The aggregation and segregation in wild plants at degradation environment at Muradia, Baquba, Iraq

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Abstract

The study was conducted in October to November 2015 at the neglected and degradation area at the University of Diyala of abandoned spaces, without planting or building between Science and Agriculture Colleges, about 2500m^2. Soil were bulldozed and paved dirt road in its. In this degradation area were found 17 wild plant species belonging to 10 families, (5 species are Poaceae, and 2 species are Fabiaceae). Chosen. 9 species as target plants, because they relatively abundance. The targets plants were: *Alhagi graecorium*, *Capparis spinosa*, *Cynodon dactylon*, *Imperata cylindrica*, *Lycium shawii*, *Phragmites australis*, *Prosopis farcta*, *Shanginia aegyptica*, and *Sorghum halepans*e. Those individuals species plant were taken at central of quadrates for six replicates, in 100cm radius, which record all the species within four regions, 25, 50, 75, and 100 cm. The results showed that *A. graecorium*, *C. dactylon*, *I.cylindrica*, *P australis*, and S. *aegyptica* were surrounded by about same species (aggregated species). Whereas *C. spinosa*, *P. farcta and L. shawii* and *S. halepanse* surrounded by different species (segregated species), which dependent on abundance values for each one. Sample of soil have been taken under the same plants in six replications. The control soil samples were taken from the spaces between the plants. pH, electrical conductivity (EC), and organic matter (OM) were measured. The results showed that pH under *L. shawii* and *C. dactylon* gave closed value and had significant difference with the rest of species. The electrical conductivity was found to be closed value *C. spinosa* and *S. bicolor* with each other and the values of low in

significant difference with the rest of the target species. Control treatments is significantly different from other in organic matter.

Key words: Aggregation, Seggregation, *Alhagi graecorium*, *Capparis spinosa*, *Cynodon dactylon*, *Imperata cylindrica*, *Lycium shawii*, *Phragmites australis*, *Prosopis farcta*, *Shanginia aegyptica*, and *Sorghum halepans*e.

التجمع والتفرق في النباتات البرية في بيئة متدهورة في المرادية، بعقوبة، العراق

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الخلاصة

اجريت الدراسة في محيط جامعة ديالى بين شهري تشرين الأول وتشرين الثاني 2015 في منطقة المرادية في المساحات المتروكة والمتدهورة بيئياً وبمساحة 2500 م^2 بفعل شق الطرق الترابية وجرف التربة، هذه المنطقة تقع بين كليتي الزراعة والعلوم. وجد في هذه المنطقة 17 نوعا نباتياً برياً تعود لعشرة عوائل نباتية، خمسة منها تعود للعائلة النجيلية، واثنين للعائلة البقولية. أختير ثمانية انواع منها كنباتات هدف، تم الأختيار بسبب وفرتها نسبياً في المنطقة. هذه الأنواع هي: العاقول، الشفلح، الثيل، الحلفا، العوسج، القصب، الشوك، الطرطيع و السفرندة. اخذ كل فرد من نباتات الهدف كمركز للكوادريت على شكل دائرة نصف قطرها 100 سم وقسمت الى اربع مناطق حول النبات الهدف وهي الى 25، 50، 75 و 100 سم. اظهرت النتائج ان العاقول، الثيل، الحلفا، القصب، السفرندة والطرطيع تتجمع مع بعضها. بينما الشفلح، الشوك، العوسج والسفرندة تحيط بها نباتات مختلفة (معتمدين في التجمع والتفرق على قيم الغزارة). تم اخذ عينات التربة من تحت النباتات وبعمق 10 سم، اما عينات السيطرة فقد اخذت من الفراغات بين النباتات. وقد بينت النتائج ان العوسج والثيل والسفرندة متقاربة مع بعضها في الرقم الهيدروجيني ولها فرق معنوي عن بقية نباتات الهدف. اما التوصيل الكهربائي فقد وجد ان الشفلح والسفرندة متقربة مع بعضها ولها فرق معنوي مع بقية نباتات الهدف. اما المادة العضوية فقد وجد ان السيطرة فقط اختلفت معنوياً عن باقي المعاملات.

الكلمات المفتاحية: تجمع النباتات، تفرق التباتات، العاقول، الشفلح، الثيل، الحلفا، العوسج، القصب، الشوك، الطرطيع، والسفرندة.

