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Soil Properties and Land-Use Influence on Weed Occurrence in the Southern Guinea Savanna of Nigeria

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Abstract

The objective of this research was to study the relationships between soil characteristics and land use on resulting weed vegetation in order to find the most effective factors in the separation of weed species and morphological types in Southern Guinea Savannah of Nigeria. The assumption that 'soils' and 'vegetation' are closely associated was tested by describing soils along the University of Ilorin Teaching and Research Farm catena, Ilorin (located approx. on latitude 8^0 29'N, longitude 4^0 35'E on an elevation of 310m above sea level, and with an average annual rainfall of 1000 - 1240mm). There were 3 plots representing soil types on which soil profiles pits were dug for physical and chemical analysis of the soils and classification of the pedon. Two land use types (cropped and non-cropped) represented the fields which were identified within each plot from which vegetative sampling was done. The 'Soils' were considered at two levels: soil type classification [15] and soil properties (physical and chemical). 'Vegetation' was considered in three ways: species, morphology and life cycle. Richness and similarity indices showed that some weed species were common to more than one soil and land use types while others were exclusive in their existence. Results showed that weed vegetation distribution patterns were mainly related to soil characteristics such as texture, sodium, magnesium, soluble potassium, nitrogen content and land use type. The variations in weed composition and abundance in each sampled plot might have resulted from cultural practices, environmental sieve and local soil properties and conditions.

Keywords: weed; soil; land use; vegetation.

1. Introduction

The increasing and competitive demand for land, both for agricultural production and for other purposes requires that decisions be made on the most beneficial use of limited land resources, whilst at the same time conserving these resources for the future. This planning must be based on an understanding of both the natural environment and of the kinds of land use envisaged. There have been many examples of damage to natural resources and of unsuccessful land use enterprise resulting from failure to take into account the natural relationships between land and land uses. It is the function of land evaluation to bring about such understanding and to present planners with comparisons of the most promising kinds of land use [16].

Wise land use is an essential basis for a healthy and prosperous future for the human race. In many developing countries, land well-suited for the production of food is already in short supply. This is often obscured by the existence of vast areas with limited potential for production. Uses and activities such as fuel wood, cash crops, timber for construction and grazing for livestock compete with food crops for space on better quality lands. The pressures which this competition engenders, coupled with unsuitable land-use practices lead to degradation, erosion and eventually, to complete destruction of the soil [8]. Vast areas of the planet's best land resources have already been destroyed as a result of man's activities. Meanwhile the numbers of human beings and their domestic animals continue to multiply.

The analysis of species–environment relationship has always been a central issue in ecology. For over a century, ecologists have attempted to determine the factors that control plant species distribution and variation in vegetation composition. Arid and semi-arid regions are characterized by minimal precipitation and frequent droughts; thus water availability is one of the

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primary factors controlling the distribution of species [5][19]. Abiotic factors related to water availability include annual precipitation (AP), soil properties, and topography. Rooting depth, soil water potential, absorption, and distribution of nutrients are influenced by the amount and availability of soil moisture [5][19], this is therefore an indication that soil characteristics play major role in distribution of plant species.

Many weeds have wide ranges of tolerances to soil conditions including nutrient levels, textures, and pH, and/or considerable tolerance to drought, temperature extremes, waterlogging, or repeated disturbance. These weeds tend to become troublesome to farmers over wide geographic ranges, sometimes around the world. Others are adapted to specific stresses, such as the extreme soil acidity or toxic excesses of trace elements characteristic of mining wastes (these pioneer plants may do more good than harm!), or frequent flooding, such as barnyard grass (Echinocloa crus-galli), which is a major weed of rice paddies. Knowing what conditions tend to favor a particular weed species, and how that weed functions in relation to the plant community and ecosystem, can help an organic grower identify and change management practices that may be giving that weed an advantage over crops.

