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Study of Weed Flora in the Central Region of Chhattisgarh: A Scientific Survey

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ABSTRACT
Weeds are generally considered as undesirable & unwanted plants which cause enormous direct & indirect loses. Weeds are a serious problem in agriculture, and by competing with crops for water, minerals, space and light, they significantly reduce the productivity of agricultural tendencies. Under favourable conditions of high fertility and abundant soil moisture, weeds also show enhanced increased the potential for lush growth. The present investigation was carried out from January,2023 to April, 2023, coinciding with the winter, summer season to study the weed flora composition in the central region of Chhattisgarh. Quadrat method was adopted for ecological studies of weeds. A total of 64 plant species belonging to 28 families were identified out of which Euphorbia maculata L. Cynodondactylon (L.) Pers. and Marsileaquadrifolia were the dominant ones. Asteraceae was the dominant family seen during observation. Frequency, Relative Frequency, Density, Relative Density, Abundance, Relative Abundance, Importance Value Index of the species were calculated.
Keywords: *Weeds; Chhattisgarh; dominant; Asteraceae; Relative Abundance*

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INTRODUCTION

In one of his earliest authoritative texts on Weed Ecology, the famous weed scientist Professor Alden Springer Crafts quoted, "In the beginning there were no weeds". What he meant by this statement was that the categorisation of certain plants as weeds was purely an anthropomorphic approach that existed solely because of the human ability to judge resources based on their utility or apparent futility. Just as the mankind venerates several plants for their utility, aesthetic value and known medicinal properties, plants categorised as weeds are censured for their apparent lack of similar traits. [1, 2, 8] The long-standing herbal remedies used by poor communities residing in remote areas to tackle even untreatable illnesses, as well as to treat their livestock, exemplify the valuable traditional knowledge of ethnomedicine. Medicinal plants are the basis of health in many health care systems. [1] The weeds are very common, predominant and wide & extend not only to grain fields but also to unused areas. All over the world today thousands of plants, mainly weeds, are also utilised as a source of medicine. [2, 3]Approximately 85% of traditional medicines utilized for primary health care worldwide are derived from plants.[4]All over the world today thousands of plants, mainly weeds, are medicinal plants.[5,7,9] In India and Ayurveda and medicinal plants are utilized by 66% of the rural population to address essential health requirements. A significant portion of the world's population employs botanical parts directly as medicinal remedies, which do not typically carry the side effects associated with allopathic medicines. [12] Notably, many modern medicines are indirectly derived from medicinal plants. [1]In fact, the use of plants is not just about treating illness. It can help boost the economy by manufacturing medicines to treat illness. [6]

The Central Plains Agroclimatic Zone of Chhattisgarh boasts a distinctive grassland ecosystem, replete with an abundance of unspoiled vegetation and vast expanses of fertile farmland. Paddy agriculture reigns supreme in this region, with a majority of the cultivated area devoted to this crop. However, it was revealed that local cultivators predominantly employ the dry-seeded method, rendering their crops vulnerable to the deleterious effects of weed infestations. In an effort to gain a holistic understanding of the ecological landscape, this study undertook a comprehensive evaluation of not only croplands, but also fallow fields and roadside vegetation. By illuminating the intricacies of these varied ecosystems, the findings of this study hold great potential for promoting more effective and sustainable agricultural

practices in the region.
This paper aims at exploring the community structure of a Greenfield area in an upcoming rich state being developed as a model for across India. The location of the study was purposively chosen as no study was conducted on community ecology of weeds. Several field visits were conducted to record data. This study can potentially help in identification of dominant species of weeds in the area.

