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PROTECTIVE SOLID FENCES AND ITS IMPACTS ON REDUCING EROSION AND STABILIZATION OF WIND SEDIMENTS IN SOME DESERT AREAS OF SOUTHERN IRAQ

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Abstract

This study was conducted in 2013 to solve the problems of increasing wind erosion and sedimentation, which threaten dumping of agricultural of civil projects in Iraqi southern desert, like the Almssab Alaam project, which was the most affected. Where protective solid earthy fences were used to minimize the impact of this problem and they were two types of solid fences, conventional linear soiled fences model and the linear solid fences with the front trench with three replications were used.

The periodic measurements found that there was a significant increase in the amount of wind sediment collected during July-October, in front of the repeated model of the linear solid fence with the front trench of 12474,00 tons/km of its maximum capacity of 42336,00 ton/km, compared to the traditional linear solid fence model, Which gathered around it the amount from the sedimentation 6316.74 tons/km of its maximum capacity of 25536.0 ton/km of wind sediment. It was found that most of the deposition processes of the sediments were concentrated in the front lines facing the direction of the Northwest wind windward side of the studied fences, in addition to the frontal trench to the linear earthen dikes with the frontal trench.

Increased sedimentation activity around fences was observed in the second half of July and the first half of August, due to the activity of the induction and transport to sediments because of high temperatures and small rainfall amount, the decrease in relative humidity, fast winds and dryness. Winds speed slow down in winter because of rain falling which it comes to growing natural plants (vegetation cover) and that help to increase the stability of the accumulated deposits on solid earthy fences.

Key words : Desert areas, wind erosion, high fragility, natural plants.

Introduction

Due to the wide area of soils affected by wind erosion and wind borne sediments, which has become the risk of proliferation threatens the desertification of several million hectares of agriculture in Iraq. This addition to the danger of creeping these wind precipitation on some vital agricultural and civil installations, especially project of the Almassab Alaam (study area) vertical in most of the province on the direction of the north-west winds prevailing in the region and conveying huge amounts annually of these sediments. The main reasons for this complex problem are the interaction between the dry area environment with high fragility and the bad exploitation of humans as reported by Abbas and Thajil (2012).

The field methods used to address the problem of wind erosion and the resulting sediments can be limited in several ways "pedology, volumetric, formality, photographic, historical or archaeological, vegetative growth, budget method and methods of prose". These methods focused on determining the physical and chemical composition of the sediment soil, by exposing the soil to wind effects and monitoring the results in laboratory or field. The laboratory relied on fixed and mobile wind tunnel, space images, space visualization and remote sensing systems to estimate the damage caused by wind erosion and the methods of controlling it (Al-Azawe, 2013; Varma *et al*., 2014). Al-Adhami (2001) estimated the rate of movement of sand dunes in the study area, using remote sensing and found that the speed of movement was 25 m / year.

Steel needles or poles that are installed on the ground in the form of vertical lines on the slopes were used by Zachar (1982) to estimate the loss of soil from a field by wind erosion. Gerlach (1964) was adopted the balance system via wires between poles and measuring the vertical distances between the wires and the surface of the earth to determine the difference in height before and after the wind erosion during periods of time.

Speed and wind direction is important to the planners to implement designs for agricultural facilities in areas affected by erosion and wind sediments, Laboratory experiments that reflect the natural conditions of the laboratory are often used (Al-Kellabi, 1996; Pasqual, 2014). The dynamic movement of air around obstacles is influenced by the size, the way in which these obstacles are combined (Shaheen and Abdellatif, 1980; Bautet, 1987), where the air changes direction when a collision with an obstruction creates high-pressure areas" due to air compression, behind the barriers create a low-pressure zone (Al-Munir, 1977; Lafta *et al.*, 2009). The basic rule of air movement around the obstacles is that the moving air mass has a momentum, equal to multiply its mass by its velocity rate, the momentum has a "directional" amount and direction and can change in value and direction through other forces, when the air hits an obstacle, its velocity slows down, but it causes pressure on the barriers, the reason is to create statics areas on both sides of the barrier, vortex and eddy are formed in front and behind the positive and negative pressure the impediments, respectively (Shaheen and Abdellatif, 1980; Lafta *et al*., 2009). Because of the momentum of the wind layers on the windward side, the air may move above the obstacle and sideways to a distance, which then returns to the normal state. As a result of the low speed behind the barrier, a zone with negative pressure is formed, the area called the wind shadow (fig. 1).

In dry and open areas, some soil particles are often transported with the wind in the form of wind sediments, and wind sediments are the backwardness and accumulation of wind load after a decrease in speed or collision with obstructions or fixed bumpers in the path of the wind the loaded with soil particles, these sediments can be divided According to the particles formed into two basic types (Faraji, 2000; Abbas and Thajil, 2012; Dewan, 2015) as following :

(A) Sand accumulation, which consists of large areas near the beaches and on the banks of rivers and desert areas and it consists of various forms. The most important are sand shadows and sand drifts sand dunes, sand sheets or sand seas.