Knowledge of weed indicators can thus allow modification of soil management practices. Weeds can give insight into soil problems, as Soil quality affects soil factors that can affect weed presence, abundance and type. These are the thrust of this research work.

2. Material and Methods

2.1 Site Description

The experiment was conducted in the University of Ilorin Teaching and Research Farm, Ilorin, Kwara State located approximately by latitude $8^0 29'$N and longitude $4^0 36'$E, on an elevation of 310m above sea level. The area receives an average annual rainfall of between 1000mm - 1240mm [28]. It is about 15km east of Ilorin the state capital and forms part of the south western sector of the Nigerian Basement Complex. Both metamorphic and igneous rocks occur in the university farm area. The metamorphic rocks include biotite gneiss, quartzite, augen gneiss and granite gneiss. The intrusive site includes granite, pegmatite and vein quartz [28]. The site is in the Southern Guinea Savannah vegetation zone, characterized by the presence of fire tolerant woody shrubs, and trees that are about 12 meters high, and grasses that are about 1.5 to 2.5 meter in height. The peak is nearly about midway between the two valley bottoms. Slopes are generally gentle and straight.

2.2 Soil Sampling

Top (0–15 cm) soil was sampled using auger (20cm × 7cm) along the catena; starting from the crest (summit) through the upper slope (shoulder), middle slope (back slope), lower slope (foot slope), the toe slope, and bottom (flat). Notes were taken of areas where there was a change in the soil type according to the morphological properties. Profile pits were thereby dug, representative of each soil type and soil samples were taken from each pedogenic horizon in the profile for analyses and classification. The different soil types formed the experimental units. Units were divided into segments according to land use types defined by cropping activities as:

1. Cropped land (regularly cropped for at least 3 years prior to the study)
2. Non-cropped land (not cropped for at least 3 years to the study)

2.3 Soil Analysis

Profile pits were described following FAO 2006 guidelines and soil samples taken from each pedogenic horizons were subjected to physical and chemical laboratory analyses. Soil properties analyzed were; particle size, soil pH, available phosphorus, total nitrogen, exchangeable bases, percentage organic carbon, exchangeable acidity, cation exchange capacity and base saturation.

2.4 Vegetative Sampling

Quadrates of $1m^2$ were randomly marked on 3 spots in cropped and non-cropped areas within each soil type. Top soil to a depth of 15 cm were taken within the quadrats using a precision auger (7.4cm in diameter), bagged in polythene nylons, labelled both inside and outside and transported to the screen house. These soils were transferred carefully into wide plastic containers (40 cm diameter, 13cm depth), avoiding contamination. Ten perforations were made at the base of each bowl to facilitate drainage of excess water in the soil samples. Soil samples were watered to field capacity at the commencement of the experiment and on alternate days thereafter; then monitored for seed emergence. Emerging plant seedlings were enumerated either as broadleaves, grasses and sedges at four week intervals; identified to species level, counted and then pulled out. Identification of plant seedlings was carried out with the aid of the plant identification manual of [2]. Soil samples were stirred using a spatula after each assessment to stimulate germination by bringing to the surface other plants seeds that might have been deeply buried in them. The experiment was terminated at three months after its commencement.

2.5 Weeds seed bank estimation

The number (size) of plant seeds in the seed bank (Y) per land area (m^2) was estimated by multiplying the number of seeds in an auger sample (G) by the inverse ratio of the volume of soil in the auger sample to the volume of soil in $1m^2$ area sampled to the depth of the auger (10cm). The ratio was computed according to Ndarubu and Fadayomi [34] as follows:

Volume of soil from the auger sample (V_1)

$V_1 = \pi r^2 h$, where $\pi = 22/7$, r = radius of the auger and h= depth of sampling

$V_1 = 22/7 \times (3.7cm)^2 \times 10cm = 430.139cm^3$

Volume of soil from $1m^2$ area sampled (V_2)

$V_2 = L \times B \times H$, where L = length, B = breadth and H = depth of sampling.

