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Phytosociological Analysis and Distribution Pattern of Woody Species in Selected Forests of Jalaun District, Uttar Pradesh

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A B S T R A C T

The present study deals with the phytosociological analysis and distribution pattern of woody species in selected forests of Jalaun district of Uttar Pradesh. A total of 68 and 71 woody plant species (tree/shrub/climber/woody grass) have been recorded in Ikona and Rampura forests respectively. *Prosopis juliflora* was the dominant tree species with highest range of IVI value (42.62 to 43.61) in all two study sites while the shrub species of *Capparis decidua* (12.16) in Ikona-forest community and *Capparis sepiaria* (13.25) were dominated in Rampura Forest. The range of density was 442 to 456 Plant/ha and its value for lower groups of plant was varied from 124 to 156 Plant /ha. The total basl of different tree species varied between 10.47 to 0.08 m^2/ha (Ikona-fprest) and 14.04 to 0.14 m^2/ha (Rampura-fporest). The distribution pattern of all the woody species was contiguous followed by random distribution pattern, regular distribution pattern was not shown in all the two-forest community.

***Key words*:** Phytosociological analysis, Distribution pattern, Woody species, *Capparis sepiaria*

Jalaun district is located in the central part of Uttar Pradesh's Bundelkhand region, occupying 4565 square kilometres area. The district is bordered on the north by the Yamuna River, on the south by the Betwa River, and on the west by the Pahuj River. This reason, which is confined along the banks of these rivers, has culminated in deep ravines along the river's edge, whereas the high ground, which represents the level of the former flood plain, is popular for extremely productive agricultural production. The landscape in these regions is relatively flat. The forest vegetation of Jalaun and the surrounding area is intermediate between the southern-tropical and northern dry deciduous types. Tropical dry deciduous and tropical mixed dry deciduous scrub forests are the most prevalent forest types in the district [2]. Tropical forests are commonly referred to as a species-rich terrestrial ecosystem. Their immense biodiversity provides a diversified variety of natural resources to facilitate local communities' survival [17]. Grazing, fodder, firewood, agricultural inputs, timber, railing, as well as other local forest needs are including: Forests are perhaps the most economically significant source for mankind, and they play a key role in safeguarding multiple environmental resources [14]. The low levels of productivity indicate that they have been presently being exploited through to overgrazing, looping, deforestation, and illicit cutting, emphasizing that sustainable approaches are essential. The overexploitation of flora and fauna makes a significant contribution to habitat devastation [26]. Quantitative assessments reveal information on the nature of species and forest diversification, as well as comprehensive statistics on the ecosystem structure. The overall continued existence of tropical dry deciduous forests is still worse than moist and wet forests all around world [16]. Floral composition, diversity, and biomass information are essential for understanding forest ecosystem processes and sustainability. This can be used to estimate the degree of environmental adaptation and its ecological consequence [20]. Many different researchers [8], [9], [14], [23], [25], [31], [33] have recently worked on phytosociological and floristic studies in various Indian forest habitats.

A significant portion of this investigation, particularly on woody species, has not been done scientifically in this area. As a result, it was deemed appropriate to investigate this relevant theme in the dry deciduous forest of this region in order to understand the richness, structure, and distribution pattern of woody vegetation.

MATERIALS AND METHODS

The current research was conducted within two forests in the Jalaun district of Uttar Pradesh. Jalaun is an important district in the Jhansi mandal, which is a part of the Bundelkhand region. It is centred in 27° N latitude and 79-52° E longitude, with the elevation of 151 metres above mean sea level. It is bordered on the north by Etawah and Kanpur-dehat, just on south by Jhansi and Hamirpur, as well as on the west by the Madhya Pradesh district of Bhind. On the grounds of temperature and precipitation, the climate of the studied area

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can be defined as monsoonal, with three separate seasons: rainy, winter and summer.

