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Comparative Study of the Seed Bank of Arable Land and Natural Vegetation in El-Jabal El-Akhdar Plateau and Coastal Zone

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ABSTRACT

This is the comparative study of seed bank of agricultural areas which lies in eastern coast of libya at the first terrace of El-jabal El-Akhdar area, located between 20^o $30^/$-21^o E longitude and 32^o - 32^o $30^/$N latitude at El-Aggouria, Butraba, El-Bakour and El-Marj area to determine transient and permanent seed bank, comparison of the density of seed bank and total biomass/gm/m^2 between seedling of agricultural lands and natural vegetation, identification of emerged seedlings, estimation of remnant portion of seeds, dominant species and viability of dormant seeds.

From germination experiment all seedlings, were annuals, 55 species germinated in the soil seed bank belonging to 49 genera and 17 families, according to the number of species the largest family represented were Poaceae and Asteraceae (12 species) followed by Fabaceae (10 species) and then Brassicaceae (4 species), the highest seedling density was in natural vegetation around wheat field (844 seedlings/m^2) with percentage 37.4%, while the lowest density was in apricots farm (15 seedlings/m^2) with percentage 0.66%, the largest number of dormant seeds was in natural vegetation around cactus farm (7367 seeds/m^2) with percentage 10.97 %, where the lowest number was in natural vegetation around graded hills (326 seeds/ m^2) with percentage 0.49 %, there were significant differences in number of emerged seedlings between agricultural lands and natural vegetation ($P < 0.05$). From seed density experiment the highest number of seeds was in sample of barley field (9051 seeds/ m^2) with percentage 12.6 %, while the lowest number of seeds was in sample of peach farm (2311 seeds/ m^2) with percentage 3.22 %, there were not significant differences between agricultural lands and natural vegetation ($P > 0.05$), percentage of viability of seeds was 16.7%.

Key Words: Seed bank; Arable lands; Jabal El-Akhder.

INTRODUCTION

The agroecosystem soil seed bank is highly related to weeds, the weed seed banks have been studied more intensely than the others because of its economical importance. Its determination allows building models of population establishment through time, making possible the definition of weed control programs (Martins & Silva, 1994).

The weed species have survived throughout time, because of their ability to resist to several adverse climatic conditions, tolerating high and low temperatures, dry and humid

environments and variation in oxygen supply. The fundamental point in the success of weed survival is their persistence capacity in certain areas, this capacity is a consequence of a great number of seed produced, long term viability, continuous germination, phenotypic and genetic plasticity (Freitas, 1990; Fernandez-Quintanilla & Saavedra, 1991), the weeds produce polymorphic seeds, with a certain proportion that is dormant and other not (Freitas, 1990).

This study aims to determine transient and permanent seed bank, comparison density of seed bank and total biomass/gm/m^2 between seedlings of agricultural lands and natural vegetation, identification of emerged seedlings, estimation of remnant portion of seeds, dominant species and viability of dormant seeds.

The study area lies in eastern coastal zone of Libya at the first terrace of El-Jabal El-Akhdar area, located between 20o 30-21o E longitude and 32o - 32o 30/N latitude, samples were taken from 16 sites as follow: Barley field at Butraba area zero from sea level, Cactus farm at El-Aggureia area zero from sea level, field at El-Bakourarea 240 meter from sea level, Apricots farm at the main road to El-Marj area 500 meter from sea level, olive farm at the main road to El-Marj area 500 meter from sea level, Grapes farm also at the main road to El-Marj area 500 meter from sea level Peach farm at the main road to El-Marj area 500meter from sea level, Mountain graded hills located at the main road to El-Bakour area 25 meter from sea level, and natural vegetation around each farm or field.

EXPERIMENTAL

Colliction of Samples:

Two soil samples were collected from each of the eight sites, (one sample from each farm or field and one from natural vegetation around that farm or field) twice to both experiments:

Seed Density Experiment:

Soil samples placed on sheet papers and leaved to dry naturally for three days, seeds were separated by using Floating methods (Johnston, Crawley, & Murry, 1978), then counted by using binocular microscope and results were listed in Table. 1 and analyzed by t test.