$V_2 = 100cm \times 100cm \times 10cm = 100{,}000cm^3$

The inverse ratio (V_2/V_1) was calculated as $100000cm^3/430.139cm^3 = 232.56$.

$Y = V_2/V_1 \times G$, where

Y = estimated density of plants (number of plant species) per m^2 to the depth of 10 cm.

G = density of plants (number of plant species) in an auger sample.

The calculated inverse ratio of the volume of soil from an auger sample to the volume of soil per meter square was 232.56. The data on plant density and diversity per auger sample were therefore extrapolated to plant density and diversity per meter square by multiplying with 232.56.

2.6 Data Analysis

Quantitative analysis as density, frequency, and abundance of plant species identified as; grasses, sedges and broadleaf species were determined as per [10].

The Importance Value Index (IVI) was used to determine the overall importance of each species in the community structure. In calculating this index, the percentage values of the relative frequency, relative density and relative dominance were summed up together and this value is designated as the Importance Value Index (IVI) of the species [9].

Indices of similarity and dissimilarity were calculated by using formulae as per [32] and [38] as follows:

Index of similarity (S) = 2C/A+B

Where;

A = Number of species in the community A

B = Number of species in the community B

C = Number of common species in both the communities.

Index of dissimilarity = 1-S [6]

Species richness as a measure of the total number of species in a community was calculated by using the Margalef's index of richness (Dmg) according to [30]

Dmg = (S-1)/ In N

where:

S = Total number of species,

N = Total number of individuals.

The higher the index, the more the richness of species in the community

Species diversity and dominance were evaluated using Simpson's index of dominance and diversity.

[37] index of Dominance is given as:

$D = \Sigma (pi)^2$

where:

D = Simpson index of dominance

*p*i = the proportion of important value of the ith species (*p*i = *n*i / N)

*n*i= the importance value index of ith species and

N= important value index of all the species.

Simpson's diversity D is given as; $(\sum n (n-1))/ (N (N-1))$

Regression analysis was carried out to test the relationship of determined soil physical and chemical properties with plant populations within the soil types using Microsoft Excel and Genstat discovery edition 4 statistical package.

3. Results and Discussion

3.1 Characterization, Description and Classification of the Soils

The physical and chemical properties of three modal profiles dug are as given in Tables 1 and 2 respectively. Modal profiles were classified according to [15] as; Pit I: Gley Luvisol, Pit II: Vertic Luvisol, Pit III: Luvic Arenosol.

3.2 Physical and Chemical Properties of the Soils

Sand was the most abundant particle size fraction in the farm site. The percentage ranged between 72.48 and 88.24 with a mean of 82.03%, percent gravel ranged from 1.02% - 49.37% with a mean of 14.83%. Clay ranged between 7.76% and 24.48% and a mean of 12.10%, silt fraction had a range between 2.0% and 14.0% and a mean of 8.41% (Table 1).

Table 1: Physical property (Size fraction) of three modal profiles on UNILORIN Teaching and Research Farm site

Profile pits	Horizons	Horizon designation	% Gravel	% Sand	% Silt	% Clay	Textural class
I. Gley Luvisol	1	A_p	20.05	84.08	2.00	9.92	Loamy sand
	2	A_2	10.90	80.08	10.00	11.92	Sandy loam
	3	A_3	11.85	74.08	14.00	21.92	Sandy clay loam
	4	B_1	21.97	74.08	4.00	16.48	Sandy loam
II. Vertic Luvisol	1	A_p	2.12	84.24	6.00	9.76	Loamy sand
	2	A_2	3.17	82.24	8.00	9.76	Loamy sand
	3	A_3	1.02	88.24	4.00	7.76	Loamy sand
	4	B_1	6.46	82.24	8.00	9.76	Loamy sand
	5	B_2	13.71	80.24	8.00	11.76	Sandy loam
	6	B_3	17.23	72.48	5.60	21.92	Sandy clay loam
	7	B_4	10.26	80.08	6.00	13.92	Sandy loam
III. Luvic Arenosol	1	A_p	2.89	83.52	6.56	9.92	Loamy sand
	2	A_2	3.61	85.52	4.56	9.92	Loamy sand
	3	B_1	3.19	85.52	4.56	9.92	Loamy sand
	4	B_2	5.36	87.52	4.56	7.92	Loamy sand

