Greener Journal of Agricultural Sciences
Vol. 12(1), pp. 75-85, 2022
ISSN: 2276-7770

https://gjournals.org/GJAS

Common Weeds Found in Selected Cassava Farms in Eastern Zone of Tanzania

Joseph A. Leonard[1]; Abdul B. Kudra[1]; Frederick Baijukya[2]; George M. Tryphone[1]

[1]Department of Crop Science and Horticulture, Sokoine University of Agriculture, P. O. Box 3005 Chuo Kikuu, Morogoro, Tanzania.
[2]Internatioal Institute of Tropical Agriculture, P. O. Box 34441 Dar Es Salaam, Tanzania.

ARTICLE INFO

Article No.: *022422022*
***Type*:** *Research*
Full Text: ***PDF*, *HTML*, *PHP*, *EPUB***

Accepted: *03/03/2022*
Published: *04/04/2022*

Corresponding Author
Tryphone GM
E-mail: *muhamba@ sua.ac.tz*

Keywords: *Weed, Thomas methodology, Relative Abundance, Weed density.*

ABSTRACT

A field study was conducted at Kiimbwanindi village, Mkuranga district and Ilonga village, Kilosa district. Coast and Morogoro regions of Tanzania, respectively to identify the common weeds affecting cassava fields. A total of 24 random 1 m × 1 m quadrat were placed in each cassava field where by all weed species found in each quadrat were identified to a species level. During weed identification, weed density, uniformity and frequency were calculated according to Thomas methodology and used to determine weeds' relative abundance. Also, a composite soil samples were collected based on random sampling procedure at a depth of 0 to 50 cm from each field before land preparation and analysed in the laboratory in order to determine the amount of nutrient content available in the soil. A total of 22 weeds species belonging to 16 families were identified, whereby out of these 14 were broad leaved weeds, 6 grassy weeds, 1 mushroom and 1 sedged weed belonging to 10 perennial and 12 annual weeds plant. During weed identification, *Cyperus rotundus* and *Echinochloa colona* were the most abundantweed species while *Dactyloctenium aegyptium*, *Portulaca oleracea*, *Agaricus sp* and *Bidens pilosa* were the least occurred weed species. Perennial weeds *Cyperus rotundus*, *Echinochloa colona*, *Trichodesma zeylanicum*, *Reissantia sp*, *Mucuna pruriens* and *Commelina benghalensis* found to be the mostly abundant weed species due to their ability to adapt into various soil types and their ability to reproduce as compared to other weeds. The study recommended that, research toward new or improved weed control measures is needed and also more survey work is needed on a regular basis to identify possible weed population shifts.

INTRODUCTION

Weed is any plant that originated in a natural environment and in response to imposed or natural environments evolved, and continues to do so, as an interfering associate with crops of interest and its activities. Weeds can also be defined as the plants, which grow where they are not wanted that is objectionable or interferes with the activities or welfare of man (Rana and Rana, 2016; Conrad et al., 2018). The interference of weeds in the farm, they interface with the utilization of natural resources, harmful, dangerous, prolific, persistent, resistant, competitive, even poisonous, and economically detrimental and can grow under adverse climatic conditions (Rana and Rana, 2016). Weeds have the following characteristics; they have long seed life in soil, they are quick in emergence, they have ability to survive and prosper under the disturbed conditions of a cropped field, they have rapid early growth and they do not have any special environmental requirements for their seeds to germination. Example Rana and Rana (2016), explained that *Cyperus rotundus* which have 78% viability can propagate through tubers.

Weeds can be classified using taxonomic key (Scientific identification method) where by all the visible characteristics of the plant that remain roughly constant among all individuals within a specific species are identified. Due to that, Rana and Rana (2016) mentioned, there are at least 450 families of flowering plants and over 350,000 different species, in which only about 3,000 of them have been used by humans for food. Fewer than 300 species have been domesticated, and of these, there are about 20 that stand between humans and starvation. Other classification methods are based on life history, habitat and morphology or plant type (Rana and Rana, 2016).

Cassava is highly susceptible to weed infestation especially from perennial weeds. This is because of its initial slow growth rate, wide plant spacing used on its production and the long maturity period of between 12 and 18 months (Chikoye et al., 2001; Howeler, 2007; Ekeleme et al., 2019). According to Olorunmaiye et al., (2013), cited by Ekeleme et al., (2019), in West Africa, environments where cassava is growing tend to be dominated by perennial weed species such as *Imperata cylindrica, Chromolaena odorata, Panicum maximum, Cyperus rotundus*, and *Mimosa invisa* (Ekeleme et al., 2019). Also, Reshma et al. (2016) reported cassava requires good weed management during the first three to four months after planting, as it has a tendency of exhibiting slow initial growth and incomplete canopy cover. When the field is kept free from weeds for the first several weeks after planting, it gives the cassava a competitive edge that allows it to out compete weeds that would emerge later in the season (Reshma et al., 2016; Ekeleme et al., 2019).

