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DISTRIBUTION OF HERBACEOUS WEEDS OF SELECTED UNDISTURBED LOCATIONS ON UNIVERSITY OF ABUJA MAIN CAMPUS

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ABSTRACT

A study was carried out to determine occurrence and distribution of herbaceous weed species of selected undisturbed locations of University of Abuja Main Campus. 8 locations were selected and 12 coordinate points were assessed within each of the locations using a Geograhical Positioning System (GPS).Weed species were sampled with the use of quadrat (1 m^2), randomly thrown at different points of infestation of herbaceous weeds. A total of 1735 herbaceous weeds belonging to 39 species and 14 families were identified. Hyptis suaveolens (mint weed) was observed to be the most occurring specie (398), followed by *Calopogonium mucunoides* (248), Sida acuta (110), *Paspalum vaginatum* (88) and *Tridax procumbens* (81). The highest density of Hyptis suaveolens was observed at the School Gate (7.3), followed by Senate Building (5.8), The highest relative densities were observed at School Gate (32.4) and Faculty of Agriculture (24.1). Also,the highest frequency of occurrence of identified species were observed at the School Gate (100 %) and senate building (85 %), respectively. Weed abundance was observed to be highest at the School Gate (733.3), followed by Senate Building (690). The lowest abundance was at Faculties of Law and Veterinary Medicine (211.1). It is, therefore, recommended that control is required to mitigate their harmful effects. Also, the need for appropriate design and implementation of weed management strategies which may decrease the density or noxiousness of herbaceous weeds.

Keywords: Herbaceous weeds; Undisturbed locations

INTRODUCTION

Herbs as weeds express their harmful effects slowly, steadily and inconspicuously but may encumber other species and increase soil seed bank if no restrictions are imposed to control infestation (TNAU, 2016; Solomon *et al.,* 2004). The weeds reduce plant diversity by competing for nutrients, moisture, solar radiation and space. They serve as hosts for insects, and harmful pathogens or their root exudates may be detrimental (Grime *et al.,* 2016). Knowledge of weeds' distribution, density and abundance dynamics is therefore, a prerequisite for early detection and consequently, timely management (Maszura *et al.,* 2018), especially as an essential step for prevention before they become established, hence, the need for this research.

Objective of Study

The study aimed to determine the density and distribution of herbaceous weed species at selected undisturbed locations on the University of Abuja Main Campus.

MATERIALS AND METHODS

Location of study

Eight (8) undisturbed locations at the University of Abuja Main Campus, Federal Capital Territory (FCT), Nigeria were selected and used for this study. In each location, plots measuring 10 x 20 m, with alleys of 2 m apart and coordinates taken accordingly were also used (Table 1). In each plot, 12 quadrats (1 m^2) points were thrown randomly, and weed species within each quadrat were identified and counted based on the hierarchical trend of family and species.

Parameters measured

Weed density

Weed density measured the number of the species collected and counted in a 1 m^2 quadrat. This calculated as:

$$\text{Density} = \frac{\text{total number weeds in a quadrat}}{\text{total area of a quadrat (1 } m^2\text{)}}$$

Weed relative density

Relative density expressed number of observed species of individuals of all the species occurring at each location, expressed as a percentage of all species present.

$$\textit{Relative Density} \frac{\textit{No of individuals of target species occurred}}{\textit{Number of individuals of all species occurred}} \times 100$$

Weed frequency

Frequency was determined as the number of times a specie occurred in a sampling unit, expressed as a percentage (Booth *et al.,* 2018). It was used as an index

for comparing plant community changes (Bonham *et al.*, 2013), determined as:

$$Frequency\ (\%) = \frac{number\ of\ quadrats\ with\ weed\ species}{total\ no\ of\ quadrats\ used\ in\ each\ plot} \times 100$$

Weed relative frequency

Relative frequency is expressed as a percentage of measure of the degree of dispersion of observed species in the sampling units. Relative frequency was calculated by dividing frequency by the sum of the frequencies of all species, multiplied by 100.

$$\text{Relative frequency } (\%)\ \frac{numer\ of\ target\ species\ occured}{number\ of\ all\ the\ species\ occured} \times 100$$

Weed species abundance

Species abundance estimates the number of individuals in the sampled locations (Kent, 2015), calculated as:

$$Abundance = \frac{total\ \ No\ of\ weed\ in\ all\ quarats}{Total\ No\ of\ quadrats\ in\ which\ species\ occurred}$$

Weed **species diversity**

Species diversity was determined as the number of different species present in the locations and relative abundance of each of the specie observed in the study locations.