A= A horizon; B= B horizon

Table 2: Results of chemical analysis of soil samples from the three modal profiles on UNILORIN Teaching and Research Farm site

Profile pits	Horizon designation	%OC	%OM	pH	Available P (cmol /kg)	Total N (%)	K^+ (cmol /kg)	Ca^+ (cmol /kg)	Mg^+ (cmol /kg)	Na^+ (cmol /kg)	Total acidity (cmol /kg)	ECEC (cmol/ kg)	% base Sat.
I	A_p	0.36	0.62	6.70	0.101	2.80	0.127	0.03	0.24	0.739	0.40	1.536	73.95
	A_2	0.50	0.86	6.90	0.005	1.75	0.793	0.05	0.24	1.174	0.80	3.057	73.83
	A_3	0.54	0.93	7.00	0.096	3.50	0.972	0.04	0.33	0.652	0.40	2.394	83.29
	B_1	1.24	2.14	7.00	0.002	18.9	1.125	0.04	0.23	0.522	10.0	11.917	16.08
II	A_p	0.20	0.34	6.80	0.083	1.70	0.230	0.03	0.17	0.522	0.60	1.552	61.34
	A_2	0.16	0.27	6.80	0.097	1.90	0.255	0.02	0.14	0.609	0.60	7.024	91.45
	A_3	0.08	0.14	6.80	0.094	0.21	0.051	0.02	0.13	0.565	0.80	1.566	48.91
	B_1	0.14	0.24	6.00	0.099	2.15	0.025	0.04	0.09	0.478	0.80	1.433	44.17
	B_2	0.06	0.10	6.40	0.198	1.2	0.102	0.03	0.17	1.131	0.40	1.833	78.17
	B_3	0.20	0.34	6.60	0.089	1.90	0.076	0.02	0.12	0.478	0.80	1.494	46.45
	B_4	0.62	1.07	7.10	0.110	2.20	0.153	0.04	0.15	1.000	0.80	2.143	62.66
III	A_p	0.42	0.72	6.70	0.081	1.20	1.151	0.17	1.63	0.783	0.20	3.934	94.91
	A_2	0.82	1.41	6.80	0.004	2.80	0.230	0.12	0.86	0.913	1.00	3.123	67.97
	B_1	0.92	1.59	6.70	0.006	2.00	0.255	0.11	0.84	0.265	0.60	2.070	71.01
	B_2	0.34	0.59	6.90	0.087	1.40	0.255	0.16	1.33	0.652	2.40	4.979	51.79

OC= Organic carbon; OM= Organic matter

pH ranged between 5.9 and 7.10 with a mean of 6.67. The pH therefore fell between neutral and acidic. Total Nitrogen had a wide range of between 0.21% - 5.9%. Percent organic matter ranged between 0.10% and 2.14%, with a mean of 1.01%. Available phosphorus had values between 0.002cmol/kg and 0.198cmol/kg, mean 0.10cmol/kg. Magnesium was the most abundant basic cation while calcium was the least abundant. Base saturation was high, and total acidity was low (Table 2).

Phyto-Sociological Survey and Important Value Indices

58 plant species belonging to 16 families were identified; 36 annuals, 22 perennials. Result in Table 3 show species composition on each soil type and their classification into morphological and lifecycle groups. The results show that both annual and perennial weed seedling populations are higher in non-cropped fields on Glay Luvisol. The reverse is the case on Luvic Arenosol while there was only a slight difference in weed seedling population from cropped and non-cropped fields on Vertic Luvisol. Details of 5 species with the highest important value indices within each soil type is given in Table 4.