Seedlings Experiment:

Sixteen woody boxes (size 50×50×13 cm) were brought and filled with washed sand (5 cm depth) as the base, then sixteen samples were placed in the boxes (2cm depth), sample numbers were written on the boxes. The soil were kept continuously wet, temperature was recorded, experiment continued for 5 months, the results were listed in tables and statically analyzed using t test, total biomass production (mg) was estimated at the end of the growth period, seedlings were identified remnant portion of seeds was separated and viability of dormant seeds was estimated in laboratory by tetrazolium chloride test.

RESULTS AND DISCUSSION

Seed Density Experiment:

Barley Field: number of seeds in soil sample from barley was (9051 seeds/m^2) with percentage of (12.6 %). **Natural vegetation:** number of seeds for natural vegetation soil was (7037 seeds/ m^2) with percentage of (9.81 %), Table 1.

Cactus Farm: number of seeds in soil samples from cactus farm was (6072 seeds/m^2) with percentage of (9.33 %). **Natural vegetation:** number of seeds for natural vegetation soil was (4230 seeds/ m^2) with percentage of (5.91 %), Table 1.

Wheat Field: number of seeds in soil samples from wheat field was (2550 seeds/m^2) with percentage of (3.54 %). **Natural vegetation:** number of seeds for natural vegetation soil was (4514 seeds/ m^2) with percentage of (6.28 %), Table 1.

Apricots Farm: number of seeds in soil samples from Apricot farm was (6644 seeds/m^2) with percentage of (9.25 %). **Natural vegetation:** number of seeds for natural vegetation soil was (2686 seeds/ m^2) with percentage of (3.74 %), Table 1.

Olive Farm: number of seeds in soil samples from Olive farm was (4722 seeds/m^2) with percentage of (6.57 %). **Natural vegetation:** number of seeds for natural vegetation soil was (5039 seeds/ m^2) with percentage of (7.01 %), Table 1.

Peach Farm: number of seeds in soil samples from Peach farm was (2311 seeds/m^2) with percentage of (3.22 %). **Natural vegetation:** number of seeds for natural vegetation soil was (4258 seeds/ m^2) with percentage of (5.93 %), Table 1.

Graded Hills: number of seeds in soil samples from graded hills was (2448 seeds/m^2) with percentage of (3.41 %). **Natural vegetation:** number of seeds for natural vegetation soil was (2458 seeds/ m^2) with percentage of (3.42 %), Table 1.

From results total number of seeds was (71832 seeds/m^2), this high density may be attributed to the annual weeds can produce high number of seeds (Maxwell, 2004; Bazzaz & Carlson, 1979)., which may fill gaps created in natural vegetation by grazing, trampling, natural death and other factors, this agree with (Thompson & Grime, 1979).which cited the transient seed bank are adapted to exploit the gaps created by seasonally-predictable damage and mortality in vegetation.

The total number of seeds recorded varied enormously between sities, this coincides with (Thompson & Grime, 1979), they cited to some extent this variation could be related to seed size, since in general the most abundant that seeds were also the smallest, thus the sites with an abundance of small-seeded species tended to posses large seed bank, and this may be also attributed to the collection of samples from different topographic sites. Coastal plain, mountainous farms, graded hills, near the sea, or far of it also because the distances between sites are wide, and may be due to diversity of species or due to predation on large seeds helps in creating the difference in seed bank (Louda, 1989).

The highest number of seeds was of barley field (9051seeds/ m^2) with percentage of (12.6%), followed by natural vegetation soils around it (7037 seeds/m^2) percentage (9.81%) Table 1. this may be due to the area characterized by filds in open coastal plain surrounded by great number of bare areas, this coincides with (El-Getlawi, 2004) which cited the soil erosion is one of the main factors in supplying seeds in neighboring zones, and with (Maxwell, 2004)which cited dispersal of seeds into the site from nearby disturbed patches, also low level of soil stability leads to greater soil loss through wind and water erosion.

The lowest number of seeds was recorded in soil collected from peach farm (2311 seeds/m^2) with percentage of (3.22 %), followed by natural vegetation around grape farm (2341 seeds/ m^2) with percentage of (3.26 %) Table 1, my be attributed to the practice of weed resistance and control in the farms because its small size, where in regularly cultivated fields seed bank decline will be faster for most species because of the stimulation (increased seed bank output) from cultivation brings seeds to the soil surface.

However, the rate of decline is also dependent on a reduction in seed rain with regular cultivation or other intensive practice (e. g. herbicides) can kill weeds before they go to seed, and my be because it is located at mountain plateau where topographic and physiographic factors play an important role in forming seed bank (Peco, Ortega , & Levassor, 1998).