(B) Losses sediments, which that are very soft and were accumulated outside the boundaries of desert areas, when the wind loses its ability to carry the suspended sediments. Most of them are the size of the silt and the proportion of them in the size of clay, or very fine sand, chemical compositions of closet fluorspar, mica and a little quartz.

Sediment movement begins when the speed of the wind is about 3.33 - 5.30 m/sec. (Bagnold, 1960 and Lafta *et al*., 2009) adding that the direction movement of air and sediments do not necessarily coincide if the particles continue to move straight when the air currents deviate from their straight path. The particles which collide with other particles bounce back from the obstacle and fall into the sand shadows and sand drifts. This sand cavity is formed to the limit where it consists of the special slope degree (Angle of repose, 34 degrees) while the extra sediment material slides down to the bottom and connected to the stream of sediment passing from both sides of the obstacle. The rise of sediment deposits in front and behind the barriers of "solid fences" is always determined by the surface areas of both the sand shadow and the wind shadow respectively, and that any particles slide down on the sides of these shadows are removed by a stronger external wind as reported by Al-Kellabi (1996) and Moussawi (2015) (fig. 2).

Wind erosion and stabilization sandy sediments can be reduced by improving the physical and chemical soil properties and their resistance to wind erosion, reducing wind speed and reducing their momentum by growing vegetation, agricultural processes and by mechanical ways, Vegetation is one of the most effective way of controlling wind erosion, through the mechanical effect of its green groups against the forces of wind withdrawal and the physical and chemical effect of its roots and the resulting organic matter (Dewan, 2015; Hussein and Kazem, 2016). In addition to the importance of the windbreaks, the solid fences and the non-solid fences" in reducing the length of the field and reduce the wind speed and sedimentation. The best fenders are the plant fenders but slow and difficult to grow in the conditions of severe desertification and the cost of high establishment may prevent their implementation at the outset, unless they are protected by effective mechanical means, such as concrete walls or protective solid fences. Where, the small shrubs are protected from sand landfill in the first dry season of agriculture, this is in addition to its importance in the collection and spread of natural plant seeds in the region during the dry season, germination and growth in subsequent rainy seasons of the same year (AL-Ghamdi, 1986; Dewan, 2015).

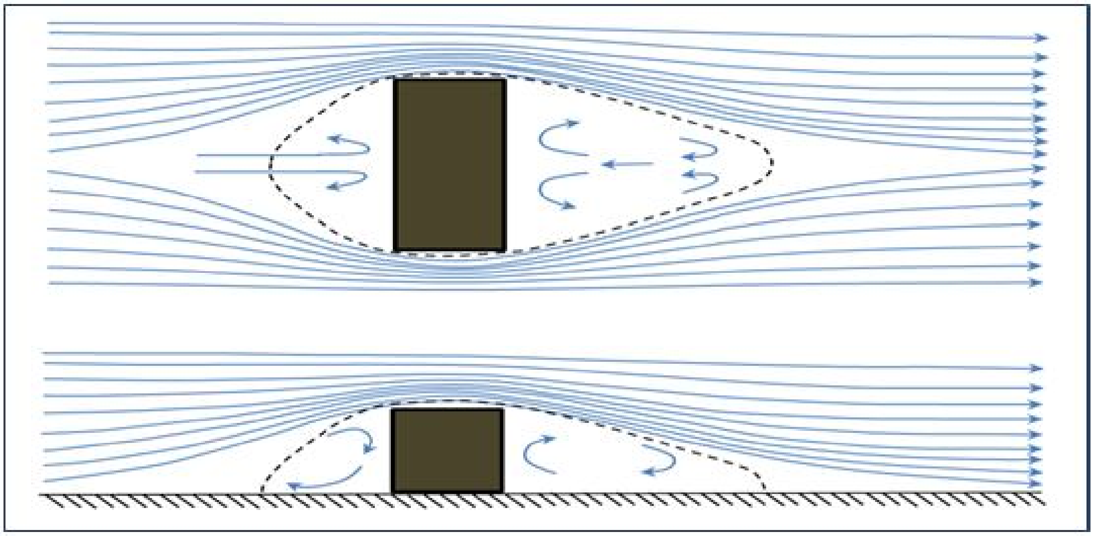


Fig. 1 : Areas of stillness of air in front and behind obstacles (Koenigsberger, 1987).