STUDY AREA

Chhattisgarh has been the 26th state in the Indian union since its formation on November 1, 2000. It only occupies 4.14% of the nation's total area and it is home to 2.11 % of the population as per the 2011 census. [8]The current study focuses on the ecological statistical distribution pattern of those naturally existent in Chhattisgarh's central region, one of the primary areas of grassland and one that is important to the ecosystem.[10] The region primarily has a tropical climate, with short, mild winters and extremely hot summers. The current survey's objectives were to find and identify weeds throughout central Chhattisgarh while also gathering statistical information on weeds. [11]

MATERIAL AND METHODS

The study was conducted from January, 2021 to April, 2022, which spans over the winter, summer and monsoon season in the region. Frequent visits were carried out for sampling of plants in order to record the data regarding the diversity of weeds in the study area by quadrat method and to identify the weeds by using the taxonomic key. [11-23] Habit of plants, Flower colour, Flowering and Fruiting, Ecological surrounding and adaptation, morphological peculiarities, if present were also recorded enlisting of collected specimens were also carried out simultaneously. [22, 25]
The structure and composition of vegetation in the agricultural fields have been compared in terms of frequency, density, abundance, and basal area of major species. Importance Value Index (IVI=relative frequency + relative density + relative dominance) were derived from the primary data separately for each species. [31, 32]
The collected plant specimens were identified. The scientific names of the plant listed in the present work have been consulted with experts and literature followed by citation along with original references of the valid name. Appropriate identification was done with the help of standard published literature.
Quadrats of 1m x 1m were laid down over an area of 500 square metres over the three kinds of lands studied. All the species occurring in each quadrat were noted & collected separately & their numerical count was carried out. All the plant species were recorded and deposited in the Herbarium of Kalinga University for future references and studies.The names of species and number of individual species in each unit were recorded and the Frequency, Density, Abundance, Relative Frequency, Relative Density, Relative Abundance & Importance Value Index were calculated using the formula:
% Frequency= Total no. of quadrats in which species occur / Total number of quadrats used in the study x 100
Relative Frequency = Frequency of the individuals of species / Total frequency of all species x 100
Density = Total number of individual species in all sampling units (quadrats) / Total number of sampling units (quadrats) investigated
Relative Density = Density of individuals of species / Total density of all species x 100
Abundance = Total number of individual species in all quadrats / Total number of quadrats in which species occurred
Relative Abundance =Abundance of individual of species / Total abundance of all species x 100
Importance Value Index = Relative density + Relative frequency + Relative abundance

RESULTS

In this study around 64 plants belonging to 28 different families were recorded. The major families which contributed to the weeds were Asteraceae (14%) with 9 species followed by Euphorbiaceae (12%) with 8 species, Amaranthaceae (9%), Fabaceae (9%) &Poaceae (9%) with 6 species each, Convolvulaceae (5%) &Rubiaceae (3%) with 3 species each, Commelinaceae (3%) &Polygonaceae (3%) with 2 species each & remaining 19 families were with 1 species each .
aOut of 64 weed species recorded, 59 plants are found to be of ethnomedicinal uses & the remaining 5 plants are non-medicinal as no studies were conducted on these plants till date [33]. Further studies are required to be conducted in order to reveal the medicinal uses of these plants if any. Many weed species are taken as medicine to cure several diseases. The percentage of plant parts used for curing different diseases were presented in Fig.2 & leaves (30%) are found to be the most common plant part which is used for herbal preparation with 44 species, followed by whole plant (20%) with 29 species, root (16%) with 24 species, stem (9%) with 13 species, aerial part (8%) & seed (8%) with 12 species, flower (5%)

with 8 species, fruit (2%) with 3 species, inter-nodal segments (1%) & tuber (1%) with 1 species each. Leaves are the most common part used for the preparation of traditional medicines as compared to other parts.

Table 1. The density, frequency, Abundance of different species occurring in the study area