From t test to estimate the difference between seed number means of samples taken from farms or fields and those taken from natural vegetation there were no significant difference generally but there were significant differences between each site and natural vegetation around it, like in barley field (9051 seeds/ m^2) and natural vegetation around (7037 seeds/ m^2) this is attributed to tilling and rooting of soil in barley field where in agriculture systems the rooting of soils is frequent and seed bank reacting to establishment of species survival (Roberts, 1981), where the tilling may cause dormancy breaking and changing depth of burial or may introduce new seeds with agriculture crop seeds, in other sites the difference was very low as in soils of graded hills (2448 seeds/ m^2) this may be due to the fact that graded hills are abandoned for a long time and there are no any agriculture treatment, (Table 1).

Monitoring of Germinated Seedlings in the Different Sites:

Barley Field: Number of seedlings were 153/m^2 from 20 species dominated by *lolium loliaceum* 107 seedlngs/m^2, followed by *Medicago polymorpha* 9 seedlings/m^2 followed by *Beta vulgaris* 6 seedlings/m^2, and Biomass of 66.795 gm/m^2. **Natural Vegetation:** Number of seedlings were 103/m^2 from 13 species dominated by *Anacyclusclavatus* 37 seedlngs/m^2, followed by *Medicago polymorpha* 14 seedlings/m^2 and *Hordeum bulbosum* 14 seedlings/m^2 followed by *lolium loliaceum* 13 seedlngs/m^2, and Biomass of 37.503 gm/m^2 , there were significant differences between number of seedlings of barely field and natural vegetation ($p< 0.05$), (Table 2).

Cactus Farm: Number of seedlings were 122/m^2 from 20 species dominated by *Medicago polymorpha* 30 seedlngs/m^2, followed by *Phalaris minor* 24 seedlings/m^2 followed by Calendula arvensis 22 seedlings/m^2, and Biomass of 38.34 gm/m^2. **Natural Vegetation:** Number of seedlings were 66/m^2 from 8 species dominated by *Malva parviflora* 42 seedlngs/m^2, followed by *Chenopodium foliosum* 8 seedlings/m^2, followed by *lolium*

Table 1. Density and percentage of seeds in each site

Sites	Number	Percentage
Barley field	9051	12.60
Natural vegetation	7037	9.81
Cactus farm	6702	9.33
Natural vegetation	4230	5.91
Wheat field	2550	3.54
Natural vegetation	4514	6.28
Apricots farm	6644	9.25
Natural vegetation	2686	3.74
Olive farm	4722	6.57
Natural vegetation	5039	7.01
Grapes farm	4886	6.80
Natural vegetation	2341	3.26
Peach farm	2311	3.22
Natural vegetation	4258	5.93
Graded hills	2448	3.41
Natural vegetation	2458	3.42
total	71832	100%

loliaceum 6 seedlngs/m^2, and Biomass of 27.367 gm/m^2 , there were significant differences between number of seedlings of cactus farm and natural vegetation ($p< 0.05$), (Table 2).

Wheat Field: Number of seedlings were 844/m^2 from 24 species dominated by *Melilotus sulcatus* 81 seedlngs/m^2, followed by *Avena sterilis* 20 seedlings/m^2 followed by *Medicago polymorpha* 8 seedlings/m^2, and Biomass of 62.109 gm/m^2 (Table 2b). **Natural Vegetation:** Number of seedlings were 844/m^2 from 24 species dominated by *Malva parviflora* 751 seedlngs/m^2, followed by *Medicago polymorpha* 26 seedlings/m^2 followed by Melilotus sulcatus 17 seedlings/m^2, Biomass of 218.99 gm/m^2 , there were significant differences between number of seedlings of wheat field and natural vegetation ($p<0.05$) (Table 2).

Apricots Farm: Number of seedlings were 15/m^2 from 6 species dominated by *lolium loliaceum* 4 seedlngs/m^2, followed by *Melilotus sulcatus* 3 seedlings/m^2 and *Anacyclus clavatus* 3 seedlings/m^2, and Anagallis arvensis 3 seedlings/m^2, and Biomass of 5.37 gm/m^2**.** **Natural Vegetation:** Number of seedlings were 28/m^2 from 9 species dominated by *Anacyclus clavatus* 7 seedlngs/m^2, followed by *lolium loliaceum* 4 seedlings/m^2 and *Medicago polymorpha* 4 seedlings/m^2, and *Melilotus sulcatus* 4 seedlings/m^2, and Biomass of 11.995 gm/m^2 , there were significant differences between number of seedlings of apricots farm and natural vegetation ($p< 0.05$).

