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PHYTOSOCIOLOGICAL STUDIES *ON TEPHROSIA PURPUREA* L. IN VINDHYA REGION

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ABSTRACT

Ecological studies determines the influence of environment on the life of plants and crops community. The structure of a community is formed with the continuous interaction of climatic, edaphic and biotic factors. A competition among the different species as well as the same species also affects greatly the structure of the community. Thus during the course of present investigation only the qualitative characters viz. Frequency, Density, Dominance and Importance Value Index has calculated to assess the structure of the community in which the plant *Tephrosia purpurea* L. flourishes. In the present study, *Tephrosia purpurea* and its associates have been recorded in the four districts viz. Rewa, Satna, Sidhi and Shahdol of the Vindhyan region.

KEY WORDS: *Tephrosia purpurea*, Frequency, Density, Dominance and Importance Value Index etc.

INTRODUCTION

The plant *Tephrosia purpurea* (L) Pers is an important source of medicinal drugs and has a well recognized place in the indigenous system of medicine. It has been mentioned in both the Ayurvedic and Unani systems of medicine [1]. Different plant parts are known to be used for various ailments effectively [2]. Watt, 1889 described the dried plant as useful in bronchitis and diseases of liver, spleen and kidney. The plant is also recommended as a blooded in the treatment of boils and pimples [3]. Applied with the leaves of Cannabis sativa L., the plant is said to be a remedy for bleeding piles and with black paper as diuretic useful in gonorrhea. The whole plant is uprooted as soon as the flowers begin to appear and are

dried. The dried plants are then bundled and sold in the market [4]. Kirtikar and Basu, 1935 have also mentioned similar properties of this plant. The leaf act as a good general tonic and are said to be useful in diseases of the lungs and chest, piles, syphilis and gonorrhea. The root is bitter and is given in chronic intestinal disorder like diarrhea [5].

The fresh root bark pounded and rolled as pills with black pepper is given in cases of obstinate colic. The plant has found use as an anthelmintic for children. The seeds are useful in cases of poisoning due to rat bite [6, 7]. In French Guina, the root is used in cases of fish poison. It has described that the plant parts with the combinations of other medicines can work as an antidote for snake bite [8].

Tephrosia purpurea (L) Pers known as Kuchiki' in Distt. Koraput (Orissa State) and 'Uvadhoo' in Bastar (Madhya Pradesh) and it is used as a cure for poisonous snake bite. The root of the mature plant is grounded to make a paste. Slaked lime soaked in water is then mixed the paste in the ratio of 2:1. Half teaspoon full of turmeric powder is then added in to the mixture. This mixture is then heated over a low flame for a few minutes, then applied over the injured part and bandaged. The patient is not allowed to sleep. The drug is said to have the sucking effect on the poison which is sucked out of the system [9,10].

The leaves of the plant are made into a paste with half a seed of Strychnos nuxvomica L. The paste is well grounded, then mixed with honey and ghee or vegetable oil. Three doses at the intervals of two hours each, the medicines is given to the patient. This miracle-working medicine is said to tone up the nervous, respiratory and intestinal systems. It has a 'poison killing' and stimulating effect. The patient is said to recover within 12 to 18 hours time. The oil of the seeds is also used as a specific remedy for itch and scabies. Benzene extract of the whole plant has been shown to exhibit a depressant effect on the central nervous system [11,12,13].

Some researchers have mentioned that fresh juice of the plant can cause hypoglycemic activity. Oral administration of the aqueous extract of seeds of *Tephrosia purpurea* (L) led to a marked lowering glucose levels in the blood of normal and alloxan induced diabetic rabbit [14]. The hypoglycemic effect of the extract was comparable to that of tolbutamide in normal rabbits. In diabetic rabbits the extracts exerted 60 to 70 percent hypoglycemic effect as compared to tolbutamide. Hypoglycemic activity of the whole plant extract is any much lower than of the seed [15].

