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Research Article

Prevalence and Distribution of Weed Flora in Some Major Sugarcane Growing Areas of Southern Guinea Savanna, Nigeria

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Abstract
Weed population survey was undertaken to determine prevalence and distribution of weeds, and asses weed flora shift in major sugarcane growing areas in Southern guinea savanna of Nigeria. The selected areas surveyed are namely Badeggi, Sulti, and Isenyi. The Sugarcane fields were assessed using 1.0 m x 1.0 m quadrat placed randomly at vegetative stage. Weed seedlings in each quadrat were clipped at the soil level and identified according to standards. Result revealed that a total of 38 weed species were recorded. Graminaea and compositae were most abundant and diversified families based on the number of species recorded. Individual weed species shows variation in their abundance, dominance and frequency. The most frequent weed species in the Sugarcane fields irrespective of the soil, climate and crop varieties were Hyptis suaveolens, Paspalum scrobiculata, Kyllinga squamulata, Dactylactenum aegypium and Cynadon dactylon and were considered as the most important species in the surveyed areas. From Similarity indices, variations were observed between locations. Accordingly, areas having similarity indices more than 60 % indicate similarities in weed community. Thus, when devising a weed control strategies same control option should be considered for the location that have similar weed flora and vise-versa.

Keywords: *Weed flora, Sugarcane, Survey, Weed Prevalence, Distribution*

Introduction

Sugarcane (*Saccharum officinarum* L.) is a leading cash crop that accounts for over 60 % of the sugar required in the world and the remnant 40 % being contributed by sugar beet (Sulaiman *et al*., 2015). In 2016, a total of 26,774,304 ha were harvested with 1.93 % of the world's harvested area, which places it as the 12th most important crop globally (FAOSTAT, 2019). For the same year, sugarcane production was 1, 890,661,751 tons, placing it as most important crop in the world in terms of volume and representing 21.1 % of the total world crop production. It is widely grown in several tropical and subtropical countries of the world (FAOSTAT, 2019). The major sugar-producing countries of the world are Brazil, India, China and Thailand which contributes 60 % of the total production (De Aquinoa *et al*., 2017). In tropical Africa, Mauritius, Kenya, Sudan, Zimbabwe, Madagascar, Ethiopia, Malawi, Zambia, Tanzania, Nigeria, Cameroun and DR Congo are the leading sugarcane producers (Sulaiman *et al*., 2015).

Weeds constitute a major factor limiting sugarcane production in Nigeria. The competition for water, light, nutrients and space between weeds and the crop can reduce sugarcane stalk population and yield. Weed interference is a major biotic constraint to optimal crop production (Takim *et al*., 2014). Weeds are one of the major factors reducing crop yield, deteriorate quality of crops and reduce farmers' income. Weeds pose tough competition to sugarcane crop because of wide spacing, slow germination and initial growth, heavy fertilization and frequent irrigations (Refsell and Hartzler, 2009). Initial slow growth and wider row spacing provide ample opportunity for weeds to occupy the vacant spaces between rows and offer serious crop- weed competition (Mahima and Bijnan, 2016). Apart from the quantitative

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damages caused by weeds due to competition with water, light and nutrients, weeds also cause a reduction in crop yield (Ahmed *et al*., 2014; Bassey *et al*., 2017). Singh *et al.* (2012) reported yield loss to an extent of 28 -38 % in ratoon crop due to weeds, and the most critical period for weed competition was between 30- 60 days after ratoon initiation. Weed can reduce sugarcane tonnage in the field, sucrose recovery in the mills and shortened ratoon lives (Chuadhari *et al*., 2016). The extent of loss in cane yield caused by weeds is from 10 % to total crop failure depending upon composition and diversity of weeds (Takim and Amodu, 2013).

