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# Study of natural reproduction of *Atriplex canescens* and it's role in rageland improvement of Iran (case study: Cheper Ghoyma Rangeland-Gonbad Kavus)

**Zahra Mansouri***

*Department of Rangeland Management, Gorgran University of Agricultural and Natural Resources Sciences, Gorgan, Iran*

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**Key words:** Natural reproduction, *Atriplex canescens*, Planting, Cheper ghoyma, Gonbad kavus.

**Abstract**

Planting with *Atriplex canescens* is a common revival methods of rangelands over more than three decades in Iran. It seems that has not been considered to ecological conditions in planting decision making and monitoring the effect of this species on soil and native species after planting. In ths study was investigated the natural reproduction of planted *A. canescens* in Cheper Ghoyma rangeland. Ploting method was used for achieve this goal, thus 25 plot of 100 square meters was stationed in the study area. For the easy access study area was divided into five growth area. 1111 shrubs was counted in all of the plots and 13 shrubs was natural reproduction thus natural reproduction of the study area was 6% in five growth area. One growth area had more natural reproduction that other growth area (11%). The average height from see level was the most difference between five growth areas due to the higher altitude in the area with higher natural reproduction, the reason of higher reproduction was higher altitude and got away from ground water level. The calculations was performed by SPSS software and one-way ANOVA exam. The overall conclusion was due to positive role of *A. canescens* in cover vegetation and grazing this species. Due to *A. canescens* has improved the cover vegetation and grazing in rangelands but natural reproduction of this plant was not acceptable if the death of existing plants, area will be empty and soil will be saltier than the initial state.

***Corresponding Author:** Zahra Mansouri ✉ zahra.mansouri2999@gmail.com

## Introduction

The Iranian plateau is located in the dry zone of the northern hemisphere. One of the most important problems of the arid areas of Iran are saline and sodic soils and extreme changes in temperature (jafari,1994). In spite of these limitations, proper management can be the most reasonable use of the natural substrates. One of the management corrective actions to achieve this purpose is planting with species adapted to local conditions (hanteh,1990).

*Atriplex canescens* (Pursh) Nutt. (Shrub of chenopodiaceae's family and *Atriplex* genus) is a perennial and non-native shrub that the widely has been used to improve deteriorated rangelands of Iran (mosavi aghdam, 1987). Original homeland of *A. canescens* is the north and west America and northern Mexico (Manson *et al*, 2004).

Based on studies in the planting of this plant can be count some advantages and disadvantages as follows. This species have advantages such as forage production, being evergreen, adding organic matter to the soil and increase soil nutrients such as potassium in sub-floor soil (Stutz, 1978) (Baily, 1970) (Yuma, 2006) (Nemati, 1977).

On the other hand, some studies were done that refers to negative effect of *Atriplex* planting on associated plant and soil of the region. (Henteh, 2005) ،(Naseri, 1999) ،(Saghari & Foroghifar, 2006) ، (Jafari *et al*, 2009). (Akbarinia, 2009). In some cases Atriplex had a negative effect on native species (Heshmati *et al*, 2006), And in some researches planting with *Atriplex* totally was rejected (Sharma & Tongway, 1973).

It is important to mention that non-native species must be planted in similar habitat tentatively if their answer is positive then planted in widespread areas. (Sheidaei & Saraj, 1976).

*Atriplex* has been planted in large scale in iran, before enough studies. These studies are discussed about some ecological effect of this plant to vegetation cover and soil in planted areas and they have not been studied in relation to natural reproduction whereas one of the factors that should be considered befor planting about non-native species is natural reproduction due to this factor guarantees the species persistence in the environment. The planted areas will be empty after existing shrub's death, if the plants that entered into the field have not natural reproduction, thus will have problems such as erosion, the shortage of forage for livestock and also investment losses thus the aim of this study was to investigate the natural reproduction of *A. canescens* in the rangelands around Gonbad kavus.

## Materials and methods

*Study area*

This study was conducted in Cheper Ghoyma region. That is 30 km north-east of Gonbad kavus in Iran and located in 37° 26´ northern latitude and 55° 5´eastern longitude with a height of 40 m above sea level. It's area is 6456 hectares and it's a part of winter rangelands of Golestan province. Average rainfall is 350 mm and the mean daily temperature is 18° c. The soil is brown to dark brown in some areas because of soil salinity and salt on white with silt-loam medium texture and intensive building. Ph of the soil is equal to 8.3 and soil electrical conductivity is 46 mmoh/cm (Department of Natural Resources and Watershed management, Golestan province, 2008). (e.g. fig. 1.)