MATERIALS AND METHODS

Phytosociological studies

Tephrosia purpurea is a plant found in open spaces in rocky and barren grounds as weed. In the present study qualitative characteristic viz. relative frequency, relative density and relative dominance were estimated in the four selected places of Rewa, Satna, Sidhi and Shahdol. Using the quadrates of M^2 random quadrate method was used. Quadrates are thrown ten difference places in each of the sites selected for study. Weeds associated of different species were counted each time and the average for each area was calculated. Frequency classes of associated were assigned as per method suggested by Mishra et al., 1964 and Pandey et al., 1968. Then the total number of quadrates in which the individual species occur is counted [16, 17]. Also the total number of individual species in all the quadrates was counted. Relative frequency, relative density, and relative dominance were calculated by the following formula:

$$\textbf{Relative frequency (R.F.)} = \frac{\text{Total no of density of one species}}{\text{No. of occurrence of all species}} \times 100$$

$$\textbf{Relative density (R.D.)} = \frac{\text{Total no of density of all the species}}{\text{Total no. of plants of all species}} \times 100$$

$$\textbf{Relative Dominance (R. Dom)} = \frac{\text{Total basal area of one species}}{\text{Total basal area of all the species}} \times 100$$

$$\text{Basal area} = \pi r^2$$

Where r = radius of stem.

Important value index

Rrelative frequency (RF) + Relative density (RD) + Relative Dominance

RESULTS

Frequency

Frequency indicates dispersion of species in a community. Variation in distribution is caused by several factors like soil conditions, vegetative propagation, quantity and dispersal of seeds, grazing or other biotic activities and predation by insects or diseases. So frequency can be defined as degree of dispersion of an individual species in an area. This is expressed in percentage occurrence. If a species is abundantly spread all over the area it will have changes

of occurring in all the sampling quadrate and therefore, its frequency will be 100. A species with a few individual ones spread over or clamped in a small area unevenly spread will have changes of occurrence in only a few quadrats and its frequency value will be low. In the present study the frequency of a species in terms of its dispersion relative to that of all the rest of the species has been studied. Relative frequency is determined by the use of the following formula using the data obtained by the quadrate method. The ecological importance of individual species in a community becomes clearer with the help of relative value rather than the absolute value.

$$\text{Relative frequency of species} = \frac{\text{Number of occurrence of a species}}{\text{Number of occurrence of all species}} \times 100$$

Density

It is an expression of a species where the total number of individual of each species is divided by the total number of absolute studied. Each organism occupies only the area that can adequately meet its requirement. Thus density involves measurement of the amount of space that individual of each occupies in comparison to the total space in community. In other words it gives an idea of degree of competition of an individual. Density does not give a clear idea of an individual where it stands in the community. So far getting a picture of an individual in a community was studied for the relative density.

Relative density is the study of numerical strength of a species in relation to total number of individual of all species and can be calculated as

$$\textbf{Relative Density} = \frac{\text{Number of individual of the species in all quadrats} \times 100}{\text{Number of individual of all species quadrats}}$$

Important value Index

In any community structure, the qualitative value of each of the frequency, density, abundance and cover has its own importance. Only one of these cannot give the total picture of ecological important. Therefore, in order to have a clear overall picture of ecological important of a species with respect to the community structure, the percentage value of the relative frequency, relative density and relative dominance are added together and this value out of 300 is called the importance value index or IVI of the species.Phytosociological studies including Relative Frequency, Relative Density, Relative Dominance and Important Value Index for both the Rewa and Satna district are shown in Table1, 2, 3 and 4.