SL.NO.	BOTANICAL NAME	DENSITY	R DENSITY	FREQUENCY (%)	R.FREQUENCY (%)	ABUNDANCE	R.ABUNDANCE	IVI
1	*AbelmoschusmoschatusMedik.*	0.35	5.73	29	7.1	1.32	6.6	19.43
2	*Agerantumconyzoides L.*	0.27	5.19	23.34	6.32	1.17	6.51	18.02
3	*Agerantumhoustonianum Mill.*	0.2	1.87	20	3.41	1	3.93	9.21
4	*Alternantherabettzickiana(Regol.) Voss.*	0.33	4.95	20	5.08	1.67	7.53	17.56
5	*Alternantheraficoidea (L.) P. Beauv.*	0.2	3	13.33	3.39	1.5	6.76	13.15
6	*Alternantherasessilis (L.) DC.*	0.27	4.17	30	7.31	1.5	8.78	20.26
7	*Alysicarpusovalifolius (Schumach.) J. Leonard.*	0.27	3.54	20	4.48	1.33	6.48	14.5
8	*Alysicarpusvaginalis (L.) DC.*	0.29	3.61	20	4.21	1.42	6.08	13.9
9	*Amaranthusspinosus L.*	0.47	7.6	23.3	5.95	1.13	5.74	19.29
10	*Amaranthusviridis Hook. F.*	0.4	4.9	30.16	6.29	1.35	5.59	16.78
11	*Anagallisarvensis L.*	0.27	3.9	23.33	5.3	1.11	5.74	14.94
12	*Andrographispaniculata Wall.*	0.13	3.04	13.33	3.77	1	7.02	13.83
13	*Argemone Mexicana L.*	0.3	4.23	23.5	5.69	1.25	5.7	15.62
14	*ArtiplexpatulaL.*	0.3	4.23	23.5	5.95	1.13	5.74	15.92
15	*Blumealacera (Burm. F) DC.*	0.33	3.09	28.34	6.03	1.29	5.54	14.66
16	*Brachiariadeflexa (Schumach.) Robyns*	0.27	3.06	20	3.8	1.33	4.72	11.58
17	*Calotropisprocera (Aiton) Dryand. ex.*	0.25	4.51	20	5.94	1.5	8.11	18.56
18	*Cardamineflexuosa With.*	0.23	2.87	20.17	4.28	1.13	4.96	12.11
19	*Cassia tora (L.) Roxb.*	0.27	3.02	13.33	3.58	1.25	6.89	13.49
20	*Commelinabenghalensis L.*	0.37	4.17	23.34	4.69	1.59	6.93	15.79
21	*Cyanthilliumcinereum (L.) H. Rob.*	0.33	7.13	33.33	9.43	1	7.02	23.58
22	*CyanotisaxillarisRoem. &Schult. F.*	0.3	4.69	20	5	1.5	6.95	16.64
23	*Cynodondactylon (L.) Pers.*	1.51	21.28	62.22	14.53	2.28	13.34	49.15
24	*Cyperuscompressus L.*	0.32	5.05	26.67	6.7	1.38	7.85	19.6
25	*Dactylocteniumaegyptium (L.) Wild*	0.27	3.06	20	3.8	1.33	4.72	11.58
26	*Desmodiumtriflorum (L.) DC.*	0.27	4.93	23.34	6.02	1.17	6.75	17.7
27	*DesmostachyabipinnataStapf.*	0.13	5.6	13.33	6.9	1	12.45	24.95
28	*Echinochloacolona (L.) Link.*	0.44	7.45	33.33	9.15	1.22	9.04	25.64
29	*Eragrostisunioloides (Retz.) Nees. Ex. Steud.*	0.27	8.18	23.33	5.98	1.17	5.9	20.06
30	*Euphorbia cordifolia C.A. Mey&Boiss*	0.53	6.02	40	7.51	1.33	6.12	19.65
31	*Euphorbia geniculataOrteg.*	0.59	7.67	40	10	1.75	8.1	25.77
32	*Euphorbia hirta L.*	0.7	11.37	48.67	12.34	1.28	7.92	31.63
33	*Euphorbia maculata L.*	0.4	17.24	33.33	17.24	1.2	14.94	49.42
34	*Euphorbia nutans Lag.*	0.47	11	26.67	7.55	1	7.02	25.57
35	*Euphorbia prostata*	0.72	9.36	41.5	9.72	1.57	7.26	26.34
36	*Evolvulusalsinoides (L.) L.*	0.39	.6	36.67	8.11	1.05	5.44	19.15
37	*Evolvulusnummularis (L.) L.*	0.8	13.09	53.33	11.94	1.5	7.3	32.33
38	*Gnaphaliumluteoalbum L.*	0.2	3	13.33	3.39	1.15	6.76	13.15
39	*Heliotropiumindicum L.*	0.35	5.41	23.34	5.95	1.5	7.58	18.94
40	*Hydroleazeylanica (L.) Vahl*	0.27	3.11	23.34	4.77	1.13	4.77	12.65
41	*Lantana camara L.*	0.2	3.25	12.22	6.31	1.67	9.91	19.47
42	*Lapsanacommunis L.*	0.34	3.6	23.5	4.26	1.38	4.33	12.19
43	*Marsileaquadrifolia L.*	1.14	18.36	65	15.51	2.61	15.26	49.13
44	*MedicagodenticulataWilld.*	0.27	6.32	46.67	13.21	1.43	10.04	29.57
45	*Merremiaemarginata (Burm. f.) Hall. F.*	0.37	6.4	33.36	9.64	1.13	6.31	22.35
46	*Mimosa pudica L.*	0.27	3.26	20	3.8	1.33	6.39	13.45
47	*Mitracarpushirtus (L.) DC.*	0.53	5.23	40	20.69	1.33	16.56	42.48
48	*Mitracarpusvillosus (SW.) DC.*	0.13	1.95	13.33	3.39	1	4.51	9.85
49	*Oldenlandiadiffusa (Wild.) Roxb.*	0.6	6.82	33	6.26	1.8	6.39	19.47
50	*Oxalis corniculata L.*	0.22	10.29	16.67	5.95	1.25	9.7	25.94
51	*Partheniumhysterophorus L.*	0.34	5.87	30	7.54	1.17	6.57	19.98
52	*Phyllanthusniruri L.*	0.5	11.54	28.89	10.08	1.58	13.05	34.67
53	*Phyllanthusurinaria L.*	0.4	7.6	30	7.5	2	14.29	29.39
54	*Polygonumaviculare L.*	0.27	3.84	23.34	5.69	4.17	5.98	15.51
55	*Polygonumplebeium R. Br.*	0.33	4.95	26.67	6.78	1.25	5.64	17.37
56	*Portulacaoleracea L.*	1	11.08	44.45	8.62	2.23	9.49	29.19

