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The Study and Comparison of Changes in Vegetation and Production in Two exclusion and grazed areas

(Case study: Tange-Sorkh and Mala-Shore of Yasooj, Iran)

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ABSTRACT

Exclusion can be considered as a management tool for restoring rangelands vegetation. In addition, rangeland managers observing the status of plants inside exclusion and comparing it with outside the exclusion can assess the condition of rangeland outside the exclusion one. This study investigated the effects of exclusion on vegetation and the amount of production in 2011. For this, two regions in Iran (around Yasooj city called Tange Sorkh and Mala-Shore) were selected. From each of inside and outside the exclusion areas, two representative regions were determined for sampling. In each representative region, four 100 meters transects and along each transect plot 10 m square were used and sampling was done using random– systematic method. Canopy cover was measured with plotting and production with clipping and weighting methods. The number of collected species in the exclusion is respectively, 2.4 and 2 times of grazed range at Tange-Sorkh and Mala- Shore sites. The independent t-test was used to examine and analyze the data. Results showed that increasing rangeland production due to exclusion at Tange-Sorkh site (about 80%) and Mala- Shore site (about 45%), respectively, in levels ($p<\%1$) and ($p<\%5$) are statistically significant. However, the increase of vegetation due to exclusion at Tange-Sorkh and Mala-Shore rangelands (23 and 5% respectively) statistically shows no significant, that particularly in the site of Mala-Shore can be caused by the invasion of perennial invasive and unpalatable species in grazed range.

Key words: Rangeland, Exclusion, Grazed, vegetation, Production, Tange-Sorkh, Mala-Shore, Yasooj.

INTRODUCTION

Exclusion (ungrazed) is a simple and inexpensive method of restoration and improvement of rangeland. Appropriate management practices and adopting suitable restoring procedures to enhance the level of rangeland renewal and restoration of rangelands, requires enough information and knowledge on rangeland ecosystems. Since vegetation coverage forms a substantial portion of natural ecosystems structure, therefore, its studying and examining is the first step toward gaining scientific knowledge, accurate understanding of phenomena and events taking place in the rangeland ecosystems (38).

One of the objectives of rangeland exclusion is to making required qualitative and quantitative changes in vegetation and the production rate. So, it is necessary for exploiting and protecting rangeland, also in such a way as to ensure sustainability, to identify and enforce the simplest and most appropriate procedures.

Exclusion is to prevent livestock from entering all or part of the rangeland for one or more consecutive years which is done for different purposes. It is obvious that to obtain result in this case, rangelands exclusion in limited areas for a long time are required. According to limited area these exclusions, have no significant effect on reducing the capacity of the rangelands area (3 and 11).

Indeed, exclosures enhance vegetation cover and litter accumulation (31 and 44), increase diversity of herbaceous species (9).

Exclusion is one of the easiest ways to modify rangelands and under all weather conditions cause vegetation to be restored. Using short and medium term exclusions for natural revival and establishment of palatable plant species has many applications.

So far various studies have been done to evaluate the effects of grazed and exclusion on vegetation and production in rangelands different plant communities using short and long term exclusions testing (12, 20, 22, 29, 36, 39).

Comparing vegetation changes with its improvements inside and outside the exclusions in the number of species (10, 23 and 30), canopy cover(2, 40 and 43),abundance of palatable and forage species(6, 29), land cover(6 and 43), abundance of annual plants(29,41) and perennial(22), species composition(3,10, 23, 30, 40) and forage productio(6, 22 and 41) have shown significant changes.

(18) 6-year study (1999-2004) showed litter difference in perennial grass standing crop, total vegetation cover, vegetation composition, or rangeland ecological condition between adjacent areas receiving conservative winter grazing and long-term (22-year) grazing exclusion. So vegetation composition based on basal cover was similar between the grazed and grazing excluded area at both the beginning and the end of our study period.

In this regard (21) expressed that estimated forb richness per hectare was 16% lower in livestock exclosures than the adjacent grazed pasture in 2001 but no difference was found in 2002. In 2001, the canopy cover mean and standard error for the exclosures was 22.5% ± 2.1% and 20.9% ± 4.4% for the grazed pasture. In 2002, the forb canopy cover for the exclosures was 21.3% ± 2.4% and 18.6% ± 3.9% for the grazed pasture. Based on the nested subplots of the modified Whittaker design, estimated 16% fewer forb species in cattle exclosures than in adjacent grazed pasture in 2001. Where cattle had been excluded, indicating that cattle exclusion did not increase forb diversity. Canopy cover by forbs did not differ significantly between cattle exclosures and adjacent grazed areas in either year, although both years showed marginally greater canopy cover in exclosures.

