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Comparative study Betweensoil Seed Bank And Above Ground Vegetation Cover Along with national Park Of Khulais,Saui Arabia.

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Abstract:*The present study conducted at KhulaisNational Park , West Saudi Arabia, to assess soil seed bank, and above ground vegetation.A total of 28 emerging seedlings of plant species belonging to 7 families were recorded in the soil seed bank samples during the germination period. From the emerged seedlings 81.5% were annuals and 18.5% perennials. The range of variation between life forms was small. The dominant families were (Poaceae , Fabaceaesub.f. Mimisoideae and Portulacaceae*(*The most dominant species were Acacia ehrenbergian, Eragoristis species, Panicumturgidum, Dactyloniumaegyptiacum, Zygophyllum simplex andportulacaquadrifidaThe density of live soil seed banks in the study area was 80 seeds/m2, which consider as viable seeds.The above ground vegetation cover of the study area was determined in order to compare it is floristic composition with that of the soil seed bank. A total of 45 species were identified to represent the habitats of the study area. The most dominant family in the study area is Poaceae (Graminae).The similarity between above ground vegetation and live soil seed bank of the area in question was found to be 30.6%. This is considered a low index of similarity ,according to Sorensen (1948).*

Keywords: *Vegetation cover, emerging seedlings, live soil seed bank, life forms, density of seeds and similarity index.*

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I. Introduction :

Knowledge of seed bank composition and dynamics is a crucial factor in the definition of restoration policies and strategies (Ma et al 2010). Knowing the relation between soil seed bank and above- ground vegetation may help conservationists to manage against exotic species, plant community responses to disturbances, restore diversity and better understand the resilience of an ecosystem(Hopfensperger,2007). Seed banks were also considered to be an important potential seed source for restoration of plant communities (Bossuty et al, 2008). Most of the seeds in the seed bank come from the nearby parent plants, while the remaining seeds are contributed by plant communities along distance away from the parent plants (Slomon,2011). Seed banks play a critical role in the vegetation maintenance,succession, ecosystem restoration, differential species management of conservation of genetic variability (Hills et al 1992). Although the seed bank is an important element in a desert ecosystem , little is documented on the diversity of the soil seed bank and it is relations to the above ground vegetation in arid regions (Kemp, 1989).

The physical extraction of seeds from the soil tended to overestimate the number of germinating seeds, since extraction counts may include dormant and dead seeds. The seed numbers are normally expressed as a number of seeds/m^2 related to certain depth. The determination of the proportion of dead seeds present in the soil seed bank is important in studying population dynamics and consequently, methods of determining viabilities have been developed.

Another way for estimating changes in the size of seed bank is to register the number of emerged seedlings .The weed species have survived through time, because of their ability to resist several adverse climatic conditions including tolerance to high or low temperatures, dry or humid environmentsand variations in oxygen supply. Elsafori (2006) reported that the average seed bank size of live seeds was 3193 seeds/m^2 and 5086 seeds/m^2dead seeds in arid lands.

This study was designed to determine the composition and dynamic of soil seed banks associated with above ground vegetation cover in the study area.

II. Materials and Methods:

Collection of soil samples:

Ten transects were made and soil samples were taken from 70 sample plots(10 *10 cm), in the study area from depths (0-10cm). The global positioning system (GPS) was used to determine the images of the study area, transects and sampleplots. A total of 7 sample plots were demarcated along each transect. The samples were mixed thoroughly and a sub- sample of half weight was prepared for germination. The soil sub- samples were spread in layers 1cm deep over 10cm of sand on trays (20×20× 10cm).All the trays were randomly arranged in green houses in Agricultural Research Station of King AbdulazizUniversity, HadaElsham district, and were watered regularly with tap water to maintain a saturated condition. Seedlings were counted weekly and removed as soon as identified. Seedlings that could not be identified were transplanted to empty trays and allowed to grow until they could be identified. Germination was recorded for 8 months ,until there had no further germination.The emerged seedlings were identified by comparison with the above ground vegetation growing in the study area. Magnifying lenses and a Mbc-10 dissection were used for identification.

Determination of live seeds (emerged seedlings) of soil seed banks:

The density of live seeds was determined by the following formula:

$$\text{Density of seeds} = \frac{\text{Number of seeds /soil depth} \times 2 \times 10000}{\text{Quadrat area} \times \text{number of quadrats/soil depth}}$$

Above ground vegetation survey:

The vegetation cover of the study area was surveyed throughout the study area during two seasons (2014/2015). Fresh plant specimens were collected from different sites of the study area at different times of years 2014 and 2015. Whole plants were collected for herbs and grasses, whereas twigs with leaves, flowers and/or fruits were clipped for trees and shrubs. Further analysis and /or identification were done, initially by examining the various parts of the specimens collected by using a hand –lens. Fine floral characterswere examined under Mbc-10 dissection microscope. A preliminary species identification was carried out using a set of keys. The identified species were compared with already identified herbarium specimens.