57	*Senecio vulgaris L.*	0.15	2.38	15.55	4.16	1	5.45	11.99
58	*SolanumvirginianumL.*	0.3	4.01	23.34	5.29	1.29	5.18	14.48
59	*Sphaeranthusindicus L.*	0.4	8.11	30	7.83	1.25	8.87	24.81
60	*Stellaria media (L.) Vill.*	0.27	4.01	22.5	5.25	1.17	5.81	15.07
61	*Tribulusterrestris L.*	0.23	7.85	9.86	9.85	1	3	20.7
62	*Tridaxprocumbens L.*	0.95	14.77	56.61	13.91	1.95	10.44	39.12
63	*Verbascumblattaria L.*	0.24	3.1	20	4.4	1.17	4.68	12.18
64	*VisnagadaucoidesGaertn.*	0.67	7.6	33	6.26	2	7.1	20.96

Table 2: Dominant Species and their Importance Value Index

S.No	Dominant species	IVI
01	*Euphorbia maculata L.*	49.42
02	*Cynodondactylon (L.) Pers.*	49.15
03	*Marsileaquadrifolia L.*	49.13
04	*Mitracarpushirtus (L.) DC.*	42.48
05	*Tridaxprocumbens L.*	39.12

Euphorbia maculataL. ,Cynodondactylon (L.) Pers., Mitracarpushirtus (L.) DC. Andas well as the pteridophytic genus *Marsileaquadrifolia L* were found to be the most dominant species.

Frequency: *Cynodon dactylon* exhibited the maximum frequency of occurrence while *Tribulus terrestris* exhibited the least frequency

Density: Cynodondactylon exhibited the maximum density while *Mitracarpusvillosus* (SW.) DC exhibited the least density.

Importance Value Index: *Euphorbiam aculata L.* exhibited the maximum Importance Value Index while *Ageratum houstorianum* Mill. exhibited the least Importance Value Index.

