubs & herbs along with grasses covering greater area of hill. Amongst trees *Azadirachtaindica*, *Acacia leucophloea* having white coloured bark are prominent.

Under shrubs *Capparisaphyla*, *Lantana camara*, *Zizyphusrotundifolia*, *Carissa carandus*, and *Ipomeafistulosa* are common. The common twinners and or climbers spreading on these shrubs are *Cuscutareflexa*, *Cocculushirsutus* and at few places *Abrusprecatorius* and *Aristolochiabracteolata* have also been found. Amongst grasses *Apludamutica* is fairly common. One of the characteristic observation is the occurrence of a perennial herb *Lepidogathishemiltoniana* in the crevices of the rocky substratum. In the course of our study, we collected, identified & preserved some of the valuable plant species by our interest which is enumerated below with their family, habit and local name.

**Table 1- Dicots**

S.No.	Name of the Plant	Family	Habit	Available Local Name
1.	<i>Cocculushirsutus</i>	Menispermaceae	A climbing herb spreading on adjoining shrubs	Patalagarudi
2.	<i>Sidacordifolia</i>	Malvaceae	An erect herb ovate leaves	
3.	<i>Polygallachinensis</i>	Polygallineae	A delicate herb, pinkish flower	
4.	<i>Corchorusacutangulus</i>	Teliaceae	An erect herb	
5.	<i>Capparisdeciduas</i>	Capparidaceae	A. Branched leafless fruits	Teti (Fruit) used in pickles
6.	<i>C. sepiara</i>	Capparidaceae		
7.	<i>Tribulusterrestris</i>	Zygophyllaceae	Prostrate herb, spiny fruits	Gokhru
8.	<i>Azadirachtaindica</i>	Meliaceae	Tall tree compound leaves, bitter in taste. Great medicinal importance	Neem
9.	<i>Callistemon lanceolatus</i>	Myrtaceae	An erect small tree	Bottle brush
10.	<i>Crotalaria medicaginea</i>	Papilionaceae	A herb with yellow flower	
11.	<i>Abrusprecatorius</i>	Leguminosae	A twinning herb with compound leaves	Ratti
12.				
13.	<i>Indigoferapendula</i>	Fabaceae	Prostrate herb, red flowers	
14.	<i>Cassia tora</i>	Caesalpinaceae	Woody herb, yellow flowers	Pawar
15.	<i>C. occidentalis</i>	Caesalpinaceae	Tall herb	
16.	<i>Tephrosiapurpurea</i>	Caesalpinaceae	Branched herb	
17.	<i>Zizyphusrotundifolia</i>	Rhamnaceae	Prickly under shrub	Ber
18.	<i>Acacia leucophloea</i>	Mimosaceae	Small tree white bark	Safed babul
19.	<i>Spermacocestricta</i>	Rubiaceae	Erect herb	
20.	<i>S. hipsida</i>	Rubiaceae		A small herb with white flower
21.	<i>Oldenlandiadichotoma</i>	Rubiaceae	Dichotomously branched herb.	
22.	<i>Balanitesnoxburghii</i>	Rubiaceae	Woody shrub.	Hingota
23.	<i>Tridaxprocumbens</i>	Asteraceae	Herb with a single head	
24.	<i>Xanthium strumarium</i>	Asteraceae	Coarse leafy herb. Fruits spiny	
25.	<i>Echinopsechinatus</i>	Asteraceae	Prickly xerophytic herb with compound head	Altavista
26.	<i>Launaeaasplenifolia</i>	Asteraceae	Herb with Prostrate leaves	
27.	<i>Sonchusarvensis</i>	Asteraceae	Herb with prostrate leaves	
28.	<i>Bidensbiternata</i>	Asteraceae	Hardy herbs prickly fruits adaptation for dispersal.	
29.	<i>Vernonia sp.</i>	Asteraceae	A herb with white or pink head	
30.	<i>Ageratum conyzoides</i>	Asteraceae	Herb with opposite leaves	
31.	<i>Justicia simplex</i>	Acanthaceae	A small dense herb spike inflorescence	
32.	<i>J. quinqueangularis</i>	Acanthaceae	Herb with angular stem.	
33.	<i>Barleria sp.</i>	Acanthaceae	Tall fruit	
34.	<i>Peristrophebicalyculata</i>	Acanthaceae	Branched and spreading herb with small pink flowers	
35.	<i>Lepidogathishamiltoniana</i>	Acanthaceae	A globose spiny structure arising from the crevices of rocks, flowers white.	
36.	<i>Convolvulus pluricaulis</i>	Convolvulaceae	Trailing herb white flowers	Shankhpushpi
37.	<i>Ipomeafistulosa</i>	Convolvulaceae	A shrub	Beshrum
38.	<i>Cuscutareflexa</i>	Convolvulaceae	Leafless parasite twiner, watery	Amarbel