Olive Farm: Number of seedlings were 110/m^2 from 17 species dominated by *Malva parviflora* 26 seedlngs/m^2, followed by *Medicago polymorpha* 21 seedlings/m^2 followed by *Hedypnois cretica* 12 seedlings/m^2, and Biomass of 62.505 gm/m^2 . **Natural Vegetation:** Number of seedlings were 31/m^2 from 12 species dominated by *Medicago polymorpha* 8 seedlngs/m^2, followed by *lolium loliaceum* 3 seedlings/m^2 and *Anacyclus clavatus* 3

seedlings/m^2, and *Trifolium tomentosum* 3 seedlings/m^2, and *Malva parviflora* 3 seedlings/m^2, and Biomass of 15.117 gm/m^2, there were significant differences between number of seedlings of Olive farm and natural vegetation ($p< 0.05$).

Grape Farm: Number of seedlings were 128/m^2 from 17 species dominated by *Malva parviflora* 24 seedlngs/m^2, followed by *Stellaria media* 21 seedlings/m^2 followed by *Hedypnois cretica* 20 seedlings/m^2, and Biomass of 116.258 gm/m^2 (Table 2c). **Natural Vegetation:** Number of seedlings were 122/m^2 from 19 species dominated by *Stellaria media* 32 seedlngs/m^2, followed by *Malva parviflora* 20 seedlings/m^2 followed by *Sonchus oleraceus* 16 seedlings/m^2, and Biomass of 78.024 gm/m^2, there were significant differences between number of seedlings of grapes farm and natural vegetation ($p< 0.05$).

Peach Farm: Number of seedlings were 225/m^2 from 13 species dominated by *Stellaria media* 146 seedlngs/m^2, followed by *Malva parviflora* 39 seedlings/m^2 followed by *Medicago polymorpha* 30 seedlings/m^2, and Biomass of 71.067 gm/m^2 (Table 2d). **Natural Vegetation:** Number of seedlings were 50/m^2 from 16 species dominated by *Trifolium tomentosum* 11 seedlngs/m^2, followed by *Medicago polymorpha* 8 seedlings/m^2 followed by *Anagallis* arvensis 5 seedlings/m^2, and Biomass of 37.911 gm/m^2, there were significant differences between number of seedlings of Peach farm and natural vegetation ($p< 0.05$).

Graded Hills: Number of seedlings were 39/m^2 from 11 species dominated by *Trachnia distachya* 17 seedlngs/m^2, followed by *Trisetaria macrochaeta* 6 seedlings/m^2 followed by *lolium loliaceum* 4 seedlings/m^2, and *Euphorbia peplus* 4 seedlings/m^2, and Biomass of 10.043 gm/m^2 (Table 2d). **Natural Vegetation:** Number of seedlings were 79/m^2 from 11 species dominated by *Trisetaria macrochaeta* 52 seedlngs/m^2, followed by *Psilurus incurvus* 6 seedlings/m^2 followed by *Trachynia distachya* 5 seedlings/m^2, and Biomass of 5.225 gm/m^2, there were significant differences between number of seedlings of graded hills and natural vegetation ($p< 0.05$).

Generally the seedling densities of the seed bank of either agriculture sites or natural vegetation in the uphills (El-Marj area) were higher than the seedling densities of those in the coastal area this agree with (Maxwell, 2004) which cited reduced salt concentration in soil trigger germination.

From t test there were no significant differences between seedling numbers in samples of farms and natural vegetation ($p< 0.05$).

All seedlings in germination experiment were annuals, this suggest that seed bank of farms or fields came from annual plants, this agree with (Hume & Archibold, 1986), where reported that the most seeds enter seed bank of arable land come from annual herbs growing in the same site where Mediterranean grassland are mainly composed by annuals, this high germination ratio of annuals attributed to dispersal ratio of small seeds (VanRooyen & Grbbelar, 1982; Kemp, 1989).