Table-1 Phytosociological observations in locality of Rewa district

S. No.	Name Of the plant	Relative frequency	Relative density	Relative dominance	IVI
1	Argemone maxicana	1.34	1.91	5.487	8.737
2	Abution indicum	1.34	1.59	0.291	3.221
3	Acacia nilotica	4.02	1.59	1.821	7.431
4	Achyranthes aspera	1.34	3.14	1.821	6.301
5	Amaranthus caudatus	2.01	1.59	1.092	4.692
6	Altewrnathera sesilis	2.68	1.59	0.455	4.725
7	Boerhaavia diffusa	2.68	2.23	0.382	5.292
8	Brachiaria cristata	1.34	0.63	0.128	2.098
9	Bareleria cristata	1.34	1.27	0.492	3.102
10	Calotropis procera	2.01	1.59	6.861	10.461
11	Cassia obtusifolia	2.01	1.91	4.03	7.95
12	Cassia tora	6.04	4.79	2.766	13.596
13	Chloris virgata	0.67	0.31	0.085	1.065
14	Croton sparcuflorus	0.67	0.31	0.151	1.131
15	Caluome viscose	0.67	0.63	0.728	2.028
16	Commelina enghalensis	1.34	0.95	0.178	2.468
17	Cynodon dactylon	6.04	9.90	1.053	16.993
18	Datura metel	1.34	0.95	1.607	3.897
19	Euphoriba microphylla	2.68	1.59	0.307	4.577
20	Euphoriba hirta	4.02	1.91	0.379	6.309
21	Eragrostis tenella	0.67	0.67	0.046	1.386
22	Heliotropium supinum	2.01	0.95	1.170	4.13
23	Indigofera cordifolia	4.02	3.83	2.016	9.866
24	Indiogofera linifolia	1.34	1.91	1.793	5.043
25	Justicia simplex	5.36	3.99	2.194	11.544
26	Launaea nudicaulis	3.35	2.55	0.880	6.78
27	Merrimia emarginata	4.02	3.83	4.395	12.245
28	Ocimum canum	2.68	3.51	1.593	7.783
29	Oxalis coaniculata	3.35	3.51	1.126	7.986
30	Peristrophe bicalyculata	4.02	3.119	0.643	7.182
31	Phyllanthus niruri	0.67	0.63	0.074	1.374
32	Sonchus asper	0.67	0.95	0.604	2.224
33	Solanum surattense	5.36	5.11	3.508	13.978
34	Sida acuta	0.67	0.31	0.030	1.01
35	Sporobulus diander	0.67	0.95	0.503	2.123
36	*Tephrosia purpurea*	6.04	11.18	36.066	53.286
37	Tridex procambens	3.35	5.75	1.461	10.561
38	Tribulus terrestris	2.68	2.55	0.631	5.861
39	Xanthium strumarium	1.34	1.91	2.341	5.591
40	Zizyphus mauridiana	2.01	3.19	8.781	13.981

Table-2 Phytosociological observations in locality of Satna district

S. No.	Name Of the plant	Relative frequency	Relative density	Relative dominance	IVI
1	Acacia nilota	5.263	4.347	5.93	15.54
2	Achyranthes aspera	4.385	3.478	2.365	10.228
3	Alternanthera sessilis	2.631	5.217	1.663	9.512
4	Amaranthus caundatus	2.631	3.768	2.51	8.889
5	Argemone maxicana	2.631	0.869	2.783	6.283
6	Boerhaavia diffusa	5.263	6.086	1.578	12.927
7	Calotropis procera	2.631	1.739	9.142	13.512
8	Cassia tora	2.631	0.869	7.097	11.467
9	Commelina benghalensis	2.631	15.072	0.170	3.67
10	Cynodon dactylon	8.771	2.185	1.793	25.636
11	Datura metel	2.901	30188	2.988	8.074
12	Euphorbia hirta	2.631	0.579	0.799	6.618
13	Euphorbia microphylla	4.385	2.608	0.67	8.243
14	Heliotropium supinum	0.877	2.318	0.799	2.255
15	Indigofera cordifolia	3.508	3.768	1.53	7.646
16	Justicia simplex	3.508	0.869	2.42	8.246
17	Launaea nudicaulis	5.263	3.478	4.83	13.861
18	Launaea aspera	2.631	0.869	0.16	9.191
19	Merremia emarginata	4.385	3.478	4.46	12.323
20	Ocimum canum	0.877	0.869	0.439	2.185
21	Peristrophe bicalyculata	2.631	2.028	0.45	5.109
22	Phyllanthus niruri	0.877	0.289	0.036	1.202
23	Solanum suraitence	1.754	1.159	0.906	30189
24	Sonuchus asper	1.754	0.869	0.51	3.133
25	Sida acuta	0.877	0.869	0.007	1.753
26	Sporobolus diander	1.754	1.159	0.29	3.203
27	*Tephrosia purpurea*	7.017	8.985	31.16	47.162
28	Tribulus terrestris	2.631	2.318	0.72	5.669
29	Tridex procombens	5.263	5.127	1.508	11.988
30	Xanthium strumarium	1.754	0.869	1.18	3.803
31	Zizyphus mauritiana	4.385	3.188	9.79	17.363