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

Where, D= Species diversity index, N= Total number of weeds of all species, n= total number of weeds of each species, ∑= Sum.

Shannon-Weiner diversity index

The Shannon-Wiener diversity index (H) was used to estimate the diversity or species richness (the number of species in the study locations)

$$H = -\sum[(pi) \times \log(pi)],$$

Where: H - Shannon diversity index, pi - Proportion of individuals of i-th species in a whole community:

pi = n / N, where: n - individuals of a given type/species; and N - total number of individuals in a community, ∑ - Sum symbol; and log - Usually the natural logarithm.

Statistics analysis

The data collected were subjected to descriptive analyses. The weed species were represented in tabular, pie chart forms.

RESULTS

Table 2 shows herbaceous weeds observed at selected locations of University of Abuja Main Campus. A total of 1,735 species were observed in 39 species belonging to 14 families.

Figure I shows the percentage occurrence of identified families of herbaceous weeds at the study locations. Species of the family Lamiaceae had the highest (22 %) distribution of herbaceous weeds, followed by Poaceae (21 %), Leguminoseae (20 %), Malvaceae and Commelinaceae (9 %) respectively, while Cyperaceae was the least occurring (1 %) specie.

Table 3 shows herbaceous weeds sampled at University School Gate. 9 families of herbaceous weeds were observed with *Hyptis suaveolens* been the highest (88) preponderant, with a frequency of 100 % and density of 7.3, followed by *Calopogonium mucunoides* 75, frequency of 100 % and density of 6.3, *Sida acuta* 24, frequency of 75 % and density of 2. *Sida garckeana* Polak 20, frequency of 66 % and density of 1.7, *Mitracarpus villosus* 17, frequency of 58 % and density of 1.4, respectively.

Table 4 shows weeds observed at Senate Building. 9 families totaling 467 species were observed of which the preponderant were *Hyptis suaveolens* (69), with frequency of 83 %, density of 5.8, *Azolla pinnata* (35), frequency of 66 % and density of 2.9, *Oldenlandia corymbosa* Linn., *Hackelochola granularis* and *Bracharia lata* (Schumach.) each 31, but with frequencies of 88 % and 75 % and densities of 2.6 respectively.

Table 5 shows the occurrence and distribution characteristics of herbaceous weeds at Faculties of Agriculture and Veterinary Medicine.

At Faculty of Agriculture, 7 families were observed, with a total number of 206 weed species. *Hyptis suaveolens* was observed to be the highest occurring weed (50), frequency of 66 % and density of 4.2, followed by *Calopogonium mucunoides* (38), frequency of 83 % and density of 3.2, *Tridax procumbens L.* (31), frequency of 91 % and density of 2.6, *Panicum Laxum* SW (20), frequency of 66 % and density of 1.7, *Mitracarpus villosus* (15), frequency of 66 % and density of 1.3 respectively.

At Faculty of Veterinary Medicine however, 7 families were observed, totaling 123 weed species. *Calopogonium mucunoides* was observed to have the highest number (21), with a frequency of 75 %, density of 1.8, followed by *Hyptis suaveolens* (19), frequency of 75 %, density of 1.6, *Spermacocoe ocymoides* Burm

F. (17), frequency of 66 % and density of 1.4, *Paspalum vaginatum* SW. (17), frequency of 66 %, density of 1.4. *Synedrella nodiflora Gaertn.* (15), frequency of 66 %, density of 1.3 respectively.

Table 6 shows the results obtained at Faculty of Engineering and Female Hostel.

At Faculty of Engineering, 7 families were observed, amounting to169 species out of which *Calopogonium mucunoides* was preponderant (27), frequency of 75 % and density of 2.3, followed by *Sida acuta Burn. F.* with total number of 26, frequency of 83 % and density of 2.2, *Tridax procumbens Linn.* with total number of 22, frequency of 66 % and density of 1.8, *Neptunia oleracea Lour.* with total number of 17, frequency of 66 % and density of 1.4, *Ageratum conyzoides Linn.* with total number of 15, frequency of 66 % and density of 1.3 Were the five highest weeds at the location.