Table 3: Identified weed morphological groups on the different soil types and land use types

Identified weed morphological groups on the different soil types and land use types												
Plot	**Soil Classification**	**No. of species on soil type**	**Weed seedlings**									
			Annuals		**Perennials**		**Broadleaf**		**Grass**		**Sedge**	
			C	**N**	**C**	**N**	**C**	**N**	**C**	**N**	**C**	**N**
I	Gley Luvisol	22	8	11	4	7	6	11	4	4	3	3
II	Vertic Luvisol	30	11	11	8	10	10	10	7	7	3	4
III	Luvic Arenosol	28	11	7	7	6	9	7	5	4	4	1

C= *cropped field; N= Non-cropped field*

On Gley Luvisol, land use effect was seen in weed seedling population of broadleaves, but there was no difference recorded on population for grass and sedge. On Vertic Luvisol, no difference in weed seedling population was recorded for grass and broadleaves while sedge population was slightly higher in non-cropped than cropped field. Land use effect was recorded on weed seedling populations for the three lifecycle groups on Luvic Arenosol. Seedling population was higher in cropped field for broadleaf, grass and sedge. Results in Table 4 shows that broadleaves had higher importance on heavier, gravelly Gley and Vertic Luvisol, while grass and sedge dominated on loose Luvic Arenosol. Identified broadleaf species on the Luvic Arenosol were present only on the non-cropped field.

3.3 Vegetative Richness and species diversity

Richness is a measure of the number of different species in a community. Richness and diversity (measure of richness and evenness) patterns between plots and land-use types are as shown in Table 5. Luvic Arenosol had the highest overall weed richness and diversity, while Gley Luvisol had the least. On Gley Luvisol and Luvic Arenosol, there were more species present on cropped than non-cropped fields while the reverse is the case on the Vertic Luvisol. On both Vertic Luvisol and Luvic Arenosol, diversity was higher in cropped field than on non-cropped fields. The result is opposite for Gley Luvisol.

3.4 Similarity Indices

Similarity indices used were Sorenson's similarity index and Bray-Curtis dissimilarity index. Results of the analysis showed a very dissimilarity of 80% between cropped and non-cropped field on Luvic Arenosol. Similarity and dissimilarity were both 50% on Vertic Luvisol, while dissimilarity was close for Gley Luvisol at 56% and 43% similarity. Results are as shown in Table 6. Table 7 shows similarity and dissimilarity indices between plots.

Table 4: Prevalence of weed species on soil types according to Importance Value Index (IVI)

Prevalence of weed species on soil types according to Importance Value Index (IVI)									
Soil type					**Weed population**		**Important Value Index (IVI)**		
	S/N	**Plant species**	**Life cycle**	**Plant type**	**C**	**N**	**C**	**N**	**Total**
I. Gley Luvisol	1	Ageratum conyzoides	A	Broadleaf	202	0	98.00	0	98.00
	2	Setaria babarta	A	Grass	10	30	9.66	53.15	62.82
	3	Scoparia dulcis	A	Broadleaf	54	11	36.04	23.18	59.23
	4	Oldenlandia corymbosa	A	Broadleaf	25	19	21.79	33.99	55.79
	5	Panicum maximum	P	Grass	0	25	0	42.10	42.10
II. Vertic Luvisol	1	Laportea aestuans	A	Broadleaf	30	38	39.46	45.75	85.21
	2	Pycreus lanceolatus	P	Sedge	17	23	28.33	33.26	61.59
	3	Zornia latifolia	P	Broadleaf	10	22	20.09	36.28	56.38
	4	Senna obtusifolia	A	Broadleaf	7	8	16.56	16.78	33.35
	5	Setaria babarta	A	Grass	6	8	11.22	12.78	24.01
III. Luvic Arenosol	1	Pennisetum pedicellatum	A	Grass	10	12	25.83	49.51	75.34
	2	Pycreus lanceolatus	P	Sedge	15	2	41.25	13.79	55.04
	3	Andropogon tectorum	P	Grass	8	4	26.66	20.90	47.60
	4	Crotolaria retusa	A	Broadleaf	0	7	0	45.16	45.16
	5	Oldenlandia herbacea	A	Broadleaf	0	8	0	35.22	35.22

