*IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*
*e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 10 Ver. III (Oct. 2016), PP 14-21*
*www.iosrjournals.org*

# "Phytosociological Analysis of Weeds in Durg District of Chhattisgarh"

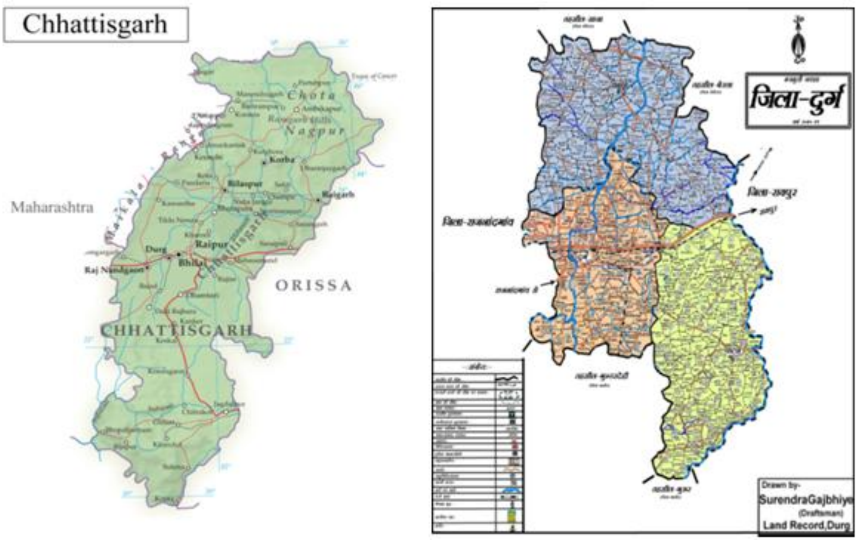
AnitaTikariha*, A.K. Shrivastava[1] and S. Patra[2]
*[1]P.G. Department of Botany, Govt. D. T. College, Utai, Durg, C.G*
*[2*]P.G. Department of Botany, Govt. NPG College of Science, Raipur, C.G.*

**Abstract:** *The phytosociological survey done in 2012-2013 and 2013-2014 in Durg District of Chhattisgarh state showed the biodiversity of different weeds. Weeds are the plants, which grow where they are not wanted. Present study work – 46 species, 43 genus and 20 families were identify in the field surveyed. Plants grow in vary widely in variable environmental conditions to form vegetation. The ecological amplitude of all the species growing in vegetation is not equal. Different plants respond differently towards the changing influences of ecological factors- precipitation, relative humidity of atmosphere, availability of light, temperature, edaphic, topological and biotic factors. A thorough knowledge of the habit and habitat conditions and different adaptive features are essential to establish any ecological conclusion. Density, frequency, abundance, relative density, relative frequency, relative abundance, IVI were noted by quadrats method then central tendencies, SE, SD and coefficient of variance were calculated. IVI ranges from 4.22 to 26.15, Mean 13.41, Median 9.99, Mode 25.77, SD were 36.58 while SE were 5.39 and coefficient of variance were 272.78.*

**Keywords:** *Vegetation, Biodiversity, Phytosociological, Durg, IVI.*

## I. Introduction

Durg district of Chhattisgarh state is famous for its natural resources, tribes and rich Biodiversity since ancient times. The site selected for the present study is situated in the 21' $13^0$ N and 81' $26^0$ E in Durg district. The state is endowed with 44% of forest cover. A large size of population resides in forest and villages. Plants play important role in their life particularly in dialects, socioreligious ceremonies, traditional and domestic system of medicine. A vegetation is the sum total of the plants covering an area, which generally consists of a number of communities. A biological community consists of all the organisms living together in an interrelated fashion in a given environment. Each community consists of a set of many different species, which persist year after year, and each species is represented by innumerable individual or strands. Individual of the same community are together termed population . Therefore, in response to the climatic complex, the entire vegetation responds by its distribution into groups, each of which is near equilibrium (Verma, 1978; Shukla, *et. al.* 1973; Shrivastava, *et. al.* 2014; Rameshkumar *et. al.* 2013; Naik, 1998; Misra, 1959; Almeida, 1996; Ali, *et. al.* 1985). Many of them were used as medicinal plant. The data is tabulate in the mean value of the plant present in this area throughout the year 2012-2013 and 2013-2014. The help of quadrats performed ecological studies by sampling method and IVI were note down by the standard formula.




**MAP: Chhattisgarh and Durg District**

## II. Material and Method

The weed flora and information based on weeds were collected from Durg and its neighboring areas – Bhilai Steel Plant, Bhilai Industrial area, Chunkatta Bhilai Area etc. The extensive and intensive seasonal survey of weed flora in different habitat of waste land was done for the collection of weed flora and for the preparation of herbarium. Quadrat were placed month wise before at 10 places randomly, and mean value recorded.