At the Female Hostel, 138 weed species were observed with *Hyptis suaveolens* been the preponderant (31), frequency of 83 %, density of 2.6, followed by *Calopogonium mucunoides* (28), frequency of 100 %, density of 2.3, *Sida acuta Burn F.* (22), frequency of 75%, density of 1.8, *Senna obtusifolia* (16), frequency of 66%, density of 1.3, *Paspalum vaginatum SW.* (16), frequency of 66 % and density of 1.3 were the five (5), highest weeds at the location.

Table 7 shows the occurrence and distribution of herbaceous weeds at Faculties of Law and Social Sciences. At Faculty of Law, 118 weed species were observed, with *Calopogonium mucunoides* occurring relatively higher (21), than all the other species, frequency of 100 % and density of 1.8, Followed by *Hyptis suaveolens* (19), frequency of 75 % and density of 1.6. *Ipomoea aquamoclit* L. (14), frequency of 66 % and density of 1.2. *Neptunia oleracea* (13), frequency of 66 % and density of 1.1. *Typha australis* Schum. & Thonn. (12), frequency of 58 % and density of 1.

At Faculty of Social Sciences, l 145 weed species were observed, among which *Hyptis suaveolens* occurred higher (22), that all other species, with frequency of 83 %, density of 1.8 and followed by *Digitaria horizontalis Wild.* (21), frequency of 75 % and density of 1.8, *Setaria megaphylla (Steud.)* (18), frequency of 75 % and density of 1.5, *Neptunia oleracea Lour.* (17), frequency of 66 % and density of 1.4. *Calopogonium mucunoides* (17), frequency of 66 % and density of 1.4 respectively.

Table 1: Sampled locations and coordinates at University of Abuja Main Campus

Location	Description	Coordinates	
		Latitude	**Longitude**
1	School gate	8°59'21.9"N.	7°11'33.1"E
2	Senate Building	8°58'53.8"N	7°10'52.8"E
3	Faculty of Agriculture	8°17'98.8"N	7°17'98.7E
4	Veterinary Medicine	8°58'36.4"N	7°08'51.0"E
5	Faculty of Engineering	8°58'38.8"N	7°10'34.3"E
6	Female Hostel	8°58'33.6"N	7°10'32.4"E
7	Faculty of Law	8°97'87.7"N	7°18'42.5"E
8	Faculty of Social Sciences	8°58'39.7"N	7°11'06.2"E

Table 2: Families, scientific/common names and number of all herbaceous weeds observed at the study locations

S/N	Family	Scientific name	Common name	Total
1	Lamiacea	*Hyptis suaveolens*	Mint	Weed
			389	
2	Leguminosae	*Calopogonium mucunoides*	Calopo	248
3		*Senna obtusfolia.* L.	Java bean	35
4		*Senna hirtus*	Hairy senna	8
5		*Neptunia oleraceae* Lour.	Water mimosa	47
6	Malvaceae	*Sida acuta*	Broom weed	110
7		*Sida garckeana Polka*	Corymbosa R. E. Fr	20
8		*Sida rhombifola.* L.	Wire weed	22
9		*Malvastrum coromandelianum.* L.	False mallow	13
10	Poaceae	*Paspalum vaginatum SW.*	Seashore paspalum	88
11		*Digitaria nuda (Schumach.)*	Crab grass	28
12		*Pennisetum pedicellatum*	Feather grass	16
13		*Paspalum scrobiculatum.* L.	Kodo millet	22
14		*Hackelochloa granularis.* L.	Pit scale grass	31
15		*Seteria megaphylla (Steud.)*	Big leaf bristle grass	36
16		*Bracharia lata (Schumach)*	Signal grass	31
17		*Panicum laxum. Sw.*	Lax panic grass	20
18		*Dactylocetenium aegyptium*	Crow foot grass	9
19		*Cynodon dactylon*	Bermuda grass	23
20		*Digitaria horizontalis* Will.	Digit grass	21
21		*Sporobolus pyramidalis*	Cat's tail grass	10
22		*Digitaria longiflora*	Crab grass	14
23		*Rottboellia cochinensis*	Itch grass	14
24	Azollaceae	*Azolla pinata. Br.*	Mosquito fern	63
25	Rubiaceae	*Mitracarpus villosus*	Mitracarpus hirtus	56
26		*Oldenlandia corymbosa.* Linn.	Diamond flower	31
27		*Spermacocoe ocymoides*	Button weed	31
28	Campanulaceae	*Wahlenbergia perrotteti*	Manding Bambara	5
29	Cyperaceae	*Mariscus alternifolius*	Umbrella sedge	19
30	Asteraceae	*Synedrella nodiflora gaertn*	Starwort synedrella	53
31		*Tridax procumbens*	Tridax, coat buttons	81
32		*Ageratum conyzoides* Linn.	Billy goat weed	16
33	Euphorbiaceae	*Euphorbia hirta.* L.	Asthma plant	12
34		*Euphorbia hyssopifolia* Linn.	Hyssop leaf sand mat	6