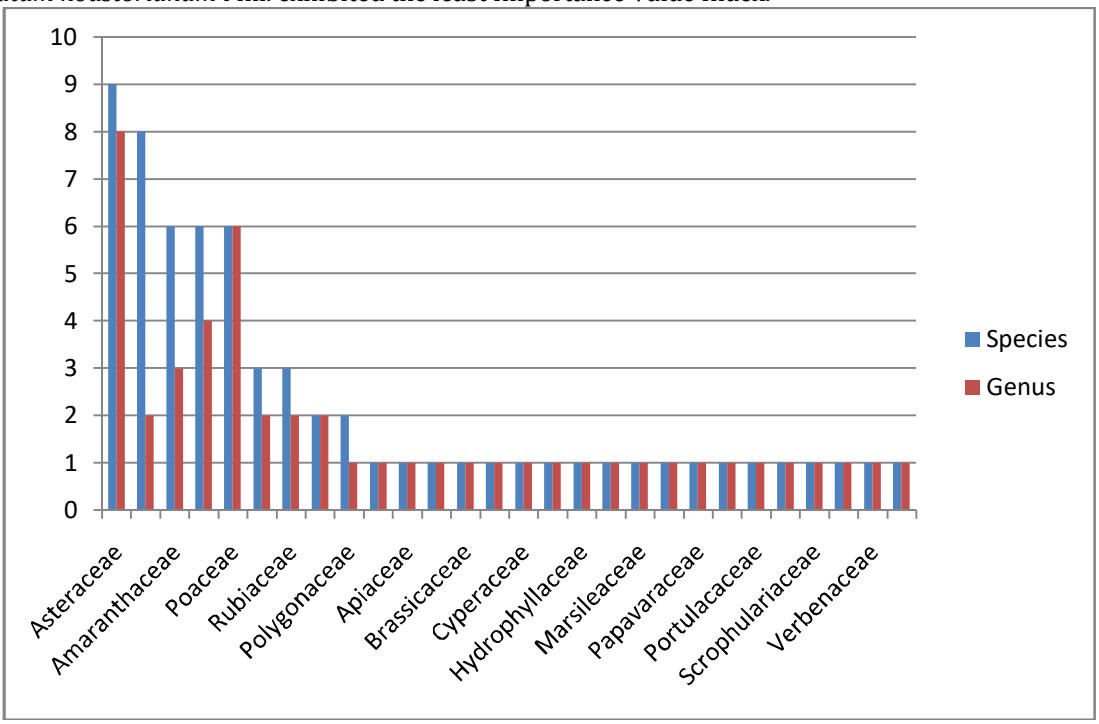

Figure 1: Graph showing Genera and Species ratio of different family

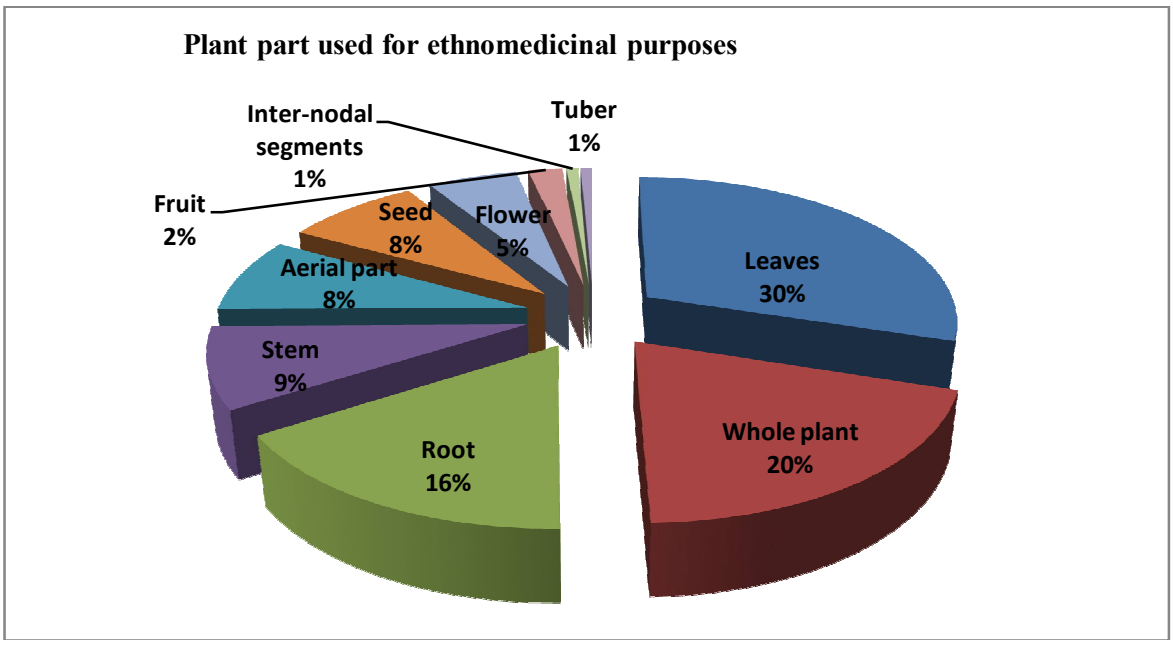

Figure 2: Different plant parts used for ethnomedicinal purposes

DISCUSSION

It was found that areas near the croplands and the roadside exhibited higher frequency and density of plant communities as compared to the fallow lands. A few species were found to be dominant over the others while many were found in very few numbers. This might be because a species' distribution and density are associated with the effects of environmental factors. Nonetheless, species diversity and richness were not the same among different plant families. For instance, the highest species richness and diversity were observed in Asteraceae. [30] On the contrary, 19 families had the least species richness and diversity. The reason for high species diversity and richness of Asteraceae may be due to their abilities as prolific seed producers with the capability to produce small but numerous viable seeds, in addition to wind-assisted seed dispersal, rapid growth, a short juvenile period, and high reproductive efforts.[30] Asteraceae weeds grew mostly on bare ground and along roadsides and on fallow lands indicating that plant species growing in such habitats should have strategies to adapt to extreme fluctuations in temperature and moisture conditions there.[30]Studies on the seeds of the members of Asteraceae have revealed tolerance to a wide temperature range as well as water stress to allow seed germination. [25, 26]
Euphorbiaceae was found to be the second most dominant family. Most members of Euphorbiaceae escape herbivory due to the presence of wide range of unusual secondary metabolite.[33, 34]There are also reports of manufacture of different lectins due to different environmental stress factors. Members of Euphorbiaceae also possesses numerous traits such success in disturbed sites, phenotypic plasticity, high SLA compared to native species, high reproductive output, and seeds lacking dormancy — that have been associated with invasive.[28,29]