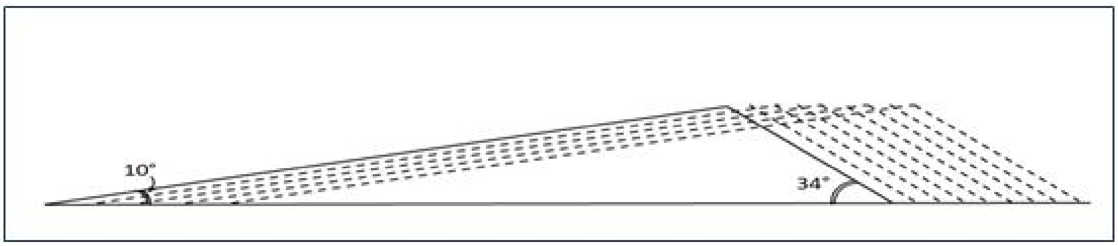


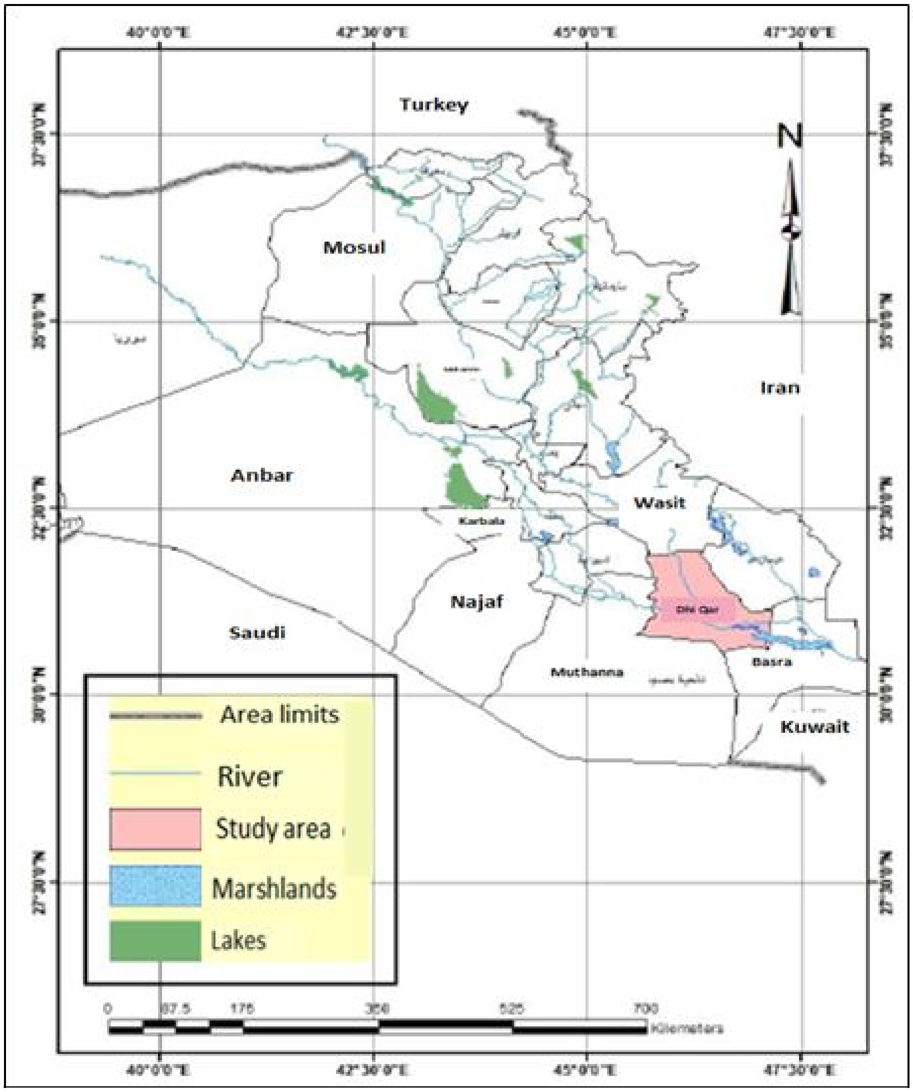
Fig. 2 : Moving sand dunes.

To fix the movement of wind sediment two basic stages were used. Temporary fixation and permanent fixation. The temporary fixation is prevent wind soil erosion reducing the speed by erecting mechanical fences and improving the stability of soil aggregates using some optimizers (El-Hady, 1984; Hussein and Kazem, 2016). Permanent fixation depends on the principle of increasing the capacity of soil and sand dunes to resist the effects of wind through the development of vegetation, after providing the appropriate conditions through the temporary fixation (AL-Shakhatra, 1985; Shallal, 2009). The direction and speed of wind prevailing, where they are formed parallel lines when the prevailing winds in the region in one direction or in opposite directions, chess boxes are set up when the wind is changing direction, and the length of its sides varies by the wind speed in the region (Kaul, 1985; Hussein, and Kazem, 2016).

Due to the large area of soils affected by erosion and the movement of wind sediments in the southern sedimentary plain of Iraq, and the need to reduce the risk of creeping these sediments on some agricultural and civil facilities, in particular the main drainage channel in the Almassab Alaam project in the study area, serious considerations has been given to reducing this risk in many ways, including the establishment of "earthy" protection, for the lack of studies evaluating the work of this fences, this study was conducted.

Materials and Methods

From the study and analysis of information available from the results of studies, maps, aerial photos and previous space visuals, the middle area of the Almassab Alaam was selected in the Iraqi sedimentary plain between the widths of 30 33 and 3205 north and 45 27 and 47 12 east. (Abu Thuheb area - Tal Habandiyat) Map 1, affected with wind erosion and sand dunes to carry out the field experiment. In the beginning, the area was described geomorphological, samples from soil and wind deposits from the above-mentioned area were collected to identify some physical and chemical properties of soil and wind sediments that determine soil susceptibility to wind erosion, some climatic elements were also studied from nearby climate station data for the time period (1970-2013) in order to identify some climatic elements related to desertification and wind capacity for wind erosion and its trends, as measurements were also made for the volume distribution of the separated by wet sieve and the pipette method, depending on Tamimi and Mahdi (2017). Soil salinity, lime ratio and organic matter, according to Jaekson (1958) for soil and wind sediment models, to identify the nature of soil



Map 1 : Geography of the study area.

particles affected by wind erosion.