Weed flora of sugarcane crop differs from one location to another depending on environmental conditions, irrigation, fertilizer use, soil type, weed control practices and cropping sequences (Anderson and Beck, 2007; Dixit *et al*., 2008a & b; Bassey *et al*., 2020). Weed growth, population density, and distribution also vary from place to place depending up on the soil and climatic factors that affect weed flora, and farmers' management practices. On the other hand, density of single or many weed species can changed depending on factors such as seed purity, choice of crop rotation, harvest time, fertilization, chemical and mechanical weed control method during long period (Bassey *et al*., 2020).

Therefore, to design effective weed control measures, identification, characterization, and quantification of weed species in a certain area are important steps to be followed. Information on weed density, distribution, and species composition may help to predict yield losses and such information helps in deciding whether it is economical to control specific weed problem (Firehun and Tamado, 2009; Bassey *et al*., 2020). Thus, survey of weed flora is a continuous process and it should be done periodically. However, little effort has been done on weed assessment in Sugarcane growing areas of southern guinea savanna (Takim *et al.*, 2014). Keeping this point in view, survey was conducted to determine the prevalence and distribution of weeds in some major sugarcane growing areas in southern guinea savanna of Nigeria.

Materials and Methods

Study sites

Survey of weed flora was conducted in three major sugarcane growing areas of Southern guinea savanna namely, NCRI Sugarcane field, Badeggi (Lat. 9^0 45' N, Long. 6^0 07' E and 89 m above sea level), Sulti Sugar Estate (09^0 18 N; $05^0$50 E and 124 m above sea level) and Isenyi Sugar Estate (Lat. 90 29' N and Long. 40 35' E and 307 m above sea level) in 2018/19 during the wet and dry season. The total rainfall during the survey period for Badeggi, Sulti and Isenyi were 1504.1, 1340.7 and 1045.4 mm, respectively while, the mean air temperature during the sugarcane vegetative stage for Badeggi, Sulti and Isenyi ranged from 35 to 38 ^{0}C, 35 to 37^{o}C and 34 to 36^{o}C in 2018/19 cropping seasons. Selected soil physical and chemical properties of the three sites before survey in 2018/19 are shown in Table 1.

Data collection, weed identification and analysis

The survey was done once at vegetative stage of the crop. Qualitative and quantitative weed data were collected in all assessed sugarcane fields using 1.0 m x 1.0 m quadrant. The first quadrant sample was taken following the procedure of (Kevme *et al*.,19 91), where the surveyor walks 50 paces along the edges of the field, turns right angle, walk 50 paces in to the field, throws quadrants and starts taking sample and each field was sampled three (3) times by 30 m distance. The number of weeds recorded by species in each quadrant was counted. The weeds were identified using the handbook of West African Weeds (Akobundu *et al*., 2016). The data on weed species composition were analyzed by abundance (A), dominance (D), frequency (F), and similarity index (SI) determinations using the principles presented by Das (2011). The composition of the weed flora was analyzed by calculating the following:

Relative abundance

This is the number of individuals of different species in a community per unit area in the quadrats where they occurred. It is used in determining the dominance of a species and can be expressed as follows:

$$R.A = \frac{Total\ number\ of\ individual\ of\ a\ species\ in\ all\ the\ quadrats}{Total\ number\ of\ quadrats\ in\ which\ the\ species\ occurred} = \sum \frac{WI}{n}$$

Where ∑ Wi is the sum of individual of a species occurring in all the quadrats, "n" is the number of quadrats in which the species occurred (Das, 2011).

Relative dominance

Relative dominance is the proportion of the basal area of a species to the sum of the basal coverage of all the species in an area. It is expressed as the percentage value obtained by dividing abundance of a species by total sum of abundance of all species

$$\text{Relative dominance (R. Do.)} = \frac{Abundance \text{ of a species}}{\text{Sum−total of } abundance \text{ of all species}}\ x\ 100$$

$$= \frac{A}{\sum Ai} \text{ x } 100$$

Where 'A' is the abundance of a species and '(∑Ai)' is the sum of abundance of all species (Das, 2011).