The forest division of Jalaun district is divided by seven ranges and one unit (Table 1) with the total geographical area of 25639.35 hectare. Two forest sites were considered for the vegetation analysis of woody plant species i.e., Ikona forest of Kadaura forest range, Rampura Forest of Madhaugarh range with the forest area, 1258.19 and 955.11 hectare respectively.

Table 1 Forest ranges of Jalaun division

S. No.	Forest range	Area (hectare)
1	Orai	5130.91
2	Kadaura	3533.14
3	Kalpi	2800.22
4	Konch	3813.29
5	Jalaun	2537.55
6	Nyamatpur	898.68
7	Madhaugarh	3416.38
8	Ait (Unit)	3508.88
	Total	25639.35

Source: Forest Working Plan 2007-2016, Jalaun Forest Division

Phytosociological analysis

At fortnightly durations, wide and intense field surveys of the studied areas were accomplished in all seasons. The research study was conducted from December 2017 to November 2020. To acquire a glimpse of the entire vegetation that falls under the study area, a stroll through survey was conducted. The data was gathered through using quadrate sampling method. Fifty quadrates of 10 × 10 m size were randomly placed on each study site, the size and number of total studied quadrate was determined by the species-area curve method [17] and the running mean method [13]. All woody species having its circumference measured at breast height (1.37m above the ground level). Vegetation data was quantitatively analysed for frequency, density, abundance, Importance value index (IVI) [5], [17]. The distribution pattern was asses following the method [4]. The similarity and dissimilarity index was measured by following as per standard method [29].

RESULTS AND DISCUSSION

A total of 46 and 55 tree species have been found in the Ikona and Rampura Forest communities, respectively. The total density of tree species in the Ikona-forest was from 456 to 4 Plant/ha (Table 3a). *Prosopis juliflora* has the highest density (456 Plant/ha), whereas *Ficus rumphi*, *Crateva religiosa*, *Morus alba*, and *Xylosma longifolia* have the lowest density (04 Plant/ha). The tree density in the Rampura-forest plant community was from 442 to 02 Plant/ha (Table 4a), while *Prosopis juliflora* (442 Plant/ha) having the highest density, *Ficus rumphi* and *Murraya koenigii* (2 Plant/ha) to have the lowest. In the Ikona and Rampura forests, there are a total of 22 and 16 species of shrubs, climbers, and woody grass, respectively. Within Ikona-forest (Table 3a), *Ziziphus oenoplia* seemed to have the highest density (124 Plant/ha), however *Abrus precatorius* seemed to have the lowest density (10 Plant/ha). Within Rampura-forest, *Capparis sepiaria* had the maximum density (156 Plant/ha) whereas *Grewia hirsuta* had the lowest density (06 Plant/ha).

Table 2a Phytosociological traits of tree species of Ikona-forest of Jalaun district