Take a quadrat of 1M by 1M size; lay it randomly of places. Find out the presence or absence of each of the species in each segment or square of the quadrat and tabulate the data. Only those plant species were considered which touch the quadrat boundary. Record the observation in a tabular form. Note down observation in the table no. 1. Using the recorded data, prepare a graph. (Bor, 1942; Champion, 1936, Weaver *et. al*., 1925; Westhoff *et. al*. 1973; Bredenkamp *et. al*. 1998). Identify the species then prepare herbarium and count the number of individual of each species occurring from each square of the quadrat in this area. The collected plants are identified by using "The flora of Marathwada" (Naik, 1998), "Flora of Bombey presidency" (cooke, 1958), "The flora of Maharashtra" (Almeida, 1968).

**Calculation:-** After extracting the essential data, following structure of the community could be determined…as Percentage Frequency, Density, Abundance, Relative frequency , Relative Density, Relative Abundance, Important Value Index (IVI), Mean, Median, Mode, Standard deviation, Standard error, Coefficient of variation etc.

(A)Calculate the percentage frequency as follows- Percentage frequency = x/y *100

Where, x= Total no. of quadrat in which species occurred, Y= Total no. of quadrat studied

(B) Calculate the density as follows- Density = x/y

Where, x= Total no. of individuals of a species, Y= Total no. of quadrats studied

I Calculate the abundance as follows- Abundance = x/y

Where, x= Total no. of individuals of a species, Y= Total no. of quadrats in which species occurred

**For phytosociological purposes, it is generally express as:**

(D) Calculate the relative frequency as follows- Relative frequency = x/y *100

Where, x= Total no. of quadrat in which species occurred, Y= Total no. of occurrence of all the species

(E) Calculate the relative density as follows- Relative density = x/y *100

Where, x= no. of individual of a species, Y= no. of individual of all the species

(F) Calculate the relative abundance (Dominance) as follows- Relative abundance = x/y *100

Where, x= Total basal area of a species, Y= Total basal area of all the species

(G)IVI takes into consideration relative frequency, relative density and relative abundance. Calculate the Important Value Index (IVI) as follows-

IVI = relative frequency + relative density + relative abundance

(H)Mean- M = $x_1+x_2+x_3+$………. / n

Where, M= Mean, x = Summing up the observation, n = Total number of observation

(I)Median – Md = n+1/2 or Md = $n/2^{th}$ value + $(n/2+1)^{th}$ value / 2

Where, Md = Median, n = Total number of observation

(J)Mode- In a frequency distribution, 'mode' is defined as "the value of the variable for which the frequency is maximum.

(K) Standard deviation- SD = $\frac{\sqrt{\Sigma d^2}}{n}$ or SD = =$\frac{\sqrt{\Sigma f.d^2}}{\Sigma f}$

Where, SD = standard deviation, d = deviation from mean, n = total number of observation, f = frequency of each class, $\sum$ = summation taken over all the classes of the distributed

(L) Coefficient of variation- Coefficient of variation = Standard deviation / Mean * 100