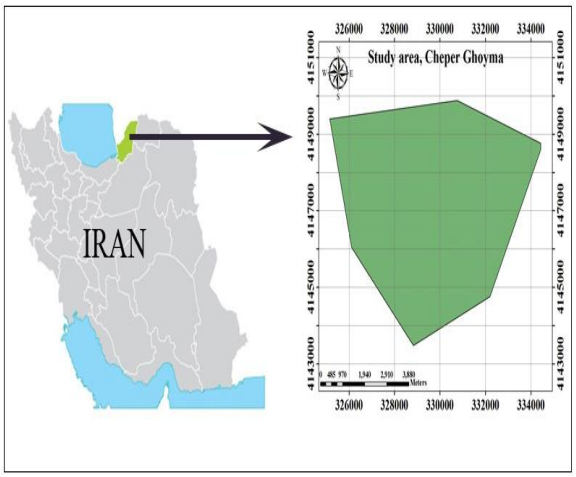


**Fig. 1.** Cheper Ghoyma Rangeland, Gonbad Kavus city, Golestan province, Iran.

*Data collection and Analysis*

The sampling was done by plots. 25 number of 10*100 plot deployed in random-systematic method in region. The study area was divided into five growth area. The average height above sea level in A region was 51 m and in B was 59 m and plots established on the slopes of a hill. In B region shrubs were in unregulated rows that could be because of irregular planting. the average height above see level in C region was 48 m and 46 m in D region. E region was a flat area with 46 m height.

The results of the sampling were analysed by SPSS software and one-way ANOVA exam.

**Results**

The number of total shrubs, natural reproductions and height from sea level given in (table. 1.) based on growth areas accordingly B area had the highest number of shrubs and also the highest number of natural reproductions on the contrary, the number of shrubs were at least in A region and natural reproductions were at least in E region.

**Table 1.** Statistics about 5 growth area in Cheper Ghoyma.

| Growth area | Number of shrubs | Number of reproduction | The average height |
|---|---|---|---|
| A | 153 | 4 | 51 |
| B | 344 | 35 | 59 |
| C | 277 | 8 | 48 |
| D | 199 | 15 | 46 |
| E | 188 | 3 | 48 |

*The total number of existing shrubs*

There was significant difference between The total number of existing shrubs in growth areas (table. 2.) . According to (table. 3.), A region had significant difference with C and B region. B region had significant difference with all regions. There was significant difference in the C with A and B regions also the number of existing shrubs had significant difference in E and D regions.

**Table 2.** F test results.

| | Total squars | $\int f$ | Average | F | sig |
|---|---|---|---|---|---|
| Between rows | 138.800 | 4 | 1067.740 | | |
| Within rows | 23.200 | 20 | | 17.095 | 00 |
| Total | 162000 | 24 | 62.060 | | |

*The number of natural reproduction*

There was significant difference between natural reproduction in study regions, it shows in (table. 4.). The information contained in table 3 shows that A region had significant difference with B and D regions. B region had significant difference with all regions. There was significant difference in the C with B region. The number of natural reproduction had significant difference in D with A, B and E regions also E region had significant difference with B and D regions.

**Discussion**

One of the factors that should be considered befor planting about non-native species is natural reproduction of the species that guarantees the species persistence in the environment, soil surface cover, forage production. In this study The rows of planting were regular in 5 growth area that shrubs in

B region were denser and had a different age classes and different dimensions. According to statistical study, the average natural reproduction totally was 6%. This result indicates that the natural reproduction was inappropriate in fact this species is incompatible with the climatic conditions and soil of region in natural reproduction also in the long term run the shrubs are destroyed because of the lack of natural reproduction. Shrub death makes the empty area of vegetation and caused to salination of soil is greator than it's initial state (Henteh, 2005). (Naseri, 1999).