S. No.	Name of species	F (%)	D (Plant/ha)	TBA (m^2/ha)	A	A/F	IVI
1	*Prosopis juliflora* (Swartz.) DC.	90	456	10.47	5.06	0.056	43.61
2	*Balanites aegyptiaca* (L.) Delile	46	124	3.26	2.69	0.058	14.51
3	*Acacia leucophloea* (Roxb.) Willd	34	68	3.42	2	0.058	11.09
4	*Madhuca longifolia* (Roxb.) A. Chev.	4	14	4.95	3.5	0.875	7.96
5	*Acacia catechu* (L.f.) Willd.	34	54	1.03	1.58	0.046	7.11
6	*Tamarindus indica* L.	10	10	3.67	1	0.1	6.56
7	*Cassia fistula* L.	24	26	1.58	1.08	0.045	5.69
8	*Ficus glomerata* Roxb.	8	10	3.15	1.25	0.156	5.64
9	*Holoptelea integrifolia* (Roxb.) Planch.	16	26	1.71	1.62	0.101	5.09
10	*Senna siamea* Lam.	24	32	0.96	1.33	0.055	5.08
11	*Ficus benghalensis* L.	6	6	2.93	1	0.166	4.96
12	*Ziziphus mauritiana* Lam.	24	26	0.82	1.08	0.045	4.62
13	*Prosopis spicigera* L.	24	28	0.73	1.16	0.048	4.57
14	*Syzygium cuminii* L.	16	16	1.59	1	0.062	4.47
15	*Acacia nilotica* (L.) Willd. ex Delile	18	18	1.29	1	0.055	4.34
16	*Dalbergia sissoo* DC.	16	18	1.35	1.12	0.07	4.23
17	*Pongamia pinnata* (L.) Pierre.	18	24	1	1.33	0.073	4.2
18	*Bombax ceiba* L.	8	18	1.8	2.25	0.281	4.09
19	*Bauhinia variegata* L.	14	18	1.33	1.28	0.091	4.01
20	*Ficus religiosa* L.	6	6	2.13	1	0.166	3.83
21	*Leucaena leucocephala* (Lam.) de Wit.	16	22	0.91	1.37	0.085	3.79
22	*Aegle marmelos* (L.) Corr.	12	12	1.34	1	0.083	3.57
23	*Feronia limonia* (L.) Swingle	6	6	1.79	1	0.166	3.36
24	*Albizia lebbeck* (L.) Benth.	14	40	0.16	2.85	0.203	3.33
25	*Butea monosperma* (Lam.) Taub.	6	8	0.2	1.33	0.221	3.21
26	*Azadirachta indica* A. Juss.	10	12	1.22	1.2	0.12	3.2
27	*Cordia dichotoma* G. Forst.	14	14	0.88	1	0.071	3.19
28	*Miliusa tomentosa* (Roxb.) Finet & Gagnep.	4	6	0.11	1.5	0.375	2.79
29	*Prosopis cineraria* (L.) Druce.	14	20	0.37	1.42	0.101	2.75
30	*Bauhinia racemosa* Lam.	14	16	0.44	1.14	0.081	2.66
31	*Eucalyptus globulus* Labill.	8	10	1	1.25	0.156	2.61
32	*Moringa oleifera* Lam.	10	12	0.69	1.2	0.12	2.46

33	*Peltoforum pterocarpum* (DC.) K. Heyne	12	12	0.53	1	0.083	2.43
34	*Phoenix sylvestris* (L.) Roxb.	10	16	0.49	1.6	0.16	2.35
35	*Ficus rumphi* Bl.	4	4	1.27	1	0.25	2.33
36	*Pithecellobium dulce* (Roxb.) Benth.	8	8	0.6	1	0.125	1.96
37	*Sterculea foetida* L.	8	8	0.58	1	0.125	1.93
38	*Delonix regia* (Bojer ex Hook.) Raf.	8	8	0.55	1	0.125	1.89
39	*Melia azedarch* L.	8	8	0.36	1	0.125	1.62
40	*Sterculea urens* Roxb.	6	8	0.36	1.33	0.221	1.43
41	*Diospyros melanoxylon* Roxb.	6	6	0.34	1	0.166	1.31
42	*Ficus carica* L.	8	8	0.12	1	0.125	1.28
43	*Borassus flabellifer* L.	4	10	0.19	2.5	0.625	1.08
44	*Crateva religiosa* G. Forst.	4	4	0.21	1	0.25	0.84
45	*Morus alba* L.	4	4	0.13	1	0.25	0.73
46	*Xylosma longifolia* Clos	4	4	0.08	1	0.25	0.66

Table 2b Phytosociological traits of shrub/climber/woody grass of Ikona-forest of Jalaun district