Since weeds vary not only in their ability to compete with crops and reduce yields but also vary in their response to different management strategies, thus it has been reported that, in Africa, the annual cost of weed control has been estimated to be $ 4.3 billion (Kayeke et al., 2018). Also, Rana and Rana (2016) and Ekeleme et al. (2019), reported that, in cassava production, weeding activities take 50 to 80 percent of the total cassava production budget and poor and improper weeding has been reported to cause cassava root yield losses ranging from 40%-90% (Chikoye et al., 2001; Ekeleme et al., 2019). Therefore, proper weed management, and accurate weed identification (information on weed species diversity, frequency of occurrence, competitive ability and abundance) is the first step to successfully managing these weeds in a proper timing and using improved technologies.

MATERIALS AND METHODS

Description of the study sites

The study was conducted in Eastern zone of Tanzania where by two fields were selected, one at Ilonga village, Kilosa district, Morogoro region (6°46’ 27” S, 37°2’14” E, and 479.95 m asl) and another at Kiimbwanindi village, Mkuranga district Coastal region (7°12’19” S, 39°20’38” E and 93.87 m asl). At Ilonga Kilosa, the district experiences the mean annual temperature of about 25°C with an average of eight months of rainfall starting from October to May (Kajembe et al., 2013; Zakayo, 2015). According to Zakayo (2015) stated that the rainfall distribution at Kilosa site is bimodal, with short rains begins from October to January, followed by long rains starting from mid-February to May. While at Kiimbwanindi Mkuranga, average monthly temperature ranges from 18.8 °C during the coolest months of July and August to the highest monthly means of 31.9 °C to 32.6 °C during the hot season from December to March (Mkuranga, 2009). Relative humidity ranges from 67-70 % from August to October and increasing to 82 % during the wettest month of April, and the site is experiencing bi-modal rainfall pattern; form March to May (the main wet season) with averaged 550 mm of rain and November to December (short rains) with averaged 235 mm of rain (Mkuranga, 2009; RCO, 2011).

Sampling procedure

A survey of weeds in the selected cassava fields of 861 square meters each at Ilonga, and Kiimbwanindi was conducted between November 2019 and April 2020. A total of 24 quadrats (1 m × 1 m) were placed at random in each cassava field. In each quadrat all available weed species were identified to a species level, counted and recorded. Clear pictures of these weeds (including those weeds found out of the quadrats) were taken for records. The position of each field sampled was recorded using a Global Positioning System (GPS) whereby the information on history of cultivation, methods of land

preparation, fertilizer application, troublesome and most challenging weeds and weed management practices were also collected.

Data collection

Weed data: Data collected include weed species, density, frequency, uniformity and relative abundance of each weed found within a placed 1 m × 1 m quadrat.

Soil data: At each studied field, a minimum of six soil samples collected at the depth of 0-20 cm and 21-50 cm separately, were collected at a zigzag sampling procedure and then bulked to form one composite sample for each depth and each field. These soil samples were collected before land preparation and taken to IITA analytical soil laboratory to be analysed for the assessment of the soil fertility status (physical and chemical properties) of the studied area.

Data analysis

Weed data analysis: For the determination of relative abundance (RA) of each species in the Thomas method, five quantification measures were used, these are weed frequency, relative frequency, uniformity, relative uniformity, and mean field density (Thomas, 1985). The following are procedures and formulae used to determine the RA as describe by by Thomas (1985).

i. Weed density of each weed species was obtained by taking the number of real plants in each field/quadrat divide by the number of fields/quadrats. Thus

$$D_{ki} = \frac{\sum Zj}{n} \quad \text{(i)}$$

Where by

D_{ki} = density (number of plants or spikes/panicles/m^2) of the species k in field i
Z_j = number of plants/spikes/panicles in each $1m^2$ sample
n = number of fields

ii. Weed frequency of each weed species was obtained by taking the ratio of the number of fields where the species was present, to the total number of fields. Thus

$$F_k = \frac{\sum Yi}{n} \times 100 \quad \text{(ii)}$$

Where by
F_k = frequency of the species k
Y_i = present (1) or absence (0) of the species k in the field i and n = number of fields

iii. Weed uniformity indicates the percentage of quadrats infested by a species and is an estimate of the area infested by a weed. Thus

$$U_k = \frac{\sum\sum Xij}{m} \times 100 \quad \text{(iii)}$$

Where by
U_k = field uniformity value for species k,
X_{ij} = presence (1) or absence (0) of species k in quadrat j in field i, and
m = number of quadrats per field.