Relative frequency

Relative frequency can be determined from absolute frequency or by the following formula using number of species- wise occurrence of species out of total number of quadrats studied. It is useful in computing the ecological importance, that is importance value index (IVI) of individual weed species in the plant community (Das, 2011).

$$\text{Relative frequency (RF)} = \frac{Number\ of\ occurrence\ of\ a\ species}{Sum\ of\ occurrence\ of\ all\ species} \text{ x } 100$$

***Similarity index (SI)*:** It is expressed as similarity of weed communities among different locations. It was calculated as follows

SI = (Epg) / (Epg + Epa + Epb) x 100

Where, SI= similarity index; Epg = number of weed species found in all locations; Epa = number of species only in location a; Epb = number of species only in location b.

Results and Discussion

From the results of survey, out of 22 weed species recorded in Sulti Sugar Company, 11 were broadleaved weeds, 8 grassy weeds and 3 sedges. The frequency, abundance and dominance levels of individual weed species ranged from 0.49 up to 14.71 %, 2.00 up to 38.33 % and 0.98 up to 18.69 %, respectively (Table 2). The most frequent weed species observed were *Hyptis suaveolens (Poit), Cynadon dactylon (Linn.), Dactylactenum aegyptium (Linn.), Commelina benghalensis (L.), Cyperus esculentus (Linn.), Sebastiania chamaelea and Corchorus olitorius (L.),* whereas, *Gomphrena celosiodes(Mart.), Tridax procumbens (Linn.), Sesamum alatum, Calopogonium mucunoides* and *Leucas martinicensis* were the least frequent one.

Boerhavia diffusa, Cynadon dactylon (Linn.), Hyptis suaveolens (Poit), Digitaria nuda (Schumach) and *Brachiaria deflexa (Schumach) C.E* were the most abundant weed species, whereas, *Tridax procumbens (Linn.), Physalis angulata, Leucas martinicensis, Rottboellia cochinchinensis(Lour.), Sebastiania chamaelea, Sesamum alatum and Calopogonium mucunoides* were the least abundant weed species. *Boerhavia diffusa, Cynadon dactylon (Linn.), Hyptis suaveolens (Poit), Digitaria nuda(Schumach)* and *Brachiaria deflexa (Schumach) C.E* were the most dominant weed species with dominance level greater than 51 % which contributed up to 0.5 % of total infestation, whereas, *Tridax procumbens (Linn.), Physalis angulata, Leucas martinicensis* and *Rottboellia cochinchinensis (Lour.)* were the least dominant with dominance level less than 5 %. They contributed up to 0.1 % of total infestation (Table 2).

From the results of survey, out of 34 weed species recorded in NCRI Sugarcane field, 14 were broadleaved weeds, 17 grassy weeds and 3 sedges. The frequency, abundance and dominance levels of individual weed species ranged from 0.38 up to 17.56 %, 2.50 up to 38.0 % and 0.46 up to 7.19 %, respectively (Table 2). The most frequent weed species observed were *Paspalum scrobiculatum Linn, Kyllinga squamulata (Thorn.ex Vahl, Eleusine indica (L) Gaertn., Imperata cylindrical (Linn.), Brachiaria jubata (Fig&De Not.) and Digitaria horizontalis (Willd.),* whereas,