S. No.	Name of species	Habit	F (%)	D (Plant/ha)	TBA (m^2/ha)	A	A/F	IVI
1	*Capparis decidua* (Forssk.) Edgew.	S	56	122	0.97	2.17	0.038	12.16
2	*Ziziphus oenoplia* (L.) Mill.	S	44	124	0.92	2.81	0.063	11.02
3	*Flacourtia indica* (Burm.f.) Merr.	S	36	62	0.31	1.72	0.047	6.65
4	*Abutilon indicum* (L.) Sweet	S	28	32	1.23	1.14	0.04	5.84
5	*Grewia rothii* DC.	S	20	58	0.27	2.9	0.145	4.87
6	*Woodfordia fruticosa* (L.) Kurz	S	18	56	0.27	3.11	0.172	4.59
7	*Helicteres isora* L.	S	20	48	0.28	2.4	0.12	4.44
8	*Lantana indica* Roxb.	S	12	60	0.28	5	0.416	4.2
9	*Bambusa vulgaris* (Schrad.) ex J.C.Wendl.	WG	6	62	0.28	10.33	1.721	3.71
10	*Capparis sepiaria* L.	S	16	38	0.25	2.37	0.148	3.57
11	*Ziziphus nummularia* (Burm.f.) Wt. and Am.	S	16	34	0.35	2.12	0.132	3.53
12	*Grewia forbesii*	S	14	36	0.12	2.57	0.183	3.1
13	*Cassia occidentalis* L.	S	14	28	0.36	2	0.142	3.08
14	*Lawsonia inermis* L.	S	10	34	0.3	3.4	0.34	2.88
15	*Adhatoda vasica* Nees.	S	8	38	0.12	4.75	0.593	2.61
16	*Tinospora cordifolia* (Willd.) Miers	C	14	26	0.07	1.85	0.132	2.59
17	*Vitex nigundu* L.	S	10	32	0.1	3.2	0.32	2.51
18	*Calotropis procera* (Aiton) Dryand.	S	8	26	0.17	3.25	0.406	2.15
19	*Calotropis gigantia* (L.) Dryand.	S	8	22	0.15	2.75	0.343	1.95
20	*Asparagus racemosus* Willd.	C	6	14	0.03	2.33	0.388	1.23
21	*Pergularia daemia* (Forssk.) Chiov.	C	4	14	0.05	3.5	0.875	1.06
22	*Abrus precatorius* L.	S	4	10	0.04	2.5	0.625	0.87

In the Ikona and Rampura-forests, the total basal area of different tree species ranged from 10.47 to 0.08 m^2/ha and 14.04 to 0.14 m^2/ha, respectively (Table 2a and 4a). *Prosopis juliflora* had the largest basal area (10.47 m^2/ha) in the Ikona-forest, followed by *Madhuca longifolia* (4.95 m^2/ha) and *Tamarindus indica* (3.67 m^2/ha). *Xylosma longifolia* had the lowest total basal area (0.08 m^2/ha). *Prosopis juliflora* had the highest total basal area (14.04 m^2/ha) in the Rampura-forest (Table 4a), followed by *Holoptelea integrifolia* (10.80 m^2/ha) and *Ficus glomerata* (6.28 m^2/ha), while *Prosopis spicigera*, *Sterculea urens*, and *Ehretia laevis* (0.14 m^2/ha each) had the minimum value. The total basal area of the lower group of Ikona-forest woody plant species (Table 2b) ranged from 1.23 to 0.03 m^2/ha. The highest total basal area (1.23 m^2/ha) is represented by *Abutilon indicum*, while the lowest total basal area is represented by *Asparagus racemosus* (0.03 m^2/ha).

Table 3a Phytosociological traits of tree species of Rampura-forest of Jalaun district

