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Effect of Livestock Grazing on Growth Characteristics of *Atriplex Canescens*

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Abstract

It has often been stated or implied that grazing is an important factor in the land degradation process, a suggestion supported by various research projects, and this study investigated the effect of livestock grazing on stem height, crown cover, production, basal diameter, stem biomass, litter, leaf-stem index (leaf to stem weight) , root diameter and weight and seed production per individual of the even-aged *Atriplex canescens* , by comparing two sites (grazed and non-grazed) across Zarand, Shahreiar rangelands located in the southwestern of Tehran, Iran. For this purpose, by using systematic-random sampling method, four 300 m long transects were set up in each sampling area and ten quadrats were randomly assigned per transect [8] to measure the stem height as well as the crown cover, production, basal diameter, stem biomass, litter, leaf-stem index , seed production per individual and root biomass and diameter were measured at 3 soil depth (0-30, 30-70, >70 cm) with 4 replications within each of the two studied sites, results indicated that, grazing had no significant influence on stem height and leaf-stem index but crown cover, production, basal diameter, stem biomass, litter, seed production per individual, root weight and diameter of the even -aged *Atriplex canescens* were significantly greater than those of the un-grazed site.

Keywords: *Atriplex canescens*; Enclosure; Grazing; Quantitative and qualitative properties

1. Introduction

There is no doubt that overgrazing, leads to the deterioration of rangeland production in arid and semi-arid regions. The improvement of the vegetation due to full or partial protection was depicted also by Black burn, 1983; Bock carl, 1984; Correal *et al.*, 1990; Dahlgren *et al.*, 1997; Delgado *et al.*, 2000; Dormar *et al.*, 2002; Trlica *et al.*, 1989.

According to standard definitions, an enclosed site is part of the rangeland totally closed to animal grazing and is used for ecological and biological studies. However, there were significant improvements in the growth patterns of different range plants through being within a range enclosure. It has often been stated or implied that overgrazing is a major problem in the land degradation process in China, Iran, Saudi Arabia, and elsewhere and

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plantations can play an important role in stabilization and improvement of the degraded rangeland. The most species *of Atriplex Spp* could be planted in saline soils with low water and can play an important role in arid and semi-arid environments in many areas of the world. It can be utilized as the main or secondary source of feed in periods when the availability of conventional forage is low. *Atriplex* species remains green even during droughts and maintain a relatively high crude protein content throughout the year. This species originated from north America and has some cultivars, adapted to different ecological conditions (cold, warm, and hot deserts) throughout the world and is planted worldwide to increase forage production on arid and semi-arid rangelands. Most of these plants have low energy content (Hassan et al., 1979). In spite of its low productivity, *A. canescens* is another species of interest, because of its high chilling resistance.

In Iran, more than 20 species of *Atriplex* grow spontaneously. Most of them are herbaceous (Koocheki, 2000), while only *Atriplex griffthi*, *A. leucoclada*, and *A. verrucifera* are shrubs. In spite of that, a large extension of fodder shrub plantations such as *A. lentiformis*, *A. halimus*, *A. nummularia*, and, especially, *A. canescens* (Rashed, 2000) are found in this country since 1965. The latter species is the best adapted to the environmental conditions of Iran, because of its cold tolerance (Nejad and Koocheki, 2000). This study measured the effect of livestock grazing on some quantitative and qualitative of *Atriplex csnescens*, specially under exclosure and non-exclosure conditions, for economic reasons.

2. Materials and methods

2.1. Study Area

The study was carried out during 2009 and 2010 at the Zarand, Shahreiar rangelands located on the 82 km southwestern of Tehran, Iran. This area declared as a scientific center of soil conservation since 1992 (by cooperation FAO experties). We selected 400 hectare enclosure and 1000 hectare non-enclosure experimental even aged *At. canescens* sites (planted at 2002) at this rangelands. The free grazing area is lying adjacent to protected area

2.2. Site Characteristics

To evalute the climatic traits, the climatological data of Paike- Zarand station, over 1980-2005 were used. The results of analysis showed that the elevation, climate, mean yearly temperatures, rainfall, respectively are, 1140(m), cold and semi-arid, 13.3(centigrade), 170.3 (mm/month) and aridisols.

2.3. Sampling procedure

We conducted 8-year browsing experiments, that consisted of grazing in autumn and winter. We hypothesized that some even aged *A. canescens* characteristics inside both protected and the free grazing sites are different. For this purpose, by using systematic-random sampling method, four 300 m long transects were set up in each sampling area and by using the following Equation:

$$N = \frac{t^2 \times s^2}{(\overline{x} \times k)^2} \qquad (1)$$

$$N = 2.82(0.43)/(3.5*.05)2$$

$$N = 40$$

Where:

N = Number of essential samples

t = The t student value with (n-1) and = 5%

s = Standard variation

$\overline{x}$ = Mean vegetation cover

n = Primary sample number

k = Precision coefficient (10%)

The proper number of quadrats in each site were calculated (40 quadrats) therefore, ten quadrats were randomly assigned per transect (Delgado and Muñoz, 2000). in each quadrat the stem height as well as crown cover, production, seed production per individual, basal diameter, stem biomass, litter, leaf-stem index of even aged *A. canescens* were measured at the end of the autumn season considering the location of the root intake and other properties of *A. canescens* root and soil properties, the 3 soil depths (0-30, 30-70, >70 cm) were selected and root biomass and diameters, , were measured with 4 replications, within each of the two studied sites.

