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RELATIONSHIP BETWEEN SOIL SEED BANK AND STANDING VEGETATION IN FOUR DIFFERENT SITES IN ONDO EAST AND ONDO WEST LOCAL GOVERNMENT AREAS, ONDO, ONDO STATE, NIGERIA.

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ABSTRACT

This study was carried out to determine the relationships between soil seed banks and the standing vegetation in four contrasting sites (oil palm plantation,natural forest,taungya system and teak plantation) in Ondo East and Ondo West Local Government Areas of Ondo, Ondo State,Nigeria. Eight study plots measuring 25 m x25 m and comprising of four plots from each local Government areas were used in each of dry and rainy seasons for the study.Ten replicates soil samples were randomly collected in each of the two seasons from each site to a depth of 0-15cm and were subjected to seedling emergence test for six months in each case.The differences between the soil seed banks and standing vegetations were analyzed using Sorensen's similarity index while Two- way ANOVA was used to determine the variation in the seedling emergence seasonally and the total seed bank among the plots.Results indicated that the similarity between the soil seed bank and the standing vegetation was very low.Sorensen's index of similarity (%) indicated that site A(Oil palm plantation) and site D (Teak plantation) had 0%,Site B(Natural forest)had 8.5% while Site C (Taungya system) had 12.5%.It can be concluded from this study that high dispersal rates and persistence of the extant vegetation are strong determinants of the seed bank composition.Open forest canopies enhance dispersal of seeds while closed forest canopy can reduce the seed rain that may reach the ground which can

be corroborated by the fact that three out of the four sites used for this study had closed forest canopies.

INTRODUCTION

Seeds are living organisms that are responsible for the continuous existence and success of seed plants in dominating biological niches on land, from forest to grasslands both in hot and cold climates. One important function of most seeds is delaying germination which allows time for dispersal and prevents germination of all the seeds at one time. Longevity of seeds is very variable and depends on many factors, in ordinary moist soils the longevity of seeds buried in the soil range from nearly zero to several hundreds of years. Seed dormancy or longevity is what makes possible the existence of a seed bank. The seeds are alive and patient, waiting for the right time to germinate.

However, not all seeds germinate immediately; though most seeds germinate a few years after they fall onto the soil, some last several years before they germinate. All reserve of viable seeds present on or in the soil or associate litter constitutes the soil seed bank. It is also defined as a buildup of viable but ungerminated seeds in or on the soil (Lynn, 2000).The prominent roles seed banks play in rehabilitation, restoration and regeneration of forest ecosystems cannot be over emphasized. Soil seed banks play a major role in natural regeneration and restoration after disturbances such as fire, logging and over grazing in humid environments (Swaine and Hall, 1983).

Determining the composition and density of seed bank is considered as an essential step in artificial restoration of degraded vegetation (Van der Valk, 1989). The seed bank consists of new seeds recently shed or other seeds that have persisted in the soil for several years. Bakers (1989) stated that the reservoir of seeds in or on the soil corresponds to the seeds not permeated but potentially capable of replacing the annual adult plants which had disappeared by natural death or other means and perennial plants that are susceptible to diseases, disturbances (logging, shifting cultivation, forest fires e.t.c) and animal consumption including man. The seed bank is an indicator of past and present population of a community. Seed bank may play important roles in conservation of genetic diversity in natural vegetation as well as to recover endangered plants species. There are enormous viable seeds in the soil although a great number of the buried seeds might have been in the soil for few years; seeds of some species can remain viable for decades. It has been estimated that only a few percentage of the viable seeds produced in a given years develop into seedlings, the rest remain viable and will germinate in subsequent years depending on the depth of burial (Christoffoleti et al., 1998). The species richness and abundance in seed banks may provide information on the potential of a community for regeneration (William - Linera, 1993). The composition of seed bank reflects the richness of species present in the local vegetation or immediate vicinity (Saulei and Swaine, 1988). However, there is evidence that disturbance and fragmentation may influence species richness and abundance in the soil (Hopkins et al., 1987). The seed bank is an indicator of past and present populations buried by percolation, action of animals, soil litter and physical methods that have persisted in the soil for several years (Oke et al., 2007).