In this experiment 55 species germinated in the soil seed bank belonging to 49 genus and 17 families, Table 3, according to the number of species the largest families represented were Poaceae (12 species with 16.7 % from total percentage) and Asteraceae (12 species too, with

percentage 10.004%) followed by Fabaceae (10 species with percentage of 17.2%) and then Brassicaceae (4 species with percentage of 2.2 %), this agree with Flora of Libya (Ali & Jafri, 1976-1989), also with (Brullo, 1979), which reported that these species belongs to Secatelia " new formed alliance" which spreads from east north of libya to Egyptain lands (Brullo, 1979) which includes different plant species such as **Real Facultative infestant** in plains, wilds, cereal crops field and natural vegetation represented by *Anagallis arvensis* and other species such as *Anacyclus clavatus* which also grow in coastal zones from Tolmitha to Sidi-khalifa north of El-Marj plateau, these weeds belongs to **Tragopogono torlidetum leptophyllae** according to (Brullo, 1979).

Although *lolium loliaceum* is very rare species in Flora of Libya (Ali & Jafri, 1976-1989) bur it was found in 16 habitats and the highest density was in barley field. The lowest density was in wheat, field, peach farm, natural vegetation around and around grapes farm, but these seeds do not occure in great number in the soil, although *Medicago polymorpha* and *Hedypnois cretica* are very rare species in Flora of Libya but they are found in 15 and 7 habitats, but there are few species that did not appear except in one site represented by only one individual like *Cakile aegyptica Chamomilla aurea, Aira cupaniana, Hordeum vulgare, Senecio leucanthemifolius, Trifolium campestre, Plantago coronopus, Mesembryanthemum nodiflorum, and Apium graveolens,* or more than one individual like *Beta Vulgaris, Crithopsis delileana, Lamarckia aurea, Argyrolobium, Onobrychis crista-galli, Didesmus bipinnatus, Plantago ovata, Sheradia arvensis* and *Lamium amplexicaule*.

The highest individual density was of *Malva Parviflora* which appear in 10 sites, the highest density was in natural vegetation around wheat field and due to it is attributed heigh density seedlings, but seeds of this plant were not very abundant in seed bank although this plant is annual, this coincides with (Thompson & Grime, 1979) they cited there are several instances of species which predominate in the vegetation but were not detected as seeds.

Stellaria media was found only in farms of El-Marj area and its seedlings do not appear in coastal farms or graded hills or wheat field.

Density of first germination was highest than new germination which may be attributed to increasing temperature of spring season where dormancy of some seeds broken by temperature (Baskin, & Baskin, 1998; El-Mugassbi, 1999).

Generally the biomass of either samples of farms and natural vegetation coincides but when considered each habitat alone, differences where found. The highest biomass was in natural vegetation around wheat field due to the presence of Poaceae species in this habitat that have small size and high weight.

After germination experiment remnant or dormant seeds "permanent seed bank" were separated and counted, their number was (67058 seeds) then compared with seed density "total seed bank" (71832), if we add number of dormant seeds to number of seedlings "transient seed bank" (2259) we note that there is alogic convergence, dormancy represents main mechanism of species preservation in the seed bank (Christoffoleti & Caetano, 2004).

Viability of Fabaceae (and other families) seeds was estimated in laboratory due to its impartance (Dimmitt, 2003) and its high percentage in sites of study by Tetrazolium chloride test (Copland & McDonald, 1995) it was 16.7%.

Although percentage of dormant seeds of fabaceae in nature is higher than percentage of germinated seedlings but in this study number of seedlings was more than number of dormant seeds this may be attributed to increasing temperature according to (Maxwell, 2004) which cited heat cue hard-seeded legumes for germination.

The highest percentage of total soluble salts and calcium carbonate and the higher electric conductivity was in cactus farm, this may be attributed to its location near the sea and to fire in farms, this agree with (Maxwell, 2004) which cited pH change from ashed plants. (Tables 2, 3, 4 & 5).