(8) by the study on « vegetation change after 65 years of grazing and grazing exclusion » stated total vegetation cover was different between inside and outside exclosures within 6 of the 16 sites in 2001. Percent total cover was greater inside exclosures and at some sites; the results have been obtained contrary. So had such a situation such as; total plant density, shrub cover and herbaceous plant cover. In 2002, total cover inside and outside exclosures was equal at all sites except Conner,s Station. Therefore, exclusion can be considered as a correction factor.

Since to compare the two regions, it is needed to determine appropriate parameters in the rangeland such as coverage, production and species composition, this important issue has been studied. Data gathering was done at the time of maximum growth of grass plants and at the same time nomadic farmers turned to grazed areas.

with multiple projects of range management and exclusion areas by people in collaboration with the Department of Natural Resources, the farmers incline to production other than animal products such as medicinal plants for example, *Ferula galbani-flua*, *Ferula assa-foetida* and Prongus and gardening is more than Livestock and cattle. Because of this, grazed areas are greatly reduced. The exploitation of medicinal plants and gardening projects has caused more income for ranchers and for this reason, animal husbandry has declined.

Given that exclusion has been performed in large areas of Tange-Sorkh and Mala-Shore sites of Yasooj for 700 ha, assessing success of Department of Natural Resources' strategy in range management plans (focusing on medicinal plants instead of livestock, limited and managed land use changes and gardening) was especially felt on production factors and vegetation in this area that is the purpose of this study.

MATERIALS AND METHODS

Area Geographical position

The area is located in the southeastern Yasooj. The area is located between latitude 30 degrees and 25 minutes and 58 seconds to 30 degrees and 31 minutes and 4 seconds north and longitude 51 degrees 45 minutes and 18 seconds to 51 geographical degrees 50 minutes 30 seconds east.

The Study region

For this study, two sites in surroundings of Yasooj city, Mala- Shore and Tange-Sorkh, were selected as the study areas. It has humid climate and is one of the summer rangelands.

This area is an area over 700 ha, the most important features of this region is high altitude and strong steep. The average height is 2423 meters above sea level (the maximum altitude of 3595 meters and a height of at least 2252 m). Also the average precipitation is 904 mm per year. The soil is heavy (clay), has suitable EC and no salt restriction. Acidity is suitable and the amount of carbon and phosphorous are much. By initial studies it was identified that both sites for 10 years, from 1370, have been exclusion that with the area of 700 ha, are located in East Yasooj. After the initial detection and field operation, inside and outside the exclusion areas, two regions were referred for sampling.

In each representative area, four 100 meters transects (2 to the bulge in the direction perpendicular to the slope gradient and 2) and along each transect 10 one square meter plots were used and data gathering was done using random- systematic sampling method. In each region a total of 16 transects and 160 plot inside and outside the exclusion rangeland were harvested. After preparing photo, the canopy cover with a plot method and production with clipping and weighting method were measured. The species in each plot (Grasses and forb plants from the surface of a centimeter-sized eruption, bushes plants of size year grow) were separately cut and were put into the paper pocket and put in suitable place, then transferred to the laboratory and the Aven (65 °) was used for 24 hours for drying. After complete drying of species, forage of each species on different plots was weighed. The various after obtaining the total weight of forage species, each species was divided by the number of plots so that to obtain the average weight of forage of that species. This action was taken for all the species in harvested plots.

GPS was used for providing photo (before picking the samples) and storing the locations of sampling and team of four people was used field harvesting. As archive, the pictures were used for subsequent studies and correcting possible errors while working with data. For data analysis, t-test by SPSS software was used.

Results

Comparison of Species number

The results of harvesting plant species in plots 1 square meters from grazed and un grazed areas in Mala-Shore and Tange-Sorkh sites have been summarized in Table 1.

In Tange-Sorkh site from 48 species collected and identified, generally, 34 species belonged to exclusion area and 14 species belonged to grazed area (Figure 1). Apiaceae, Poaceae and Asteraceae plant families are the most important components of vegetation coverage and 7 species and shared between the two regions (Table 1).