S. No.	Name of species	F (%)	D (Plant/ha)	TBA (m^2/ha)	A	A/F Ratio	IVI
1	*Prosopis juliflora* (Swartz.) DC.	96	442	14.04	4.6	0.047	42.62
2	*Holoptelea integrifolia* (Roxb.) Planch.	34	36	10.8	1.05	0.03	16.1
3	*Balanites aegyptiaca* (L.) Delile	58	180	2.2	3.1	0.053	15.19
4	*Ficus glomerata* Roxb.	28	36	6.28	1.28	0.045	10.72
5	*Acacia leucophloea* (Roxb.) Willd	36	54	2.49	1.5	0.041	8.11
6	*Anthocephalus cadamba* (Roxb.) Miq.	30	44	2.95	1.46	0.048	7.65
7	*Bombax ceiba* L.	14	22	4.92	1.57	0.112	7.44
8	*Dalbergia sissoo* DC.	24	28	3.59	1.16	0.048	7.14
9	*Acacia catechu* (L.f.) Willd.	38	76	0.48	2	0.052	7.08
10	*Acacia nilotica* (L.) Willd. ex Delile	24	32	2.6	1.33	0.055	6.24
11	*Cordia dichotoma* G. Forst.	24	28	1.11	1.16	0.048	4.47
12	*Madhuca longifolia* (Roxb.) A. Chev.	6	10	3.05	1.66	0.276	4.22
13	*Tamarindus indica* L.	8	8	2.95	1	0.125	4.19
14	*Terminalia arjuna* Roxb. ex DC.	16	24	1.62	1.5	0.093	4.15

15	*Azadirachta indica* A. Juss.	8	8	2.74	1	0.125	3.96
16	*Albizia lebbeck* (L.) Benth.	14	16	1.88	1.14	0.081	3.91
17	*Ficus benghalensis L.*	4	4	3.01	1	0.25	3.74
18	*Pongamia pinnata* (L.) Pierre.	16	24	0.92	1.5	0.093	3.39
19	*Acacia auriculiformis* (A.Cunn.) ex Benth.	6	6	0.35	1	0.166	3.14
20	*Helicteres isora* L.	14	38	0.23	2.71	0.193	3.1
21	*Melia azedarch* L.	8	8	1.72	1	0.125	2.87
22	*Syzygium cuminii* L.	14	14	0.98	1	0.071	2.86
23	*Peltoforum pterocarpum* (DC.) K. Heyne	12	12	1.07	1	0.083	2.7
24	*Milingtonia hortensis* L.f.	14	14	0.79	1	0.071	2.65
25	*Parkinsonia aculeata* L.	16	20	0.39	1.25	0.078	2.65
26	*Kigelia africana* (Lam.) Benth.	6	6	1.71	1	0.166	2.6
27	*Ficus religiosa* L.	12	12	0.97	1	0.083	2.59
28	*Phoenix sylvestris* (L.) Roxb.	6	16	1.28	2.66	0.443	2.57
29	*Leucaena leucocephala* (Lam.) de Wit.	10	14	0.82	1.4	0.14	2.34
30	*Bauhinia variegata* L.	8	16	0.6	2	0.25	2.01
31	*Ziziphus mauritiana* Lam.	8	12	0.68	1.5	0.187	1.93
32	*Alianthus excelsa* Roxb.	10	12	0.5	1.2	0.12	1.9
33	*Feronia limonia* (L.) Swingle	8	8	0.77	1	0.125	1.84
34	*Eucalyptus globulus* Labill.	8	12	0.59	1.5	0.187	1.83
35	*Tectona grandis* L.f.	8	12	0.52	1.5	0.187	1.75
36	*Aegle marmelos* (L.) Corr.	8	8	0.67	1	0.125	1.74
37	*Ficus palmata* Forssk.	10	16	0.19	1.6	0.16	1.74
38	*Ficus rumphi* Bl.	2	2	1.32	1	0.5	1.66
39	*Morinda pubescens* Sm.	8	14	0.32	1.75	0.218	1.63
40	*Senna siamea* Lam.	8	12	0.37	1.5	0.187	1.59
41	*Prosopis cineraria* (L.) Druce.	8	16	0.19	2	0.25	1.57
42	*Mangifera indica* L.	6	8	0.6	1.33	0.221	1.49
43	*Cassia fistula* L.	6	6	0.48	1	0.166	1.28
44	*Heterophragma adenophyllum* Wall ex G. Don	6	6	0.4	1	0.166	1.2
45	*Moringa oleifera* Lam.	6	6	0.19	1	0.166	0.97
46	*Prosopis spicigera* L.	6	6	0.14	1	0.166	0.92
47	*Delonix regia* (Bojer ex Hook.) Raf.	4	4	0.38	1	0.25	0.91
48	*Artocarpus heterophyllus* Lam.	4	4	0.38	1	0.25	0.91
49	*Thespesia populnia* (L.) Sol. ex Correa	4	4	0.23	1	0.25	0.75
50	*Callistemon lanceolatus* (Sm.) Sweet	4	4	0.21	1	0.25	0.73
51	*Pithecellobium dulce* (Roxb.) Benth.	4	4	0.2	1	0.25	0.73
52	*Nyctanthes arbor-tristis* L.	4	4	0.17	1	0.25	0.69
53	*Sterculea urens* Roxb.	4	4	0.14	1	0.25	0.66
54	*Ehretia laevis* Roxb.	4	4	0.14	1	0.25	0.66
55	*Murraya koenigii* (L.) Spreng.	2	2	0.15	1	0.5	0.41

