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# The Effects of Some Improving Methods on Dry Matter Yield and Vegetation Cover on Heavy Grazed Rangeland

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**Abstract:** The experiment was conducted on heavy grazed rangelands in Erzurum. In this study, three forage species, crested wheatgrass (*Agropyroncristatum*), alfalfa (*Medicago sativa*) and smooth brome (*Bromusinermis*) were selected and mixed to establish for rangeland improving. Four treatments, artificial pasture, over seeding, fertilization and control were applied; main subjects were grazing free and enclosure to grazing for animal. About 10 kg N da$^{-1}$ + 7 Kg $P_2O_5$ da$^{-1}$ was applied as a fertilizer on over seeding and artificial seeding plots only in planted year, 6 kg N da$^{-1}$ + 4 kg $P_2O_5$ da$^{-1}$ on fertilization plots in each year. According to average of five study years, dry matter yield was 264.4 kg da$^{-1}$ in fertilization plots; 183.2 kg da$^{-1}$ was in artificial pasture plots in enclosed site. In grazed site, average dry matter yield was 114.7 kg da$^{-1}$ in fertilized plots, 68.0 kg da$^{-1}$ in artificial pasture plots and there was not significant difference between control and over seeding plots. There were significant differences among treatments for vegetation cover in enclosed and grazed sites. In all study years, vegetation cover was higher in fertilizer treatment plots than the other treatment plots but especially in 2008 and 2009 years, vegetation cover showed notable increase in fertilizer treatment plots compared to the other treatments.

**Key words:** Rangeland improving, grazing, enclosure, dry matter yield, vegetation cover, Turkey

## INTRODUCTION

Rangelands occupy a considerable part of the total land area in Eastern Anatolia region of Turkey. In this region, livestock production is a major segment of the economy and rangelands are the main food source for livestock especially in summer periods but the produced dry matter in these areas is not adequate for animal's need (Gokkus and Koc, 2001) because heavy grazing pressure can reduce the productivity of rangeland.

These areas have many benefits for human beings and animals, like animal husbandry, forage production, conservation of biodiversity and limiting soil erosion (Gokkus and Koc, 2001). However, having many benefits most rangelands suffer from the untimely grazing besides the overstocking.

The major problems of rangeland can be attributed to various factors (Soni, 1975). Heavy and untimely grazing is one of the most important rangeland degradation factors (Comakli *et al*., 2008) and some physical and environmental factors can accelerate to this process. In many rangelands, soil erosion, related to vegetation cover is an important process of land degradation (Schlesinger *et al*., 1990). Heavy grazing cause degradation of the vegetation cover (Comakli *et al*., 2008) and the rate of natural erosion depends on the vegetation cover.

Due to their ecological and economical value and importance for animal husbandry, the vegetation of rangelands must be improved. However, there are many of methods to increase the vegetation cover and productivity of rangeland, the fertilization is one of the most practical ways to improve the rangelands providing that apply appropriate time and dose also the seeding is substantial for increasing the productivity of grazing areas (Rumbaugh and Pedersen, 1979) but the success of range seeding is depend upon the date of seeding (McGinnies, 1960; Hull *et al*., 1962), soil (Bement *et al*., 1965) and climatic conditions (Hull, 1974) and plant species (McGinnies *et al*., 1963). Also, the enclosure to animal grazing can be effective on productivity of degraded rangelands. The aim of this study is to evaluate

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the effectiveness of some improving methods on dry matter yield and vegetation cover on heavy grazed rangelands.

## MATERIALS AND METHODS

The experiment was conducted on heavy grazed rangelands in Sinirbasi basin of Ilica, Erzurum at an elevation of 1800 m above sea level during the years 2004 and 2009. In 2004, did not obtain any results for evaluation due to it was planted year and the results were presented for 5 years. In order to ensure healthy emergence of plants in over seeding and artificial pasture plots, the grazed range site was protected to animal grazing in 2004, slightly grazed in 2005 and grazed freely in other study years.