Desmodium tortuosum (Sw.) DC., Ipomoea asarifolia (Desr.) Roem, Chloris pilosa, Ludwigia hyssopifolia, Cyperus rotundus (Linn.), Corchorus olitorius (L.), Trianthema portulacastrum (Linn.), Eragrostis tremula (Hochst.ex.Steud) and Andropogon gayanus were the least frequent. *Setaria pumila (Poir), Kyllinga squamulata (Thorn.ex Vahl, Brachiaria deflexa (Schumach) C.E, Andropogon gayanus, Paspalum scrobiculatum Linn., Seteria barbata (Lasr.) Kunth, Setaria longiseta (P.Beauv.), Eleusine indica (L) Gaertn., Panicum laxum Sw., Eragrostis tremula (Hochst.ex.Steud, Digitaria horizontalis(Willd.)* and *Brachiaria jubata (Fig&De Not.)* were the most abundant weed species, whereas, *Dactylactenum aegyptium (Linn.), Corchorus olitorius (L.), Hyptis suaveolens (Poit), Ipomoea asarifolia (Desr.) Roem, Ludwigia hyssopifolia, Euphorbia hirta (Linn.), Tridax procumbens (Linn.), Cleome hirta, Cyperus rotundus (Linn.)* and *Desmodium tortuosum (Sw.) DC* were the least abundant weed species. *Setaria pumila (Poir), Kyllinga squamulata (Thorn.ex Vahl, Andropogon gayanus, Seteria barbata (Lasr.) Kunth, Brachiaria deflexa (Schumach) C.E, Setaria longiseta (P.Beauv.)* and *Desmodium tortuosum (Sw.) DC* were the most dominant weed species with dominance level greater than 45 % which contributed up to 0.5 % of total infestation, whereas *Tephrosia bracteolate (Guill & Perr.), Corchorus olitorius (L.), Hyptis suaveolens (Poit), Ipomoea asarifolia (Desr.) Roem, Tridax procumbens (Linn.), Cleome hirta, Cyperus rotundus (Linn.)* and *Euphorbia hirta (Linn.)* were the least dominant with dominance level less than 7 %. They contributed up to 0.3 % of total infestation (Table 3).

From the results of survey, out of 31 weed species recorded in Isenyi Sugar Company, 20 were broadleaved weeds, 8 grassy weeds and 3 sedges. The frequency, abundance and dominance levels of individual weed species ranged from 0.46 up to 16.20 %, 2.0 up to 26.75 % and 0.85 up to 11.37 %, respectively (Table 4). The most frequent weed species observed were *Hyptis suaveolens (Poit), Dactylactenum aegyptium (Linn.), Commelina benghalensis (L.), Cleome hirta, Ipomoea asarifolia (Desr.)Roem* and *Digitaria nuda (Schumach)* whereas, *Axonopus compresus, Passiflora foetida, Sesamum alatum (Thonning), Corchorus olitorius (L.)* and *Eleusine indica (L) Gaertn* were the least frequent. *Seteria barbata (Lasr.) Kunth, Hyptis suaveolens (Poit), Setaria longiseta* and *Phyllanthus niruri (Schum & ThonI* were the most abundant weed species, whereas, *Merremia aegyptia(Linn.), Tridax procumbens (Linn.), Cynadon dactylon (Linn.), Euphorbia heterophylla (Linn.), Corchorus olitorius (L.), Physalis angulata, Senna obtusifolia, Axonopus compresus, Passiflora foetida, Schwenckia Americana, Clome viscose, Hibiscus asper (Hoek.f.)* and *Oldenlandia herbacea (Linn.) Roxb.* were the least abundant weed species. *Hibiscus asper (Hoek.f.), Tridax procumbens(Linn.), Seteria barbata (Lasr.) Kunth, Hyptis suaveolens (Poit), Setaria longiseta, Sesamum alatum (Thonning)* and *Boerhavia diffusa* the most dominant weed species with dominance level greater than 45 % which contributed up to 0.4 % of total infestation whereas, *Cynadon dactylon (Linn.), Euphorbia heterophylla (Linn.), Corchorus olitorius (L.), Senna obtusifolia, Axonopus compresus, Passiflora foetida, Schwenckia Americana* and *Clome viscose* were the least dominant with dominance level less than 30 %. They contributed up to 0.4 % of total infestation (Table 4).