Table-3 Phytosociological observations in locality of Sidhi district

S. No.	Name Of the plant	Relative frequency	Relative density	Relative dominance	IVI
1	Acacia nilota	2.684	4.096	4.06	10.84
2	Achyranthes aspera	1.342	1.927	0.955	4.224
3	Abutilon indicum	0.671	0.240	0.036	0. 947
4	Amaranthus caudatus	2.013	2.409	1.169	5.591
5	Altewrnathera sesilis	5.369	4.819	1.116	11.304
6	Argemone maxicana	2.013	2.409	6.07	10.492
7	Brachiaria cristata	1.342	0.963	0.302	2.607
8	Boerhaavia diffusa	5.369	3.855	0.732	9.956
9	Bracharia ramosa	0.671	0.240	0..005	0.916

10	Calotropis procera	4.026	2.891	10.782	17.699
11	Cassia obtusifolia	4.697	3.373	10.008	18.078
12	Cassia tora	2.684	2.409	2.241	7.334
13	Corchorus capsularis	1.342	1.204	0.558	3.104
14	Chloris virgata	0.671	0.481	0.078	1.23
15	Cynodon dactylon	6.771	19.518	1.705	27.934
16	Cleome viscosa	2.013	0.732	0.858	3.593
17	Comelina enghalensis	1.342	0.772	0.104	2.168
18	Corton sparsiflorus	0.671	0.481	0.18	1.332
19	Datura metal	3.355	2.650	4.07	10.075
20	Ephorbia microphylla	4.697	3.614	0.592	8.002
21	Ephorbia hiorta	2.684	2.650	4.84	10.174
22	Halliotropium upinum	2.013	0.691	1.434	4.138
23	Indigofera cordifolia	5.369	4.578	1.952	11.899
24	Justicia simplex	2.013	0.691	1.09	3.794
25	Launaea nudicaulis	2.684	2.891	2.689	8.264
26	Merremia emarginata	2.684	2.891	2.689	8.22
27	Ocimum canum	1.342	0.963	0.315	6.268
28	Oxalis corniculata	1.342	0.963	8.086	10.391
29	Peristrophe icalyculata	4.026	1.927	0.315	6.268
30	Solanum suraitence	0.671	0.481	0.268	1.42
31	Sida acuta	0.671	0.722	0.004	1.397
32	Sporobolus diander	1.342	0.963	0.175	2.48
33	*Tephrosia purpurea*	6.711	9.156	23.08	38.947
34	Tribulus terrestris	1.342	0.691	0.33	2.363
35	Tridex procombens	5.369	3.373	0.708	9.45
36	Xanthium strumarium	0.671	0.481	0.478	1.63
37	Zizyphus mauritiana	3.369	4.578	10.22	18.167

Table-4 Phytosociological observations in locality of Shahdol district

S. No.	Name Of the plant	Relative frequency	Relative density	Relative dominance	IVI
1	Acacia nilota	4.225	5.076	5.03	14.331
2	Achyranthes aspera	2.816	3.807	1.88	8.503
3	Amaranthus caundatus	2.816	3.229	8.313	14.428
4	Alternanthera sessiles	2.816	4.822	1.116	8.754
5	Argemone maxicana	2.886	1.776	4.476	9.118
6	Boerhaavia diffusa	4.225	6.345	1.195	11.765
7	Cassia tora	1.408	1.269	0.395	3.072
8	Cassia obtusifolia	2.112	2.030	6.018	10.16
9	Cynodon dactylon	7.042	12.182	1.053	20.277
10	Calotropis procera	5.633	2.034	7.56	15.227
11	Cleame viscose	0.704	0.253	0.35	1.307
12	Corcorus capsularis	2.112	2.030	0.470	4.612
13	Camelina benghalensis	1.408	0.507	0.072	1.037
14	Croton sparciflorus	1.008	0.761	0.115	1.884
15	Datura metal	1.408	1.269	1.94	4.617