Natural seed bank dynamics influence processes of succession and disturbance, and determine the success of weeds and invasive plants. Seed bank exists because of natural selection for plant species that can withstand harsh conditions and germinate in optimal ones (Hyatt, 1999). The presence of seed banks in soil allows plant species to maximize its chance for survival, creating benefits for that population. Seed banks are essential to maintaining life and growth in forest. Seeds stored in the seed bank can withstand harsh conditions over many years allowing the plant species to be propagated many years after initial seed dispersal. Seed bank input is determined by the seed rain which comes from seed dispersion from mother plants and also from secondary dispersion. Seed losses result from germination, animal predation, deep burial, redispersal, natural senescence and death caused by pathogens and some animals. Seeds in the soil display horizontal and vertical dispersion reflecting initial dispersal and subsequent movement. Investigation of seed and spore bank has become a recognized and indispensable part of plant ecology now and has been an active research area.

An understanding of persistent seed bank is the key to many aspects of rehabilitation and restoration because seed banks give insight into potential regeneration of forest. A number of workers (Sandrine et al., 2005; Oke et al., 2006) worked on the species composition of seed bank in various forest soils, reporting either similarity or lack of similarity between the species in the soil seed bank and the above ground vegetation. Sandrine et al. (2005) reported that a total of 34 species were found in the above ground vegetation of which 35% were present in the seed bank, thus they concluded that there was no close relationship between the seed bank composition of vegetation of a managed temperate forest ecosystem. This study provides information on the species composition of the standing vegetation and that of the seed bank with a view to establishing the similarities and differences between the seed bank and vegetation composition of the sites.

MATERIALS AND METHODS

Description of the study sites

Four different physiognomies designated as A, B, C and D were used for the study in each of Ondo east and Ondo west local Government Areas.Physiognomy A is the oil palm plantation, B is a natural forest, C is the taungya system while D is the teak plantation.

DATA COLLECTION

In this study,eight study plots (comprising of four plots from each local government area) each measuring 25mx25m in each of dry and rainy seasons were used for the study. One plot was marked out of each of the four sites in each of the two local government areas that were used for the study.

In each of the study plots, all woody species (1m and above) and dominant under storey vegetation (mainly herbaceous) were enumerated and identified to species level. The identification followed the floral of tropical West Africa(Hutchinson and Dalziel 1954 – 1972). Species whose identification were doubted and unidentified species were collected, coded and pressed for identification or confirmation of identification in the herbarium.

Tree species composition and number of families were established for each plot. A marker was used to put A mark is place on each enumerated plant to avoid repetition of enumeration.The geographic location of each sample plot was determined at the centre of each plot by using a Global Positioning System (GPS).

In each of the four study sites, that is eight plots from the two local government areas, ten (10) replicate soil samples were randomly collected in each of the dry and rainy seasons to a depth of

0 -15cm using a metal soil auger at a specific interval. The soil samples were collected in August 2017 and March 2018 for the rainy and dry seasonsrespectively.The collected soil samples were put in polythene bags and labeled after collection and were transferred to the laboratory at the department of Biology, Adeyemi College of Education where they were spread on benches for air drying and occasionally turned for proper drying.

The soil samples collected were spread in porous shallow plastic plates (to allow excess water to drain out) in the screen house where they were watered daily and monitored for seedling emergence tests; when seedlings emerge from the soil samples in the plates, they were identified, counted and removed. Germinated seeds were observed and counted daily up to six months to confirm no further seed germination.

DATA PROCESSING AND STATISTICAL ANALYSIS:

1. Density of all enumerated woody plants in the standing vegetation was determined.
2. The species and families of the standing vegetation were also established.
3. The percentage contribution and the number of seedlings of all species as well as the number of species in the seed bank per plot was determined.
4. Variation in the seedling emergence seasonally and total seed bank among plots was determined using two - way ANOVA.
5. Sorensen's (1948)/index of similarity were used to compare the similarities inspecies composition of the soil seed bank and standing vegetation among theplots .
6. The percentage contribution of each species to the seed bank was determined seasonally.

RESULTS

TABLE 1: PLANT SPECIES COMPOSITION AND THE PERCENTAGE CONTRIBUTION OF EACH ENCOUNTERED WOODY SPECIES IN THE STANDING VEGETATIONS.

