

## Studying Some Ecological Properties of *Sphaerocoma Aucheri* in Hormozgan

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### ABSTRACT

*Sphaerocoma aucheri* is one of the most important genus of Hormozgan coastal regions. In this paper, at first, dispersion map was provided and then, the investigations have been done in 7 regions such as Pibeshk, Jask, Keryan, Divan, Hosseine and Chark from east to west of Hormozgan (about 700 Km from the first and the last searching site).

This genus, with an extent about 23794 hectare in the coastal regions of Hormozgan with an altitude near the sea level in Qeshm island to the height of 100 meter from sea level in Chark Port, is being seen on the lands with a fine-texture and on the stabilized sand hills. Based on the lands' capability maps, this species is being seen in the lands' units as 3.5, 8.1, 8.2 and X.2.

Measuring the vegetative parameters in these regions indicate that the most percentage of coverage (vegetative coverage) in this plant and the least one are about 10.67% in Divan region and 2.05% in Hosseineh, respectively. Based on the density (number of stems/stalks in hectare), Chark with 11583 stalks is in the 1<sup>st</sup> place and Pibeshk with 2500 stalks is in the last place. And also the maximum density is about 60.39% in Divan region and the minimum one is about 13.23% in Hosseineh region.

**KEYWORDS:** Ecology, Hormozgan, *Sphaerocoma aucheri*.

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### INTRODUCTION

Plants as one of the main sources of ecosystem play role in the life of living creatures/organisms, nature survive and ecosystem balance, and are being observed in the lands/dryness fields and waters with a more complex structure and also constitute the 3<sup>rd</sup> element of natural environment.

Coastal sandy lands of Persian Gulf and Oman sea have a determined growth type means they do not have a multiyear variety because the special types are able to tolerate these dry and frail conditions. For the 1<sup>st</sup> time, *Sphaerocoma aucheri* from Caryophyllaceae family was introduced by Edmond Boasei in 1867, based on a sample which was collected from Qeshm island of Iran [9].

This genus due to its growth in the coastal regions was called as a coastal type Mozapharian in Hormozgan was called as *Sphaerocoma aucheri*. *Sphaerocoma aucheri* is a short shrub with 40-55 cm. height; its color is dark grey; has young branches with dense fuzzes; the old branches without fuzzes, sometimes with leaves' falling; leaves are falling not in determined time (premature falling of leaves), in the length of 5-11mm. and its width is less than 2 mm.; cylindrical, meaty like, without fuzz and with a tip having throne; stipulate in the length of 1 mm., triangle like, in the ciliate margin, in the fuzz back surface with brown veins in the middle of it; inflorescence near the stems; inflorescence in the length of 5-9mm, with fuzz or without it; flowers in the length of 4-5 mm, without peduncle or with peduncle shorter than 1 mm; leaves like sepal but shorter, in the length of 1.5-2 mm; sepals in the length of 3-4 mm, like egg, on the back surface with fuzz, stiff leather, with a yellow throne in the tip, with brown veins in the middle, in the membrane margin; petals in the length of 2 mm, like rectangle, thin membrane, with a knot in the stalk; quintuplet stamen, isolated, short, inside corolla, two branches stigma, fruit as a thin membrane, monocyte with calyx [4,5].

The flowering season is from the late of winter to spring and this plant is sometimes available in the sandy regions near the sea coast in Oman Gulf [9].

*Sphaerocoma aucheri* is one of the range species as in the coastal ranges of Hormozgan, it could bear the hard climatic conditions (droughts and high temperature), and excessive grazing from the previous times and now, it was survived as a native genus of coastal regions of Hormozgan. The strength of this plant to the grazing pressure and heavy razing and also its resistance to the environmental hard conditions caused that this plant as one of the main

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species formed types in association with the other sandy types or being observed as a accompanying/additional species. This plant allocates a surface in hectare (in Hormozgan ranges) [1,3,6].