16	Euphorbia microphylla	4.225	2.538	0.391	7.154
17	Euphorbia hirta	2.112	1.095	0.184	3.391
18	Eragrostis tenella	0.704	0.253	0.041	0.998
19	Heliotropium supinum	1.408	0.761	0.754	2.923
20	Justicia simplex	2.816	2.538	1.081	6.435
21	Indigofera cordifolia	2.816	2.538	1.081	6.435
22	Indigofera linifolia	1.408	1.095	0.77	3.273
23	Launea nudicalis	4.225	2.791	2.59	9.606
24	Leucas aspera	0.704	0.507	0.70	1,911
25	Ocimum canum	1.408	0.507	0.186	2.101
26	Peristrophe bicalyculata	3.225	2.034	0.332	5.591
27	Phyllanthus niruri	1.408	0.507	0.047	1.962
28	Merremia emarginata	3.521	3.229	3.066	9.886
29	Oxalis coprniculata	3.521	4.882	3.57	11.913
30	Sonchus asper	1048	0.761	0.324	2.133
31	Solanum surattense	1.408	1.095	0.564	3.067
32	Sida acuta	0.704	0.253	0.192	1.149
33	Sporobulus diander	0.704	0.507	0.092	1.303
34	*Tephrosia purpurea*	7.042	12.451	31.89	51.383
35	Tribulus terrestris	2.112	1.776	0.405	4.293
36	Tridex procambens	5.633	4.060	0.852	10.545
37	Xanthium strumarium	2.112	1.522	1.509	5.143
38	Zizipus mauritiana	13.521	4.568	10.196	18.285

DISCUSSIONS

The phytosociological studies made during the course of the present investigation shows that there were 40 associates found with *Tephrosia purpurea* in the locality of Rewa. They are Argemone maxicana, Abution indicum, Acacia nilotica, Achyranthes aspera, Amaranthus caudatus, Altewrnathera sesilis, Boerhaavia diffusa, Brachiaria cristata, Bareleria cristata, Calotropis procera, Cassia obtusifolia, Cassia tora, Chloris virgata, Croton sparcuflorus, Caluome viscose, Commelina benghalensis, Cynodon dactylon, Datura metel, Euphoriba microphylla, Euphoriba hirta, Eragrostis tenella, Heliotropium supinum, Indigofera cordifolia, Indiogofera linifolia, Justicia simplex, Launaea nudicaulis, Merrimia emarginata, Ocimum canum, Oxalis coaniculata, Peristrophe bicalyculata, Phyllanthus niruri, Sonchus asper, Solanum surattense, Sida acuta, Sporobulus diander, *Tephrosia purpurea*, Tridex procambens, Tribulus terrestris, Xanthium strumarium, Zizyphus mauridiana. Frequency, density, dominance and Importance Value Index were obtained from the associates found the Rewa district. Based on Importance Value Index the community was recognized as Tephrosia- Cynodon- Zizipus. The highest Importance Value Index was in the case of *Tephrosia purpurea* i.e. 53.28 and the least Importance Value Index was for Sida acuta i.e. 1.01.

Thirty one associates of *Tephrosia purpurea* were found in locality of Satna. Frequency, density, dominance and Importance Value Index were calculated of *Tephrosia purpurea*, and its thirty one associates. Based on Importance Value Index the community was recognized as Tephrosia- Cynodon- Launea. The highest Importance Value Index was in case of *Tephrosia purpurea* i.e. 47.16 and the least Importance Value Index was for Phyllanthus niruri i.e. 1.202.

Thirty seven associates of *Tephrosia purpurea* were found in locality of Sidhi. Frequency, density, dominance and Importance Value Index were calculated of *Tephrosia purpurea*, and its thirty one associates. Based on Importance Value Index the community was recognized as Tephrosia- Cynodon- Zizypus. The highest Importance Value Index was in case of *Tephrosia purpurea* i.e. 38.947 and the least Importance Value Index was for Abutilon indicum i.e. 0.947.

Thirty Eight associates of *Tephrosia purpurea* were found in locality of Shahdol. Based on Importance Value Index the community was recognized as Tephrosia- Cynodon- Zizypus. The highest Importance Value Index was in case of *Tephrosia purpurea* i.e. 51.383 and the least Importance Value Index was for Eragrostis tenella i.e. 0.998.

CONCLUSION

We can conclude from present investigation that phytosocilogy of *Tephrosia purpurea* shows a vast number of common associates in the four observations sites of Rewa, Satna, Sidhi and Shahdol. Forty associates of *Tephrosia purpurea* were found in the Rewa site. Thirty one associates of *Tephrosia purpurea* were found in locality of Satna. Thirty seven associates of *Tephrosia purpurea* were found in locality of Sidhi and Thirty Eight associates of *Tephrosia purpurea* were found in locality of Shahdol.

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