The aggregation and segregation in wild plants at degradation environment at Muradia, Baquba, Iraq

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Introduction

Vegetation study in degradation environment region and the survival of some species steadfast in this environment demonstrates the survival of some species steadfast in this environment and reflected the strength of those species as well as the characteristics of those species enable them to live in such degradation environment [1, 2]. The aim of this study is to highlight the wild plants that remain survive in this degraded region, despite of enormous pressure from drought, pollution, and the action of dirt roads, which the dominance in this region is *Shanginia aegyptica* [3, 4]. Study of aggregation and segregation of the plant species community is of a great importance because it represents a certain plants that combine with each other has been linked, and aggregated with each other by rhizomes [5, 6]. Some species are falling thier seeds in the same area, do not distribute far away, so that planted nearest together [3]. Others species may have different means of defense and does not need to this gathering or aggregation [7]. The defenses are clearly present in animals and is also present in the plants [8, 2]. The non-clustered or dispersed plants segregation possess other ways as secretion of retardant material inhibited the growth of other species, that may be compete for natural resources as water, nutrients, place or light [9]. The aim of this study is to diagnose the species that can continue to live and grow in the deteriorating and contaminated environment, and to know the accompany species around the target species, is it the same member of species or other species. To conduct those aims were chosen 9 from 17 as target species. The reason of chosen those species because were relatively abundance [10].

Material and Methods

The study have been carried out in October and November 2015 before the rain fall, and the temperature was 16 to 35 C°. The location of the area under study is between the faculties of agriculture and science. The area about 2500 m^2 where the paved and dirt roads are covered with gravel with coarse sand. The area was neglected since 30 years.

Comprehensive survey was done to record wild plants for the area under study, which the dominant species is *Shanginia aegyptica*. There are *Eucalyptus* trees planted long time ago. Eight wild species were selected, named target species from the total 17 wild plants growing

in this region. The circle quadrate was chosen, with radius 100cm, which were divided into four regions, starting from (target species), as a center of the quadrat, from zero to 25, 50, 75, and 100 cm [11, 7]. Those target species were chosen because are relatively abundance. Target species take its as a center of the circles, and the individual plant species were recorded around the target species. The following measurement were recored [12, 13, 14]:

1- density 2-Frequency 3- abundance 4- Dominance, as follows:

1. **Density** = Number of individual plants per meter / Total of the quadrates, which are 6 replicates.
2. **Frequency** = Number of times where the individual plant species appear / Number of replicates, then multiplied by 100
3. **Abundance** = Number of individual plant species / number of quadrate which the individual plant species appeared.
4. **Dominance** = Frequency plus density.

Soil samples have been taken from the soil under the plant directly in depth of 10 cm with six replicates. The control samples taken from the spaces between the plants. The measurement pH, Electrical Conductivity (EC) and Organic Matter (OM) were done as described in [15].

Results and Discussion

Result presented in Table 1, Showed there are 17 species of wild plant species in studied area, five of them belong to Poaceae family, two species from each of Fabiaceae, Chenopodaceae and Asteraceae, and some species from Caparaceae, Convolvulaceae, Solanaceae, Brasicaceae, Malvaceae, and Tamaricaceae. Eight species chosen from them as target species, which are: *Alhagi graecorium*, *Capparis spinosa*, *Cynodon dactylon*, *Imperata cylindrica*, *Lycium shawii*, *Phragmites australis*, *Prosopis farcta*, *Shanginia aegyptica*, and *Sorghum halepans*e.

Table 2 showed that the individual species of *Alhagi graecorium*, surrounded by the same species, which mean aggregate species, the abundance reached/ $3m^2$ at first circle, this value relatively quiet high, as well as existing at the other parts of quadrate, Also we have noted that

dominance this species 68.6, 85.1 at first and second region of quadrate, which regard are quite high values. The connected by rhizomes as defense device, as well as spines, which grazed by herbivore as most of Fabiaceae family plants.

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Table 1: Species survey of the area under study.

Sequence	Local Name (Arabic)	Scientific Name	Family Name
1	عاقول*	*Alhagi graecorium**	Fabiaceae
2	شفلح	*Capparis spinosa**	Capparaceae
3	ثيل*	*Cynodon dactylon**	Poaceae
4	مديد	*Convolvulus arvensis*	Convolvulaceae
5	حلفا	*Imperata cylindrica**	Poaceae
6	عوسج	*Lycium shawii**	Solanaceae
7	ام الحليب	*Lactuca serriola*	Asteraceae
8	جنيبرة	*Lipiddium draba*	Brasicaceae
9	خباز	*Malva parviflora*	Malvaceae
10	شعير الفأر	*Phalaris minor*	Poaceae
11	قصب*	*Phragmites australis**	Poaceae
12	شوك	*Prosopis farcta**	Fabiaceae
13	مليح	*Sasola kali*	Chenopodiaceae
14	طرطيع*	*Shanginia aegyptica**	Chenopodiaceae
15	كلغان	*Silybum marianum*	Asteraceae
16	سفرندة (خريزة)*	*Sorghum halepanse**	Poaceae
17	طرفة	*Tamarix aucherana*	Tamaricaceae

Target species*

Table 2: *Alhagi graecorium* species as a center for a radius 100 Cm around it.