Results of data regarding the similarity indices revealed that weed species composition was different across locations. Accordingly, except for NCRI Sugarcane field and Isenyi sugarcane fields in southern guinea savanna, weed species composition in sugarcane fields was similar (SI > 60%) among the surveyed sites (Tables 5). Similarly, weed species composition was similar between assessed fields of Sulti Sugar Company and Badeggi Sugarcane Field (Tables 5). This might be because of the variation in soil, climatic and human practices among these locations. Similarly, Anderson and Beck (2007) and Dixit *et al*. (2008a & b) reported that weed flora of crop differs from area to area and field to field depending on environmental conditions, irrigation, fertilizer use, soil type, weed control practices and cropping sequences.

The high frequency of these species is an indication of their importance as troublesome weeds of sugarcane. This can be attributed to their rapid growth and abundant shading which produce high amounts of diaspores, which may favour the

re-infestation and positively affects neighbouring plants. These could also be as a result of their ability to adapt to the local conditions and compete efficiently with the sugarcane crops. These findings are in agreement with the work of Moreira and Bragança (2010); Batista *et al*. (2014); Ramirez *et al.* (2017) and Bassey *et al.* (2020), who stated that weed species may exhibit high frequencies only in environments that they are adapted to irrespective of the disturbances in the ecological conditions of the site.

Our finding shows that species of the Poaceae family were not highly populated in sugarcane field in the year of study. It could be that some of the high amounts of diaspores produced could not favour the re-infestation due to extreme weather condition and depletion of seed reserves. This finding is not in consonance with Ndarubu *et al*. (2006) and Takim *et al*. (2014) who reputed that species of Poaceae family are the most densely populated weeds associated with sugarcane in Nigeria, followed by broadleaved weeds and the sedges being the least.

The dominance of these species indicates their power of regeneration, tolerance ability and survivability in sugarcane fields. In Nigeria, Ndarubu *et al*. (2006) earlier reported the scourge of poaceae family on the Nigerian sugar company Bacita fields. The high value of these species indicate that their dominance and ecological success was due to their high phenotypic plasticity, more competitive characteristics such as large production of seeds, alternating forms of propagation and a high capacity of spread. These results also corroborate with the work of Blanco (2014); Rafael *et al*. (2015); Welday *et al*. (2018) and Bassey *et al.* (2020) who found that *C. esculentus* and *P. scrobiculatum* showed dominant value of weeds in sugarcane fields.

The variation observed in abundance, dominance and frequency of weed species might also be attributed to difference in farmer's practices, ecological variation like soil types and climatic conditions. This result is consistent with the findings of Mennan and Isik (2003) and Megersa *et al.* (2017), who stated that difference in altitude, climate, soil types and field management practices applied to the different survey strata could be the cause that affected the distribution, abundance and dominance of the weed species

Conclusion

Generally, from this weed population survey, it can be concluded that, the assessed Sugarcane growing locations in the Southern guinea savannah were highly diversified in weed species and contains different individual species with varied level of abundance, dominance and frequency. The most dominant families according to the frequency and number of weed species were Graminaea and Compositae, which are considered as the most important species in the surveyed areas.

Weed species composition varied between the locations in all surveyed areas. Thus, when devising a weed control strategy in the future, different weed management options would be required for the locations differing in weed flora composition whereas the same weed management practices would be advised for the locations that show the similarity indices greater than (> 60). Further identification of weed species composition, characteristics and flora change in these Sugarcane producing areas is necessary, to adopt effective weed management option that would encourage farmers to produce Sugarcane in these areas.

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Conflict of interest

There was no conflict of interest

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Table 1: Some soil physical and chemical properties of the surveyed sites in 2018

	Values		
Properties	Sulti	Isenyi	Badeggi
Sand (g kg^{-1})	795	650	76.52
Silt (g kg^{-1})	116	236	15.56
Clay (g kg^{-1})	89	114	7.92
Textural class	Loamy sand	Sandy loam	Sandy loam
pH (H_2O) (g kg^{-1})	6.7	6.8	6.40
Organic Carbon (g kg^{-1})	3.30	2.8	3.45
Total Nitrogen (g kg^{-1})	1.80	0.1	0.33
Available Phosphorus(mg kg^{-1})	18	14	23.15
Na+ (cmol kg^{-1})	0.09	0.5	0.22
K+ (cmol kg^{-1})	0.19	0.2	0.30
Mg++ (cmol kg^{-1})	0.98	1.6	3.68
Ca++ (cmol kg^{-1})	4.96	2.77	4.18
Exchangeable acidity(cmol kg^{-1})	0.11	0.04	1.07
ECEC (cmol kg^{-1})	6.32	5.05	14.67