Dina ravand said that the growth of this plant in Hormozgan is in the sandy areas of sandy hills. He said that the flowering season is from the late of winter to spring and this plant is being observed in the sandy regions near the sea coast in Oman Gulf[4]. he mentioned that the geographical dispersion regions of this plant are Iran, Pakistan, and Saudi Arabia and its dispersion in Iran is in the south and south east parts such as Hormozgan (Qehsm, Bandare Abbas, Charak Port, Lark Island, Kish Island, Bandare Lengeh, Horomz Island, Jask and Minab) and Baluchestan (Chabahar and Konarak). Akhani said that this plant is one of the halophyte plants, resistant to salinity of Iran, is in a camphyte growth form and also is one of the sandy – salinity plants[7,2].

Gary Brown said that this genus is one of the main types of sandy hills near a coast in Abu Dhabi region[8].

## METHODS AND MATERIALS

In this paper, in order to study the growth of *Sphaerocoma aucheri*, at first, by using the available maps of the vegetative coverage Asad poor and continuous investigations, a map of dispersion was provided[5,6]. after that, for measuring the growth parameters, seven regions from east to west in a distance of 700 km. as Pishbek, Koohe mobarak (jask), Sirik, Keryan (Minab), Divan (Bandare lengeh), and two sites in Hosseineh region (Chark port) in which there are verities in the growth of this plant, its type and its soil condition, were selected and it was attempted to introduce these regions as indicators of dispersion regions (table 1).

Table 1: properties of these regions

Plant type	Area	Rainfall average	Absolute maximum of temperature	Absolute minimum of temperature	Average of heat/temperature	Region
Sp.au+ Pa. tu	417	132/81	44/8	6	26/85	Jask
Ac. to + Sp.au	95344	140	48/5	5/5	28	Sirik
Sp. au + He. Ba	2472	222/5	49	2/8	27/36	Keryan
Sp. au + Pa. tu	29637	152	47	2	27/21	Divan
Ac. to+ Ha. sa + Sp. Au	123679	179	47	3	25/94	Hosseineh
Sp. au+ Ac. to	24483	179	47	3	25/94	Chark
Ha.sa+ Sp. au+ Pe. di	214241	Without Aerology station	Pishbek	Ha.sa+ Sp. au+ Pe. di	214241	Without Aerology station

In each site, three transacts (in 1000 m. distance) were placed. Then, in 100 m. distance in order to measure the percentage of vegetative coverage of this plant and the other bush/shrub types, and also in order to measure the tree types and the other shrub types, placing plots (in 4 m<sup>2</sup>) and (100 m<sup>2</sup>) was done, respectively. 4 m<sup>2</sup> plots were determined (based on Minimal area).

Therefore, in each station, 30 plots were measured. for measuring the chemical and physical properties, 3 profile in each transact were excavated and form the depths of 0-25, 25-50, and 50-75 cm., a soil sample was provided (63 profiles and 189 soil samples) and for measuring the parameters such as saturation percentage, E.C./electrical conductance, saturated flower reaction, lime, gyph, O.C./organic carbon, azoth, phosphor, potassium, Ca + Mg/calcium+magnesium, sodium, sodium absorption ratio/S.A.R., solution potassium, clay amount, silt and sand were transferred to the laboratory. By using the statistics of Aerology stations, the properties of climatic factors of these regions were evaluated.



Figure 1: *Sphaerocoma aucheri*

## RESULTS

### 1- DISPERSION REGIONS

Altitude (altitudinal altitude) of dispersion in this plant is variable from the sea level in Jask port to 100 m. height from the sea level in Chark port. This species exists in the lands with fine soil and on the sandy hills (almost stabilized regions) (figure 2).