Distance (Cm)	Species	Density /m2	Frequency%	Abundance/m 2	Dominance
≥ 25	Alhagi graecorium	2.0	66.6	3.0	68.6
26-50	Alhagi graecorium Prosopis farcta	1.8 0.7	83.3 33.3	2.2 2.0	85.1 34.0
51-75	Alhagi graecorium	0.3	16.6	2.0	16.9
76-100	Alhagi graecorium	1.0	50.0	2.0	51.0

Table 3 showed that *Capparis spinosa*, surrounded by different plant species, included *Shanginia aegeptica* and *Imperata cylindrica.* This target species doesn't appear as high aggregate, we could name as semi aggregate, may be because herbivore did not palatable it for

grazing it, so will not need such aggregate device, [7]. It is also depends on itself to get on the water by extended its root deeply in the soil [3]. Associated by *I. cylindrica, S. aegyptica and A. graecorium.*

Table 3: Survey of *Capparis spinosa* species as a central of quadrate for a radius 100 Cm.

Distance (cm)	Species	Density/m^2	Frequency%	Abundance/m^2	Dominance
≥ 25	*Capparis spinosa*	1.3	16.6	2.0	17.9
	Imperata cylindrica	0.3	16.6	2.0	16.9
	Alhagi graecorium	0.2	16.6	1.0	16.8
	Shanginia aegyptica	0.5	16.6	3.0	17.1
	Convolvulus arvensis	0.2	16.6	1.0	16.8
26-50	*Capparis spinosa*	0.4	16.6	2.0	17.0
	Imperata cylindrica	0.6	16.6	4.0	17.2
	Alhagi graecorium	0.2	16.6	1.0	16.8
	Sorghum halepanse	0.2	16.6	1.0	16.8
51-75	*Imperata cylindrica*	0.2	16.6	1.0	16.8
	Alhagi graecorium	0.3	16.6	2.0	16.9
	Shanginia aegyptica	0.5	16.6	3.0	17.1
76-100	*Capparis spinosa*	0.2	16.6	1.0	16.8
	Shanginia aegyptica	0.2	16.6	1.0	16.8
	Sorghum halepanse	0.2	16.6	1.0	16.8

Table 4 represent wild *Cynodon dactylon*, which noted that most of individual species surrounded are the same individual species, as the aggregation pointed out the aggregation which reached 4.3/m^2 at the first part of quadrate, which regarded high value. That is mean aggregation with each other which individual plant connected together by rhizomes [10]. We noted also the Dominance reached, 104.3, 84.9, 85.5 68.2 for the 4 parts of quadrate respectively some individual species of *I. cylindrica* and *S. aegyptica*.

Table 4: *Cynodon dactylon* species as a central of quadrate for a radius 100 Cm around it.

Distance (Cm)	Species	Density /m^2	Frequency%	Abundance/m^2	Dominance
≥ 25	*Cynodon dactylon*	4.3 0.2	100	4.3	104.3
	Imperata cylindrica	0,2	16.6	1.0	16.8
	Alhagi graecorium		16.6	1.0	16.8
26-50	*Cynodon dactylon*	1.6 0.2	83.3	2.0	84.9
	Imperata cylindrica	0.8	16.6	1.0	16.8
	Shanginia aegyptica		66.6	1.0	67.4
51-75	*Cynodon dactylon*	2,2 0.5	83.3	2.6	85.5
	Imperata cylindrica	0.5	16.6	2.0	17.1
	Shanginia aegyptica		50.0	1.0	50.5
76-100	*Cynodon dactylon*	2.2 0.2	66.6	3.3	68.2
	Alhgi graecorium		16.6	1.0	16.8

Table 5 represent *Imperrata cylindrica*, which noted most of the individual plants are the same species, which the abundance reached fairy high 5/m^2 for abundance, and 104.6 for dominance, which regards are quite highest values. Its mean this species is aggregate by rhizomes, also [3] noted *Shanginia aegeptica*, which this species is a dominant in this area under study, in other hand the two parts of qudrate, 75, and 100 cm were empty from any plant

Table 5: *Imperat cylindrica* species as a central of quadrate for a radius 100 Cm.