Based on the results of a previous laboratory study (Al-Kellabi, 1996) for the results of wind tunnel experiments, which characterized the model of the earthy linear fence with the trench vertical front on the direction of the wind, when compared with other fence models, the Bucklin Drilling Machinery was used to implement the earthy linear fence, "A" conventional fence in the desert areas of Iraq and the earthy linear fence with the field front trench "B" with a height of three meters, a length of 50 meters and a trench in front at a depth of 3 m for the earthy linear fence with the front trench, and three replicates of each it vertical on the direction of the Northwest wind prevailing (fig. 3).

The principle of periodic measurement for the average volume of the wind sediments about replicates the field protective fence for the period of July-November 2013, through the installation of pegs numbered, and calculate the periodic differences in the depth of the sediments in both the front trench, the side of the fence to face the wind windward side, the direction of the opposite of the direction of the wind leeward side. In order to test the effectiveness of this fence and to determine the efficiency of the fence model, using a statistical comparison analysis, and to find the least significant difference of LSD from the t-test of the computational averages of the accumulated sediments on the repeaters of each "A" and "B" fence.

Results and Discussion

Geomorphology study area

The study area is part of the Iraqi sedimentary plain formed by the flood deposits of the Tigris and Euphrates rivers. It is characterized by a flat, where the rate of the height of the terrain does not exceed 5.0 meters, its slope

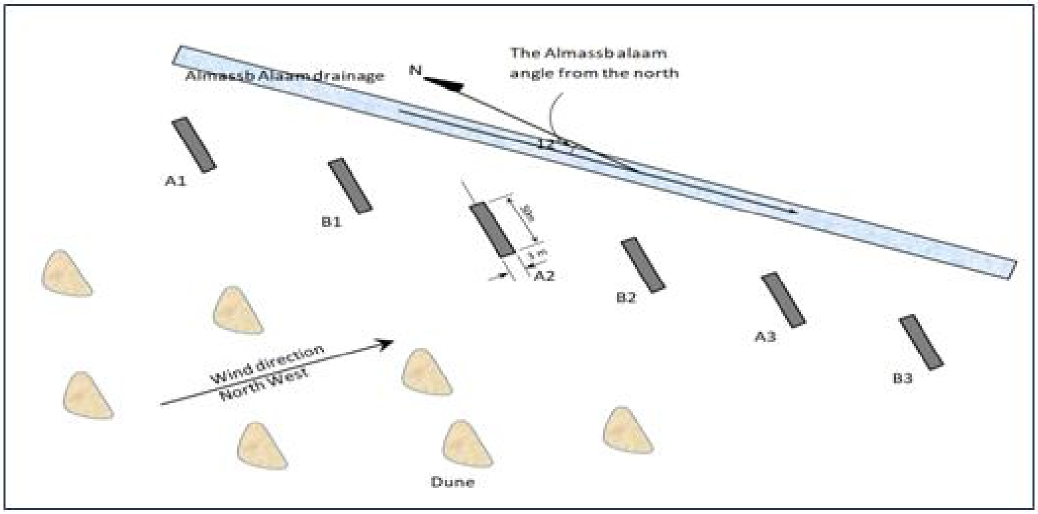


Fig. 3 : A field plan for the method of implementation of the protective fence in study area.

is similar to that of the Iraqi sedimentary plain (0.009%). This gradient has a significant effect on the erosion processes and the transfer of wind sediments, especially that northwest wind direction southeast of the same direction slope and encouraging the movement.

The region is divided by chains of highlands that are thought to be the remains of an ancient irrigation cistern or remnants of an antiquities spread on both sides of the Menderes river valley called the Nile Shatt and be the activity that makes the Almassab Alaam channel threatened by the sand creeping. It is believed that these dunes were formed due to wind erosion of the dry deposits of the Euphrates river and its tributaries in the region, which have been formed by recurrent floods since ancient times, and that climate factors play a major role in diversifying geomorphological processes and shaping the earth's landscape in the region. Human activities also play an active role in exacerbating the problem of sand dunes, due to poor soil and water management, the high salinity of the soil and leave the area without exploitation for many years, in addition to the overgrazing of few natural plants.

The variety of sand dunes and overlapping with each other and the difference in the speed and direction of wind constituents it in the study area, prevented to give distinctive form for it, there has been a rule of moving sand dunes, which were represented by the sand dunes and the Burkhans chains, in addition to the transverse and longitudinal sand dunes, there are fixed sand dunes, such as shadow dunes, Al-Nabgah dunes and some mechanical fixation sand dunes covered with some dry vegetation fences, or with a layer of soil of the clay area and thickness of up to 30 cm, The results may confirm the findings of both (Al-Kellabi, 1996; Hussein and Kazem, 2016).