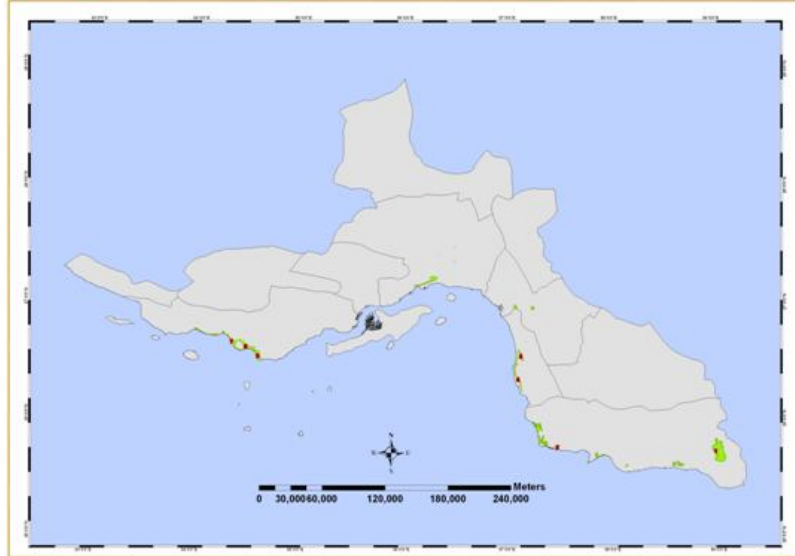


Figure 2: dispersion map of *Sphaerocoma aucheri* in Hormozgan

### 2- AEROLOGY AND CLIMATE

Coastal regions of Hormozgan are located under the coverage of dry and warm climates and in fact, they created a dominant climate of this province. Based on the calculations, the climates of these sites were determined by these methods; Amberzheh, Coupem and Domarten for all stations as sever warm, dry or arid and desert.