Distance (Cm)	Species	Density /m^2	Frequency%	Abundance/m^2	Dominance
≥ 25	*Imperata cylindrica*	4.6	100	5.0	104.6
	Prosopis farcta	0.1	16.6	1.0	16.7
	Shanginia aegyptica	0.3	33.3	2.0	33.6
	Cynodon dactylon	0.5	50.0	3.0	50.5
26-50	*Imperata cylindrica*	2.3	4.0	4.0	6.3
	Shanginia aegyptica	0.3	100	1.0	100.3
	Convolvulus arvensis	0.5	33.3	1.0	33.8
	Cynodon dactylon	0.1	16.6	1.0	16.7
51-75	---------	----	------	-------	-----
76-100	----------	------	-----	-------	-----

Table 6 represent, *Lycium shawii*, which noted this plant semi- aggregated with its self, but doesn't intensity for each part of the quadrates, the dominance is relatively high value at second and third part of quadrate (67.3 and 50.6 respectively). The reason for that might be because this species relatively large size. Associated with this species, such as *C. dactylon*, and S. halepanse. Those two species the are very little competition with *L. shawii* because *L.shawii* has tap root go deep in the soil, whereas *C.dactylon* and *S. halepanse* have fibrous roots, which distributed near the surface of soil [16].

Table 6: *Lycium shawii* species as a central of quadrate for a radius 100 Cm.

Distance (cm)	Species	Density/m^2	Frequency %	Abundance/m^2	Dominance
≥ 25	*Lycium shawii*	1.3	33.3	1.0	34.6
	Cynodon dactylon	0.3	33.3	1.0	33.6
26-50	*Lycium shawii*	0.6	66.7	1.0	67.3
	Sorghum halepanse	0,3	16.6	2.0	16.9
	Cynodon dactylon	0.3	33.3	1.0	33.6
51-75	*Lycium shawii*	0.6	50.0	1.3	50.6
	Sorghum halepanse	0.1	16.6	1.0	16.7
	Shanginia aegyptica	0.1	16.6	1.0	16.7
76-100	*Lycium shawii*	0.1	16.6	1.0	16.7
	Prosopis farcta	0.1	16.6	1.0	16.7
	Capparis spinosa	0.1	16.6	1.0	16.7

Table 7 represent *Phragmites australis,* surrounde by the same species, which the abundance recorded quite high, its reached 5,5/m^2, its mean aggregate with individual of same individual species, which the abundance reached fairy high 5.5/m^2 and the dominance was 101.8. This species possess rhizome connected with each other, also found some of other species lived with them, such *I. cylindrica*, *C. dactylon* and *S. aegyptica*.

Table 7: *Phragmites australis* species as a central of quadrate for a radius 100 Cm.

Distance (Cm^2)	Species	Density/ m^2	Frequency%	Abundance/m^2	Dominance
≥ 25	*Phragmites australis*	1.8	100	5.5	101.8
	Prosopis farcta	0.1	16.6	1.0	16.7
	Cynodon dactylon	0.3	33.3	1.0	33.6
	Imperata cylindrica	0.1	16.6	1.0	16.7
26-50	*Phragmites australis*	0.8	33.0	2.5	33.8
	Cynodon dactylon	0.2	16.6	1.0	16.8
	Imperata cylindrica	0.2	16.6	3.0	16.8
51-75	*Phragmites australis*	0.2	16.6	1.0	16.8
	Imperata cylindrica	1.6	83.3	2.0	84.9
	Shanginia aegyptica	0.2	16.6	1.0	16.8
76-100	*Cynodon dactylon*	0.5	33.3	1.5	33,8
	Imperata cylindrica	1.0	33.3	3.0	34.3

Table 8 represent *prosopis faracta,* which surrounded by different species which do not aggregate, in spite of Dominance 84 in the first part of quadrate, but the abundance at the same part was relatively low value (1.2). which is the abundance about similar with other species, its mean (segregation) with its individual. It is well known that this species possess very deep roots, may be reach to 30 m deep in the earth to reach ground water. So will not need to aggregate with each other for surviving and associated with *A. graecorium, C. dactylon,* and *L. shawii*.

Table 8: *Prosopis faracta* species as a central of quadrate for a radius 100 Cm.