35		*Euphorbia heterophylla* L.	Spurge weed	10
36	Portulacaceae	*Portulaca oleraceae Lour.*	Hog weed	10
37	Commelinaceae	*Commelina erecta* L.	Whitemouth dayflower	26
38	Typhaceae	*Typha australis Schum. & Thonn*	Reed maces	38
39	Convolvulaceae	*Ipomea quamoclit* L.	Cypress vine	14
				Mean?
Total	**14 families**			**1735**

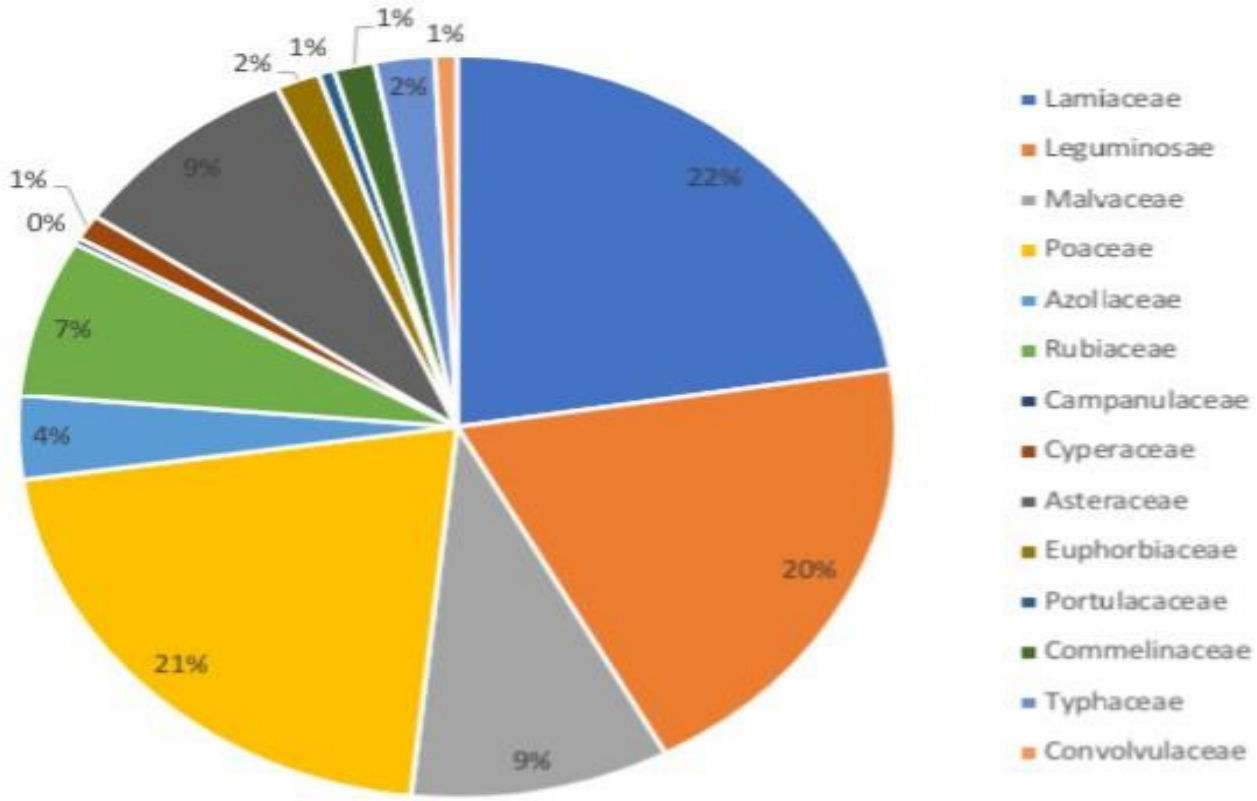

Figure I: Pie chart showing distribution of herbaceous weeds at the study locations

Table 3. Distribution of herbaceous weeds at University of Abuja School Gate

S/N	Family	Scientific name	Common name	Total	F(%)	RF	D	RD	A
1	Lamiaceae	*Hyptis suaveolens*	Mint weed	88	100	16.5	7.3	32.4	733.3
2	Leguminosae	*Calopogonium mucunoides*	Calopo	75	100	16.5	6.3	28	625.0
3	Malvacaea	*Sida Acuta Burn. F.*	Broom weed	24	75	12.4	2	8.8	266.7
4	Poaceae	*paspalum Vaginatu SW.*	Seashore paspalum	12	66	10.9	1	4.4	150.0
5	Azollacaea	*Azolla pinnata*	Mosquito fern	14	58	9.6	1.2	5.3	200.0
6	Malvaceae	*Sida Garckeana Polak.*	Sida Corymbosa R.E.Fr	20	66	10.9	1.7	7.5	250.0
7	Rubiaceae	*Mitracarpus villosus*	Mitracarpus hirtus	17	58	9.6	1.4	6.8	242.8
8	Rubiaceae	*Spermacocoe ocymoides Burm.*	Button weed	14	50	8.3	1.2	5.3	233.0
9	Campanulaceae	*Wahlenbergia perrottetii*	Manding Bambara	5	33	5.5	0.4	1.7	125.0

F=frequency RF=relative frequency D=density RD=relative density A=abundance

Table 4. Distribution of herbaceous weeds at Senate Building

S/N	Family	Scientific name	Common name	Total	F %	RF	D	RD	A