In this study, three forage species, crested wheatgrass (*Agropyroncristatum*), alfalfa (*Medicago sativa*) and smooth brome (*Bromusinermis*) were selected and mixed to establish for rangeland improving. The rate of species was 30% alfalfa, 35% smooth brome and 35% crested wheatgrass (Bakir, 1985). The experiment was designed in a split model of a randomized complete block design, replicated three times. Individual plots were $1\times9$ m = 9 $m^2$ in size. Four treatments, artificial pasture, over seeding, fertilization and control were applied; main subjects were grazing free and enclosure to grazing for animal. Blanket rate of 10 kg N $da^{-1}$ +7 Kg $P_2O_5$ $da^{-1}$ was applied as a fertilizer on over seeding and artificial seeding plots in planted year, 6 kg N $da^{-1}$ +4 kg $P_2O_5$ $da^{-1}$ on fertilization plots in each year.

Three soil samples were collected randomly from study location and particle size distribution of soil, pH, organic matter, phosphorus, potassium, calcium carbonate was analyzed. The soil in rangeland was loamy-sand with 3.7% organic matter, average pH was 7.2, available P 9.2 kg $ha^{-1}$, available K 714.4 kg $ha^{-1}$ and lime content 3.0%. The average temperatures were 5.1, 6.4, 4.5, 4.8, 5.8 and 5.8°C for study years and the long-term mean, respectively. Annual total precipitation were 479, 357, 436.6, 317.8, 437.1 and 435.4 mm in the study years and the long-term mean, respectively; total precipitation were 250.1, 158.9, 244.3, 155.2, 240.3 and 156.0, respectively for summer months. The harvest date of all plots was 20 July in every study year when the dominant species were at mature stage. Dry matter yield was determined by weighing the material harvested from three quadrates (0.25 $m^2$) at the centre of each plot after oven drying at 70°C for 24 h. In order to determine the vegetation cover the line interception method was used, developed by Canfield (1941) in each study year. The data related to the vegetation cover were in percentages and were arcsine square root transformed to improve the normality of data. Analysis Of Variance (ANOVA) was computed by SAS (2002) GLM with mean separation according to the LSD test.

## RESULTS AND DISCUSSION

According to average of 5 years results, year, treatment and site had significant ($p<0.01$) effects on dry matter yield of rangeland. Also, year x treatment, year x site, site x treatment, year x site x treatment interactions had significant ($p<0.01$) effects on dry matter yield. Dry matter yield was affected by all treatments in both range sites and there were significant differences ($p<0.01$) among the treatments in both grazed and non-grazed range sites. The highest dry matter yield was in fertilized plots, the lowest was in artificial pasture plots in enclosed, grazed sites and the averaged over both sites. In enclosed site according to average of five study years, dry matter yield was 264.4 kg $da^{-1}$ in fertilization plots; 183.2 kg $da^{-1}$ was in artificial pasture plots. In control plots, dry matter yield was higher than that of over seeding and artificial pasture plots. In grazed site, average dry matter yield was 114.7 kg $da^{-1}$ in fertilized plots, 68.0 kg $da^{-1}$ in artificial pasture plots and there was not significant difference between control and over seeding plots. On the other hand, in averaged over both sites, range improving methods had significant effects on dry matter yields. Similarly to enclosed and grazed sites in averaged over sites, the highest dry matter yield (189.6 kg $da^{-1}$) was in fertilized plots; the lowest (125.6 kg $da^{-1}$) was in artificial pasture plots (Table 1).

Dry matter yield showed significant differences among treatments in all study years. Fertilized range plots had the highest dry matter yield except in 2006, artificial pasture plots had the lowest dry matter yield in enclosed

Table 1: The effects of improving methods on the changing of average dry matter yield and vegetation cover in enclosed and grazed range sites and average of the both sites

| | Dry matter yield (kg $da^{-1}$) | | | Vegetation cover (%) | | |
|---|---|---|---|---|---|---|
| Treatments | Enclosed | Grazed | Average | Enclosed | Grazed | Average |
| Control | $214.0^B$ | $78.3^B$ | $146.2^B$ | $44.6^C$ | $31.4^C$ | $38.0^C$ |
| Overseeding | $197.9^C$ | $78.1^B$ | $138.0^C$ | $49.2^B$ | $35.1^B$ | $42.2^B$ |
| Fertilization | $264.4^A$ | $114.7^A$ | $189.6^A$ | $62.3^A$ | $43.9^A$ | $53.1^A$ |
| Artificial | $183.2^D$ | $68.0^C$ | $125.6^D$ | $34.5^D$ | $26.9^D$ | $30.7^D$ |
| LSD | 13.8 | 6.7 | 7.6 | 4.0 | 2.3 | 2.4 |