Table 2: Weed composition, frequency, abundance and dominance in Sunti sugar company

Weed species	**LC**	**MG**	**Freq**	**Abun**	**Dom**
Corchorus olitorius(L.)	A	B	6.86	6.14	2.99
Hyptis suaveolens(Poit)	A	B	14.71	16.63	8.11
Digitaria nuda(Schumach)	A	G	5.88	16.50	8.04
Imperata cylindrical(Linn.)	P	G	1.47	10.67	5.20
Gomphrena celosiodes(Mart.)	A	B	0.49	6.00	2.93
Tridax procumbens(Linn.)	A	B	0.49	2.00	0.98
Cyperus esculentus (Linn.)	P	S	8.33	10.59	5.16
Brachiaria deflexa(Schumach) C.E	A	G	3.43	14.29	6.97
Commelina benghalensis(L.)	P	S	8.33	7.76	3.79
Dactylactenum aegyptium (Linn.)	P	G	10.29	9.81	4.78
Paspalum scrobiculatum Linn.	A	G	3.43	6.86	3.34
Rottboellia cochinchinensis(Lour.)	P	G	1.47	2.67	1.30
Phyllanthus niruri(Schum.&Thonn)	A	G	5.39	11.09	5.41
Cynadon dactylon(Linn.)	A	S	11.27	19.57	9.54
Sebastiania chamaelea	A	G	7.35	4.00	1.95
Boerhavia diffusa	P	B	2.94	38.33	18.69
Physalis angulate	A	B	1.47	2.00	0.98
Schwenckia Americana	A	B	2.45	5.20	2.54
Tephrosia linearis	P	B	1.96	5.00	2.44
Leucas martinicensis	A	B	0.98	2.00	0.98
Sesamum alatum	A	B	0.49	4.00	1.95
Calopogonium mucunoides	A	B	0.49	4.00	1.95

Table 3: Weed composition, frequency, abundance and dominance in NCRI Badeggi Sugarcane field

Weed species	LC	MG	Freq	Abun	Dom
Andropogon gayanus	P	G	0.76	29.00	5.37
Kyllinga squamulata(Thorn.ex Vahl	A	S	13.36	36.00	6.67
Cynadon dactylon(Linn.)	P	G	1.15	9.33	1.73
Setaria verticillata	A	G	1.15	8.67	1.61
Cleome viscose(L.	A	B	1.53	7.00	1.30
Setaria pumila(Poir)	A	G	1.91	38.80	7.19
Eragrostis tremula(Hochst.ex.Steud	A	G	0.76	22.00	4.08
Sacciolepis Africana(Hubb & Snowd	P	G	2.29	18.33	3.40
Panicum laxum Sw.	A	G	1.15	25.67	4.76
Seteria barbata (Lasr.)Kunth	A	G	3.05	28.00	5.19
Euphorbia hirta (Linn.)	A	B	1.15	4.67	0.86
Digitaria horizontalis(Willd.)	A	G	5.73	22.53	4.18
Tridax procumbens(Linn.)	A	B	1.15	4.67	0.86
Eleusine indica(L) Gaertn.	A	G	9.16	25.13	4.66
Brachiaria jubata(Fig&De Not.)	A	G	5.34	22.86	4.24
Cyperus esculentus (Linn.)	P	S	3.82	16.40	3.04
Brachiaria deflexa(Schumach) C.E	A	G	6.49	30.35	5.62
Imperata cylindrical(Linn.)	P	G	1.91	15.60	2.89
Trianthema portulacastrum(Linn.)	A	B	0.76	11.00	2.04
Tephrosia bracteolate (Guill&Perr.)	A	B	1.53	2.50	0.46
Dactylactenum aegyptium (Linn.)	A	G	4.58	25.75	4.77
Setaria longiseta(P.Beauv.)	A	G	1.15	27.33	5.07
Chloris pilosa	A	G	0.38	13.00	2.41
Corchorus olitorius(L.)	A	B	0.76	3.00	0.56
Ipomoea asarifolia(Desr.)Roem	P	B	0.38	4.00	0.74
Digitaria milangina	A	G	3.05	16.50	3.06
Cleome hirta	A	B	1.15	5.00	0.93
Commelina diffusa(Burm.)	P	B	1.91	8.80	1.63
Cyperus rotundus(Linn.)	P	S	0.76	5.00	0.93
Hyptis suaveolens(Poit)	A	B	1.15	3.33	0.62
Paspalum scrobiculatum Linn.	P	G	17.56	29.02	5.38
Desmodium tortuosum(Sw.)DC.	A	B	0.38	6.00	1.11
Ludwigia hyssopifolia	A	B	0.76	4.00	0.74
Commelina benghalensis	P	B	1.91	10.40	1.93