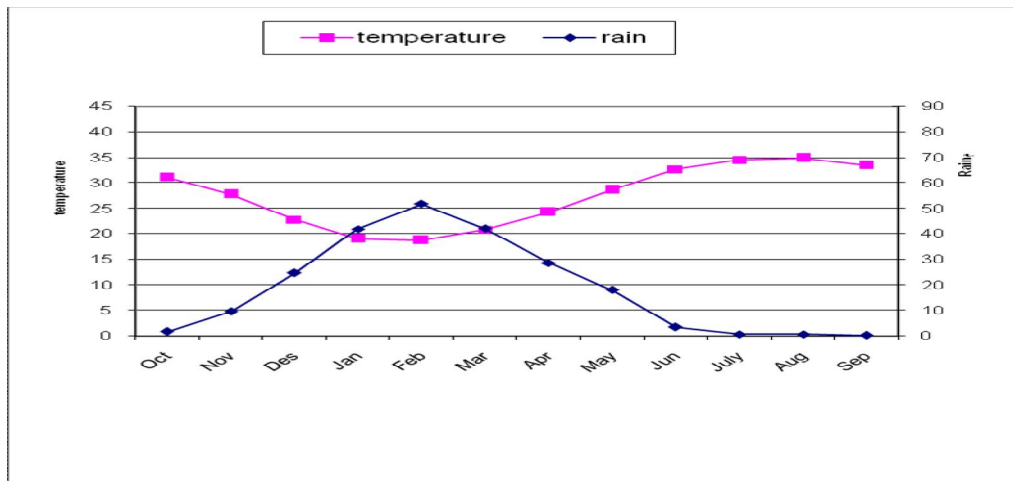


Figure 3: Ambrothermic curve of Minab station

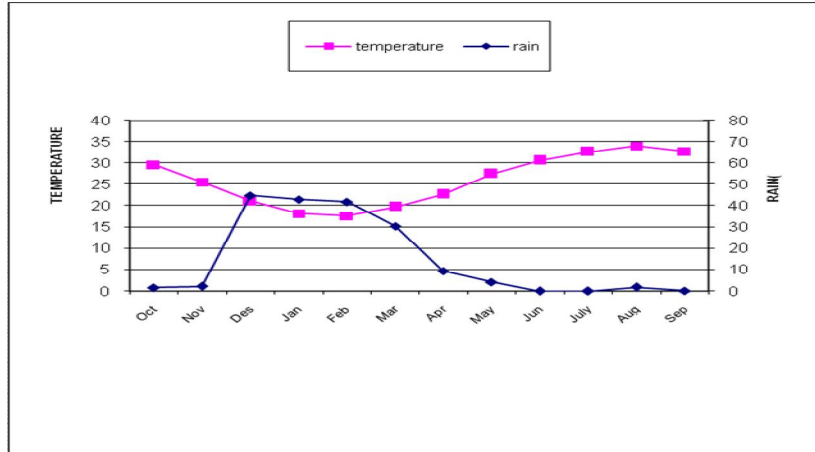


Figure 4: Ambrothermic curve of Hosseineh station

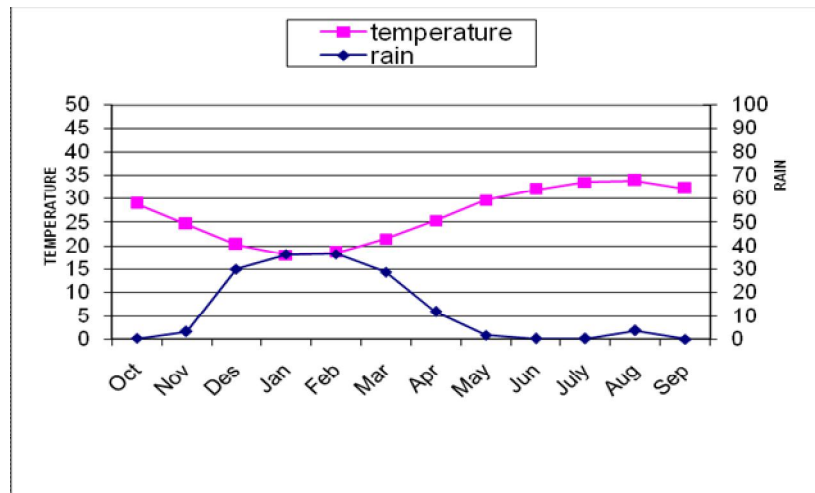


Figure 5: Ambrothermic curve of Lengeh station

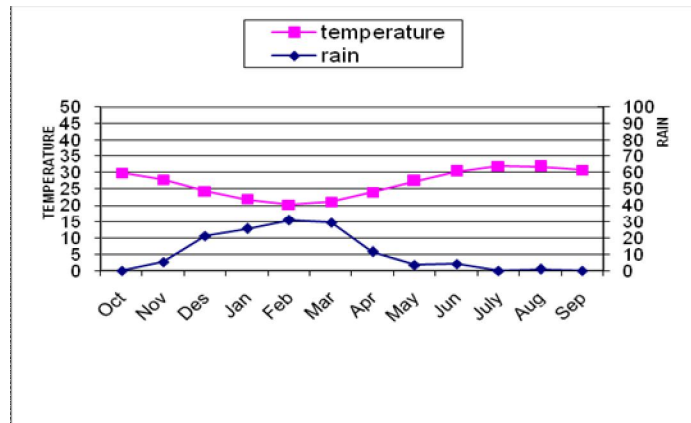


Figure 6: Ambrothermic curve of Jask station

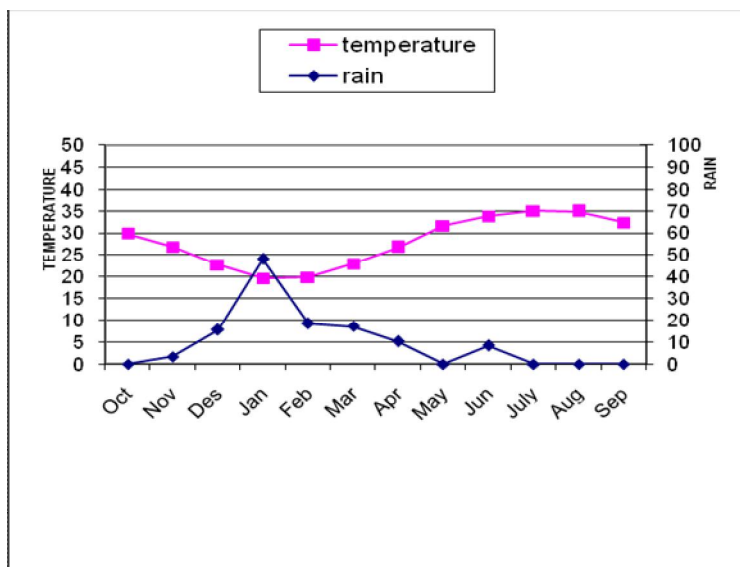


Figure 7: Ambrothermic curve of Sirik station

Climatic factors such as temperature and rainfall were investigated during different periods in 6 regions (Pishbek region does not have Aerology station). In these 6 stations, temperature degree did not equal 0. The least temperature of absolute minimum and the most one were about 2<sup>o</sup> C in Bandareh Lenghe station during March and Minab station during July and August, respectively. Annual average of temperature in Jask, Gaze Taheri (Sirik), Minab (Keryan), Lengeh Port (Divan) and Hosseineh were about 26.85, 28.03, 27.36, 26.5 and 25.9<sup>o</sup>C, respectively.

The highest annual rainfall and the lowest one were Minab (during 1995) and Jask (during 2000) and Hosseineh (2002-2003) about 526.9, 7.7 and 11, respectively. The average annual rainfall Jask, Gaze Taheri (Sirik), Minab (Keryan), Lengeh Port (Divan) and Hosseineh were about 261.25, 140, 222.45, 140.3 and 136.69, respectively.

### 3- GEOLOGY

Geology of dispersion region of this species is on the sandy hills between the sandy piles.

### 4- LANDS' TYPE

Based on the maps of lands' capability in the lands' unit, 3-5 includes plateaus and old gravel alluvium regions with highland or lowlands and a little slope; 8-1 includes gravel debris with low or highlands and little slope with less depth/shallow soil to half-deep