Table 3b Phytosociological traits of shrub species of Rampua-forest of Jalaun district

S. No.	Name of species	F (%)	D (Plant/ha)	TBA (m^2/ha)	A	A/F	IVI
1	*Capparis sepiaria* L.	70	156	0.41	2.22	0.031	13.25
2	*Capparis decidua* (Forssk.) Edgew.	60	102	0.56	1.7	0.028	10.2
3	*Flacourtia indica* (Burm.f.) Merr.	50	102	0.29	2.04	0.04	9.06
4	*Carissa carandas* L.	40	94	0.31	2.35	0.058	7.86
5	*Ziziphus oenoplia* (L.) Mill.	44	86	0.24	1.95	0.044	7.78
6	*Lantana indica* Roxb.	30	40	0.1	1.33	0.044	4.41
7	*Lantana camera* L.	26	44	0.1	1.69	0.065	4.24
8	*Woodfordia fruticosa* (L.) Kurz	20	44	0.12	2.2	0.11	3.74
9	*Ziziphus nummularia* (Burm.f.) Wt. and Am.	16	44	0.42	2.75	0.171	3.73
10	*Grewia forbesii*	16	48	0.01	3	0.187	3.47
11	*Sterculea foetida* L.	10	18	1.41	1.8	0.18	3.14
12	*Abutilon indicum* (L.) Sweet	10	24	0.25	2.4	0.24	2.15
13	*Lawsonia inermis* L.	8	26	0.16	3.25	0.406	1.98
14	*Grewia villosa*	4	10	0.05	2.5	0.625	0.82
15	*Calotropis procera* (Aiton) Dryand.	4	10	0.04	2.5	0.625	0.81
16	*Grewia hirsuta* Vahl.	2	6	0.02	3	1.5	0.45

In the Rampura-forest, the total basal area of distinct shrub species ranged from 1.41 to 0.01 m^2/ha, with *Sterculea foetida* having the highest value (1.41 m^2/ha) and *G. forbesii* (0.01 m^2/ha) having the lowest total basal area (Table 3b).

Prosopis juliflora was the dominant tree species in the Ikona-forest and Rampura-forest, respectively, based on the Importance value index (IVI) of different tree species in distinct forest communities of Jalaun district. In the Ikona-forest,

Balanites aegyptiaca was second dominant species with 14.51 IVI, followed by *Acacia leucophloea*, *Madhuca longifolia*, and *Acacia catechu* with IVI 11.09, 7.96, and 7.11 respectively, whereas in the Rampura-forest, *Holoptelea integrifolia* was second dominant species with IVI 16.10, followed by *Balanites aegyptiaca* (Table 2a and 3a). *Capparis decidua* (12.16) had the largest IVI value among the lower plant groups of Ikona-forest, followed by *Ziziphus oenoplia* (11.02), *Flacourtia indica* (6.65), *Abutilon indicum* (5.84) and *Abrus precatorius* (0.87) had the lowest IVI value (Table 2b). *Capparis sepiaria* (13.25) was the most abundant shrub species in the Rampura-forest community followed by *Capparis decidua* (10.20), *Flacourtia indica* (9.06), and *Carissa carandas* (7.86). *Grewia hirsuta* (0.45) having the least IVI value (Table 3b).