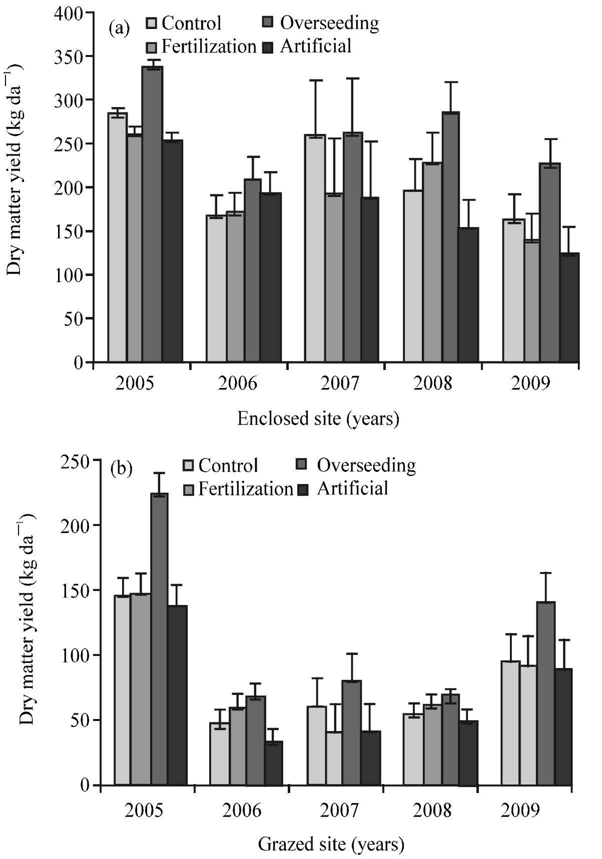


Fig. 1a, b: The effects of rangeland improving methods on the changing of dry matter yield in study years with lsd bar

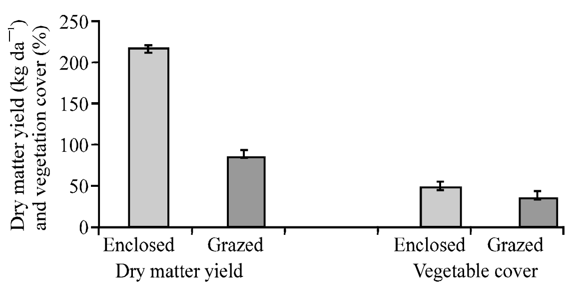


Fig. 2: Changing of average dry matter yield and vegetation cover in enclosed and grazed sites with lsd bar

and grazed sites (Fig. 1). Analysis of variance revealed significant ($p<0.01$) between main subjects for dry matter yield. Dry matter yield was higher in enclosed range site than that of the grazed site (Fig. 2). There were significant differences among treatments for vegetation cover in enclosed and grazed sites (Fig. 3). In all study years, vegetation cover was higher in fertilizer treatment plots

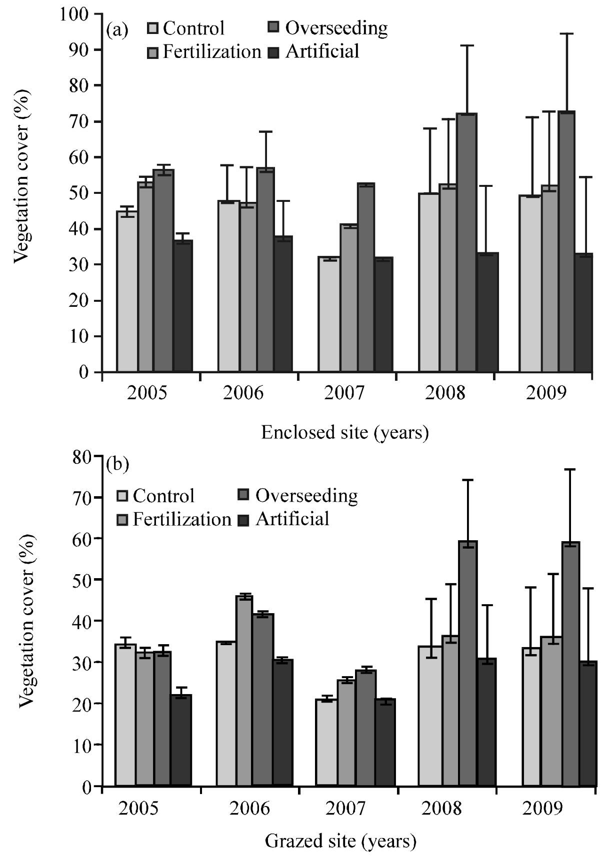


Fig. 3: The effects of rangeland improving methods on the changing of vegetation cover in study years with lsd bar