(M) Standard error – SE = SD/ $\sqrt{n}$

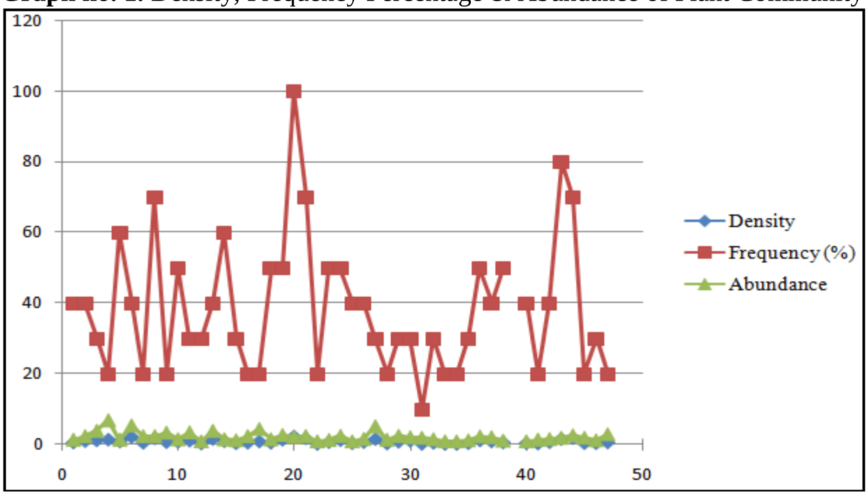
## III. Results and Discussion

**Table No. 1.** Phytosociological Data of Weed Flora of Durg District in Chhattisgarh

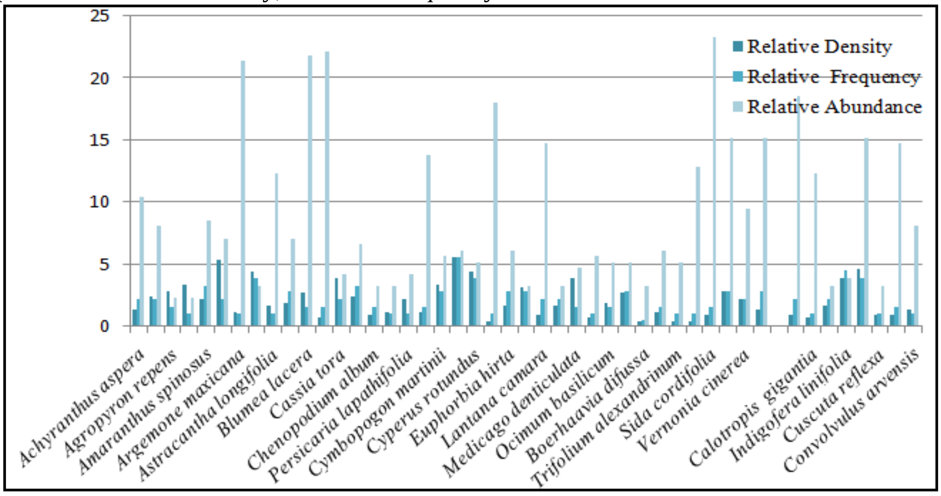
| S N | Botanical Name | Family | Total no. of a species | Total no. of quadrat in which species occurred | Density | Frequency (%) | Abundance | Relative Density | Relative Frequency | Relative Abundance | IVI (Important Value Index) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Achyranthus aspera* | Amaranthaceae | 6 | 4 | 0.6 | 40 | 1.5 | 1.4 | 2.2 | 10.45 | 14.05 |
| 2 | *Ageratum conyzoides* | Asteraceae | 10 | 4 | 1.0 | 40 | 2.5 | 2.4 | 2.2 | 8.07 | 12.67 |
| 3 | *Agropyron repens* | Poaceae | 12 | 3 | 1.2 | 30 | 4.0 | 2.9 | 1.6 | 2.37 | 6.87 |
| 4 | *Alternanthra paranychioides* | Amaranthaceae | 14 | 2 | 1.4 | 20 | 7.0 | 3.4 | 1.1 | 2.37 | 6.87 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | *Amaranthus spinosus* | Amaranthaceae | 9 | 6 | 0.9 | 60 | 1.5 | 2.2 | 3.3 | 8.55 | 14.05 |
| 6 | *Andropogan odoratus* | Poaceae | 22 | 4 | 2.2 | 40 | 5.5 | 5.4 | 2.2 | 7.12 | 14.72 |
| 7 | *Argemone maxicana* | Papaveraceae | 5 | 2 | 0.5 | 20 | 2.5 | 1.2 | 1.1 | 21.37 | 23.67 |
| 8 | *Aristida adscensionis* | Poaceae | 18 | 7 | 1.8 | 70 | 2.5 | 4.4 | 3.9 | 3.32 | 11.62 |
| 9 | *Astracantha longifolia* | Acanthaceae | 7 | 2 | 0.7 | 20 | 3.5 | 1.7 | 1.1 | 12.35 | 15.15 |
| 10 | *Barlaria alba* | Acanthaceae | 8 | 5 | 0.8 | 50 | 1.6 | 1.9 | 2.8 | 7.12 | 11.82 |
| 11 | *Blumea lacera* | Asteraceae | 11 | 3 | 1.1 | 30 | 3.6 | 2.7 | 1.6 | 21.85 | 26.15 |
| 12 | *Calotropis procera* | Asclepiadaceae | 3 | 3 | 0.3 | 30 | 1.0 | 0.7 | 1.6 | 22.11 | 24.41 |
| 13 | *Cassia tora* | Fabaceae | 16 | 4 | 1.6 | 40 | 4.0 | 3.9 | 2.2 | 4.27 | 10.37 |
| 14 | *Centella asiatica* | Apiaceae | 10 | 6 | 1.0 | 60 | 1.6 | 2.4 | 3.3 | 6.65 | 12.35 |
| 15 | *Chenopodium album* | Chenopodiaceae | 4 | 3 | 0.4 | 30 | 1.3 | 0.9 | 1.6 | 3.32 | 5.82 |
| 16 | *Cleome viscose* | Capparidaceae | 5 | 2 | 0.5 | 20 | 2.5 | 1.2 | 1.1 | 3.32 | 5.62 |
| 17 | *Persicaria lapathifolia* | Polygoniaceae | 9 | 2 | 0.9 | 20 | 4.5 | 2.2 | 1.1 | 4.27 | 7.57 |
| 18 | *Centratherum anthelminticum* | Asteraceae | 5 | 5 | 0.5 | 50 | 1.6 | 1.2 | 1.6 | 13.77 | 21.94 |
| 19 | *Cymbopogon martinii* | Poaceae | 14 | 5 | 1.4 | 50 | 2.8 | 3.4 | 2.8 | 5.70 | 11.9 |
| 20 | *Cynodon dactylon* | Poaceae | 23 | 10 | 2.3 | 100 | 2.3 | 5.6 | 5.6 | 6.17 | 17.37 |