A species' distribution pattern is measured by the abundance/frequency (A/F) ratio. As a result, a regular distribution has a higher frequency but a lower abundance, and a contiguous distribution has a higher abundance but a lower frequency. Throughout this investigation, the woody plant species of the Ikona-forest had a 10.29% random distribution and an 89.70% contiguous distribution, whereas the Rampura-forest had a 16.90% random distribution and an 83.09 percent contiguous distribution (Table 4). The regular distribution pattern was modest in both forest communities.

Table 4 Distribution pattern of woody species in different study forests

Study site	Total basal area (m^2/ha)	Density (Plant/ha)
Ikona-forest	64.09	1284
Rampura-forest	88.47	1438

Table 5 Total basal area and total density values of tree species of the study forests

Study site	Distribution pattern		
	Regular (%)	Random (%)	Contiguous (%)
Ikona-forest	0	10.29	89.7
Rampura-forest	0	16.9	83.09

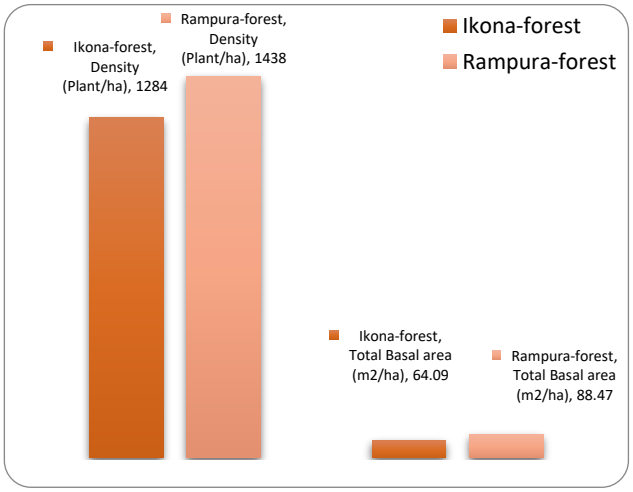

Fig 4 Representation of total density and total basal area of tree layer in two studied forests

The dominance-diversity curve for woody species of Jalaun district forest have been illustrated in (Fig 1-3) which have been generated from the basic data. The dominance-diversity curves for the forest are defined with lower number of species in higher IVI ranges and higher number of species in lower IVI ranges.

The highest total tree density per hectare was observed in Rampura-forest, while the lowest was recorded in Ikona-forest. The density of tree species ranged from 1284 to 1438 plants per hectare. The total tree density value was found to be within the range of values (349-1875 Plant/ha) recorded from India's tropical dry deciduous forests [3], [10], [15], [27], [28], [30], [34], and Mexican tropical forests [1], [7]. This range of stand density was higher when compared with the result of Shervarayan hills, Kalrayan hills, Coromendal coast of Eastern Ghats, Tropical dry deciduous forests of Hastinapur, and different tropical dry deciduous forests of Uttar Pradesh [11], [12], [14], [19], [32]. Higher density in the forest indicates higher proportion of individuals in lower diameter class.

The overall tree density was higher in each of the forests studied, as per the results. The fact that the stems were stunted and exhibited their shrubby and bushy structure rather than the mature tree shape was the decisive factor. It was the main impact of biotic influences, which culminated in the de-shaping of our natural forest ecosystems, as well as reduced productivity and devastation. As tree density is increased, light infiltration to the ground diminishes, reducing lower story and ground flora density [24]. The availability of further light on the ground may explain the higher shrub density on highly compromised sites. The lower value of these parameters towards the least disturbed site may be due to sever competition for resources with trees and deep shade. Some previous workers have also made similar observation [2], [24].