gravel regions and having soil with fine soil texture; 8-2 includes gravels' debris with soft slope and low or highlands with fine texture to the normal one and also X.2 includes coastal sands that most of them are not stabilized. The other limitation of this unit is the movement of smooth sands.

### 5- SOIL CONDITION

Of seven sites, soil of the 5<sup>th</sup> station was without gyphs but in the site of Charak and Hosseineh which are in the west of this province (in the less distance from each other), 1 and 3 has gyphs, respectively and it seems that this plant does not prefer the soils with gyphs. It is necessary to mention that in Hosseineh, *Sphaerocoma aucheri* is not a type making element.

The habitants' soil of this species is soft with sandy texture and these soils are not fresh (young) and evolved. Acidity of alkaline soil and its extent is variable from 7.69 to 8.75 in various regions. The soil of Gerishhek is not enriched in nutrients and is less than 0.5 in all excavated profiles and as a whole; the percentage of O.C. is variable in various regions (from 0.01 to 0.39).

E.C. level in all regions is less than 4 deci Siemens/m. and in most regions, it does not exceed from 2.5 deci Siemens/m. and based on the amount of S.A.R. in profiles and E.C., the soil of dispersion regions is non-saline soil mans usual. There are cations as sodium, magnesium and calcium (in various amounts) in all soil layers. Percentage of neutralized materials (lime) is variable; from 26.43 in Pey Bashak region to 60.69 in Divan region. Table 2 shows the maximum and minimum amount of measure parameters in soils of all regions and tables 3-5 show the comparison of soil parameters in three depths; 0-25, 25-50 and 50-75 cm. in heptad regions.