Euphorbia maculata was the most dominant species and this might be due to the hetrotoxic potential of its organs on the germination as well as the chlorophyll and carotenoids content of its nearby plants.[27,31]Its presence significantly affected the radical length and seed length vigour Index of its adjacent plants, thereby allowing it to flourish. [34]Cynodondactylon .The second most dominant species is a stoloniferous grass and its dominance might be attributed to its extensive stolon and rhizome system that provide a means of rapid expansion. [24] Further, it can have allelopathic effects on its neighbouring plants by inhibiting seedling germination, radical elongation and root growth. [32, 33]
Because the modern material civilization is fully dependent on the exploitation and consumption of already-existing resources derived from the environment and produced through human labour, the habitat is of enormous significance to humans. [34]The theory of species richness, which takes resource availability and disturbance into account as elements for organising plant communities, mentions the governing mechanisms of biodiversity in various environments. Thus it is important to identify plant community structure and species distribution variations at a spatial scale which also provides an insight into the environmental requirements of the plant species. [34]

CONCLUSION

The objective of this study was to embark on a comprehensive exploration and identification of the diverse weed species inhabiting the Chhattisgarh Plains Agroclimatic Zone, in order to provide invaluable information to local farmers, agriculturists, and academics. The data gathered from this study will facilitate the accurate identification of these weeds and enable the development of appropriate control strategies. This is of utmost importance as weeds can pose a serious threat to crop yields by competing with paddy crops for vital resources. Moreover, they can adversely impact the quality of germplasm and result in significant losses to farmers. Thus, the findings of this study have the potential to significantly improve agricultural practices in the region and enhance the overall sustainability of the agricultural industry.

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