iv. Relative abundance is the overall evaluation of the importance of each species with respect to others, and the RA of each weed species was obtained by the formula

$$RAk = RFk + RUk + RDk \quad \text{(iv)}$$

Where by
RA_k = the relative abundance of species k
RF_k = (the frequency of species k / sum of all frequencies of all species) × 100
RU_k = (uniformity of species k / sum of all uniformity values of all species) × 100
RD_k = mean density of species k / sum of mean field densities of all species) × 100

Soil data analysis: Soil pH, amount of N, P, K, Ca and Mg nutrients were analysed in the laboratory at IITA in Dar es Salaam to assess fertility status following the soil analysis procedures stated by Jones (2001) and Jones (2012). These data were helpful in proper weed identification and in the study of the best weed management combination.

RESULTS

Physical and chemical characteristics of the soils at studied sites

Soil chemical characteristics and particle size class (0 to 20 cm and 21 to 50 cm deep) at experimental sites in 2019 are shown in Table 1. The soil of the two sites were found to be silty clay loam (24% cay, 15% silt and 61% sand) with sufficient available phosphorus, total nitrogen and exchangeable potassium (5.07 ppm, 0.25% and 0.67 $cmol_c kg^{-1}$), respectively and pH of 5.88 at Ilonga. Also, there was loamy sand (12% clay, 3% silt and 85% sand) with sufficient available phosphorus, total nitrogen and exchangeable potassium (10.79 ppm, 0.25% and 0.23 $cmol_c kg^{-1}$), respectively and pH of 5.47 at Kiimbwanindi.

This soil condition was optimal hence the locations support the cassava production (Soil staff, 1993).

Table 1: Soil characteristics of the studied sites

Parameter	Method used	Ilonga		Kiimbwanindi		Range suitable for cassava production	Rated according to:
		0-20 cm	21-50 cm	0-20 cm	21-50 cm		
pH (in H_2O)	pH meter	5.88	5.61	5.47	5.24	4.5 - 7.0	CIAT (2011)
OC (%)	Walkley - Black	1.48	1.26	0.66	0.3	4.0 - 10.0	Landon (2014)
P ($mgkg^{-1}$)	Bray 1	5.07	2.86	10.79	5.86	< 4.2	Howeler (2002)
N (%)	Kjeldahl	0.25	0.2	0.25	0.2	0.20 - 0.50	Landon (2014)
Ca ($cmol_c kg^{-1}$)	Ammonium Acetate Extraction pH 7.0	10.8	10.82	2.21	0.93	1.0 - 5.0	CIAT (2011)
Mg ($cmol_c kg^{-1}$)		2.57	2.66	0.9	0.32	0.40 - 1.00	CIAT (2011)
K ($cmol_c kg^{-1}$)		0.67	0.38	0.23	0.17	0.15 - 0.25	CIAT (2011)
Na ($cmol_c kg^{-1}$)		0.08	0.12	0.04	0.03	< 2	Howeler (2002)
Cu ($mgkg^{-1}$)	DTPA Extraction pH 7.3	2.04	2.24	0.6	0.83	0.3 - 0.8	Motsara and Roy (2008)
Zn ($mgkg^{-1}$)		0.59	0.39	2.07	1.18	1.0 - 3.0	Motsara and Roy (2008)
Mn ($mgkg^{-1}$)		21.5	21.31	26.61	26.92	1.2 - 3.5	Motsara and Roy (2008)
Fe ($mgkg^{-1}$)		55.35	50.56	20	22.39	4.0 - 6.0	Motsara and Roy (2008)
Textural class	Hydrometer	SCL	SCL	LS	SL		

SCL = silty clay loam soil, LS = loamy sand soil and SL= sandy loam soil

Weed species, families and their lifecycle

The results of the occurred weeds in the surveyed fields are presented in table 2 and table 3 for Ilonga, Kilosa site and Kiimbwanindi, Mkuranga site, respectively. A total of 22 weed species belonging to 16 families were identified. These 16 weed families include Poaceae with five species, Asteraceae and Fabaceae with two species each and Agaricaceae, Apocynaceae, Boraginaceae, Commelinaceae, Convolvulaceae, Cyperaceae, Euphorbiaceae, Lamiaceae, Nyctaginaceae, Phyllanthaceae, Portulacaceae, Celastraceae, and Malvaceae had one species. Out of these identified weed species, 14 were broadleaf weeds, 6 grassy weeds and 1 sedge weed.