P= Perennial; A= Annual; C= Cropped field; N= Non-cropped field

Table 5: Weed diversity on soil types and land use types measured using the Margalef's index of richness and Simpson's index of diversity

Weed diversity on soil types and land use types measured using the Margalef's index of richness and Simpson's index of diversity					
Soil type	**Land use type**	**Total number of species per plot**	**Total number of individuals in plot**	**Margalef's index of Richness**	**Simpson's Index of Diversity**
I.Gley Luvisol	overall	25	426	3.96	89%
	C	19	312	3.13	85%
	N	13	114	2.53	90%
II.Vertic Luvisol	overall	30	352	4.94	92%
	C	19	170	3.50	92%
	N	21	182	3.84	90%
III.Luvic Arenosol	overall	28	152	5.37	94%
	C	18	96	3.72	92%
	N	13	56	2.98	90%

C= *cropped field; N= non- cropped field; Overall= value for whole plot*

Table 6: Percentage similarity and dissimilarity of weed species between land use types measured by Sorenson's index of similarity and Bray-Curtis index of dissimilarity

Percentage similarity and dissimilarity of weed species between land use types measured by Sorenson's index of similarity and Bray-Curtis index of dissimilarity					
Soil type	**C**	**I**	**J**	**Sorenson's similarity index**	**Bray Curtis dissimilarity index**
I. Gley Luvisol	7	19	13	43%	56%
II. Vertic Luvisol	10	19	21	50%	50%
III. Luvic Arenosol	3	18	13	19%	80%

c= number of species common to both plots; i= number of species present in first plot (cropped field); j= number of species present in second plot (non-cropped field)

Table 7: Levels of similarity and dissimilarity of weed species occurrence between soil types following Sorenson's index of similarity and Bray-Curtis index of dissimilarity

Levels of similarity and dissimilarity of weed species occurrence between soil types following Sorenson's index of similarity and Bray-Curtis index of dissimilarity						
Soil type i	**Soil type j**	**C**	**I**	**J**	**Sorenson's similarity index**	**Bray Curtis dissimilarity index**
I. Gley Luvisol	II	12	22	30	46%	53%
	III	12	22	28	48%	52%
II. Vertic Luvisol	I	12	30	22	46%	53%
	III	13	30	28	44%	55%
III. Luvic Arenosol	I	12	28	22	48%	52%
	II	13	28	30	44%	55%

c= number of species common to both plots; i= number of species present in first plot (soil type); j= number of species present in second plot (soil type)

3.5 Influence of Land Use on Plant Distribution

Soil properties had differing effects across the soil types and land use types investigated. Results show that potassium had the most negative (73.3%) determining effect on sedge population in cropped field (4.5% in non-cropped field). Phosphorus had the most positive correlation with sedge population both on cropped and non-cropped fields with a close coefficient of determination of 46.6% in cropped and 47.6% on non-cropped fields. None of the effects of tested properties was significant at (*$p \leq 0.05$)* on sedge population. Magnesium, calcium and organic matter had strong negative relationship with sedge population in non-cropped fields at 86.8%, 79.5% and 89.4% respectively. Magnesium and organic matter had positive relationship on cropped fields, with low determining strength of 2.2% and 0.1% respectively. These relationships were significant ($p \leq 0.05$) on non-cropped fields and otherwise on cropped fields. Silt soil fraction was positively correlated with sedge population on non-cropped field but otherwise on cropped field. % sand, % silt, pH, K, Mg, ECEC, % base saturation, OC and OM differed in their relationship with sedge populations between cropped and non-cropped fields.