Table 2. Number of families and number of species of each family from study sites

	Family	Percent %	Number of Species
1	Poaceae	16.7	12 Species
2	Asteraceae	10.004	12 Species
3	Fabaceae	17.2	10 Species
4	Brassicaceae	2.2	4 Species
5	Caryophyllaceae	9.69	3 Species
6	Chenopodiaceae	0.71	2 Species
7	Plantaginaceae	0.31	2 Species
8	Primulaceae	1.2	1 Species
9	Malvaceae	40.9	1 Species
10	Aizoaceae	0.04	1 Species
11	Illecebraceae	0.18	1 Species
12	Urticaceae	0.22	1 Species
13	Geraniaceae	0.6	1 Species
14	Rubiaceae	0.09	1 Species
15	Euphorbiaceae	0.62	1 Species
16	Apiaceae	0.04	1 Species
17	Lamiaceae	0.088	1 Species
			25 Species

Table 3. Comparison between number of species in the recent study, cyrenaica and Flora of Libya

Number of species in study area	Number of species in cyrenaica	Number of species in Flora of Libya
55 species	1300 species	1770 species

Table 4. Number of seeds in seed density experiment, germinated seedlings from germination experiment, and remnant (dormant) seeds after germination experiment

Experiment / Sites	Seed density/m^2		Germinated seedlings/m^2		Dormant seeds/m^2	
	number	Percentage %	number	Percentage %	number	Percentage %
Barley	9051	12.6	152	6.75	5765	8.61
Natural	7037	9.81	100	4.43	6725	10.03
Cactus	6702	9.33	122	5.4	3216	4.81
Natural vegetation	4230	5.91	66	0.29	7367	10.97
Apricots farm	2550	3.54	120	5.3	1606	2.39
Natural vegetation	4514	6.28	844	37.36	2251	3.36
Wheat field	6644	9.25	15	0.66	961	1.43
Natural vegetation	2686	3.74	28	1.24	6408	9.56
Olive farm	4722	6.57	110	4.87	5167	7.71
Natural vegetation	5039	7.01	31	1.37	4808	7.17
Grapes farm	4886	6.8	128	5.67	8014	11.95
Natural vegetation	2341	3.26	122	5.4	4485	6.69
Peach farm	2311	3.22	254	10.85	5771	8.61
Natural vegetation	4258	5.93	50	2.21	2902	4.33
Mountain	2448	3.41	39	1.73	1286	1.92
Natural vegetation	2458	3.42	78	3.45	326	0.49
Total	71832	100 %	2259	100 %	67058	100 %

Table 5. Number of seeds of Fabaceae in seed density experiment, germinated seedlings Of Fabaceae from germination experiment, and remnant (dormant) seeds of Fabaceae after germination experiment

Experiment / Sites	Seed density/m^2		Germinated seedlings/m^2		Dormant seeds/m^2	
	number	Percentage %	number	Percentage %	number	Percentage %
Barley	41	15.89	11	2.83	9	3.23
Natural	46	17.83	19	4.88	9	9.68
Cactus	1	0.39	31	7.97	15	48.39
Natural vegetation	43	16.67	1	0.26		
Apricots farm	40	15.5	89	22.88	5	16.13
Natural vegetation			56	14.41	6	3.23
Wheat field			3	0.77		
Natural vegetation	2	0.78	9	2.31	2	6.45
Olive farm	27	10.47	28	7.2	2	6.45
Natural vegetation	13	5.04	11	2.83	5	3.23
Grapes farm	13	5.04	40	10.3		
Natural vegetation	4	1.55	18	4.63		
Peach farm	26	10.08	42	10.8	4	3.23
Natural vegetation			24	6.17		
Mountain			3	0.77		
Natural vegetation	2	0.76	4	1.03		
Total	258	100 %	389	100 %	54	100 %

Table 6. List of species in the germinable seed bank.

Aizoaceae
1- Mesembryanthemum nodiflorum L.

Apiaceae
1- Apium graveolens L.

Asteraceae

1- Anacyclus clavatus (Desf.) Pres.
2- Calendual arvensis L.
3- Cardus getulus L.
4- Carthamus lanatus L.
5- Chamomilla aurea (Loefl.) Gay ex Cosson & Kralik.
6- Cicorium pumilum Jacq.
7- Hedypnois cretica (L.) Dum. Courset.
8- Hypochoeris achyrophorus L.
9- Notobasis syriaca (L.) Cass.
10- Senecio gallicus Chiax.
11- Senecio leucanthemifolius Poiret.
12- Sonchus oleraceus L

Brassicaceae

1-Cakile aegyptica (L.) Willd
2- Didesmus bipinnatus (Desf.) DC.
3- Enarthrocarpus pterocarpus (Pres.) DC.
4- Sinaps pubescens L.