Distance ($cm^{2)}$)	Species	Density/m^2	Frequency %	Abundance/m^2	Dominance
≥ 25	*Prosopis farcta*	1.0	83.0	1.2	84.0
	Alhagi graecorium	0.2	16.0	1.0	16.2
26-50	*Prosopis farcta*	0.8	20.0	1.6	20.8
	Alhagi graecorium	0.3	16.6	2.0	16.9
	Sorghum halepans	0.3	16.6	2.0	16.9
	Cynodon dactylon	0.1	16.6	1.0	16.7
	Shanginia aegyptica	0.5	33.3	1.5	33.8
51-75	*Lycium shawii*	0.1	16.6	1.0	16.7
	Prosopis farcta	0.1	16.6	1.0	16.7
	Shanginia aegyptica	0.3	33.3	1.0	33.6
76-100	*Lycium shawii*	0.1	16.6	1.0	16.7
	Shanginia aegyptica	0.3	33.3	1.0	33.6

Table 9 represent *Shanginia aegeptica*, its aggregated with each other, which the abundance reach 6/m^2 at the second region of quadrate, and 102 for dominance value. Growing with this species: *C. spinosa* and *P. farcta.*

Table 9: *Shanginia aegyptica* species as a central of quadrate for a radius 100 Cm.

Distance (Cm^2)	Species	Density/ m^2	Frequency %	Abundance/m^2	Dominance
≥ 25	*Shanginia aegyptica*	0.5	50.0	1.0	50.5
	Capparis spinosa	0.1	16.6	1.0	16.7
26-50	*Shanginia aegyptica*	2.0	100	6.0	102.0
	Prosopis farcta	0.1	16.6	1.0	16.7
	Capparis spinosa	0.1	16.6	1.0	16.7
51-75	*Shanginia aegyptica*	0.3	33.3	1.0	33.6
	Prosopis farcta	0.1	16.6	1.0	16.7
76-100	*Shanginia aegyptica*	0.6	16.6	1.0	17.2

Table 10 represent *Sorghum halepanse*, which surrounded by the about same species, which abundance reached 3/m^2 and 103 for dominance, this means is aggregate, but also associated with its *C. dactylon*, *I. cylindrica* and *C. spinosa*.

Table 10: Survey of *Sorghum halepanse* as a central of quadrate for a radius 100 Cm.

Distance (Cm^2)	Species	Density/m^2	Frequency %	Abundance/m^2	Dominance
≥ 25	*Sorghum halepanse*	3.0	100	3.0	103.0
	Cynodon dactylon	0.3	33.3	1.0	33.6
	Imperata cylindrica	0.1	16.6	1.0	16.7
26-50	*Sorghum halepanse*	0.8	66.6	1.1	67.4
	Cynodon dactylon	0.5	33.3	1.5	33.8
	Cynodon dactylon	0.5	16.6	1.5	17.1
51-75	----------	------	------	--------	--------
76-100	*Capparis spinosa*	0.1	16.6	1.0	16.7

From the above Tables, we could divided the target specie into two groups. First are aggregated species, such as *A. graecorium*, *C. dactylon*, *I.cylindrica*, *P australis*, and *S. aegyptica*, and *S. halepanse*, Whereas the second group are semi-segregated or weak aggregated, species, represented by *C. spinosa*, Only *P. fracta* represent segregation species. Most of aggregation plant species have rhizome connected individual which each other; this is help to defense and to help each other for getting natural resources, [3] Table 11 showed the values of pH, EC, and OM for the soil under target species growing on its. For the pH there are significant difference

between group of species, *C. dactylon*, *L. shawii* and *S. halepanse*, which gave higher value than the rest of the target species including the control. The Electrical Conductivity (EC), which represent the amount of salts in the soil, which noted that *C. spinosa* and *S. aegeptica* as group different significantly with higher value than the other target species, and tolerant the soil salinity which those two species tolerated soil salinity [17]. Whereas organic matter (OM) showed that is only control significantly difference from all the target species, this is of course because no any leaves or remain of plants at the space of the vegetation.

Table 11: Soil characteristics of target species which have been taken from root system for each target species. (Difference, A, B letters represent significant different at $p \leq 0.05$).

Species	pH	EC	OM
Alhagi graecorium	7.38 ab	1.55 ab	0.49 a
Copparis spinosa	7.41 a	2.53 b	0.48 a
Cynodon dactylon	7.48 b	1,15 a	0.47 a
Imperata cylindrica	7.28 a	1.94 a	0.46 a
Lycium shawii	7.49 b	1.96 a	0.48 a
Phragmites australis	7.31 a	1.95 a	0.48 a
Prosopis fracta	7.28 a	1.55 a	0.47 a
Shanginia aegyptica	7.30 a	3.55 b	0.45 a
Sorghum halepanse	7.53 b	1.92 a	0.47 a
Control	7.39 ab	2.35 a	0.44 b

a, b letters represent significant different

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