2.4. Statistical Analysis

Independent T-test was used for the quantitative and qualitative properties.

3. Results

Results indicated that: A) Grazing had significant influence on crown cover, seed production per individual, production, basal diameter, stem biomass, litter and these properties were greater in the un-grazed site but there was no significant difference between the stem height and leaf-stem index of even aged *Atriplex canescens* within each of the two studied sites (Table 1).

Table 1. Comparing some quantitative and qualitative properties of even aged *Atriplex canescens* under enclosure and non-enclosure conditions

Quantitative and qualitative properties	Treatment	df	Mean	Sd	t
Stem height (M)	Enclosure	39	1.2968	.22662	.161 NS
	non-enclosure		1.2890	.20289	
Crown cover (M2)	Enclosure	39	3.5363	2.04336	2.218*
	non-enclosure		2.7175	1.12963	
Seed production per individual (Kg)	Enclosure	39	.5918	.45916	5.054**
	non-enclosure		.2025	.16249	
Production (Kg)	Enclosure	39	1.5637	.85259	3.619**
	non-enclosure		1.0193	.42252	
Basal diameter (M)	Enclosure	39	1.1288	.39985	2.549**
	non-enclosure		.9373	.25685	
Stem biomass (Kg)	Enclosure	39	3.1675	1.29682	6.009**
	non-enclosure		1.6938	.85128	
Litter (Kg)	Enclosure	39	2.2500	2.20219	5.431**
	non-enclosure		.3527	.18082	
Leaf-stem index (dimensionless)	Enclosure	39	.6198	.45521	-1.67 NS
	non-enclosure		.8838	.89023	

*Significant
** Highly significant
NS: Not significant

B) The root weight and diameter of the even aged *Atriplex canescens* at 3 soil depths were significantly greater in the un-grazed site but average root diameter at third soil depth (>70) in the grazed and un-grazed sites were d = 4.16 and d = 3.50 respectively and these values were not significantly different (Table 2).

Table 2. Comparing some root properties of even aged Atriplex canescens under enclosure and non-enclosure conditions at 3 soil depth

Root properties (at 3 soil depth)	Treatment	df	Mean	T
Wet weight (0-30)	Enclosure	3	2416.66 ± 125.83	19.340**
	non-enclosure		418.66 ± 127.22	
Wet weight (30-70 cm)	Enclosure	3	1093.33 ± 51.31	15.724**
	non-enclosure		479.33 ± 44.06	
Wet weight (>70)	Enclosure	3	563.33 ± 77.67	-6.895**
	non-enclosure		985.33 ± 72.14	
Dry weight (0-30 cm)	Enclosure	3	1536.00 ± 308.00	6.058**
	non-enclosure		384.00 ± 116.63	
Dry weight (30-70 cm)	Enclosure	3	769.33 ± 35.92	10.580**
	non-enclosure		439.66 ± 40.27	
Dry weight (>70)	Enclosure	3	389.33 ± 42.77	11.312**
	non-enclosure		903.66 ± 66.12	
Average diameter (0-30 cm)	Enclosure	3	20.33 ± .57	18.141**
	non-enclosure		5.83 ± 1.25	
Average diameter (30-70 cm)	Enclosure	3	10.00 ± 1.00	5.277**
	non-enclosure		6.16 ± .76	
Average diameter (>70)	Enclosure	3	4.16 ± .76	1.26 NS
	non-enclosure		3.50 ± .500	

** Highly significant
NS: Not significant

4. Discussion and Conclusion

Atriplex canesence provides excellent browse for Wildlife and is highly palatable for most livestock and big game. It is used primarily in the winter at which time it is high in carotene and averages about four percent digestible protein. It is grazed by all classes of livestock except horses. Careful management is needed due to the brittle nature of the twigs and the overgrazing, lead to the deterioration of pasture production in non-protected site (Seeberg, 2010) by defoliation of the plant and a reduction in photosynthesis. Results indicated that, grazing had no significant influence on stem height and leaf-stem index, but crown cover, production, seed production per individual, basal diameter, stem biomass and litter, of the even-aged *Atriplex canescens* were significantly greater in the un-grazed site and except average root diameter at third soil depth (>70), the root weight and diameter of the even aged *Atriplex canescens* at third soil depth were significantly greater in the un-grazed site. The reduction in mean seed production, in non-protected site, might be due to high Clay , Na and NaCl contents compare to protected site (Mohebby, 2010), This result agreed with Essami *et. al.* (2005) and overgrazing, led to trampling and reduction in carbohydrate concentrations in *Atriplex canesence* shoot, root and seeds and could be responsible for the reduction of some quantitative and qualitative properties of this plant within non-enclosure site. We suggest that leaves are the food factory, and enable the plant to survive and the overgrazing, in non- protected site, led to the deterioration of rangeland production in arid and semi-arid regions by defoliation of the plant and a reduction in photosynthesis and lower activity of starch synthase towards seed filling. The low carbohydrate concentrations in *Atriplex canesence* root and seeds, high salinity and trampling, the reduced growth , crown cover, production, , basal diameter, stem biomass, litter, seed production per individual and could be responsible for the reduction of root biomass and diameter of this plant within non-enclosure site. These results supported by the finding of (Damavandi *et. al*, 2007; Springfield, 2002; Latifi, 2004).

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