Climate study area

The climate has a significant impact on soil susceptibility to wind erosion, the focus was on the wind as one of the fundamental variables, as it affects the erosion and movement and deposition of soil particles during the year, where it was found through data analysis of the climatic data of meteorological stations close to the study area (Nasiriyah, Samawah, Al Hayy) for the period 1970-2013, that the region is characterized by dry winds not rainy for most of the months of the year and controls the pressure of the air direction, its decline in the Iraqi sedimentary plain and its rise in the far north-west of Iraq in summer and its decline in the Arabian Gulf in the autumn and winter makes the Northwest wind is prevailing throughout the year because the low pressure will work to withdraw these winds, this is confirmed by Hussein and Kazem (2016) where the percentage of Northwest wind blowing 57.40% in the dry season followed by the West wind, North and East by 18.90%, 10.00% and 3.20%, respectively (table 1). These results were concentrated on the Northwest Winds and the construction of solid fences on them vertically, the annual rate of wind speed was 3,80 m/s and the average wind speed in July may reach 5.10 m/s, this rate increases to more than 7,00 m/s when we rely on daily observation data for 1500 hours of wind speed affecting wind erosion for the period mentioned. The period of rainfall in the region extends on winter and spring, for the months of November to April at a very low annual rate of 118.26 mm/year and the highest monthly rate of 25.53 mm in January.

The climate of the region is characterized by extreme

Table 1 : Average of some climatic data for the stations "Nasiriyah, Samawah, Hayy" for the period 1970-2013 in the study area.

Elements of climate / Months	Wind speed M / sec	Wind direction %	Rain "mm"	The Heat "C°"	Relative humidity %	Steaming "mm"	Sun brightness Hour / day
January	3.1	North 10	25.53	6.4	69.13	87.27	5.8
February	3.6	Northeast 2.3	17.63	14.2	60.33	116.9	6.8
March	3.3	East 3.2	20.23	19	55.4	200.13	7.2
April	4	Southeast 2.4	11.87	25.3	42.5	282.17	8.1
Maes	4.1	South 2.8	4.37	25.6	31.16	403.8	8.9
June	4.9	Southwest 2	0	35	23.7	522.3	10
July	5.1	West 18.9	0	37.2	22.53	584	11.5
August	4.5	North West 57.4	0	36.5	23.76	540.5	10.5
September	3.9		0.27	33	27.2	414.3	9.6
October	3.1		4.13	27.7	37.37	273.93	8
November	3.1		14.1	18.9	53.47	146.27	7
December	2.9		20.13	13.2	67.13	92.3	5.9

variations in temperature between night/day winter and summer and this difference activates physical weathering processes and thus increases the transferred sediments, where the highest monthly rate of temperature recorded in the region 37.20°C in July, as for the lowest temperature rate for the same place in January is 6.40°C, with an annual rate of 24.33°C.

There is a clear fluctuation in relative humidity, which ranged from 69.13% in January and decreased to 22.53% in July at an annual rate of 42.53% the atmosphere in the area contains little moisture. It was also found that the highest monthly evaporation of the surface of the free water in the study area 584, 00 mm for the month of July, has decreased this rate to 87.77 mm in January.

This is in addition to increasing the periods of solar radiation during the month of November 5,80 hours / day and increase to reach 11.50 hours / day of July, "schedule" and that this extreme extremism in the period of solar radiation at the rate contributed significantly to the increase in drought in the summer season.

Climate data indicate that the climate of the region is dry desert, characterized by dry summer season is not rainy and fast northwesterly wind, high temperature, low relative humidity, the increase in wind speed, low rainfall, high annual evaporation rate, high-temperature variation and temperature have all contributed to the scarcity of natural vegetation, the disintegration of surface soils and their lack of resistance to wind erosion, thus, this climate helped to form the sand deserts and worked on the extension and expansion through the movement of sand dunes and migration from one site to another, this result is in line with what was stated by Al-Kalabi (1996), Al-Adhami (2004), Husain and Kazem (2016).

Natural plants

The region was characterized by relatively few species of desert natural plants, with limited communities within large areas of sand, where the annual species that grow in the rainy season, which adapted itself to drought resistance by various ways, a large proportion of the total number of natural plants that have been characterized by instability. As for the abundance, it pointed to the absence of sovereignty for certain species or types of plants, the character of the disturbance is prevailing for the plants of this environment, wan vegetation suffers from deterioration in secondary stages. The dominant plants have deep roots and pointed leaves,

Table 2 : Physical characteristics of soil, surface sediment and sand dunes, in the study area.

Diameters	Soil		Deposits		Dunes	
(mm)	%	%	%	%	%	%
2.00 -1.00	0.05		0.05		0	
1.00 - 0.50	0.05	0.25	0.15	0.5	0.07	0.44
0.50 - 0.25	0.15		0.3		0.37	
0.25 - 0.10	3.8		16.45		12.18	
		12.45		29.55		23.45
0.10 - 0.05	8.65		13.1		11.27	
0.05 - 0.02	48.8	48.8	35.45	35.45	41.7	41.7
< 0.002	38.5	38.5	38.5	34.5	34.41	34.41
Category of texture		Silty Clay loam		Clay loam		Clay loam

Table 3 : Some chemical characteristics of soil, surface sediments and sand dunes, in the study area.