Table 1: Comparison of Species number in Tange-Sorkh and Mala-Shore Sites

Site	Region	Number of common species of exclusion and grazed	Number of single species	Number of suitable species for animal grazing
Tange-Sorkh	Exclusion	7	27	12
	Grazed		7	5
Mala-Shore	Exclusion	7	19	8
	Grazed		6	4

While in Mala-Shore site of 39 species, respectively, 26 and 13 species in exclusion and grazed areas was observed (Figure 2) that the 7 species are shared between the two regions. Apiaceae, Poaceae and Asteraceae families in terms of the number of species are the most important components of vegetation coverage in Mala-Shore rangeland.

Species diversity in Tange-Sorkh has been much greater than that in Mala-Shore site, as the number of species in the exclusion area is too much greater than the number of species in grazed areas of Tange-Sorkh and Mala-Shore sites (2.4 and 2 times respectively).

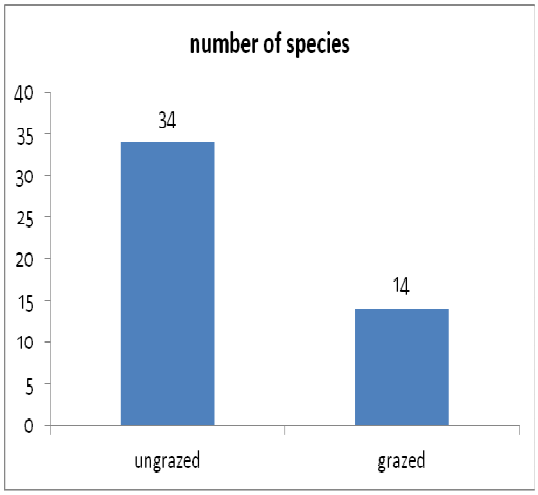

Figure 1: Species diversity of in Tange-Sorkh site

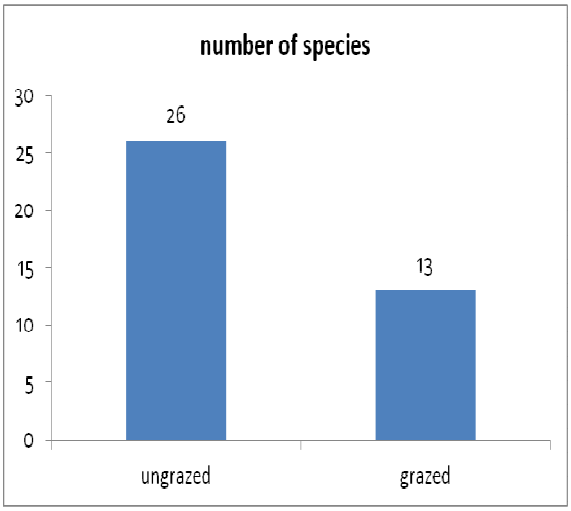

Figure 2: Species diversity of in Mala-Shore site

Comparison of Production

The amount of computational values by means of clipping and weighting method in terms of grams per square meter was calculated in each region which is given in Figure 3. The results showed that production in exclusion areas is higher than that in grazed area (Fig. 3). This amount in Tange-Sorkh was respectively 3.36 and 23.39 in grazed and exclusion areas and for Mala-Shore was 25.44 and 15.53. According to results obtained from independent t-test in Table 3, these differences were statistically significant for Tange-Sorkh and Mala-Shore sites respectively in levels (p<%1) and (p<%5).

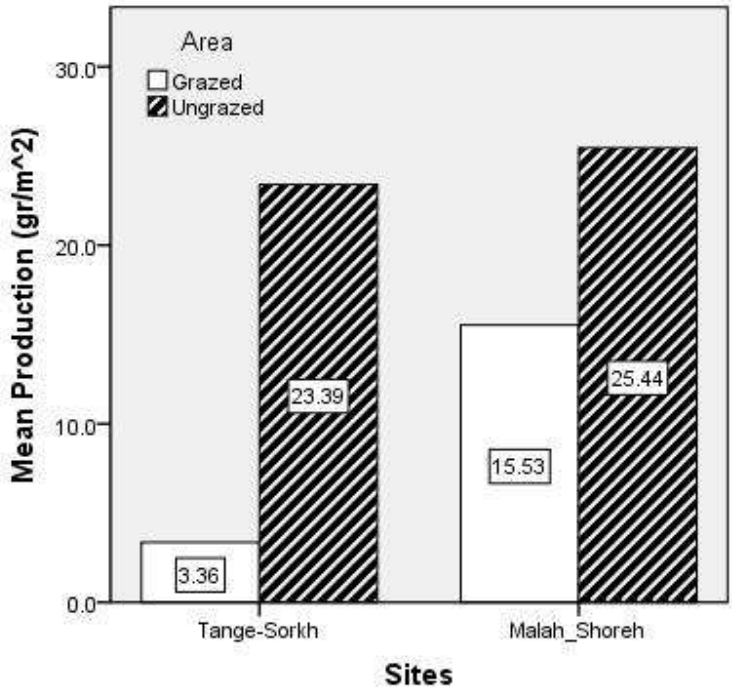

Figure 3: Measured Values of Rangelands Production in Tange-Sorkh and Mala-Shore Sites