Table 2: Weed species, families, life cycle and plant morphology found at Ilonga, Kilosa site during the 2019/2020 planting season

Sn	Scientific name	Family	Life cycle	Morphology
1	*Agaricus* sp	Agaricaceae	Annual	Convex cup mushroom
2	*Asclepias syriaca*	Apocynaceae	Perennial	Broad leaved
3	*Bidens pilosa*	Asteraceae	Annual	Broad leaved
4	*Boerhavia erecta*	Nyctaginaceae	Annual/Perennial	Broad leaved
5	*Commelina benghalensis*	Commelinaceae	Perennial	Broad leaved
6	*Corchorus olitorius*	Malvaceae	Annual	Broad leaved
7	*Cynodon nlemfuensis*	Poaceae	Perennial	Grass
8	*Cyperus rotundus*	Cyperaceae	Perennial	Sedge
9	*Dactyloctenium aegyptium*	Poaceae	Annual	Grass
10	*Echinochloa colona*	Poaceae	Annual	Grass
11	*Euphorbia hirta*	Euphorbiaceae	Annual	Broad leaved
12	*Ocimum gratissimum*	Lamiaceae	Perennial	Broad leaved
13	*Phyllanthus amarus*	Phyllanthaceae	Annual	Broad leaved
14	*Portulaca oleracea*	Portulacaceae	Annual	Broad leaved
15	*Trichodesma zeylanicum*	Boraginaceae	Annual	Broad leaved
16	*Cynodon plectostachyus*	Poaceae	Perennial	Grass
17	*Tridax procumbens*	Asteraceae	Perennial	Broad leaved

Table 3: Weed species, families, life cycle and plant morphology found at Kiimbwanindi, Mkuranga site during the 2019/2020 planting season

Sn	Scientific name	Family	Life cycle	Morphology
1	*Commelina benghalensis*	Commelinaceae	Perennial	Broad leaved
2	*Cynodon plectostachyus*	Poaceae	Perennial	Grass
3	*Cyperus rotundus*	Cyperaceae	Perennial	Sedge
4	*Digitaria* sp	Poaceae	Annual	Grass
5	*Ipomoea* sp	Convolvulaceae	Perennial	Broad leaved
6	*Mucuna pruriens*	Fabaceae	Annual	Broad leaved
7	*Reissantia* sp	Celastraceae	Perennial	Broad leaved
8	*Tephrosia* sp	Fabaceae	Perennial	Broad leaved

Weed density, uniformity, frequency and relative abundance

Table 4 shows the result of density, uniformity, frequency and relative abundance of weeds found in the selected farm at Ilonga, Kilosa site. *Cyperus rotundus* occurred in highest mean field densities followed by *Echinochloa colona* while *Bidens pilosa*, *Portulaca oleracea* and *Agaricus sp* were least in density. *Cyperus rotundus*, *Echinochloa colona* and *Trichodesma zeylanicum* were the highest abundant species and the most disturbing weed species at the studied site.

Table 5 shows the result of density, uniformity, frequency and relative abundance of weeds found in the selected farm at Kiimbwanindi, Mkuranga site. *Reissantia* sp had thehighest mean field densities followed by *Mucuna pruriens* while other weed species found to be very minimal. *Reissantia* sp, *Mucuna pruriens, Cyperus rotundus* and *Commelina benghalensis* were the highest occurred and the most disturbing weed species at this site.

Table 6 shows the result of density, uniformity, frequency and relative abundance of weeds found in the studied areas. *Cyperus rotundus* had high mean field densities of 130 plants m^{-2} followed by *Echinochloa colona* which occurred in 39.4 plants m^{-2} while *Euphorbia hirta*, *Ipomoea sp*, *Dactyloctenium aegyptium*, *Bidens pilosa*, *Portulaca oleracea* and *Agaricus sp* were least in density in descending order ranging from 0.06 to 0.02 plants m^{-2} mean field densities. The most widespread weed species in terms of frequency was *Cyperus rotundus*, *Cynodon plectostachyus* and *Commelina benghalensis*. *Cyperus rotundus* with 87.59% relative abundance, *Echinochloa colona* with 41.19% relative abundance, *Trichodesma zeylanicum* with 23.24% relative abundance and *Reissantia sp* with 20.65% relative abundance were the highest occurred and the most disturbing weed species in the studied sites.

Table 4: Mean field density (MFD), relative mean density (RD), frequency (F), relative frequency (RF), uniformity (U), relative uniformity (RU) and relative abundance (RA) of weed species collected during the 2019/2020 season at Ilonga village, Kilosa.