Sand soil fraction had a negative relationship with broadleaf populations both on cropped and non-cropped fields. The determining strength was higher on cropped field (91.9%) and significant ($p \leq 0.05$), while it was not significant at 47.5% on non-cropped field. Percentage clay and sodium were positively correlated to broadleaf populations on both fields, to a higher and significant level of 89.2% and 86.1% on cropped field respectively, and to a lower and not significant level of 38.8% and 48.9% on non-cropped fields respectively. Silt showed a strong positive relationship on non-cropped field which was significant ($p \leq 0.05$) at 84.0%. The relationship is also positive on cropped field, but insignificant ($p \leq 0.05$) at 47.6%. Magnesium showed a significant ($p \leq 0.05$) positive effect on non-cropped field at 89.0%. The relationship was negative on cropped field at 50%. Gravel, silt, K and base saturation differed in their relationship with broadleaf plant populations between cropped and non-cropped fields. None of the measured properties had significant effect on grass population on cropped field. Available phosphorus, gravel soil component and sodium were all positively correlated at 36.3%, 11% and 38% respectively. The relationship differed on non-cropped field with both available phosphorus and sodium having negative correlation with grass population at 2.6% and 2.5% respectively. None of the effects was significant ($p \leq 0.05$). Gravel was highly positively correlated with grass population on non-cropped field at 87.1% and significant ($p \leq 0.05$). Total nitrogen was positively correlated on both fields, significant ($p \leq 0.05$) at 83.7% on non-cropped field and insignificant ($p \leq 0.05$) at 5% on cropped field. % gravel, %sand, %silt, %clay, P, K, Ca, Mg and Na differed in their relationship with grass species populations on cropped and non-cropped fields.

4. Conclusions

The land use type, weed perennation and abiotic factors in the environment evidently determined the weed dynamics in this work. There was more annual than perennial weed species recorded, and more species were recorded in cropped than non-cropped fields. This may be as a result of greater disturbance in cropped fields due to management practices. Broadleaves were more abundant than other weed morphological types, with higher levels of abundance in cropped fields; this may be as a result of rapid seed germination in response to light or other stimuli that indicate recent soil disturbance and absence of competing vegetation (bare soil) in cropped fields. Grasses were more established in non-cropped fields. Grasses abundance in non-cropped fields may have resulted from their ability to shoot from vegetative propagules and easily emerge through surface residues of no-till fields. %gravel, acidity, base saturation and total nitrogen had positive influence on the abundance of grass populations, while high %gravel, acidity and nitrogen had negative influence on broadleaf and sedge populations. Potassium, magnesium and base saturation were found to have the most positive effect on sedge populations and silt soil fraction was most positively related to it.

Sodium had a positive relationship with broadleaf population, while sand had a negatively effect; more in cropped than non-cropped fields. Silt and clay fractions had the most positively effect on broadleaf populations- silt, more in non-cropped fields and clay, more in cropped fields. This relationship shows that broadleaf weed species are better able to germinate and grow in no or low till situations when the soil is loamy, while tillage enhances their growth in clayey or heavy soils. This is a relationship that results from land use. Grasses and sedges showed more variability between fields in relation to measured soil properties. It can be submitted thus that broadleaves are more specific in their occurrence on soils in relation to some soil properties given the two different land use types studied. Per cent sand, % silt, pH, K, Mg, ECEC, % base saturation, OC and OM differed in their relationship with sedge population in cropped and non-cropped fields. Percent gravel, % silt, K and % base saturation differed in their relation with broadleaf population on cropped and non-cropped fields, while per cent gravel, %sand, %silt, %clay, P, K, Ca, Mg and Na differed in their correlation with grass populations on cropped and non-cropped fields. Results obtained in this research are similar to those obtained in earlier similar works by [33] and [38].

5. References

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