Caryophyllaceae

1-Silene cerastioides L.
2- Spergularia marina (L.) Griseb.
3- Stellaria media (L.) Cyrill.

Chenopodiaceae

1- Beta vulgaris L.
2- Cenopodium foliosum L.

Euphorbiaceae

1- Euphorbia peplus L.

Fabaceae

1- Argyrolobium abyssinicum jaub. & Spach.
2- Astragalus boeticus L
3- Lotus ornithopodioides L.
4- Medicago polymorpha L.
5- Melilotus sulcatus Desf.
6- Onobrychis crista-gell (L.) lam.
7-Trifolium campestre Schreb.
8- Trifolium purpureum Lois.
9- Trifolium tomentosum L.
10- Trifolium stellatum L. Guss.

Geraniaceae

1- Erodium hirtum (Forsk) Willd

Illecebraceae

1- Paronychia argentea Lamk.

Lamiaceae
1- Lamium amplexicaule L.

Malva ceae

1- Malva parviflora L.

Plantaginaceae

1-Plantago coronopus L.
2-Plantago ovata Forckal.

Poaceae

1-Aia cupaniana
2- Avena sterilis L.
3- Crithopsis delileana (Schultes) Rozhev.
4- Hordeum bulbosum L.
5- Hordeum vulgare L.
6- Lamarckia aurea (L.) Moench, Meth.
7- Lolium loliaceum (Bory & Chaub) Hand Mazz.
8- Phalaris minor Retz.
9- Poa annua L.
10- Psilurus incurvus (Gouan) Schinz et The ll.
11- Trachynia distachya (L.) Link.
12- Trisetaria macrochaeta (Boiss) Maire.

Primulaceae
1- Anagallis arvensis L. var. Caerulea (L.) Gouan.

Rubiaceae

1- Sherardia arvensis L.

Urticaceae

1- Urtica pilulifera L.

CONCLUSION

-Number of species in germination experiment were 55 species belonging 49 genera and 17 families.
- Largest families were poaceae (12 species with percentage of 16.7 %) Asteraceae (12 species, with percentage of 10.004 %) followed by Fabaceae (10species with percentage of 17.2 %) and then Brassicaeae (4 species with percentage of 2.2 %).
- some species belongs to the rank **Secatelia** " new formed alliance" which spreads from east north of Libyan to Egyptian lands.
- The importance of seed bank studies of agricultural lands lies in that can help in the management of weeds in agricultural cropping systems and the weed seed bank is the main source of weeds in agricultural fields.
- Most seeds are attributed to the annual species which may fill gaps created in natural vegetation by grazing, trampling, natural death and other factors.
-The percentage of small seeds was higher than that of large seeds, this suggests that seed bank of farms or fields came from annual species.
-Highest number of seeds was in sample of barley field, and lowest number of seeds was in sample of peach farm collected from El Marj area (uphills).
- Soil erosion is one of the main factors in suppling seeds in neighboring zones.
- There are no significant differences generally between the means number of seeds of samples taken from farms or fields and those taken from natural vegetation but there are significant differences between each site and natural vegetation around it.
- The highest seedling density was in natural vegetation around wheat field, while the lowest density was in apricot farm.
- From t test there are no significant differences between seedling numbers in samples of fams and natural vegetation.
- Although *Lolium loliaceum* is very rare species in Flora of Libya but it was found in 16 habitats and the highest density was in barley field; while the lowest density was in wheat field, peach farm, natural vegetation around it and around grapes farm, but its seeds do not occure in great numbers in seed bank, also *Hedypnois cretica* is very rare in Flora of Libya but it is found in 7habitats.
- Few species appeared only in one site, represented by only one individual.
- The highest individual density was of *Malva parviflora* which appeared in 10 sites, the highest density was in natural vegetation around wheat field.
- Stellaria media was found only in farms of El-Marj area and its seedlings do not appear in coastal farms or graded hills or wheat field.

- Some seedlings do not resist and died before flowering.
- New wave of germination started after 60 days from irrigation and temperature ranging up to 10-30 ^{o}C.
- After 70 days of irrigation another wave of germination was noted again and continued until flowing, collected at end of April and identified where *Apium graveolens* is new species.
- Remnant or dormant seeds were less than total seed bank (from seed density experiment).
- Viability of dormant seeds was 16.7 %.

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