| 21 | *Cyperus rotundus* | Cyperaceae | 18 | 7 | 1.8 | 70 | 2.5 | 4.4 | 3.9 | 5.22 | 13.52 |
| 22 | *Datura alba* | Solanaceae | 2 | 2 | 0.2 | 20 | 1.0 | 0.4 | 1.1 | 18.05 | 19.55 |
| 23 | *Euphorbia hirta* | Euphorbiaceae | 7 | 5 | 0.7 | 50 | 1.4 | 1.7 | 2.8 | 6.17 | 10.67 |
| 24 | *Heteropogon contortus* | Poaceae | 13 | 5 | 1.3 | 50 | 2.6 | 3.2 | 2.8 | 3.32 | 9.32 |
| 25 | *Lantana camara* | Verbenaceae | 4 | 4 | 0.4 | 40 | 1.0 | 0.9 | 2.2 | 14.72 | 17.82 |
| 26 | *Leucas aspera* | Lamiaceae | 7 | 4 | 0.7 | 40 | 1.7 | 1.7 | 2.2 | 3.32 | 7.22 |
| 27 | *Medicago denticulata* | Fabaceae | 16 | 3 | 1.6 | 30 | 5.3 | 3.9 | 1.6 | 4.75 | 10.25 |
| 28 | *Mimosa pudica* | Fabaceae | 3 | 2 | 0.3 | 20 | 1.5 | 0.7 | 1.1 | 5.70 | 7.81 |
| 29 | *Ocimum basilicum* | Lamiaceae | 8 | 3 | 0.8 | 30 | 2.6 | 1.9 | 1.6 | 5.22 | 8.72 |
| 30 | *Phyllanthus niruri* | Euphorbiaceae | 11 | 3 | 1.1 | 30 | 2.2 | 2.7 | 2.8 | 5.22 | 10.72 |
| 31 | *Boerhaavia difussa* | Caryophyllaceae | 2 | 1 | 0.2 | 10 | 2.0 | 0.4 | 0.5 | 3.32 | 4.22 |
| 32 | *Sida acuta* | Malvaceae | 5 | 3 | 0.5 | 30 | 1.6 | 1.2 | 1.6 | 6.17 | 8.97 |
| 33 | *Trifolium alexandrinum* | Fabaceae | 2 | 2 | 0.2 | 20 | 1.0 | 0.4 | 1.1 | 5.22 | 6.72 |
| 34 | *Solanum xanthocarpum* | Solanaceae | 2 | 2 | 0.2 | 20 | 1.0 | 0.4 | 1.1 | 12.82 | 14.32 |
| 35 | *Sida cordifolia* | Malvaceae | 4 | 3 | 0.4 | 30 | 1.3 | 0.9 | 1.6 | 23.27 | 25.77 |
| 36 | *Tribulus terrestris* | Zygophyllaceae | 12 | 5 | 1.2 | 50 | 2.4 | 2.9 | 2.8 | 15.20 | 20.96 |
| 37 | *Vernonia cinerea* | Asteraceae | 9 | 4 | 0.9 | 40 | 2.2 | 2.2 | 2.2 | 9.50 | 13.9 |
| 38 | *Ipomea aquatica* | Convolvulaceae | 6 | 5 | 0.6 | 50 | 1.2 | 1.4 | 2.8 | 15.20 | 19.48 |
| 39 | *Ziziphus numularia* | Rhamnaceae | 4 | 4 | 0.4 | 40 | 1.0 | 0.9 | 2.2 | 18.52 | 21.62 |
| 40 | *Calotropis gigantia* | Asclepiadaceae | 3 | 2 | 0.3 | 20 | 1.5 | 0.7 | 1.1 | 12.35 | 14.15 |
| 41 | *Ipomea palmata* | Convolvulaceae | 7 | 4 | 0.7 | 40 | 1.7 | 1.7 | 2.2 | 3.3 | 7.2 |
| 42 | *Indigofera linifolia* | Fabaceae | 16 | 8 | 1.6 | 80 | 2.0 | 3.9 | 4.5 | 3.9 | 12.3 |
| 43 | *Parthenium hysterophorus* | Asteraceae | 19 | 7 | 1.9 | 70 | 2.7 | 4.6 | 3.9 | 15.20 | 23.7 |
| 44 | *Cuscuta reflexa* | Convolvulaceae | 4 | 2 | 0.4 | 20 | 2.0 | 0.9 | 1.1 | 3.3 | 5.3 |
| 45 | *Jatropa curcas* | Euphorbiaceae | 4 | 3 | 0.4 | 30 | 1.3 | 0.9 | 1.6 | 14.72 | 17.22 |
| 46 | *Convolvulus arvensis* | Convolvulaceae | 6 | 2 | 0.6 | 20 | 3.0 | 1.4 | 1.1 | 8.07 | 10.57 |
| | **Total** | | **405** | **177** | **40.5** | **1770** | **107** | **97.4** | **97.5** | **416.27** | **616.99** |