Properties / Samples	Chamical properties of the Soil.		
	Ee. ds/m	O.M. %	Calsite %
Soils	5.5	0.54	26.1
deposits	8	0.37	26.3
dunes	6.5	0.31	26
Mean	6.67	0.41	26.13

covered by wax layers, low pores to reduce transpiration and maintain moisture. Despite the lack of these plants, but they are of great benefit because they are the most important factors that keep the soil from erosion by wind, but may not be relied upon unless the human intervenes positively in the propagation and protection from overgrazing that may kill them, it is these plants are the thorns *Prosopis* Spp, *Suheda* Spp, *Alhagi mauroum*, *Atriplex* Spp, *Haloxylon solicora*, *Tamarix articulate*, *Seidlitti aromarinus*, *Cornulecam orocartha* and *Cressa critica*. The result may be consistent with Al-Kellabi (1996), Hussein and Kazem (2015).

Soil study area

Physical properties

The results showed of the analysis of the sizes each of soil particles, surface sediments and sand dunes prevailing in the site of the study (table 2) to the small proportion of sand separators larger than 0.25 mm, where it amounted to 0.25%, 0.50%, 0.44%, respectively. As for the soil of the region, it was of a mixture of slimy clay, with a sand ratio of 12.70%, 48.80% silt, clay 38,50%, with the very fine sand rule of 8.65%, fine sand with 3.8% sandblasting. The surface sediment was characterized by a mixture of clay. The ratio of sand, clay and clay was 30.05%, 35.45%, 50,34% respectively, with the fine sand rule of 16.45%, followed by very fine sand 13,10%, the dune patterns taken from different sites were characterized by a clayey mixture with an average ratio of sand, silt and clay deposits of 23.89%, 41.70%, 34.41% respectively, fine sand rule 12.18%, followed by sand Very soft 11.27% in the sandblasting, thus, most dunes in the study area are close to the soiled tissue of the region, which is characterized by good strength and the possibility of establishing a cohesive soil fence, because it is not sandy soil as is believed, but a silty clay loam soil.

The dunes are false sand dunes. The results of the analysis also indicate a large homogeneity in the distribution of the volume of particles and the rule of sand is very soft, followed by fine sand in soil models, wind sediments and sand dunes. This indicates that the source of wind sediments and sand dunes is the soil of the same area; the results may be consistent with what was mentioned by Al-Kellabi (1996), Al-Adhami (2001) and Hussein and Kazem (2016).

The wind influenced geomorphology on the soil through drying, sort their surface particles and removed by dust, and that this effect increased as a result of the high speed of wind because of the fragmentation of the region and the lack of vegetation and increased susceptibility to wind erosion. Thus, the properties of wind sediments formed as a result of the prevailing northwestern wind effect, which affected the properties of both soil, sediment and sand dunes.

Chemical properties

Results of chemical analysis of both soil, surface sediments, sand dunes in the (table 3) area were

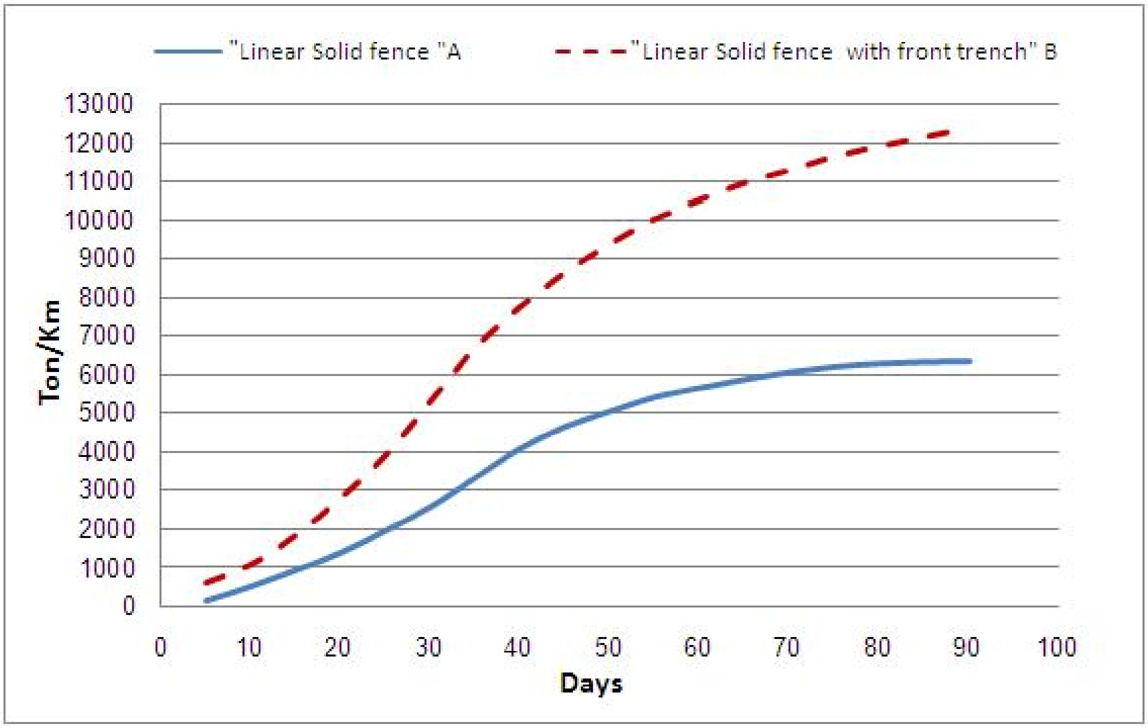


Fig. 4 : Of the volume and quantities of wind sediments on the solid fences the under study.