Comparison of Vegetation

Vegetation was not significant there between exclusion and grazed type. Fig 4 shows that the average percentage of 40 plots in grazed type was 30.25 percent while in exclusion type is 37.40 percent (Tab 2).

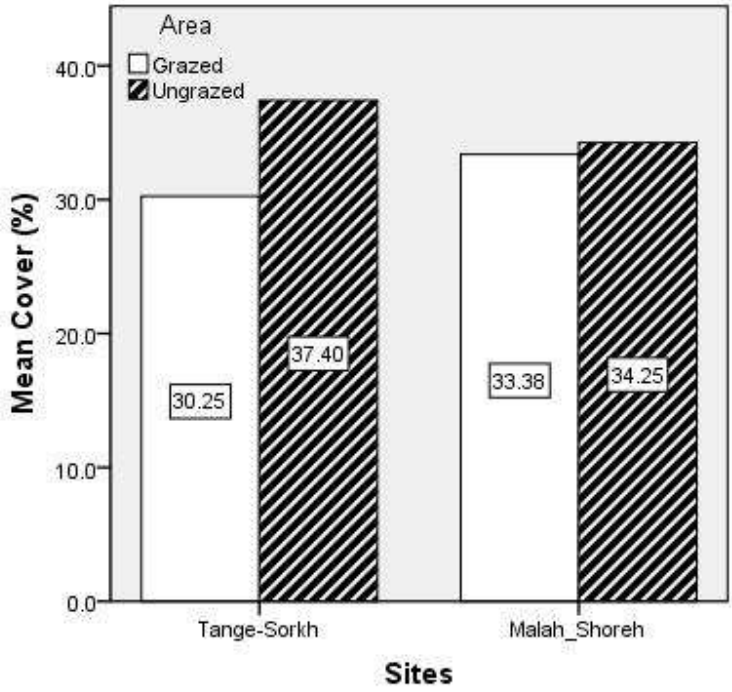

Figure 4: Comparison of Production and Vegetation Mean in Tow Exclusion and Grazed Regions

Also, in Mala-Shore site vagetation in the exclusion and grazed type is not meaningful. As seen in Figure 4, 40 plots coverage percentages in grazed type was 33.38 percent while in exclusion type it is 34.25 percent (Table 2).

Table 2: Descriptive Statistics of vegetation and production in Tange-Sorkh and Mala-Shore sites

Variable	Sites	Region	Mean	Std. Deviation
Vegetation	Tange-Sorkh	Grazed	30.2500	16.52310
		Ungrazed	37.4000	15.69387
	Mala-Shore	Grazed	33.3750	19.55884
		Ungrazed	34.2500	14.03064
Production	Tange-Sorkh	Grazed	3.3618	3.92018
		Ungrazed	23.3935	18.61721
	Mala-Shore	Grazed	25.4415	14.77909
		Ungrazed	15.5252	19.38710

At first by applying Levene test equality of variances was performed then, using t-test, the significance of differences between production and vagetation in Tange-Sorkh site was studied. As in following table (3) is seen, the hypothesis of the equality of variances for forage production in (p<%1) has been rejected, that indicates difference of variances, therefore to investigate forage production the variance t-test were run, hypothesizing that variances were not equal.

Finally, although the vegetation coverage about 23 percent i.e. 7.15 (Table 2) was more in the exclusion area, there was no significant difference between the two regions. However, the amount of forage production was significant at (p<%1). But in Mala-Shore site exclusion production was about 45% more than grazed and in (p<%5) is significant and in the case of coverage there was no significant difference between exclusion and grazed regions.