**Graph no. 1.** Density, Frequency Percentage & Abundance of Plant Community



**Graph No.2.** Relative Density, Relative Frequency and Relative Abundance of Plant Community




**Graph no. 3.** IVI of Plant Community

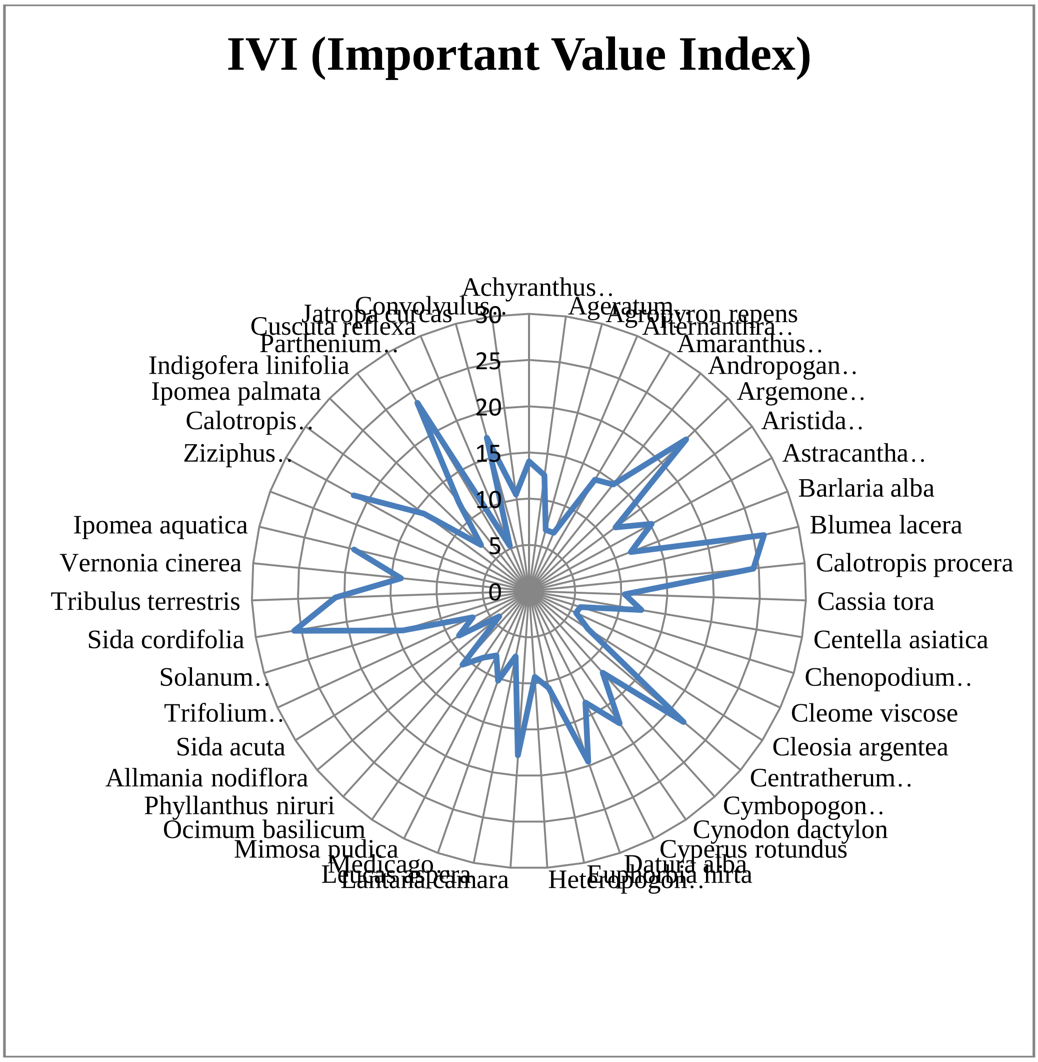
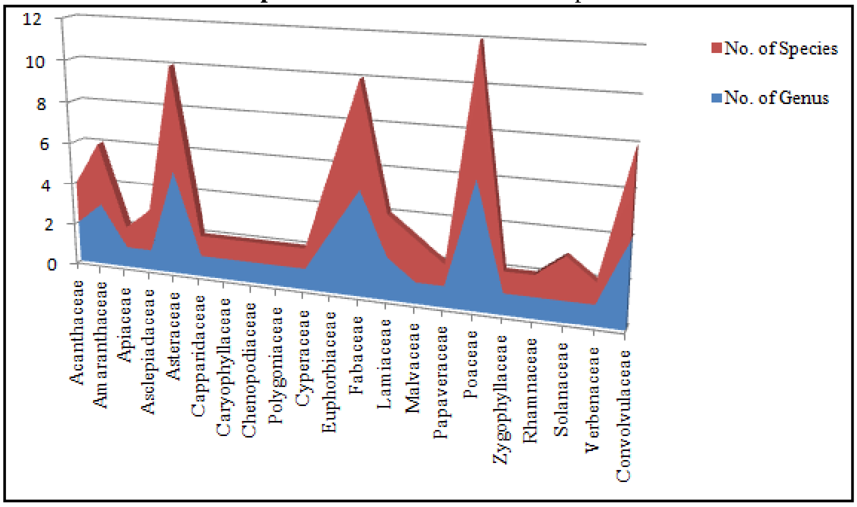