SITE A (OIL PALM PLANTATION)

S/N	PLANT SPECIES	FAMILY	DENSITY OF PLANT SPECIES IN PLOT 1 (ha-1)	DENSITY OF PLANT SPECIES IN PLOT 2 (ha-1)	MEAN DENSITY (ha-1)	% Contribution
1	*Alchornealaxiflora*	Euphorbiaceae	16	0	8	0.88
2	*Celtiszenkeri*	Ulmaceae	16	0	8	0.88
3	*Elaeisguineensis*	Palmae	608	640	624	69.02
4	*Ficus exasperata*	Moraceae	16	16	16	1.76
5	*Funtumia elastica*	Apocynaceae	80	16	48	5.30
6	*Gliricidiasepium*	Papilionoideae	16	16	16	1.76
7	*Glyphaea brevis*	Tiliaceae	16	0	8	0.88

8	*Holorrhena floribunda*	Apocynaceae	32	16	24	2.65
9	*Lannaeschimperi*	Anacardiaceae	16	0	8	0.88
10	*Margaritariadiscoidea*	Euphorbiaceae	16	16	16	1.76
11	*Morusmesozygia*	Moraceae	0	16	8	088
12	*Pterocarpussantalinoides*	Papilionoideae	64	32	48	5.30
31 3	*Rauvolfiavomitoria*	Apocynaceae	80	64	72	7.96
					904	**100**

Table 1 continued: SITE B (NATURAL FOREST)

S/N	PLANT SPECIES	FAMILY	DENSITY OF PLANT SPECIES IN PLOT 1 (ha-1)	DENSITY OF PLANT SPECIES IN PLOT 2 (ha-1)	MEAN DENSITY (ha-1)	% Contribution
1	*Agelaea Spp.*	Connaraceae	0	16	8	0.62
2	*Annonidiummanii*	Annonaceae	16	0	8	0.62
3	*Antiarisafricana*	Moraceae	32	16	24	1.87
4	*Baphianitida*	Papilionoideae	96	32	64	4.98
5	*Blighiasapida*	Sapindaceae	16	16	16	1.24
6	*Bombaxbuonopozense*	Bombaceae	16	16	16	1.24
7	*Bombaxglabberima*	Bombaceae	16	0	8	0.62

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8	*Brideliamicrantha*	Euphorbiaceae	96	48	72	5.60
9	*Celtismildbraedis*	Ulmaceae	32	16	24	1.87
10	*Celtiszenkeri*	Ulmaceae	80	48	64	4.98
11	*Cnestisferrugenia*	Connaraceae	48	32	40	3.11
12	*Cola acuminate*	Sterculiaceae	32	16	16	1.24
13	*Cola gigantean*	Sterculiaceae	320	176	248	19.28
14	*Cola millennii*	Sterculiaceae	16	32	24	1.87
14	*Cuvieraacutiflora*	Rubiaceae	16	32	24	1.87
15	*Diospyrosmonbuttensis*	Ebeneceae	16	16	16	1.24
16	*Diospyrosnigerica*	Ebenceae	108	48	78	6.07
17	*Drypeteschevalteri*	Euphorbiaceae	16	0	8	0.62
18	*Drypetes spp.*	Ebeneceae	64	0	32	2.49
19	*Elaeisguineensis*	Palmae	16	16	16	1.24
20	*Funtumiaelastica*	Apocynaceae	160	64	112	8.71
21	*Glyphae brevis*	Sterculiaceae	32	32	32	2.49
22	*Caesalpinoidea*		16	0	8	0.62
23	*Icacinatrichantha*	Icacinaceae	16	0	8	0.62
24	*Lecaniodiscuscupanioides*	Sapindaceae	48	96	72	5.60

25	*Mallotusoppisitifolius*	Euphorbiaceae	32	16	24	1.87
26	*Mansomiaaltissima*	Sterculiaceae	32	0	16	1.24
27	*Microdesmispuberula*	Pandaceae	32	0	16	1.24
28	*Miliciaexcelsa*	Moraceae	16	16	16	1.24
29	*Newbouldealaevis*	Lecythidaceae	16	32	24	1.87
30	*Rauvolfiavomitoria*	Apocynaceae	0	48	24	1.87
31	*Ricinodendronheudelotii*	Euphorbiaceae	32	48	40	3.11
32	*Sterculia oblongata*	Sterculiaceae	16	0	8	0.62
33	*Sterculiarhinopetala*	Sterculiaceae	16	32	24	1.87
34	*Terminalia superba*	Combretaceae	16	0	8	0.62
35	*Trichiliaheudelotii*	Maliaceae	16	0	8	0.62
36	*Triplochitonsclerox*	Tiliaceae	32	32	32	2