1	Poaceae	*Digitaria nuda (*Schumach.*)*	Crab grass	28	66	5.0	2.3	5.9	350.0
2	Cyperacea	*Mariscus alternifolius* Vahl.	Umbrella sedge	19	66	5.0	1.6	4.1	237.5
3	Poaceae	*pennisetum pedicellatum* Trin.	Feather Pennisetum	16	66	5.0	1.3	3.3	200.0
4	Poaceae	*Paspalum scrobiculatum* Linn.	Kodo millet	22	83	6.3	1.8	4.6	220.0
5	Rubiaceae	*Mitracarpus villosus*	Mitracarpus hirtus	16	58	4.4	1.3	3.3	228.6
6	Poaceae	*Rottboellia Cochinensis.*	Itch grass	14	66	5.0	1.2	3.1	200.0
7	Poaceae	*Hackelochola Granularis (*Linn.*)*	Pit scale grass	31	75	5.7	2.6	6.7	344.4
8	Poaceae	*Setaria Megapgylla*	Big leaf bristle grass	18	75	5.7	1.5	3.8	200.0
9	Asteraceae	*Synedrella nodiflora* Gaertn.	Starwort synedrella	14	58	4.4	2.2	3.1	175.0
10	Poaceae	*Brachiaria lata (*Schumach.*)*	Signal grass	31	58	4.4	2.6	6.7	344.4
11	Asteraceae	*Tridax procum* Linn.	Tridax, coat button	16	66	5.0	1.3	3.3	200.0
12	Rubiaceae	*Oldenlandia Corymbosa* Linn.	Diamond flower	31	75	5.7	2.6	6.7	344.4
13	Poaceae	*Paspalum Vaginatum SW.*	Seashore paspalum	28	66	5.0	2.3	5.9	350.0
14	Euphorbiaceae	*Euphorbia hirta* Linn.	Asthma plant	12	58	4.4	1	2.6	171.4
15	Leguminosae	*Senna obtusifolia. L.*	Java bean	19	75	5.7	1.6	4.1	211.1
16	Lamiaceae	*Hyptis Suaveolens*	Mint weed	69	85	6.3	5.8	14.9	690.0
17	Malvaceae	*Sida Acuta*	Broom weed	27	75	5.7	2.3	5.9	300.0
18	Leguminosae	*Calopogonium mucunoides*	Calopo	21	66	5.0	1.8	4.6	262.5
19	Azollaceae	*Azolla pinata*	Mosquito fern	35	66	5.0	2.9	7.4	437.5