Table 3: Statistical analysis of vegetation and production in Tange-Sorkh and Mala-Shore sites

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Tange-Sorkh Cover	Equal variances assumed	.02	.89	-1.984	78.000	.051	-7.15	3.60	-14.32	.02
	Equal variances not assumed			-1.984	77.794	.051	-7.15	3.60	-14.32	.02
Tange-Sorkh Production	Equal variances assumed	19.776	*.000	-6.659	78.000	*.000	-20.03	3.01	-26.02	-14.04
	Equal variances not assumed			-6.659	42.452	.000	-20.03	3.01	-26.10	-13.96
Mala-Shore Cover	Equal variances assumed	2.982	.088	-.230	78.000	.819	-.88	3.81	-8.45	6.70
	Equal variances not assumed			-.230	70.735	.819	-.88	3.81	-8.46	6.71
Mala-Shore Production	Equal variances assumed	.158	.693	2.573	78.000	**.012	9.92	3.85	2.24	17.59
	Equal variances not assumed			2.573	72.885	.012	9.92	3.85	2.23	17.60

DISCUSSION AND CONCLUSION

Generally, awareness of human and climatic impact on the condition of rangelands, access to legal relationships between the factors of productive rangelands ecosystems and proper methods of management practices is essential (19). The purpose of this assessment was examining the qualitative and quantitative evaluation of vegetation and production under the influence of exclusion and grazed.

The average percentage of coverage in 40 plots in grazed type of Tange-Sorkh site 30.25 percent was while in exclusion type was equivalent to 37.40 percent (not significant).

(38) has examined the effects of livestock exclusion and grazing for 5 years in 19 vegetation types in Fereidan region Isfahan that the results indicate that the significant difference between inside and outside the exclusion is 17. Results of research by (1) showed that in the short-term ungrazed for 6 years (1347-1353) there was increase in perennial species coverage inside and outside the exclusion, although the differences were low and statistically not significant. (4) in examining changes in rangelands vegetation of Yazd Poshtkouh, stated that exclusion its primary impact is increased density and producing *Salsola rigida* and *Stipa barbata* species.

In (14) research generally, increasing the percentage of palatable species and class I or II under the influence of exclusion operation has been pointed out and increasing class III or invasive plants was attributed mainly to grazing arbitrary banning.

Since at the grazed type of Tange-Sorkh site species of annual and perennial thorny such as Astragalus and Gundelia were replaced due to damage and loss of perennial species in a few years with high speed and intensity. So it is seen that there is no significant difference in coverage. In this case, Moghaddam (2010) has argued that the impact of grazing on rangeland plants is one factor that causes the knock-balanced of vegetation and retrogressive stages in the vegetation. In the case of overgrazing, high quality and palatable plants have been grazed too much and low quality plants and with the lower value of the forage were not primarily grazed they have been grazed much less.

However a percentage of coverage in this type has been allocated to tree and shrub species that this factor has affected vegetation increase. Vegetation coverage inside the exclusions are mainly perennial grass and legume plants with a combination of high palatability, however, outside the exclusions in grazing conditions, woody and herbaceous species of annual or non- palatable species, are dominant.

In the two-year-old HosseinAbad, Shiraz exclusion rangeland has increased the density of *Bromus tomentellus* species (Sheidaei, 1972). In 5-years Fereidan exclusion rangelands, the whole canopy cover 12.3%, litter 7.8% and density have increased 62%. Species composition of class I and II increased 0.91 and 3.1 respectively and class III decreased about 4.1 percent (38).

Results of the research by (1), (13), (33) and (34) also confirmed this issue.

In Izadkhast exclusion, animal grazing removing has helped development in *Astragalus chaborasicus* and *Trigonellae elliptica* species (5).

(24) reported that the increased production of perennial and palatable species such Puccinelluia distance and *Aeloropus lagopoides* inside the exclusion indicates a positive effect of exclusion on vegetation coverage in the region. (27) and (28) also reached similar results. (24) also argued that comparing the vegetation inside and outside of exclusion is indicative of good condition of vegetation coverage inside exclusion and the effectiveness of exclusion in restoring rangelands. It (grazing) significantly reduces the percentage of coverage because it directly reduces the amount of plant biomass and production.

The mean of the under grazing production at Tange-Sorkh site is close to the standard deviation which Indicates that a point production in certain plots is being done, Perhaps the reason is that in some parts of the rangeland plants used by animals are being established.

Generally, rangeland exclusion in Tange-Sorkh site caused forage production increases (especially perennial species, about 80 percent) significantly and to some extent has increased coverage (about 23%) which is due to the influx of invasive and non-palatable species in grazed type. This research is consistent with (17), (37), (32) and (7) that in examining the effects of the grazed and exclusion, they stated biomass increase within exclusions studies and its decrease in grazed rangelands. Production increase in exclusion areas has been reported by (15), (38), (42) and (26).

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