Table 2: maximum and minimum amount of measure parameters in soils of all regions

maximum and minimum amount of measure parameters in soils of all regions							
maximum	minimum	Parameter			Maximum	minimum	Parameter
		7/5	0/73	Phosphorus			
0/04	0	Azoth			10/10	0/18	SAR
0/39	0/04	C.O.			43/83	1/50	Sodium
28	0	Gyps			27/53	1/87	Ca + Mg
60/69	26/43	Neutralized materials percentage			14/67	5/33	Clay
8/75	7/69	Saturated flower reaction			14/67	5/33	Silt
5/93	0/43	E.C.			91/33	68/67	Sand
34/79	25/67	Saturation percentage			209/33	40/67	Potassium

Table 3: comparison of soil parameters in depth of 0-25 cm. in the heptad regions

Charak	Hosseienh	Divan	Keryan	Sirik	Jask	Pishbek	Considered factor
26/14 d	28/28 c	24/98 d	29/41 b c	30/51 b	32/54 a	32/37 a	Saturation moisture,%
1/51 a b	1/92 a b	1/13 b	2/73 a	1/67 a b	1/24 b	1/19 b	E.C.
8/25 b	7/96 c	8/25 b	8/39 a	8/20 b	8/43 a	8/49 a	Acidity
60/32 a	59/77 a	60/63 a	28/95 c	29/79 c	36/41 b	27/84 c	Lime,%
0 b	8/40 a	0 b	0 b	0 b	0 b	0 b	Gyps ,%
0/15 c	0/12 c	0/13 c	0/12 c	0/21a b	0/26a	0/15 b c	O.C. ,%
0/015 c	0/012 c	0/013 c	0/012 c	0/02a b	0/026a	0/015 b c	azoth,%
3/63b	2/89b	4/66a	3/03b	3/44b	4/95a	4/72a	Phosphorus
76/66 c	97/33 c	75/20 c	148/1a b	175/1a	127/6b	163/6a	Potassium
88/33 b	87/ b c	90/33a	88/26 b	77/06 e	86/06 c	83/8 d	Sand ,%
4/33 c	3/0 d	2/66 d	4/66 b c	13/06 a	3/86 c d	5/66 b	Silt ,%
7/33 b	10/0 a	7/0 b	7/06 b	9/86 a	10/06 a	10/80 a	Clay,%
7/17 a b c	9/92 a	5/3 a bc	8/4a b	6/9 a bc	4/3 c d	2/4 d	Ca + Mg
7/94 b	8/83 b	7/63 b	18/51 a	9/84 b	8/07 b	9/34 b	Sodium ,%
3/37b	3/66b	4/53b	5/79b	5/28b	5/4b	8/3 a	S.A.R.
40/25 b c	34/7 b c	29/9 c	29/98 c	61/29 a	48/58b	34/63 b c	Solution potassium

The averages in each row with a common letter have not a significance difference in the level of Duncan Test, 5%.

Table 4: comparison of soil parameters in depth of 25-50 cm. in the heptad regions