			white flowers	
39.	<i>Ocimum sanctum</i>	Lamiaceae	An erect herb, verticillaster inflorescence	Tulsi
40.	<i>O. basilicum</i>	Lamiaceae	Rohust erect herb, strongly aromatic smell	Janglitulsi
41.	<i>Leucasaspera</i>	Lamiaceae	Herb with a globose inflorescence, white flowers	
42.	<i>Lantana camara</i>	Verbenaceae	Branched, coarse shrub, flowers orange red or white	
43.	<i>Calotropisprocera</i>	Asclepiadaceae	Almost a shrub like, milky latex, purple cooured flowers	Akawa
46.	<i>Carissa carandas</i>	Apocynaceae	A thorny shrub	Karonda
47.	<i>Thevetianeriifolia</i>	Apocynaceae	A small tree, yellow flowers	PeelaKaner
48.	<i>Aristolochiabraceolata</i>	Aristolochiaceae	A climber and turning round the neighbouring plants. Typical umbrella like dehiscent fruit	Badakbel
49.	<i>Euphorbia hirta</i>	Euphorbiaceae	Very common herb	Doodhi
50.	<i>Euphorbia microphylla</i>	Euphorbiaceae	Prostrate small herb with small rounded leaves	
51.	<i>Croton sp.</i>	Euphorbiaceae	An erect sticky herb.	Jamalgota
52.	<i>Jatropha gossypifolia</i>	Euphorbiaceae	A shrub, palmate leaves	Ratanjot
53.	<i>Ricinus communis</i>	Euphorbiaceae	An erect tall shrub	Arandi

**Table 2- Monocots**

S.No.	Name of the Plant	Family	Habit	Available Local Name
1.	<i>Cynodondactylon</i>	Poaceae		Doob
2.	<i>Apludamutica</i>	Poaceae	Tall grass reaching height of about 1 ½ ft.	Mauritian Grass
3.	<i>Aristida sp.</i>	Poaceae		
4.	<i>Commelina sp.</i>	Commelinaceae		
5.	<i>Themeda</i>	Poaceae	Dominant on hill top	

**The Present Scenerio**

The earlier rich bio-diversity on the hills has now become past. The present scenario is completely changed. The dense and flourished vegetation has vanished little birds, snakes, peacocks are no more found due to loss of their habitat & human interference. No beauty, no such greenness left as before. The entire site has converted into heap of stones only.

The number and varieties of valuable plants found previously have decreased to a large extent amongst which certain species are endangered one. These plants need special attention.

1. ***Abrus precatorius*** : It is a small climber twinning round the adjoining shrubs with pinnately compound leaves. Dehiscent pods were collected having beautiful shining red and black coloured seeds, locally known as "Ratti".  
The seeds of the plant are of great economic importance. Due to human activity & grazing of animals, plants are being destroyed making the species as endangered.
2. ***Aristolochia bracteolata***: This is also a climber. The dehiscent fruits look like parachute, a mechanism of the seed dispersal. This plant is also on way to destruction.
3. ***Withania somnifera*** : It is an annual herb of medicinal importance. The plant is used in the treatment of cough and other medicinal uses.



Figure 1: Plant of Medical importance: *With aniasominifera* Source- Field study



Figure 2: Endangered form of *With aniasominifera* Source- Sirol village, Gwalior

**Reason behind such major change:**

The marked change in the diversity of plant species & ecosystems on the hills over last two and half years is noticeable. All this is due to uncontrolled human activities that include

- Real estate construction
- Colonization on hill slopes
- Over exploitation of natural resources
- Continuous digging of morum
- Firewood collection by local inhabitants
- Over grazing of domesticated animals

Few townships construction is on progress in these hilly regions which has totally changed the earlier ecosystems at the place of their development.



Figure 3: Real estate construction going on .....( Sirol village, Gwalior)

The soil of the hills is reddish in color from which morum is being regularly dig out. As a result of this the plant species occurring herein are destroyed & one can see those areas without any vegetation.



(a)



(b)

Figure 4 (a, b): Depletion of hill slopes due to morum digging. Source- Field study

Illegal construction of houses by local people on the hill slopes is also a great threat to the regional biodiversity.



(a)



(b)

Figure 5 (a, b): Colonization on hill slopes, Ohadpur village, Gwalior.



## CONCLUSION

Biodiversity is essential for ecosystem services. It was seen on the hills that due to involvement of biotic factors, there is loss of plant vegetation day by day and depletion of natural resources on account of overexploitation. If such biotic factors continue to operate for a long time then some of the valuable and rare plant species on these rural hilly areas may become vanished.

For preserving the important species strict action must be taken against those involved in illegal constructions. Secondly, digging of morum should be stopped only then the plants can be saved from the destruction. Further suggested that, plantation of fast growing plant species be carried out so that soil erosion can be checked and green vegetation may flourish. Certain species like *Abrus precatorius* and *Aristolochia bracteolata* are endangered one. (They used to flourish about 15 yrs back, but now are on the way to depletion). Environment has been intensively disturbed in developing country like India and the consequence are very lethal for maintaining biodiversity. Urbanization has dramatically increased in the studied area which consequently increases the rate of habitat loss and this case study should be assets for further monitoring. For preserving the important species necessary step must be taken for prevention of colonization in hilly slopes and to enhance biodiversity.

## REFERENCES

- [1] McKinney ML. *Biosci* 2002, 52:883-890.
- [2] Marzluff J M. *Restor Ecol* 2001, 9:280-292.
- [3] Marzluff J M. *Worldwide urbanization and its effects on birds*. Kluwer, Norwell, Massachusetts, 2001, pp-19-47
- [4] Agarkar DS, *Flora of Greater Gwalior*, J.Vikram University, Ujjain, M.P, 1965.