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					1,286	**100**

Table 1 continued: SITE C (TAUNGYA SYSTEM)

S/N	PLANT SPECIES	FAMILY	DENSITY OF PLANT SPECIES IN PLOT 1 (ha-1)	DENSITY OF PLANT SPECIES IN PLOT 2 (ha-1)	MEAN DENSITY (ha-1)	% Contribution
1	*Agelaeaspp*	Connaraceae	16	0	8	1.76
2	*Albiziazygia*	Mimosoideae	16	16	16	3.53
3	*Alchorneacordifolia*	Euphorbiaceae	16	0	8	1.76
4	*Brideliamicrantha*	Euphorbiaceae	16	16	16	3.53
5	*Carica papaya*	Caricaceae	32	32	32	7.07
6	*Cola acuminate*	Sterculiaceae	32	16	24	5.30
7	*Cola gigantean*	Sterculiaceae	0	16	8	1.76
8	*Cola milleni*	Sterculiaceae	16	0	8	1.76
9	*Gliridiasepium*	Papilionoideae	0	16	8	1.76
10	*Dialiumguineensis*	Caesalpiniodeae	0	16	8	1.76
11	*Ficus exasperate*	Moraceae	32	48	40	8.84
12	*Manihotesculentum*	Euphorbiaceae	360	128	244	53.98

13	*Margantariadiscoidea*	Euphorbiaceae	16	16	16	3.53
14	*Rauvolfiavomitoria*	Apocynaceae	16	0	8	1.76
15	*Vernoniaamygdalina*	Compositae	16	0	8	1.76
	TOTAL				452	100

Table 1 continued: SITE D (TEAK PLANTATION)

S/N	PLANT SPECIES	FAMILY	DENSITY OF PLANT SPECIES IN PLOT 1 (ha-1)	DENSITY OF PLANT SPECIES IN PLOT 2 (ha-1)	MEAN DENSITY (ha-1)	% Contribution
1	*Cola acuminata*	Sterculiaceae	16	16	16	1.41
2	*Gmelinaarborea*	Verbenaceae	32	64	48	4.25
3	*Glyphaea brevis*	Tiliaceae	16	0	8	0.70
4	*Holopteleagrandis*	Ulmaceae	16	16	16	1.41
5	*Icacinatrichantha*	Icacinaceae	0	16	8	0.70
6	*Tectonagrandis*	Verbenaceae	1072	992	1032	91.48
	TOTAL				1128	100

Table 2: Mean density (seeds/m^2) and percentage contributions of seedlings of each species that emerged in the seed-bank of SITE A (OIL PALM PLANTATION) in both Dry and Rainy Season Soil Collections at 0-15cm depth.

S/N	NAME OF SPECIES	DRY SEASON SEEDS/m2	% SEED BANK	RAINY SEASON SEED/m²	% SEED BANK
1	*Agelaea sp..*			18	1.94
2	*Ageratum conyzoides*	18	3.77	36	3.88
3	*Andropogon tectorum*	54	11.32	90	9.71
4	*Chromolaenaodorata*	90	18.87	207	22.33
5	*Cnetsisferrugenia*	18	3.77	27	2.91
6	*Coccorusurena*	36	7.55	72	7.77
7	*Commelinabenghalensis*	36	7 55	18	1.94
8	*CyathulaSpp*	18	3.77		
9	*Euphobiaheterophylla*	27	5.66	36	3.88
10	*Larpoteaaestuans*			18	1.94
11	*Larpoteaovalifolia*			18	1.94
12	*Ludiwigiadecurrens*			18	1.94
13	*Mariscusalternifolius*	90	18.87	153	16.50
14	*Panicum maximum*	18	3.77	36	3.88
15	*Pepperomiapelucida*	18	3.77		

16	*Poulzolziaguineensis*			18	1.94
17	*Spigeliaalthelmia*	18	3.77	36	3.88
18	*Talinumtriangulare*	18	3.77	90	9.71
19	*Vernoniacineria*	18	3.77	36	3.88
TOTAL		**477**	**100**	**927**	**100**

Table 2: Mean density (seeds/m^2) and percentage contributions of seedlings of each species that emerged in the seed-bank of SITE B (NATURAL FOREST) in both Dry and Rainy Season Soil Collections at 0-15cm depth.