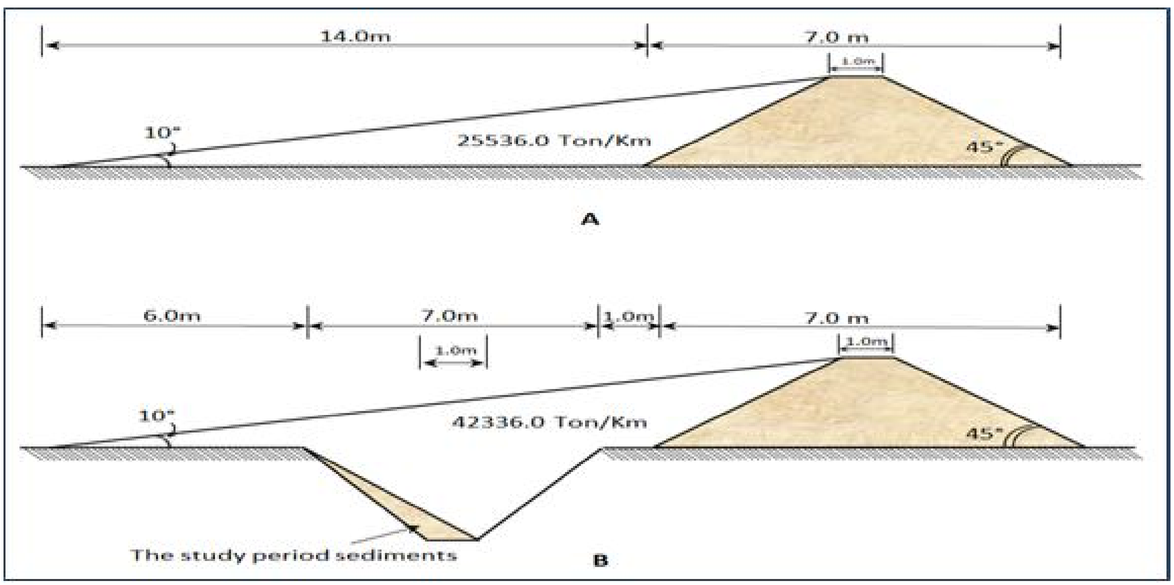


Fig. 5 : A cross-section of solid earthy fence A and solid earthy fence with front trench B.

characterized by an increase in soil salinity values of 5,50, 8.00 and 6.50 dS/m, respectively. The reason for this increase may be due to the near-surface water level in the region in the winter and the high evaporation rate in the summer and hence the salinity of soil and wind sediments. This is confirmed by Al-Kellabi (1996) and Al-Adhami (2001).

The results showed a decrease in soil organic matter by 0.54% surface deposits 0.37%, sand dunes 0.31% because of the rapid degradation of organic matter in the soil due to the increase in temperature, the result is consistent with Al-Adhami (2001). The proportion of lime in the soil area was 26.10% in surface deposits 26,30%, in sand dunes 26.00%, and that the reason for the rise of limestone may return to the nature of soil sedimentary Iraqi, which is characterized by containing a high percentage of calcium carbonate and this is confirmed by Al-Kellabi (1996).

Field protective solid earthy fences efficiency test

Through follow-up field work and periodic

Table 4 : The volume and quantities of wind sediments on the solid fences the under study.

Date (2013)	Days	Accumulated volume of deposites " m^3/50m "		Accumulated Weight of deposites " Ton/Km "	
		Linear Solid fence "A"	Linear Solid fence with front trench" B	Linear Solid fence "A"	Linear Solid fence with front trench" B"
Jul-13	5	5.7	21	161	588
	10	12.5	34.5	350	966
	15	37.5	51	1050	1428
	20	43	75	1204	2100
	25	55	100.5	1540	2814
	30	92.5	165	2590	4620
	Mean	**92.5**	**165**	**2590**	**4620**
Aug-13	35	119.7	240	3353	4720
	40	157.5	330	4410	9240
	45	178.2	352.5	4970	9870
	50	181	372	5068	10416
	55	187	384	5236	10752
	60	195.5	387	5474	10836
	Mean	**103**	**222**	**2884**	**6216**
Sep-13	65	198.2	391.5	5551	10962
	70	211.5	396	5922	11088
	75	215	405	6020	11340
	80	219	421.5	6132	11802
	85	223	433.5	6244	12138
	90	227.2	445.5	6361.7	12474
	Mean	**31.7**	**58.5**	**887.7**	**1638**
Total Accumulated of deposites		**227.2**	**445.5**	**6361.7**	**12474**