Charak	Hosseienh	Divan	Keryan	Sirik	Jask	Pishbek	Considered factor
27/61b	29/26b	24/98 d	28/6b	31/74 a	32/27 a	33/24 a	Saturation moisture,%
1/86 a b	3/15 a	2/6 a b	2/69 a	0/88 b	2/11 a b	2/02 a b	E.C.
8/11 c	7/91 d	8/14 c	8/4 b	8/39 b	8/35 b	8/54 a	Acidity
59/47 a	58/02 a	59/82 a	28/99 c	31/13 c	37/26 b	29/53 c	Lime,%
1/84 a b	3/64 a	0b	0b	0b	0b	0b	Gyps ,%
0/15b c	0/11 c d	0/05 d	0/10 c d	0/20a b	0/18a b	0/21a	O.C. ,%
0/68a	0/011 b	0/005 b	0/010 b	0/020b	0/018b	0/021b	Azoth,%
1/86 c d	2/06 c d	3/46a b	2/52b c	1/2 d	3/44a b	4/49a	Phosphorus
55/80 b	56/20 b	60/73 b	107/7a	94/66a	101/6a	91/06a	Potassium
87/4a b	84/2 b c	89/80a	88/06a b	77/46 d	85/53 b c	83/13 b c	Sand ,%
4/8 b	4/33 b	3/33 b	4/6 b	13/0 a	5/0 b	5/93 b	Silt ,%
7/8 c	11/46 a	6/86 c	7/33 c	10/5 a b	9/46 b	10/93 a	Clay,%
10/18 b	18/51 a	6/97 b c	7/14 b c	3/65 c d	10/06 b	2/64 d	Ca + Mg
8/24 b	13/5 ab	8/83 b	19/34 a	5/22 b	14/16 ab	7/28 b	Sodium ,%
3/53 c	4/37 c	4/92 ab	6/08 ab	4/07 c	7/51a	6/02 ab	S.A.R.
21/5 abc	14/91 c	22/0 abc	13/89 c	17/55bc	28/53a	25/74 ab	Solution potassium

The averages in each row with a common letter have not a significance difference in the level of Duncan Test, 5%.

Table 5: comparison of soil parameters in depth of 50-75 cm. in the heptad regions

Charak	Hosseienh	Divan	Keryan	Sirik	Jask	Pishbek	Considered factor
27/77 d	30/34c	24/98 e	30/14c	29/37c d	32/69 b	34/51 a	Saturation moisture,%
1/63b c	3/43 a	1/56b c	2/41 a b	1/32b c	2/44 a b	0/72c	E.C.
8/08 d	7/84 e	8/18 c d	8/28 b c	8/27 b c	8/67 a	8/33 b	Acidity
59/42 a	57/54 a	59/58 a	29/20 d	31/90 c	37/01 b	28/28 d	Lime,%
4/8a	0/13 b	b	b	B	B	b	Gyps ,%
0/11c	0/11c	0/14b c	0/073c	0/22a	0/18a b	0/12c	O.C. ,%
0/33a	0/012b	0/014 b	0/007 b	0/021b	0/018b	0/012b	azoth,%
1/95 c d	2/15b c	3/45a	3/05a b	1/16 d	2/79a b c	3/11a b	Phosphorus
50/73 d	58/5 c d	48/86 d	112/8a	71/13 c	91/86 b	70/0 c	Potassium
86/9 a b c	84/53 c	88/93a	87/0 a b c	78/8 d	88/26 a b	85/0 b c	Sand ,%
4/66 b	4/4 b	4/26 b	5/06 b	10/20 a	3/46 b	4/66 b	Silt ,%
8/4 b	11/26 a	6/26 c	7/93 b	11/0 a	8/26 b	10/06 a	Clay,%
10/07 b	21/1 a	6/57 b c	6/81 b c	5/51 c d	10/06 b	2/09 d	Ca + Mg
6/24 b c	13/4 ab	7/72 b c	16/88 a	7/75 b c	14/10 ab	4/76 b c	Sodium ,%
2/75 b	3/9 b	4/25 b	6/47a	4/33 b	6/64a	4/75 ab	S.A.R.
14/12 bc	19/3 bc	12/07 c	22/16 b	13/47 bc	36/75a	11/97 c	Solution potassium

The averages in each row with a common letter have not a significance difference in the level of Duncan Test, 5%.

### 6- PRESENCE OF SPHAEROCOMA AUCHERI IN VARIOUS REGIONS

Measuring the vegetative parameters in these regions shows that the most percentage of coverage and the least one are allocated to Divan (1.67%) and Hosseineh (2.05%). and based on the amount of density (number of stalk in each hectare), Charak is in the 1<sup>st</sup> place (11583) and Pishbek in the last place (2500). the most density and the least density are 60.39% in Divan and 13.23% in Hosseineh, respectively. table 6 shows the plant parameters in each site.