The woody species distribution pattern indicated an intriguing pattern. The majority of the species in both forests investigated have contiguous distribution, although the percentage of species with random distribution in each forest is quite low. In both forests, there was no regular pattern of distribution. Under natural conditions, contiguous distribution is prevalent; random distribution is only associated with relatively uniform habitats; and regular distribution occurs when severe competition between individuals subsides [18].

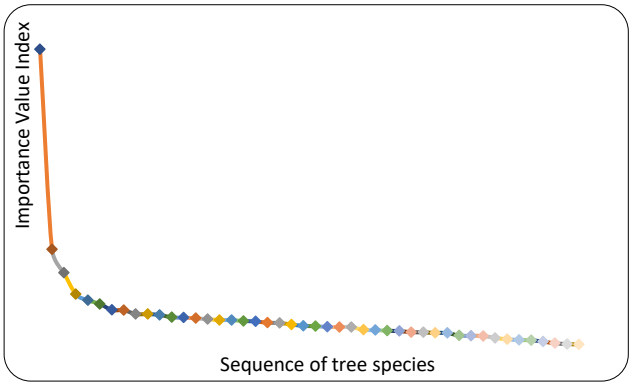

Fig 1 D-D curve of tree species of Ikona-forest

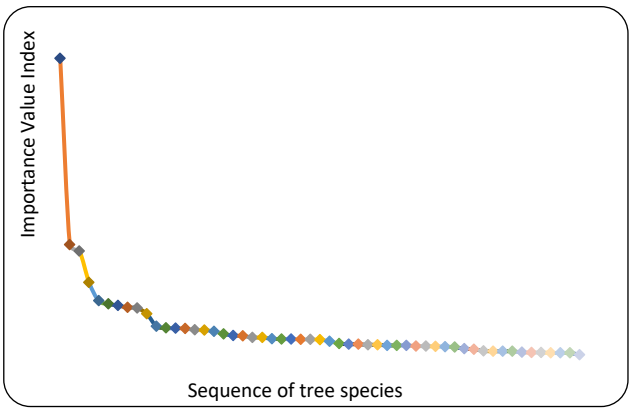

Fig 2 D-D curve of tree species of Rampura-forest

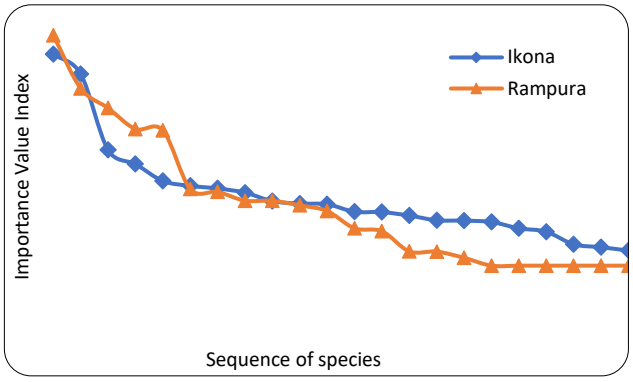

Fig 3 D-D curve shrub/climber/woody grass species of Ikona and Rampura-forest

Dominance-Diversity (d-d) curves for tree species based on IVI have been generated for existing forest communities to interpret the community system in terms of resource allocation and niche space. In this study, the D-D curves for trees, shrubs, and climbers (Fig 1-3) approximated Preston's normal distribution model (1948) [21], with lower species in the higher IVI range. For distinct tropical dry deciduous forests in India, d-d curves of a similar type were obtained by some researcher in previous study [6], [22], [33].

CONCLUSION

The present study on phytosociological analysis and distribution pattern of woody species in selected forests of Jalaun district, Uttar Pradesh have been revealed that many tree species found in the studied forests exhibit higher resilience to anthropogenic influences and have higher potential for natural regeneration, but they must be guarded from trampling, logging, illicit cuttings, and other biotic influences. The findings of this study will be applied to measure and conserve the phytodiversity of the tropical dry deciduous forest in the Jalaun district, as well as other tropical forests in India.

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