SN	Weed species	MFD (plant/m^2)	RD (%)	F (%)	RF (%)	U (%)	RU (%)	RA (%)
1	*Cyperus rotundus*	258.25	71.27	100.00	5.88	100.00	22.64	99.80
2	*Echinochloa colona*	78.79	21.75	100.00	5.88	100.00	22.64	50.27
3	*Trichodesma zeylanicum*	18.58	5.13	100.00	5.88	87.50	19.81	30.82
4	*Cynodon plectostachyus*	1.92	0.53	100.00	5.88	25.00	5.66	12.07
5	*Commelina benghalensis*	1.21	0.33	100.00	5.88	25.00	5.66	11.88
6	*Corchorus olitorius*	0.29	0.08	100.00	5.88	16.67	3.77	9.74
7	*Ocimum gratissimum*	1.00	0.28	100.00	5.88	12.50	2.83	8.99
8	*Boerhavia erecta*	0.63	0.17	100.00	5.88	12.50	2.83	8.89
9	*Asclepias syriaca*	0.54	0.15	100.00	5.88	12.50	2.83	8.86
10	*Phyllanthus amarus*	0.17	0.05	100.00	5.88	12.50	2.83	8.76
11	*Tridax procumbens*	0.17	0.05	100.00	5.88	8.33	1.89	7.82
12	*Euphorbia hirta*	0.13	0.03	100.00	5.88	8.33	1.89	7.80
13	*Cynodon nlemfuensis*	0.46	0.13	100.00	5.88	4.17	0.94	6.95
14	*Dactyloctenium aegyptium*	0.08	0.02	100.00	5.88	4.17	0.94	6.85
15	*Bidens pilosa*	0.04	0.01	100.00	5.88	4.17	0.94	6.84
16	*Portulaca oleracea*	0.04	0.01	100.00	5.88	4.17	0.94	6.84
17	*Agaricus* sp	0.04	0.01	100.00	5.88	4.17	0.94	6.84

Table 5: Mean field density (MFD), relative mean density (RD), frequency (F), relative frequency (RF), uniformity (U), relative uniformity (RU) and relative abundance (RA) of weed species collected during the 2019/2020 season at Kiimbwanindi village, Mkuranga.

SN	Weed species	MFD (plant/m^2)	RD (%)	F (%)	RF (%)	U (%)	RU (%)	RA (%)
1	*Reissantia* sp	6.17	37.95	100.00	12.50	91.67	33.33	83.78
2	*Mucuna pruriens*	5.00	30.77	100.00	12.50	79.17	28.79	72.06
3	*Cyperus rotundus*	1.75	10.77	100.00	12.50	33.33	12.12	35.39
4	*Commelina benghalensis*	2.46	15.13	100.00	12.50	20.83	7.58	35.20
5	*Digitaria* sp	0.42	2.56	100.00	12.50	25.00	9.09	24.16
6	*Tephrosia* sp	0.17	1.03	100.00	12.50	8.33	3.03	16.56
7	*Cynodon plectostachyus*	0.17	1.03	100.00	12.50	8.33	3.03	16.56
8	*Ipomoea* sp	0.13	0.77	100.00	12.50	8.33	3.03	16.30

Table 6: Frequency (F), relative frequency (RF), uniformity (U), relative uniformity (RU), mean field density (MFD), relative mean density (RD), and relative abundance (RA) of the 22 weed species collected during the 2019/2020 season in selected cassava fields in Eastern zone, Tanzania.

Sn	Weed	F (%)	RF (%)	MFD (plant/m2)	RD (%)	U (%)	RU (%)	RA (%)
1	*Cyperus rotundus*	100	8.00	130	68.67	66.67	10.92	87.59
2	*Echinochloa colona*	50	4.00	39.40	20.81	100.00	16.38	41.19
3	*Trichodesma zeylanicum*	50	4.00	9.29	4.91	87.50	14.33	23.24
4	*Reissantia* sp	50	4.00	3.08	1.63	91.67	15.02	20.65
5	*Mucuna pruriens*	50	4.00	2.50	1.32	79.17	12.97	18.29
6	*Commelina benghalensis*	100	8.00	1.83	0.97	22.92	3.75	12.72
7	*Cynodon plectostachyus*	100	8.00	1.04	0.55	16.67	2.73	11.28
8	*Digitaria* sp	50	4.00	0.21	0.11	25.00	4.10	8.21
9	*Corchorus olitorius*	50	4.00	0.15	0.08	16.67	2.73	6.81
10	*Ocimum gratissimum*	50	4.00	0.50	0.26	12.50	2.05	6.31
11	*Boerhavia erecta*	50	4.00	0.31	0.17	12.50	2.05	6.21
12	*Asclepias syriaca*	50	4.00	0.27	0.14	12.50	2.05	6.19
13	*Phyllanthus amarus*	50	4.00	0.08	0.04	12.50	2.05	6.09
14	*Tridax procumbens*	50	4.00	0.08	0.04	8.33	1.37	5.41
15	*Tephrosia* sp	50	4.00	0.08	0.04	8.33	1.37	5.41
16	*Euphorbia hirta*	50	4.00	0.06	0.03	8.33	1.37	5.40
17	*Ipomoea* sp	50	4.00	0.06	0.03	8.33	1.37	5.40
18	*Cynodon nlemfuensis*	50	4.00	0.23	0.12	4.17	0.68	4.80
19	*Dactyloctenium aegyptium*	50	4.00	0.04	0.02	4.17	0.68	4.70
20	*Bidens pilosa*	50	4.00	0.02	0.01	4.17	0.68	4.69
21	*Portulaca oleracea*	50	4.00	0.02	0.01	4.17	0.68	4.69
22	*Agaricus* sp	50	4.00	0.02	0.01	4.17	0.68	4.69