Table 6: comparison of growth parameters of this coastal plant in these regions

Composition ,%	Height average	Small dia. average	Large dia. average	Density in each hectare	Coverage, %	Surface of base crown	Growth parameter
							Region
34/51 a b c	18/13 c d	31/63 b	39/27 b	2500 d	4/66 b c	11/4a	Pishbek
16/32 c	17/62 d	24/73 b	31/62 b	4833 c d	2/05 c	4/39b	Hosseineh
26/52 b c	26/18 a	43/02 a	53/48 a	5000 c d	6/88 b	13/54a	Sirik
65/08 a	22/82 b	39/99 a	47/42 a	7833 b c	10/67a	13/05a	Divan
56/6 a b	20/97 b c	31/37 b	39/72 b	8916 a b	6/94 b	7/79b	Keryan
53/35 a b	15/62 d	25/08 b	32/39 b	9500 a b	5/07 b c	5/34b	Jask
34/34 a b c	17/01 d	26/16 b	34/35 b	11583 a	5/51 b c	4/93b	Chark

The averages in each row with a common letter have not a significance difference in the level of Duncan Test, 5%.

### DISCUSSION AND CONCLUSION

Generally, the dispersion areas of *Sphaerocoma aucheri* in the world are lack of glacial days and this plant is not able to tolerate the 0 temperature or under it. In the dispersion area of this plant in Iran, absolute minimum temperature does not equal 0. Based on the non-presence of this plant in the west province of Persian Gulf such as Bushehr and Khuzestan and some regions of Hormozgan in which the temperature sometimes equals 0, it can be said that climate factor means temperature (cold) is one of the limiting factors in the dispersion of this plant.

It is necessary to mention that Bushehr Aerology which was installed in the geographical latitude of 28<sup>o</sup> and in the height of 59 minute and in the height of 14 m. from sea level, was registered the minimum of absolute temperature about -1<sup>o</sup>C with three glacial days.

By studying the soil of these habitants and its dispersion regions, the obtained results will be as the following:

- In these regions, pH did not change significantly and the change-range of these areas (average) is negligible; between 7.92 (Hosseineh) – 8.57 (Pishbeck). This issue shows that the soils of these regions have an alkali reaction. As a result, pH can be one of the limiting factors in the dispersion of this plant.

- The change-range of E.C. in these regions is between 1.31 (Pishbek and Sirik) – 2.68 (Hosseineh) but the change-range of S.A.R. in these regions is between 3.01 (Charak) and 6.54 (Jask). So, the soil of this plant is non-saline soils.

In general, the other limiting factors after climatic ones are especial situation of habitat such as soil texture, saturated flower reaction, Ca + Mg, sodium extent, gyps, S.R.A and solvable potassium and also the other parameters such as saturation moisture percentage and potassium.

Based on the obtained results, it was determined that the maximum and minimum amount of saturation percentage factors are 21 and 54.5, respectively, and for the other factors, we have: E.C.: 16.85-0.28; acidity: 7.44-9.04; lime: 23.25-61.75; gyps: 0-84.

It is necessary to mention that 3 profiles in Hosseineh and one profile in Charak have gyps in some depths and due to this reason, soils with gyps are not suitable for this plant.

Sand (%) and S.A.R. in different regions are variable as 52-94 for sand and 0.5-29/53 for S.A.R. in general, based on the pedology studies, this plant grows in the habitats with soft and fine soils and this case is in consistent with the studies of Gary Brown & Sabitha Sakkir who said that this species is from the communities of sandy hills in Abu Dhabi[8].

Based on the soil salinity, E.C. and S.A.R, the habitat of this plant is from the usual soils although Akhani and Ghorbanli said that this plant grows in the sandy and saline soils. This paper is in consistent with the studies of Dinaravand But due to the several profiles in the habitats of this plant (69 profiles), its salinity does not confirm [4,7].

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