F=frequency RF=relative frequency D=density RD=relative density A=abundanc

Table 5. Distribution of herbaceous weeds at Faculties of Agriculture and Veterinary Medicine

S/N	Family	Scientific name	Common name	Total	F%	RF	D	RD	A
1	Lamiaceae	*Hyptis suaveolens*	Mint weed	50	66	10.5	4.2	24.1	625.0
2	Poaceae	*Paspalum vaginatum*	Seashore paspalum	15	58	9.2	1.3	7.5	214.3
3	Portulacaceae	*Portulaca oleraceae. L*	Hog weed	10	58	9.2	0.8	4.6	142.9
4	Leguminosae	*Calopogonium mucunoides*	Calopo	38	83	13.2	3.2	18.4	380.0
5	Rubiaceae	*Mitracarpus villosus*	mitracarpus hirtus	15	66	10.5	1.3	7.5	187.5
6	Leguminosae	*Senna hirtus*	Hairy senna	8	50	7.9	0.7	4.0	133.3
7	Asteraceae	*Tridax procumbens* Linn.	Tridax, coat button	31	91	14.5	2.6	14.9	281.8
8	Poaceae	*Panicum laxum SW.*	Lax panic	20	66	10.5	1.7	9.8	250.0
9	Poaceae	*Dactyloctenium aegyptinum. L.*	Crow foot grass	9	41	6.5	0.8	4.6	180.0
10	Malvaceae	*Sida Acuta*	Broom weed	10	50	7.9	0.8	4.6	166.7

Distribution of herbaceous weeds at Faculty of University of Veterinary Medicine

S/N	Family	Scientific name	Common name	Total	F%	RF	D	RD	A
1	Malvaceae	*Sida acuta*	Broom weed	11	58	11.1	0.9	8.7	157.1
2	Poaceae	*Paspalum vaginatum*	Seashore paspalum	17	66	12.6	1.4	13.6	212.5
3	Asteraceae	*Synedrella nodiflora gaertn*	Starwort synedrella	15	66	12.6	1.3	12.6	187.5
4	Lamiaceae	*Hyptis suaveolens*	Mint weed	19	75	14.4	1.6	15.1	211.1
5	Poaceae	*Cynodon dactylon*	Bermuda grass	11	58	11.1	0.9	8.7	157.1
6	Rubiaceae	*Spermacocoe ocymoides Burm. F*	Button weed	17	66	12.6	1.4	13.6	212.5
7	Commelinaceae	*Commelina erectra. L*	Whitemouth dayflower	12	58	11.1	1	9.7	171.4
8	Leguminosae	*Calopogonium mucunoides*	Calopo	21	75	14.4	1.8	17.5	233.3

F=frequency RF=relative frequency D=density RD=relative density A=abundance

Table 6. Distribution of herbaceous weeds at Faculty of Engineering and Female Hostel

S/N	Family	Scientific name	Common name	Total	F%	RF	D	RD	A
1	Commelinaceae	*commelina erectra*	White mouth dayflower	14	66	9.8	1.2	8.5	175.0
2	Asteraceae	*Tridax procumbens*	Tridax	22	66	9.8	1.8	12.7	275.0
3	Asteraceae	*Ageratum conyzoides* Linn.	Billy goat weed	16	75	11.2	1.3	9.2	117.8
4	Leguminosae	*Calopogonium mucunoides*	Calopo	27	75	11.2	2.3	16.2	300.0
5	Poaceae	*Cynodon dactylon*	Bermuda grass	12	50	7.4	1	7.0	200.0
6	Malvaceae	*Sida acuta*	Broom weed	26	83	12.4	2.2	15.5	260.0
7	Leguminosae	*Neptunia oleraceae*	Water mimosa	17	66	9.8	1.4	9.9	212.5
8	Asteraceae	*synedrella nodiflora*	Starwort synedrrlla	15	75	1.2	1.3	9.2	166.7
9	Euphorbiaceae	*Euphorbia hyssopifolia*	Hyssop leaf sand mat	6	41	6.1	0.5	3.5	120.0
10	Typhaceae	*Typha australis*	Reed maces	14	75	11.2	1.2	8.5	155.6