S/N	NAME OF SPECIES	DRY SEED SEASON/m²	% SEED BANK	RAINY SEASON SEED/m²	% SEED BANK
1	*Ageratum conyzoides*			36	8.89
2	*Azadirachtaindica*	18	6.45		
3	*Bombaxbuonopozense*	36	12.90		
4	*Celtiszenkeri*	18	6.45	54	13.33
5	*Chromolaenaodorata*	36	12-90	54	13.33
6	*Cnestisferruginea*			18	4.44
7	*Commelinabengalensis*	18	6.45	9	2.22

8	*Dialiumguineensis*	18	6.45	18	4.44
9	*Fleuryaovalifolia*	9	3.23	18	4.44
10	*Pepperomiapelucida*	36	12.90.	18	4.44
11	*Tremaorientalis*	90	32.76	180	44.44
TOTAL		**279**	**100**	**405**	**100**

Table 3: Mean density (seeds/m^2) and percentage contributions of seedlings of each species that emerged in the seed-bank of SITE C (TAUNGYA SYSTEM) in both Dry and Rainy Season Soil Collection at 0-15cm depth.

S/N	NAME OF SPECIES	DRY SEED SEASON/m²	% SEED BANK	RAINY SEASON SEED/m²	% SEED BANK
1	*Agelae sp.*			9	0.46
2	*Ageratum conyzoides*	18	0.80	198	10.09
3	*Amaranthus Sp.*			9	0.46
4	*Azadirachtaindica*			45	2.29
5	*Carica papaya*	18	0.80	27	1.38
6	*Chromolaenaodorata*	180	8.00	396	20.18
7	*Funtumia elastic*	18	0.80	18	0.92
8	*Lantana camara*			63	3.21
9	*Larpoteaaestuans*	9	0.40	18	0.92
10	*Larpoteaovalifolia*	81	3.60	90	4.59
11	*Panicum maximum*	9	0.40		
12	*Pepperomiapelucida*	1818	80.8	918	46.79

13	*Piper guineensis*			45	2.29
14	*Poulzolziaguineensis*	9	0.40	18	0.92
15	*Spigeliaathelmia*	9	0.40		
16	*Talinumtriangulare*	63	2..80	108	5.50
17	*Vernoniacineria*	18	0.80		
TOTAL		**2250**	**100**	**1962**	**100**

Table 4 Mean density (seeds/m^2) and percentage contributions of seedlings of each species that emerged in the seed-bank of SITE D (TEAK PLANTATION) in both Dry and Rainy Season Soil Collections at 0-15cm depth.

S/N	NAME OF SPECIES	DRY SEED SEASON/m²	% SEED BANK	RAINY SEASON SEED/m²	% SEED BANK
1	*Amaranthus Spp.*	18	3.85	36	10
2	*Carica papaya*			18	5
3	*Chromolaenaodorata*	162	34.61	90	25
4	*Cyathula Spp.*			27	7.5
5	*Larpoteaaestuans*	198	42.30	144	40
6	*Pepperomiapelucida*	90	19.23	45	12.5
TOTAL		**468**	**100**	**360**	**100**

Relationship between seed bank and standing vegetation: In the study sites

In site A (oil palm plantation) nineteen (19) species emerged from the seed bank consisting of only one woody species (*Agelaea spp*.) which was not represented in the standing vegetation;

though some of the understorey herbaceous plant like *Chromolaenaodorata, Talinumtriangulare* and *Andropogon tectorum* were found in the seed bank.

In site B (Natural Forest) eleven species were found in the seedbank consisting of five woody species (*Azadirachtaindica*, *Bombaxbuorrepozense, Celtiszenkeri*, *Dialiumguineensis* and *Tremaorientalis*). In the standing vegetation only *Bombaxbuorropozense* and *Celtiszenkeri* were represented.

In site C (Taungya system) seventeen species emerged in the seed bank consisting of five woody species namely *Agelaea spp.*, *Azadirachtaindica*, *Funtumiaelastica*, *Lantana camara* and *Carica papaya*. Two woody species had representative in the standing vegetation and they were *Agelaea spp.*and *Carica papaya*.

In site D (Teak plantation) six species emerged from the seed bank consisting of only one woody species (*Carica papaya*) and five herbaceous species. There was no representative in the standing vegetation.

5.0 DISCUSSIONS

5.1 SPECIES COMPOSITION AND DENSITY OF THE SEED BANK

The soil seed bank of the four contrasting sites in Ondo East and Ondo West local government area, Ondo state was dominated mainly by herbaceous species.