A weed compendium

All weeds found in the selected farms at both sites were recorded. These weeds were then identified to species level, their habit and life cycle. A total of 57 weeds belongs to 28 families were identified within and out of the random placed quadrats Appendix 1. Sample of weed pictures found at a studied sites are present below in Figure 1:

Figure 1: Some of the weeds found at studied sites

DISCUSSION

Weed density, uniformity, frequency and relative abundance from the studied sites

In the studied areas where cassava was grown, perennial weeds such as *Cyperus rotundus* tend to dominate with high density (130 plantsm^{-2}) as compared to annual weeds. This might be attributed by the reproductive ability of these perennial species, their ability to make use of the available resources in the soil and history of previous cropping systems and weed management practices. Similar results were reported by Olorunmaiye et al. (2013) who reported the high presence of perennial weeds in cassava filed.

Commelina benghalensis, *Cynodon* species and *Cyperus rotundus* had highest frequency. Frequency describes the percentage of the fields that are infested with weeds in which having high frequency is the indication of the availability of these weeds in cassava fields. Similar results to this were reported by Ekeleme et al. (2019), who stated that, environments where cassava is growing tend to be dominated by perennial weed species such as *Imperata cylindrica, Panicum maximum, Cyperus rotundus*, and *Mimosa invisa*.

Echinochloa colona, *Reissantia sp*, *Trichodesma zeylanicum*, *Mucuna pruriens* and *Cyperus rotundus* showed the highest uniformity than other weeds. Weed uniformity indicate how even these weeds are, across the fields. Weeds like *Cynodon nlemfuensis*, *Dactyloctenium aegyptium*, *Bidens pilosa*, *Portulaca oleracea* and *Agaricus sp* had the lowest uniformity which indicate they were only found in patches.

In this study, *Commelina benghalensis*, *Cynodon spp* and *Cyperus rotundus* were highly in frequency but varied in their relative abundance. *Cyperus rotundus* was highly abundant weed (87.59%) followed by *Echinochloa colona* (41.19%) and *Trichodesma zeylanicum* (23.24%). This highly abundance of these weeds is the due to their high density and frequency which reflect their dominance to the fields. The reasons

that made *Cyperus rotundus* to be abundant might be due to its ability to grow in almost every soil type over a range of soil moisture, pH and elevation as it grows best in moist fertile soils and also frequent cultivation has been suggested to promote/favour its growth. Similar results were reported by Olorunmaiye et al. (2013) that *Cyperus rotundus* can grow over a high range of soil types. *Reissantia sp*, *Mucuna pruriens* and *Commelina benghalensis* having 20.65%, 18.29% and 12.72%, respectively were also highly abundant weed species, this might be due to their ability to reproduce both sexually and asexually and highly adapted on the areas having temperature ranging from 30° C to 35° C (Webster et al., 2005) similar to that of studied sites.

CONCLUSION

The study played an important role in identifying common weed species that are mostly found in cassava fields in Eastern zone Tanzania, and hence proven that, perennial weeds *Cyperus rotundus*, *Echinochloa colona*, *Trichodesma zeylanicum*, *Reissantia sp*, *Mucuna pruriens* and *Commelina benghalensis* are the mostly and abundantly occurring weed species with intrinsic adaptive characteristics compared to other species. Thus, this study document probably the first-time common weed and its behaviour as influenced by density, uniformity, frequency and relative abundance as they are associated with cassava production systems in Eastern zone Tanzania.

Based on the above-mentioned study findings, the following have been recommended, firstly more survey work is needed on a regular basis to identify possible weed population shifts, secondly research toward new or improved control measures is needed and lastly farmers should be trained on weed management practices for increased cassava yield to optimum level.

CONFLICT OF INTEREST

I declare no potential conflict of interest.