**Table 3.** The results of total variance analysis in growth area.

| | | | | | 95% confidence Level | |
|---|---|---|---|---|---|---|
| (I) Label | (j) Label | Mean Difference (I-j) | Standard Error | Significance | Lower Bound | Uper Bound |
| | Plot B | -38.20* | 4.998 | 0.000 | -48.63 | -27.77 |
| Plot A | Plot C | -14.80* | 4.998 | 0.008 | 25.23 | 4.37 |
| | Plot D | -9.20 | 4.998 | 0.081 | -19.63 | 1.23 |
| | Plot E | -7.00 | 4.998 | 0.177 | -18.43 | 3.43 |
| | Plot A | -38.20* | 4.998 | 0.000 | 27.77 | 48.63 |
| Plot B | Plot C | -23.40* | 4.998 | 0.000 | 12.97 | 33.63 |
| | Plot D | -29.00* | 4.998 | 0.000 | 18.57 | 39.63 |
| | Plot E | -31.20* | 4.998 | 0.000 | 20.77 | 41.63 |
| | Plot A | 14.80* | 4.998 | 0.008 | 4.37 | 25.23 |
| Plot C | Plot B | -23.40* | 4.998 | 0.000 | -33.83 | -12.97 |
| | Plot D | 5.60 | 4.998 | 0.276 | -4.83 | 16.03 |
| | Plot E | 7.80 | 4.998 | 0.134 | -2.63 | 18.23 |
| | Plot A | 9.20 | 4.998 | 0.081 | -1.23 | 19.63 |
| Plot D | Plot B | -29.00* | 4.998 | 0.000 | -39.43 | -18.57 |
| | Plot C | -5.60 | 4.998 | 0.276 | -16.03 | 4.83 |
| | Plot E | 220 | 4.998 | 0.332 | -8.23 | 12.63 |
| | Plot A | 7.00 | 4.998 | 0.177 | -3.43 | 17.43 |
| Plot E | Plot B | -31.20* | 4.998 | 0.000 | -41.63 | -20.77 |
| | Plot C | -7.80 | 4.998 | 0.134 | -18.23 | 2.63 |
| | Plot D | -2.20 | 4.998 | 0.665 | -12.63 | 8.23 |

**Table 4.** F test Results in different areas of production.

| | Total squars | $\int f$ | Average | F | sig |
|---|---|---|---|---|---|
| Between rows | 138.800 | 4 | 34.00 | | |
| Within rows | 23.200 | 20 | | 17.95 | 00 |
| Total | 162000 | 24 | 1.160 | | |

(Saghari & Foroghifar, 2006). (Jafari *et al*, 2009) also will happen problems such as erosion, the shortage of forage for livestock and investment losses.

According to the results there was difference between B region and other regions, in B region rows are less regular than other regions. Main difference between they is height from sea level so shrubs that had grown in higher level from sea level had more growth and natural reproduction due to more distance from

underground water. There are not specialized researches about natural reproduction of Atriplex in iran just in some cases was mentioned that Atriplex have negligible natural reproduction in iran (Azarnivand & Zare chahouki, 2009), (Jafari & Tavili, 2013).

**Table 5.** ANOVA results in 5 growth area of reproduction.

| | | | | | 95% confidence Level | |
|---|---|---|---|---|---|---|
| (I) Label | (j) Label | Mean Difference (I-j) | Standard Error | Significance | Lower Bound | Uper Bound |
| | Plot B | -6.20* | 0.681 | 0.000 | -4.62 | -27.77 |
| Plot A | Plot C | -80 | 0.681 | 0254 | -2.22 | 4.37 |
| | Plot D | -2.20* | 0.681 | 0.004 | -3.62 | 1.23 |
| | Plot E | 0.20 | 0.681 | 0772 | -1.22 | 3.43 |
| | Plot A | 6.20* | 0.681 | 0.000 | 4.78 | 48.63 |
| Plot B | Plot C | 5.40* | 0.681 | 0.000 | 3.98 | 33.63 |
| | Plot D | 4.00* | 0.681 | 0.000 | 2.58 | 39.63 |
| | Plot E | 6.40* | 0.681 | 0.000 | 4.98 | 41.63 |
| | Plot A | 80 | 0.681 | 0.254 | -0.62 | 25.23 |
| Plot C | Plot B | -5.40* | 0.681 | 0.000 | -6.82 | -12.97 |
| | Plot D | -1.40* | 0.681 | 0.053 | -2.82 | 16.03 |
| | Plot E | 7.80 | 0.681 | 0.158 | -0.42 | 18.23 |
| | Plot A | 2.20* | 0.681 | 0.004 | 0.78 | 19.63 |
| Plot D | Plot B | -4.00* | 0.681 | 0.000 | -5.42 | -18.57 |
| | Plot C | 1.40 | 0.681 | 0.053 | -0.02 | 4.83 |
| | Plot E | 2.40* | 0.681 | 0.002 | 0.98 | 12.63 |
| | Plot A | -20.00 | 0.681 | 0772 | -1.62 | 17.43 |
| Plot E | Plot B | -6.40* | 0.681 | 0.000 | -7.82 | -20.77 |
| | Plot C | -1.00 | 0.681 | 0.158 | -2.42 | 2.63 |
| | Plot D | -2.40* | 0.681 | 0.002 | -3.82 | 8.23 |

Totally according to this research and researches has been done about other aspects of Atriplex planting can achive to this result that Atriplex is not a appropriate plant for planting in iran (Henteh, 2005). (Naseri, 1999). (Saghari & Foroghifar, 2006). (Jafari *et al*, 2009). (Akbarinia, 2009), (Heshmati *et al*, 2006), (Sharma & Tongway, 1973) and due to low platability of this plant (Azarnivand & Zare chahoki, 2009) so native species is better option to planting and it is necessary to have done detailed researches if require to have non-native species.

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