measurements for the period of July-October of the implementation of the experiment 2013 was found that the rate of wind deposition around the replicators of the models performed for the field of conventional "A" and "B" with trench was 6361.74 ton/km and 12474.00 ton/km, respectively of the length of the fence (table 4). The significant increase in the amount of wind sediments which collected in front of the linear solid earthy fences with the trench, compared to the amount of wind sediments collected around the traditional linear fences, give a strong indicator of the superiority of this model in reducing the progress of these deposits and install them and protect the land and facilities erected by the risk of erosion and desertification. It was found that most of the operations of the erosion of sediments concentrated in the parties facing the direction of the wind Northwest windward side of the fence of land considered "A and B". In addition to the front trench of the earthy linear fences model, B. And that very few deposits were deposited in the leeward side of the studied fences, where wind sediment distributed on the earthy linear fences, A, 80.25% in the windward side, and 19.75% in the leeward side of the body of the fences, while the linear fences B, around which the sediment settled around 93.20%, 5.78%, 1.02% of the fences body of the front trench, the side of the fences facing the direction of the north wind windward side and the direction of the fences to the direction of the wind leeward side, respectively.

The results in fig. 4 showed that the sedimentation activity increased during the second half of July during the first half of August due to the activity of the sedimentation and movement of wind sediments, as a result of high temperatures, lack of rainfall, and relative humidity decline, and thus dry and create a separation of soil for separation and transport by wind, which is increasing its speed in that period (table 4) after which fluctuation of erosion, transport and sedimentation, due to the lack of wind speed and high humidity relative during the period from mid-August to the end of October and finally stopped during the winter months, where some rain falls and some natural plants grow to help fix these windy sediments on the protective fences, which resembles the large Burkhan dune when it is full.

The study also showed the efficiency of the linear B fences, compared to the conventional A linear fences and spontaneously in the protection of some agricultural and civilian installations in Iraq. This is in addition to the distinction of the linear fences B and a design card high for full sediment up to about 42336.0 ton/km distributed on the front trench, which absorbs the amount of sand 16800,0 ton/km in addition to 25536.0 tons for additional accumulation, so that it shape becomes when fullness similar to the fixed Burkhan dunes, The most widespread forms are vertical axes on the prevailing wind direction, series in the field (fig. 5B). When compared with the geometric specifications of the traditional field A-type linear fences that has a maximum absorption capacity of 25536.0 ton/km (fig. 5A), which also it shape becomes when fullness similar to the Burkhan series to the smaller sizes from of the component of the linear fence with the front trench.

The fences under study have given uneven results in field activity and absorptive capacity, the linear fences B has significantly had superiority in the field activity and its absorptive capacity and therefore its high ability to stabilize most of the creeping and precipitation deposits by wind erosion, compared to the work of the linear fences A and found that the two models under study do not differ greatly in the period required for full and not more than 5.3 years, assuming the continuation of the sedimentation process for the dry summer months, in which the wind speed is more than the speed of the beginning of the surface erosion “Threshold velocity”, in addition to the homogeneity of the distribution of sediment along the protective fences and no effect of these sediments on their efficiency for a full year. After the fences are filled with by accumulated sediments of wind will become more like the fixed perkhan series that will contribute to reducing the movement of wind sediments towards agricultural and civil facilities in areas targeted for subsequent years, especially as the possibility of its movement is very weak because the root is fixed and that the cost of constructing the two models is equal, where the mechanism of work of fences B is easier because it is a process of cutting the soil from the front trench and making use of it in the construction of the adjacent fences. The results of the study are consistent with the results of Al-Kellabi (1996) and Hussein and Kazem (2015) all of which pointed to the magnitude of wind erosion in the study area and the importance of soil protection to reduce the progress of dunes and protect agricultural and civil installations in desert areas.

Conclusion

From the results of the study, the following points were reached :

1. All climatic and natural indicators confirm the activity of wind erosion, environmental degradation of the study area and that deterioration processes may be exacerbated unless scientific approach is to find appropriate ways to reduce this deterioration.
2. The physical and chemical properties of soils and sediments are very suitable for the establishment of protective soil fences, especially since the soil of the region is characterized by a mixture of clay soil texture suitable for the establishment of this effective method of “protective fences” to reduce the conditions of desertification.
3. The efficiency of the linear solid earthy fences with the front trench in repelling and stop the wind sediments, and significantly superior to the traditional linear solid earthy fences used in most desert areas in Iraq.
4. Because of the design capacity of the reservoir for approved linear solid earthy fences, they may continue to work efficiently for more than three consecutive years in reducing the movement of wind sediments and thus increase its stability through some natural plants that grow during the rainy winter months of the years in which remain sediments are fixed in the form of dunes volcanic around this mechanically executed soil fences fixed in the form of drained birch sand dunes around this mechanically executed solid earthy fences.

Recommendations

1. Expanding the study of some suitable characteristics of the solid earthy fences, such as length, height, and appropriate tilt angles of with the prevailing trend of the “Northwest” wind.
2. Research the possibility of appropriate engineering implementation and the least cost to these protective fences, taking into consideration the relevance of executed fences with both the permanent biological stabilization and the optimal agricultural exploitation of the lands targeted by the installation process in this way.

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