Prominent among them were *Chromolaenaodorata, Ageratum conyzoides, Pepperomiapelucida*, *Cythula species*, *Larpotea species*. The following species emerged early and this could be attributed to possessions or early suitable germinating conditions and short dormancy periods. The above findings agree with Oke (1993) who reported that *Chromolaenaodorata*and

*Euphobiaheterophylla*were the first set of seedlings recorded in the first week from soil samples taken under a tropical rain forest in Nigeria. Oke*et al*. (2006) also observed that herbaceous plants dominated the seed bank of a secondary low land rain forest in Nigeria.

Domination of the study sites seed banks by herbaceous species could be ascribed to the fact that in three out of the study sites, the forest canopies are not closed, and this could enhance dispersal of seeds to the sites.

Isichei*et al.* (1995) and Oke*et al.* (2007) corroborated this fact when they reported that opening of forest canopy allows the germination of herbaceous species. It was observed in the study that only few woody species emerged in the soil seed bank of the study sites and this may be attributed to low seed population and of course, lack of dormancy mechanism in most woody species especially in primary forests as reported by Hall and Swaine, 1980. The low percentage contribution of the woody species to the density of the seed bank as reported in this study agrees with the results of Hopkins and Grahams (1983) who also reported few low percentage contribution of the woody species in Australian low land tropical rain forest. TayeJara (2000) also made a similar report from the results of his study on the seed bank studies of harena forest.

In this study, the highest seed bank density was recorded in site C (Taungya system) and this could be attributed to the fact that this site is a disturbed site where farming and logging had taken place, seed production increases after logging and replenish the seed bank.

The lowest seed bank density of 279-405 seeds/m^2 was recorded in site B (Natural forest). This could be attributed to the fact that Natural forest has closed forest canopy which reduced the seed rain that may reach the ground. Another factor is that the few seeds that reach the ground may be exposed to predation because of the amount of litter layer in the forest soil which does not give room for easy burial of the seeds.

The other two sites had intermediate values of 477-927 seeds/m² and 360-468 seeds/m² in the Oil palm plantation and Teak plantation respectively. The total seed bank density of the sites ranged from 279-2250 seeds/m² contradicting the report of Hopkins and Graham (1983) who reported 200-4700 seeds/m² for the forest of neotropics, Africa and Australia.

The relationship between soil seed bank and above ground vegetation

In this study the relationship between the soil seed bank and above ground vegetation was generally low. Most of the species found in the above ground vegetation was absent in the seed bank. Sorensis index of similarity between the seed bank and above ground vegetation indicated that site A and site D had 0%, site B had 8.5% while site C had 12.5%. The reason for the absence of most of the woody species found in the above ground vegetation in the soil seed bank could be attributed to the fact that most of the woody species reproduce vegetatively and even when seeds are produced, they occur just beneath the litter cover but not inside the soil therefore making it impossible at times for small soil samples to detect seeds from collected soil samples.

Also, woody species possess rigid seeds with little or no dormancy and at times long germination periods which may be several years after seed storage in the soil and will definitely not germinate within the shorter period of greenhouse experiments.

The above findings in this study is in agreement with the reports of Sanderson *et al.* (2007) who reported that there was little relation between the species composition of the seed bank and the composition of the above ground vegetation in pastures of diverse mixtures of temperate forages were the same plot as in Elizabeth's study.

Also, Hopfenspergeret *al.* (2007) and Li *et al.* (2007) who reported that species composition of the above ground vegetation and the soil seed bank can differ. Several other workers had a similar report (Hill and Steven, 1981; Dessaint*et al.*, 1991; GromboneGuarantine*et al.*, 2004; Sandrine *et al.*, 2005; Mohammed *et al.*, 2008) while Dessaint*et al.* (1991) however gave a contradicting report of a high similarity (88.9%) between the species composition seed bank and that of the above ground vegetation.

CONCLUSION

The findings of this study would contribute to the information on the relationships between seed bank and extant vegetation particularly in different sites.with a view to predicting the possibleroles seed bank play in the vegetation restoration process as well as the vegetation potentials of plant communities.Furthermore,high dispersal rate and persistence of some species found in the extant vegetation are key factors in determining the seed bank composition.Open forest canopies enhance dispersal of seeds while closed forest canopies like the natural forest can reduce the seed rain that may reach the ground and hence subsequently reduce the seed bank density.

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