Similarity and Dissimilarity:

Similarity indices measure the degree to which the species composition of quadrats or samples matches are alike. One of the most widely used coefficient of measuring the similarity is that of Sorenson (1948). The similarity can be calculated as follows:

$$\mathbf{Ss = \frac{2a}{2a+b+c}}$$

Where:

Ss = Soreson coefficient of similarity
a = number of species common to both quadrats and sample.
b = number of species in quadrat /sample (A).
c = number of species in quadrat /sample (B).
The coefficient is multiplied by 100 to give a percentage similarity figure.

III. The Results:

Emerged seedlings from soil seed bank of the study area:

70 soil samples were taken from 7 transects in the study area to determine the live seeds(emerging seedlings). The emerged seedlings were identified for each transect and consequently species composition in each transect was determined. The soil depth (0-10cm) was chosen for each transect and seed densities and the number of live seeds (seedlings) were determined. A total of 28 emerging seedlings of plant species belonging to 7 families were recorded in the soil seed bank samples during the germination period. From the emerged seedlings 81.5% were annuals and 18.5% perennials. The range of variation between life forms was small. The dominant families were (Poaceae , Fabaceaesub.f. Mimisoideae and Portulacaceae)

The most dominant species wereAcacia ehrenbergian, Eragoristis species, Panicumturgidum, Dactyloniumaegyptiacum,Zygophyllum simplex andportulacaquadrifida.

Table (1) Soil seed bank(emerging seedlings) at the Study area:
Depth (0------10cm)

Transect No.	Species	Live soil seeds(emerging seedlings)
1	Acacia ehrenbergiana(Forssk.)Hayne	1
2	-	-
3	Acacia ehrenbergiana(Forssk.)Hayne	2
	PanicumturgidumForssk.	1
	Eragrostisminor Host	2
	Tragus racemosusL.	1
	Dicanthumannulatum(Forssk.)Stapf.	2
	CenchrusciliarisL.	1
4	-	-
5	PortulacaquadrifidaL.	1
6	Eragoristisminor Host	1
	Tragus racemosusL.	1
	Brachairiamutica(Forssk.)Stapf.	2
	Digiteriaciliaris(Retz)Koeler	1
	PanicumturgidumForssk.	2
7	Euphorbiaaegyptiacum	1
	PortulacaquadrifidaL.	1
8	Eragoristisminor Host	1
	Tamarixaphylla (L.) Karst.	1
9	Dactyloniumaegyptiacum(L.) P.Beauv.	3
	PortulacaquadrifidaL.	1
	Zygophyllum simplexL.	1
10	Tribulusterristeris L	1
Total		28

The number of live seeds/m^2 was calculated by the following equation;

$$\text{No. of live seeds/m}^2 = \frac{\text{Number of seeds/depth} \times 2 \times 10000}{\text{Quadrat area(m}^2\text{)} \times \text{Number of quadrats/depth}}$$

$$\text{Number of live seeds} = \frac{28 \times 2 \times 10000}{100 \times 70} = 77 \text{ live seeds/m}^2$$

The seed density of live seeds in the study area was 80 seeds/m^2 , which consider as viable seeds, (Table 1). For emerging seedlings, each seedling that emerged from soil represents one seed bank. Data were expressed in seeds/$m^2$to determine the live seed in specific area and to compare with the standing vegetation in the area under study.

Above ground vegetation cover:

A total number of 45 plant species were identified, belonging to 15 families(14 Dicotyledonous, and 1 Monocotyledonous),and more than 33.3% were woody species.

Table (2): Identified plant species in the study area:

Family	Species	Habit
Amaranthaceae	AmaranthusgraecizanL.	Herb
Asclepiadaceae	Caltropisprocera (Aiton)W.T.Aiton	Shrub
	Leptadeniapyrotecnica(Forssk.)Decne.	shrub
	Odontanthera radians (Forssk.)D.V.Field	Herb
	Oxystelmaesculentum(L.F.) R.Br.	Climber
Burseraceae	Commiphirakataf(Forssk.)Engl.	Tree
	Commiphoramyrrhe(Nees.) Engl.	Tree
FabaceaeSubf.Mimosoideae	Acacia ehrenbergiana (Forssk)Hayne	Tree
	Acacia hamulosaBenth.	Tree
	Acacia tortilis(Forssk.)Hayne	Tree
	Acacia tortilissubspraddianaSavi	Tree
FabaceaeSubf.Faboideae	Indigoferahoschstetteri Baker	Herb
	IndigoferaspinosaForssk.	Herb
FabaceaeSubf.Caesalpinioideae	Sennaalexandrina Mill.	Herb
	Senna italic Mill.	Herb
Capparaceae	Capparis decidua(Forssk.)Edgew	Tree
	Cadaba farinose Forssk.	Tree
	MaeruacrassifoliaFrossk.	Shrub
Chenopodiaceae	Haloxylonpersicum Bunge.	shrub
	SalosaimbricataForssk.	Herb
	Suaedaaegyptiaca(Hasselq.)Zohary	Shrub