CONTRIBUTIONS OF AUTHOR

The experiment, collection of data, data analysis, and the write-up of the manuscript was carried out by Joseph Adonia Leonard. The supervisors of this study were Abdul Kudra, George Tryphone and Frederick Baijukya. The final manuscript read and approved by all authors.

ACKNOWLEDGMENT

This is part of MSc. Research Dissertation by Joseph Adonia Leonard funded by International Institute of Tropical Agriculture (IITA) under the African Cassava Agronomy Initiative (ACAI) project.

REFERENCES

Baron, R. J. (2005). *Spatial weed distribution determined by ground cover measurements*. Dissertation for Award Degree of Master of Science in the Department of Agricultural and Bioresource Engineering at University of Saskatchewan Saskatoon. 121pp.

Chikoye, D., Ekeleme, F. and Udensi, U. E. (2001). Cogongrass suppression by intercropping cover crops in corn/cassava systems. *Weed Science* 49(5): 658-667.

CIAT (2011). The Cassava Handbook. Thai Watana Panich Press Co. Ltd., Bangkok. 801 pp.

Conrad, B., Ignacio, C. M., Corrie, M. S. and Zira, M. (2018). Weed species composition and density under conservation agriculture with varying fertiliser rate. *South African Journal of Plant and Soil* 35(5): 329-336.

Ekeleme, F., Atser, G., Dixon, A., Hauser, S., Chikoye, D., Olorunmaiye, P. M., Sokoya, G., Alfred, J., Moses C. O., Korieocha, D. S. and Olojede, A. O. (2019). Assessment of weeds of cassava and farmers management practices in Nigeria. *Tropical Agriculture* 37(2): 1-22.

Howeler, R. H. (2007). Cassava research and development in Asia: Exploring new opportunities for an ancient crop: Proceedings of the seventh regional workshop held in Bangkok, Thailand, Oct 28-Nov 1, 2002.

Howeler, R. H. (2002). Cassava Mineral Nutrition and Fertilization. In: *Cassava: Biology, Production and Utilization*. (Edited by Hillocks, R. J. et al.) CAB International, New York. pp. 115 - 147.

Jones Jr, J. B. (2012). *Plant nutrition and soil fertility manual*. CRC press. 304pp.

Kajembe, G. C., Silayo, D. S. A., Mwakalobo, A. B. and Mutabasi, K. (2013). The Kilosa District REDD+ pilot project, Tanzania. A socioeconomic baseline study IIED. *Turkish Journal of Fisheries and Aquatic Sciences* 12(4): 743–749.

Landon, J. R. (Ed.) (2014). Booker Tropical Soil Manual: A Handbook for Soil Survey and Agricultural Land Evaluation in the Tropics and Subtropics. Routledge Taylor and Francis Group, New York and London. 530pp.

Mkuranga ICMAP. (2009). Mkuranga District Integrated Coastal Management Action Plan. Prime Minister's Office Regional administration and local government, Mkuranga District Council. 170pp.

Motsara, M. R. and Roy, R. N. (2008). Guide to Laboratory Establishment for Plant Nutrient Analysis. FAO, Rome. 204pp.

Olorunmaiye, P. M., Lagoke, S. T. O., Adigun, J. A. and Orija, O. R. (2013). Effect of intercropping with maize on weed diversity in cassava. *Environmental and Experimental Biology* 11(4): 189-193.

Rana, S. S. and Rana, M. C. (2016). Principles and practices of weed management. *Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur*. 138pp.

RCO. (2011). Pwani Regional Website - Regional Commissioner's Office. [http://www.pwani.go.tz/bagamoyo/d_acl.php] site visited on 1/4/2020.

Reshma, N., Sindhu, P. V., Thomas, C. G. and Menon, M. V. (2016). Integrated weed management in cassava (*Manihot esculenta* Crantz). *Journal of Root Crops* 42(1): 22-27.

Thomas, A. G. (1985). Weed survey system used in Saskatchewan for cereal and oilseed crops. *Weed Science* 33(1): 34-43.

Webster, T. M., Burton, M. G., Culpepper, A. S., York, A. C. and Prostko, E. P. (2005). Tropical Spiderwort (*Commelina benghalensis*): A Tropical Invader Threatens Agroecosystems of the Southern United States1. *Weed Technology* 19(3): 501-508.

Zakayo, R. (2015). *Pastoral adaptive capacity in the changing climate in Kilosa district.* Doctoral Dissertation for Award Degree at Sokoine University of Agriculture. [www.weadapt.org › system › files_force › annotated_bibliography_ecosyst] site visited on 10/04/2021.