**Table No. 2.** No. of Genus and Species

| S. No. | Name of the Family | No. of Genus | No. of Species |
|---|---|---|---|
| 1 | Acanthaceae | 2 | 2 |
| 2 | Amaranthaceae | 3 | 3 |
| 3 | Apiaceae | 1 | 1 |
| 4 | Asclepiadaceae | 1 | 2 |
| 5 | Asteraceae | 5 | 5 |
| 6 | Capparidaceae | 1 | 1 |
| 7 | Caryophyllaceae | 1 | 1 |
| 8 | Chenopodiaceae | 1 | 1 |
| 9 | Polygoniaceae | 1 | 1 |
| 10 | Cyperaceae | 1 | 1 |
| 11 | Euphorbiaceae | 3 | 3 |
| 12 | Fabaceae | 5 | 5 |
| 13 | Lamiaceae | 2 | 2 |
| 14 | Malvaceae | 1 | 2 |
| 15 | Papaveraceae | 1 | 1 |
| 16 | Poaceae | 6 | 6 |
| 17 | Zygophyllaceae | 1 | 1 |
| 18 | Rhamnaceae | 1 | 1 |
| 19 | Solanaceae | 1 | 2 |
| 20 | Verbenaceae | 1 | 1 |
| 21 | Convolvulaceae | 4 | 4 |
| Total | 20 | 43 | 46 |