Euphorbiaceae	Euphorbia aegyptiacaBoiss.	Herb
	Euphorbia Arabica T.Anderson	Herb
	Euphorbia granulataForssk.	Herb
	Euphorbia indica Lam.	Herb
	PhyllanthusrotundifoliaWilld.	Herb
Nyctaginaceae	BoerhaviadiffusaL.	Herb
	BoerhaviarepensL.	Herb
Poaceae	Brachiariaeruciformis(Sm.)Griseb.	Herb
	Cenchrusciliaris L.	Herb
	Cymbopogonschoenanthus(L.) Spreng.	Herb
	Dactylocteniumaegyptium(L.)P.Beauv.	Herb
	Dicanthumannulatum(Forssk.)Stapf.	Herb
	Digitariaciliaris(Retz.)Koeler	Herb
	Eragrostis minor Host.	Herb
	PanicumturgidumForssk.	Herb
	Setariaverticillata(L.) P.Beauv.	Herb
	Tragus racemosus(L.)All.	Herb
Polygalaceae	Polygala eriopteraDC.	Herb
Portulacaceae	PortulacaoleraceaL.	Herb
Salvadoraceae	SalvadorapersicaL.	Tree
Tamaricaceae	Tamarixaphylla(L.) Kast.	Tree
Tiliaceae	Corchorusdepressus(L.) Stocks	Herb
Zygophyllaceae	FagoniaindicaBurm.	Herb
	TribulusterrestrisL.	Herb

The above ground vegetation cover of the study area was determined in order to compare it is floristic composition with that of the soil seed bank. A total of 45 species were identified to represent the habitats of the study area. The most dominant family in the study is Poaceae (Graminae).

Similarity coefficient between above ground vegetation cover (A) and live soil seed bank (emerged seedlings) (B) in the study area:

Similarity coefficients among (A)&(B) were determined by using Sorensen coefficient (Ss) as follows:

$$Ss = \frac{2a}{2a+b+c} \times 100$$

Table (3): The presence/absence of plant species in (A)&(B) at the study area: (0 = absent, 1 = present)

Species	A	B	Species common to(A&B)
Amaranthusgraecizan L.	1	0	-
Caltropisprocera (Aiton)W.T.Aiton	1	0	-
Leptadeniapyrotecnica (Forssk.)Decne.	1	0	-
Odontanthera radians (Forssk.)D.V.Field	1	0	-
Oxystelmaesculentum(L.F.) R.Br.	1	0	-
Commiphirakataf(Forssk.)Engl.	1	0	-
Commiphoramyrrhe (Nees.) Engl.	1	0	-
Acacia ehrenbergiana(Forssk.) Hayne.	1	1	1
Acacia hamulosaBenth.	1	0	-
Acacia tortilis (Forssk.)Hayne.	1	0	-
Acacia tortilissubspraddianaSavi	1	0	0
IndigoferahoschstetteriBak.	1	0	0
IndigoferaspinosaForssk.	1	0	0
Sennaalexandrina Mill.	1	0	0
Senna italic Mill.	1	0	0
Capparis decidua (Forssk.)Edgew.	1	0	0
Cadaba farinose Forssk.	1	0	0
MaeruacrassifoliaForssk.	1	0	0
HaloxylonpersicumBunge.	1	0	0
SalosaimbricataForssk.	1	0	0
Suaedaaegyptiaca (Hasselq.)Zohary	1	0	0
Euphorbia aegyptiacaBioss.	1	1	0
Euphorbia arabicaT.Anderson	1	0	0
Euphorbia granulate Forssk.	1	0	0
Euphorbia indica Lam.	1	0	0
PhyllanthusrotundifoliaWilld.	1	0	0
BoerhaviadiffusaL.	1	0	0
BoerhaviarepensL.	1	0	0
Brachiariaeruciformis(Sm.)Griseb.	1	1	1