Appendix 1: Other Weeds found in the selected cassava farms during the 2019/2020 season at Ilonga, Kilosa and Kiimbwanindi, Mkuranga in Eastern Zone of Tanzania

Sn	Scientific name	Family	Life cycle
1	*Agaricus sp*	Agaricaceae	Annual
2	*Amaranthus viridis* L.	Amaranthaceae	Annual
3	*Celosia trigyna* L.	Amaranthaceae	Erect annual plant
4	*Annona senegalensis*	Annonaceae	Perennial
5	*Asclepias syriaca*	Apocynaceae	Perennial
6	*Acanthospermum hispidium*	Asteraceae	Branched annual plant
7	*Ageratum conyzoides* L.	Asteraceae	Annual plant
8	*Bidens Pilosa* L.	Asteraceae	Annual plant
9	*Conyza* sp	Asteraceae	Annual plant
10	*Emilia javanica* L.	Asteraceae	Annual herb
11	*Kleinia* sp	Asteraceae	Perennial herbs
12	*Launaea cornuta*	Asteraceae	Herbaceous perennial plant
13	*Tridax procumbens* L.	Asteraceae	Annual, sometimes perennial
14	*Markhamia obtusifolia*	Bignoniaceae	Perennial
15	*Trichodesma zeylanicum*	Boraginaceae	Annual plant
16	*Reissantia sp*	Celastraceae	Perennial
17	*Gloriosa superba* L.	Colchicaceae	Perennial
18	*Commelina benghalensis* L.	Commelinaceae	Herbaceous perennial plant,
19	*Bonamia mossambicensis*	Convolvulaceae	Perennial
20	*Ipomoea sp*	Convolvulaceae	Perennial
21	*Jacquemontia* sp	Convolvulaceae	Perennial
22	*Merremia tridentate* L.	Convolvulaceae	Perennial herb
23	*Cucumis* sp	Curcubitaceae	Perennial plant
24	*Cyperus rotundus*	Cyperaceae	Perennial
25	*Kylinga erecta*	Cyperaceae	Creeping perennial glabrous sedge
26	*Acalypha ciliate*	Euphorbiaceae	Annual herb
27	*Euphorbia heterophylla* L.	Euphorbiaceae	Annual plant
28	*Euphorbia hirta* L.	Euphorbiaceae	Annual herb
29	*Phyllanthus amarus*	Euphorbiaceae	Annual plant
30	*Mucuna pruriens*	Fabaceae	Annual
31	*Senna hirsuta* L.	Fabaceae	Herbaceous perennial shrub
32	*Tephrosia sp*	Fabaceae	Perennial
33	*Cenchurus mitis*	Gramineae	Annual crop
34	*Cynodon dactylon* L.	Gramineae	Perennial grass

35	*Cleodendrum johnstonii*	Lamiaceae	Perennial
36	*Ocimum* sp	Lamiaceae	Perennial
37	*Cassia mimosoides* L.	Leguminaceae	Annual, or short-lived perennial herb
38	*Corchorus aestuan* L.	Malvaceae	Annual or perennial herb
39	*Corchorus olitoris* L.	Malvaceae	Annual or biennial herb
40	*Hibiscus surattensis* L.	Malvaceae	Climbing annual plant
41	*Melochia corchorifolia* L.	Malvaceae	Spreading perennial plant
42	*Waltheria indica* L.	Malvaceae	Perennial plant
43	*Corchorus olitorius*	Malvaceae	Annual
44	*Boerhavia diffusa* L.	Nyctaginaceae	Herbaceous perennial plant
45	*Boerhavia erecta* L.	Nyctaginaceae	Erect annual to perennial plant
46	*Cynodon nlemfuensis*	Poaceae	Perennial
47	*Cynodon plectostachyus*	Poaceae	Perennial
48	*Dactyloctenium aegyptium*	Poaceae	Annual
49	*Digitaria sp*	Poaceae	Annual
50	*Echinochloa colona*	Poaceae	Annual
51	*Portulaca oleraceae* L.	Portulacaceae	Annual
52	*Agathisanthemum bojeri*	Rubiaceae	Shrubby perennial herb
53	*Richardia scabra* L.	Rubiaceae	Annual plant
54	*Spermacoce pusilla*	Rubiaceae	Prostrate annual
55	*Tecca leontopetaloides* L.	Teccaceae	Perennial herb
56	*Lantana camara* L.	Verbenaceae	Perennial
57	*Tribulus terrestris* L.	Zygophyllaceae	Annual plant

Cite this Article: Leonard, JA; Kudra, AB; Baijukya, F; Tryphone, GM (2022). Common Weeds Found in Selected Cassava Farms in Eastern Zone of Tanzania. *Greener Journal of Agricultural Sciences*, 12(1): 75-85.