**Graph no. 4.** No. of Genus and Species




**Graph No. 5.** No. of Family

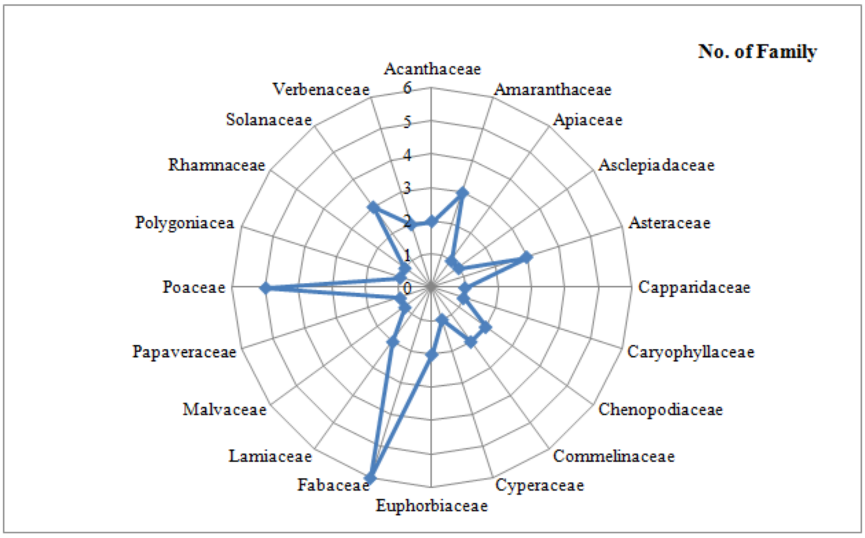


**Table No. 3.** Statistical Data of Plant Community of Durg District of Chhattisgarh

| S.No. | | Mean | Median | Mode | Standard deviation | Standard error | Coefficient of variation |
|---|---|---|---|---|---|---|---|
| 1 | Frequency | 38.47 | 50.0 | 100% (*Cynodon dactylon*) | 2.09 | 0.30 | 5.43 |
| 2 | Density | 0.88 | 1.0 | 2.3 (*Cynodon dactylon*) | 0.13 | 0.01 | 14.77 |
| 3 | Abundance | 2.32 | 2.0 | 7.0(*Alternanthra paranychioides*) | 0.44 | 0.06 | 18.96 |
| 4 | Relative Frequency | 2.11 | 2.8 | 3.9 (*Aristida adscensionis*) | 4.06 | 0.59 | 192.41 |
| 5 | Relative Density | 2.11 | 2.45 | 5.6 (*Cynodon dactylon*) | 3.55 | 0.52 | 168.24 |
| 6 | Relative Abundance | 9.04 | 4.74 | 23.27(*Sida cordifolia*) | 14.25 | 2.10 | 157.63 |
| 7 | Impotant Value Index | 13.41 | 9.99 | 25.77 (*Sida cordifolia*) | 36.58 | 5.39 | 272.78 |

## IV. Discussion

The phytosociological analysis of weeds were recorded from Durg district of Chhattisgarh state by calculating various parameters…density, frequency, abundance, relative density, relative frequency, relative abundance and IVI were noted and found that *Blumea lacera* shows maximum IVI 26.15 and minimum was in *Boerhaavia difussa*, (4.22) and other are present in between this range. So mean 13.41, median 9.99, mode 100% is *Cynodon dactylon*. It shows Standard deviation 7.47, Standard error 1.10 and Coefficient of variation 55.70.

Analysis of relative density, relative frequency, relative dominance and IVI on Durg district basis as shown in Table 1 revealed that *Blumea lacera, Sida cardifolia, Tephrosia purpurea, Argemone maxicana, Calotropis procera, Cynodon dactylon* were thickly occupied in these area as it is obvious from their IVI value. Plants showing maximum frequency were *Cynodon dactylon, Cyperus rotundus* etc. the numerical strength and abundance was recorded as high in *Alternanthra paranychioides, Andropogan odoratus, Medicago denticulate.* Density range is 0.2 to 2.3, and abundance range from 1.0 to 7.0. Plants showing minimum frequency were 0.5 to 5.6, minimum density were *Boerhaavia difussa, Datura alba, Trifolium alexandrinum, Solanum xanthocarpum*. Less abundance weed species were again *Datura alba, Trifolium alexandrinum, Solanum xanthocarpum.*

**IVI** – IVI ranges from 4.22 to 26.15, Mean 13.41, Median 9.99, Mode 25.77, SD were 36.58 while SE were 5.39 and coefficient of variance were 272.78.

**Frequency**- Mean 38.47, Median 50.0, Mode 100% (*Cynodon dactylon*) , SD were 2.09 while SE were 0.30 and coefficient of variance were 5.43.

**Density-** 0.88 Mean, Median 1.0, Mode 2.3, SD were 0.13 while SE were 0.01and coefficient of variance were 14.77.

**Abundance**- Mean 2.32, Median 2.0, Mode 7.0, SD were 0.44 while SE were 0.06 and coefficient of variance were 18.96.

**Relative Frequency**- Mean 2.11, Median 2.8, Mode 3.9, SD were 4.06 while SE were 0.59and coefficient of variance were 192.41.

**Relative Density**- Mean 2.11, Median 2.45, Mode 5.6, SD were 3.55 while SE were 0.52 and coefficient of variance were168.24.

**Relative Abundance**- Mean 9.04, Median 4.74, Mode 23.27, SD were 14.25 while SE were 2.10 and coefficient of variance were 157.63.

There are plant species showing very low population densities, which draw attention of researchers for conservation (Odum, 1971; Pala *et. al*., 2011; Panchal *et. al.* 2004; Pande, *et. al*, 2001).The sampled area requires conservation because of its potential for natural regeneration and utility value as well as varied plant diversity.