CenchrusciliarisL.	1	1	1
Cymbopogonschoenanthus(L.) Spreng.	1	0	0
Dactylocteniumaegyptium(L.)P.Beauv.	1	1	1
Dicanthumannulatum(Forssk.)Stapf.	1	1	1
Digitariaciliaris(Retz.)Koeler	1	1	1
Eragrostis minor Host.	1	1	1
PanicumturgidumForssk.	1	1	1
Setariaverticillata(L.) P.Beauv.	1	0	0
Tragus racemosus(L.)All.	1	1	1
Polygala eriopteraDC.	1	0	0
PortulacaoleraceaL.	1	1	1
Salvadorapersica L.	1	0	0
Tamarixaphylla(L.) Kast.	1	1	1
Corchorusdepressus(L.) Stocks	1	0	0
FagoniaindicaBurm.	1	0	0
TribulusterrestrisL.	1	1	1
Zygophyllum simplex L.	0	1	0
Total	45	14	13

The similarity between above ground vegetation cover (A) and Emerged seedlings (live soil seed bank)(B) in the study area calculated as follows:

$$Ss\ (A\&B) = \frac{26}{85} = 0.3058 \times 100 = 30.58\ \%$$

The similarity between above ground vegetation and live soil seed bank was found to be 30.6%. This is considered a low index of similarity ,according to Sorensen (1948).

IV. Discussion, and conclusions:

The study reported 45 plant species in the study area as above-ground vegetation. These belonging to 7 families (6 Dicots and 1 Monocots). Table (2) depicts their botanical classification and growth habit. The collection from the study area covered different habitats.

The live soil seed banks (emerging seedlings) of the area in question were assessed . The grasses and herbs recorded a reasonable number of seeds, as compared to the other life forms across the study area,(Table 1). The woody species recorded a low number of seeds, which agrees with Mustafa(1997) . This may be attributed to land over-use through a number of practices including the use of fruits as forage, predators, pathogenicity and browsing. The density of live soil seeds bank was low in the study area as compared with Elsafori (2006). This may probably be due to differences as site conditions, shedding of seeds before maturity and environmental factors. From field observations and live soil seed bank identification at the study area, it was found that some plant species were dominant and this agreed with Hafliges(1990).

The present work revealed that some woody species are threatened, from field observations and absent from live soil seed bank in the study area.These species included Doberaglabera and Salvadorapersica. The threat is probably due to soil deterioration, rainfall fluctuations, drought spells and over-grazing.

Recommendations:

- There is a vital need for efforts that can reduce sand drifts and preserve plant species of economic importance. This is according to the field observations and debate with the people in the study area.
- There is a need for reseeding plant species. The silvicultural operations of these plantsshould consider the ecological factors prevailing in the study area.
- There is a need for soil seed banks in the study area and other similar areas in the country.

References:

[1]. Bossuty, B., Honnay.O., (2008). Seed bank assembly follows vegetation succession in dune slacks. J. Veg. Sci. 15, 449À456.
[2]. Elsafori.A.K. (2006). Eco- taxonomic study on the vegetation cover of Um Rimmitta Area, White Nile State, Sudan. Ph.D. thesis. University of Khartoum, Khartoum.
[3]. Halfiges and Scolz, cited by Freitas (1990). Soil seed banks. Scientia Agricola. Vol. 55 species issue Piracicaba 1998. Brazil.
[4]. Hills, C.S., Morris., M.D.,(1992) . The function of seed banks in northern forest ecosystems: a literature review. Ontario Ministry of Natural Resources, Forest Research Information Paper No. 107, 1–25.
[5]. Hopfensperger, K.N. (2007). A review of similarity between seed bank and standing vegetation across ecosystemsOikos, 116 (2007), pp. 1438-1448.
[6]. Kemp, P.R. (989). Seed Banks and vegetation processes in deserts. In: Leck M.A., Parker V.T., Simpson R.L., editors. Ecology of Soil Seed Banks. Academic Press; San Diego: 1989. pp. 257–281.
[7]. M. Ma, X. Zhou, G. Du (2010). Role of soil seed bank along a disturbance gradient in an alpine meadow on the Tibet plateau, Flora, 205 (2010), pp. 128-134.
[8]. Mustafa, A.F.(1997). Regeneration of Acacia seyal forests on the dry land of the Sudan Clay Plain. University of Helsinki Tropical Forest .Rep.103pp.

[9]. Solomon T.B. Soil seed bank dynamics in relation to land management and soil types in the semi-arid savannas of Swaziland. Afr. J. Agric. Res. 2011;6:2494–2505.
[10]. Sorensen, T.(1948). A method of establishing groups of Equal amplitude in plant sociology, based on similarity of species content. Der kangelgedankevidenskbernesselskab, biologiskeskriter,bind,V. Nr.4 Copenhagen.
[11]. Halfiges and Scolz, cited by Freitas (1990). Soil seed banks. Scientia Agricola. Vol. 55 species issue Piracicaba 1998. Brazil.
[12]. Jensen, H.A. (1969). Content of buried seed in arable soil in Denmark and it is relation to weed population. Danskbot, Art,27 (2): 1-56.

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