Table 4: Weed composition, frequency, abundance and dominance in Isenyi sugar company

Weed species	LC	MG	Freq	Abun	Dom
Digitaria nuda(Schumach)	A	G	5.56	6.17	2.62
Dactylactenum aegyptium (Linn.)	A	G	10.19	8.18	3.48
Merremia aegyptia(Linn.)	A	B	1.85	2.00	0.85
Seteria barbata (Lasr.)Kunth	A	G	7.87	11.41	9.10
Kyllinga squamulata(Thorn.	A	S	1.39	4.00	1.70
Sida corymbosa(R.E. Fries)	A	B	3.70	2.50	1.06
Hyptis suaveolens(Poit)	A	B	16.20	11.89	9.30
Tridax procumbens(Linn.)	A	B	1.39	2.00	0.85
Eleusine indica(L) Gaertn.	A	G	4.17	5.56	2.36
Setaria longiseta	A	G	0.46	14.00	10.20
Phyllanthus niruri(Schum.&Thon	A	B	2.78	10.00	8.50
Commelina benghalensis(L.)	P	B	1.85	3.00	1.27
Cynadon dactylon(Linn.)	P	S	7.87	8.12	3.45
Euphorbia heterophylla (Linn.)	A	B	0.93	2.00	0.85
Corchorus olitorius(L.)	A	B	0.93	2.00	0.85
Rottboellia cochinchinensis(Lour.)	A	G	0.46	2.00	0.85
Ipomoea asarifolia(Desr.)Roem	P	B	1.39	3.33	1.42
Paspalum scrobiculatum Linn.	P	G	5.56	6.83	2.90
Cleome hirta	A	B	1.39	3.33	1.42
Hibiscus asper(Hoek.f.)	P	B	6.02	2.46	1.05
Cyperus esculentus (Linn.)	P	B	3.70	1.75	11.37
Cyperus rotundus(Linn.)	P	S	3.70	8.75	3.72
Oldenlandia herbacea(Linn.)Roxb.	P	B	1.39	2.67	1.13
Sesamum alatum(Thonning)	A	B	0.46	1.00	6.80
Boerhavia diffusa	A	B	3.70	1.75	4.99
Physalis angulate	A	B	1.39	8.67	3.68
Senna obtusifolia	A	B	0.93	2.00	0.85
Axonopus compresus	A	G	0.46	2.00	0.85
Passiflora foetida	P	B	0.46	2.00	0.85
Schwenckia Americana	P	B	0.93	2.00	0.85
Clome viscose	A	B	0.93	2.00	0.85

Table 5: Similarity indices of weed species composition of the study locations

Locations	Sulti	Badeggi	Isenyi
Sulti	100	60.71	64.15
Badeggi		100	52.31
Isenyi			100