## V. Conclusion

Density gives the numerical strength of a species in a community. Abundance on the other hand gives the number of individuals of a species in a habitat. Generally, frequency and abundance are co-related to find out the distribution of a species. Importance Value Index (IVI) is a measure of dominance and ecological success of a species.

In present study work the weed flora o of Durg district of Chhattisgarh state, 46 species, 43 genus from 21 families was identified in the fields surveyed. The families with the highest number of Dicotyledons species were especially from Acanthaceae, Asteraceae, Malvaceae, fabaceae, Lamiaceae, Chenopodiaceae, Solanaceae, Amaranthaceae Verbenaceae and Euphorbiaceae etc. The weed belonging to Monocotyledons species were Poaceae, Cyperaceae of which *Cynodon* and *Cyperus* species in dominating state.

## Acknowledgement

The authors are obliged to their Principal to provide lab and other required ingredient to fulfill their results.

## References

[1]. Ali, S.S. and Sharma, V. B. (1985). (Chhattisgarh Botanical Association), Botanical Researches from Chhattisgarh.
[2]. Almeida (1996). Flora of Maharashtra, Blatter herbarium, St. Xaviers College, Mumbai.
[3]. Bor , N. L. (1942). Ecology theory and practice-presidential address, *Proc Ind Sci Congr Bot Soc* 1-35.
[4]. Bredenkamp, George, Chytr, Milan, Fischer, Hagen S., Neuhäuslová, Zdenka & van der Maarel, Eddy 1998. Vegetation mapping: Theory, methods and case studies: Introduction,*Applied Vegetation Science* 1: 161-266.
[5]. Champian, H. G. (1936). A preliminary survey of forest types of India and Burma, *Indian For Res (N. S.) Silv* 1- 286.
[6]. Cooke, T. (1958). The Flora of presidency of Bombay (Vol. I, II & III) London, Reprinted Edition B.S.I. Calcutta.
[7]. J. E. Weaver, Herbert C. Hanson, AND John M. Aikman (1925). Transect method of studying woodland vegetation along streams , *Botanical Gazette*, Vol. 80, No. 2 , pp. 168-187.
[8]. Misra, R. (1959). The status of the plant community in the upper Gangetic plain, *Journal of Indian Botany Society*, 38: 1-7.
[9]. Naik, V.N. (1998). The Flora of Marathwada. (Vol. I & Vol II), Amrut prakashan, Aurangabad.
[10]. Odum EP. 1971.Fundamentals of ecology, 3rd ed. Philadelphia: *Saunders*. 574.
[11]. Pala, N. A.; Bhat, J. A.; Dasgupta, S. Negi, A. K. and Todaria, N.P. (2011). Ecological and Economic Impacts of River Based Recreation in River Ganga, *India. World Journal of Agricultural Sciences*, 7(4),375-382, 2011.
[12]. Panchal, N. S. and Pandey, A.N. (2004).Analysis of vegetation of Rampara forest in Saurashtra region of Gujarat state of India. *Tropical Ecology*, 45(2), 223-231, 2004.
[13]. Pande, P. K.; Negi, J. D. S. and Sharma, S. C. (2001). Plant species diversity and vegetation analysis in moist temperate Himalayan forest. *Indian Journal of Forestry*, 24(4), 456-470.
[14]. Rameshkumar, S. and Ramakritinan, C.M. (2013). Floristic survey of traditional herbal medicinal plants for treatments of various diseases from coastal diversity in Pudhukkottai District, Tamilnadu, India, Journal of Coastal Life Medicine; 1(3): 225-232.
[15]. Shrivastava , A.K., Tikariha, A. and Patra, S. (2014); Seasonal and Floristic Biodiversity of Weeds growing in Chunkatta and Bhilai area of Chhattisgarh, India, *International Journal of Current Microbioogy and Applied Science* , 3(6): x-xx.
[16]. Shrivastava , A.K., Tikariha, A., Patra, S. and Sinha, M. R., (2014); Impact of stone crushing industries on leaf anomoly architech of woody plants, *Indian j.sci.res.*4 (1):127-133.
[17]. Shukla, R.V. and Diwakar M. C. (1973). Aquatic and Amphibious weeds of Bilaspur, *Plant Prot Bull* 25; 1-2.
[18]. Verma, B. R. (1978). Some functional and structural aspect of a bhata waste of Raipur M. P., Ph. D. Thesis, Ravishnkar University Raipur.
[19]. Westhoff, V. & van der Maarel, E. 1973. The Braun-Blanquet approach. In: Whittaker, R.H. (ed.) Ordination and Classi-fication of Communities, Handb. *Veg. Sci. 5.Junk, The Hague*, pp. 617-726.