Distribution of herbaceous weeds at Female Hostel

S/N	Family	Scientific name	Common name	Total	F%	RF	D	RD	A
1	Leguminosae	*Calopogonium mucunoides*	Calopo	28	100	19.8	2.3	20.2	233.3
2	Malvaceae	*Sida acuta*	Broom weed	12	58	11.5	1	8.8	171.4
3	Poaceae	*Paspalum* vaginatum SW.	Seashore paspalum	16	66	13.0	1.3	11.4	200.0
4	Lamiaceae	*Hyptis suaveolens*	Mint weed	31	83	16.4	2.6	22.8	310.0
5	Malvaceae	*Malvastrum coromendelianum*	False mallow	13	58	11.5	1.08	9.5	185.7
6	Leguminosae	*Senna obtusifolia*	Java bean	13	66	13.0	1.3	11.4	200.0
7	Malvaceae	*Sida rhombifola*	Wire weed	22	75	14.8	1.8	15.8	244.4

F=frequency RF=relative frequency D=density RD=relative density A=abundance

Table 7. Distribution of herbaceous weeds at Faculty of Law

S/N	Family	Scientific name	Common name	Total	F%	RF	D	RD	A
1	Leguminosae	*Calopogonium mucunoides*	Calopo	21	100	17.2	1.8	18	175.0
2	Lamiaceae	*Hyptis suaveolens*	Mint weed	19	75	12.9	1.6	16	211.1
3	Convolvulaceae	*Ipomoea quamoclit. L.*	Cypress vine	14	66	11.4	1.2	12	175.0
4	Typhaceae	*Typha Australis*	Reed maces	12	58	9.9	1	10	171.4
5	Leguminosae	*Neptunia oleracea*	Water mimosa	13	66	11.4	1.1	11	162.5
6	Asteraceae	*Synedrella nodiflora*	Synedrella	9	50	8.6	0.8	8	150.0
7	Asteraceae	*Tridax procumbens* Linn.	Tridax	12	58	9.9	1	10	171.4
8	Rubiaceae	*Mitracarpus villosus*	Mitracarpus	8	50	8.6	0.7	7	133.3
9	Euphorbiaceae	*Euphorbia heterophylla*	Spurge weed	10	58	9.9	0.8	8	142.9

Distribution of herbaceous weeds at Faculty of Social Sciences

S/N	Family	Scientific name	Common name	Total	F%	RF	D	RD	A
1	Leguminosae	*Neptunia oleraceae. L.*	Water mimosa	17	66	10.6	1.4	11.6	212.5
2	Poaceae	*Digitaria horizontalis*	Digit grass	21	75	12.06	1.8	14.9	233.3
3	Poaceae	*Sporobolus pyramidalis*	Cat's tail grass	10	50	8.04	0.8	14.4	166.6
4	Poaceae	*Setaria megaphylla*	Bristle grass	18	75	12.06	1.5	12.5	200.0
5	Lamiaceae	*Hyptis suaveolens*	Mint weed	22	83	13.3	1.8	14.9	220.0
6	Poaceae	*Digitaria longiflora*	Crab grass	14	66	10.6	1.2	9.9	175.0
7	Leguminosae	*Calopogonium mucunoides*	Calopo	17	66	10.6	1.4	116	212.5
8	Typhaceae	*Typha australis*	Reed maces	12	66	10.6	1	8.3	150.0
9	Azollaceae	*Azolla pinata*	Mosquito fern	14	75	12.06	1.2	9.9	155.6

F=frequency RF=relative frequency D=density RD=relative density A=abundance

DISCUSSION

The differences observed in the occurrence, population, distribution and density of the herbaceous weed species at the study locations may be attributed to variability in adaptation or tolerance to availabe environmental factors - sunlight, temperature, relative humidity, (Wyant *et al* 2019, Yousseff and Al-fredan 2014). Other factors such as soil water content, nutrient availability, pH, texture, seed bank and depth respectively, which are commonly edaphic factors may also alter species densities and distribution (Anjorin *et al.,* 2021; Fried *et al*., 2008; Pinke *et al*., 2012). Also, the variations may be ascribed to variations in requirement or uptake of these edaphic factors by each specie and responses of plasticity of morphological and physiological attributes (Wulff, 1987), of the individual species, hence, influences observed in the species distribution and variations leading to the interpopulation and intrapopulation variabilities (Barbosa *et al.,* 2013), of the herbaceous weeds found at the locations.

The generally dominant occurrence of *Hyptis suaveolens* across the study locations is associated with its characteristic to invade soils where they exist and outcompete all other plants (Anjorin *et al.,* 2021), mainly due to their allelopathic nature, seed dimorphism, prolificacy of seed production, hence, high seed bank and adaption to even adverse environmental conditions, making it an invader of tropical and sub-tropical regions of the world (Afolayan 1993).

Generally, herbaceous weeds invasion has regulated plants species diversity across tropical grasslands, (Padalia *et al.* 2014: Maia 2008, Schwarzkopf *et al.* 2014), and University of Abuja Main Campus may not be an exception, especially as most of the herbaceous weeds are capable of easy dispersal to undisturbed areas, where they may remain dormant for extended periods, until conditions become suitable (Parsons and Cuthbertson, 2001). The dominance of *Hyptis suaveolens*, *Calopogonium mucunoides* and other species with similar characteristics of withstanding varying climatic conditions, their ability to grow on a wide range of soils. (Cook *et al.,* 2005), survival mechanisms associated with high seed germination, extended seed dormancy, enduring seed dissemination and vegetative reproduction (Rao 2006), may be attributed to their high frequency at the study locations, associated with their potential to produce viable and large quantities of seeds with ability to germinate over a wide range of soils (Kissman and Groth, 1993). In many cases, annual broadleaf species tend to be more abundant in frequently disturbed conventional tillage systems (Streit *et al.,* 2003), while perennial weeds (as those in the study locations), are favored by the absence of disturbance (Buhler, 1995; Nie *et al.,* 2009; Travols *et al.,* 2016), hence, their preponderance. Also, soil Fertility influences nutrient uptake, resulting in increasing growth and often, yields, as well as in modifications of weed communities (Allan *et al.,* 2015), assumed to be a key influence for the occurrence of the weeds.

The preponderance of *Calopogonium mucunoides* and *Tridax procumbens* at the study locations (mostly undisturbed areas), may be attributed to their relatively faster growth or proliferation rates and tolerance to allelochemicals exuded by *Hyptis suaveolens*, (Raizada, 2006), or other unknown attributes (compartibility or tolerance with competing species, adaptation to diverse soil and environmental conditions) of these weeds. It is also important to note that they may have had high capacity to compete for water, light and nutrients (Zimdahl, 2004), through enhanced or profuse rooting and development. The diverse distribution of herbaceous species observed at these undisturbed locations also confirms reports that weed communities tend to be more diversified in low than in high input areas (Grough *et al.,* 2000; Suding *et al.,* 2005; Bilalis *et al.,* 2010).

CONCLUSION

Among the selected locations of University of Abuja, *Hyptis suaveolens*, *Calopogonium mucunoides* and *Tridax procumbens* were the preponderant weed speciea with varying intensities of infestation. Among the occurring families of herbaceous weeds, those belonging to Lamiaceae, Poaceae and Leguminaceae were more dominant compared to other families. Based on the results therefore, there is need for appropriate designs and implementation of weed management strategies to decrease density or noxiousness to mitigate their harmful effects. Further studies on how the species are adapting phyisiologically and morphologically to the changing climate should be given priority. This will in turn improve the survivability and productivity of agricultural and horticultural crops in drought-threatened landscapes on the Univeristy campus.

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