than the other treatment plots but especially in 2008 and 2009 years, vegetation cover showed notable increase in fertilizer treatment plots compared to the other treatments. In 2007 year, there were not significant differences among the treatments and vegetation cover of control plots was near to artificial pasture plots in enclosed site.

However, generally, artificial pasture plots had the lowest vegetation cover in both sites in all study years in 2006 and 2007 years; vegetation cover did not showed significant differences among treatments in enclosed site (Fig. 3). In both rangeland sites, vegetation cover had significant difference between grazed and enclosed sites in averaged over both sites and all treatments. Average vegetation cover was higher in enclosed site than that of grazed site (Fig. 2).

The highest average dry matter yield was in 2005 and the lowest was in 2009, there were significant ($p<0.01$) differences among years in enclosed site. In grazed site the highest dry matter yield was in 2005, the lowest was in 2006. Average vegetation cover showed significant

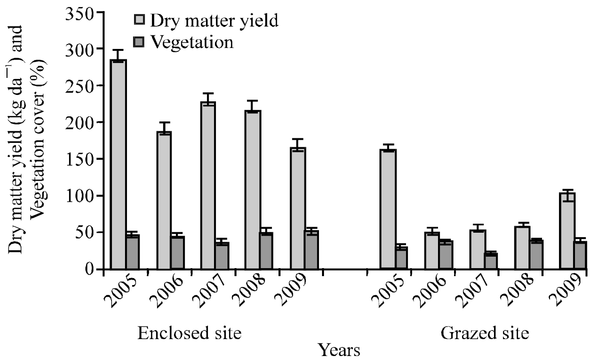


Fig. 4: Changing of average dry matter yield and vegetation cover in study years with lsd bar

($p<0.01$) differences among the study years in both sites. The highest vegetation cover was in 2008, the lowest was in 2007 in both sites (Fig. 4). Overgrazing due to excessive numbers of livestock and too early or too late grazing are the most important degrading factors in rangelands (Comakli *et al*., 2008).

The inappropriate using of rangelands can cause to decrease of dry matter production and vegetation cover (Oner, 2006). In this study, the highest dry matter yield and vegetation cover was obtained from fertilized plots in all study years and in enclosed site, vegetation cover and dry matter yield was higher than that of grazed site.

These results can most probably result from increasing effects of fertilization and enclosure to protect for grazing on yield and vegetation cover of rangelands (Koc *et al*., 1994; Gillen and Berg, 1998; Synman, 2002; Oner, 2006). On the other hand, in both sites, the reason for the variations in dry matter production and vegetation cover in study years such as high dry matter yield in 2005 and low in 2006; high vegetation cover in 2008, low in 2007 can be attributed to changing of total annual and seasonal (from April-july) precipitation.

Because of slightly reductions from normal precipitation can cause important reduction in plant production in areas having low precipitation (Klages, 1942). On the other hand, annual variability in the timing of precipitation can be more important than variability in the total amount that occurs (Holechek *et al*., 2004).

## CONCLUSION

In this study, taking into consideration their importance for livestock feeding, ecological and economical value, it is obvious that the effective improving and management methods must be practiced on rangeland.

## REFERENCES

Bakir, O., 1985. Cayir Mer'a Islahi. Ankara Universitesi Ziraat Fakultesi Yayinlari No. 947, Ankara.

Bement, R.E., R.D. Barmington, A.C. Everson, L.O. Hylton Jr. and E.E. Remmenga, 1965. Seeding of abandoned croplands in the central Great Plains. J. Range Manage., 18: 53-59.

Canfield, R.H., 1941. Application of the line interception method in sampling range vegetation. J. For., 39: 388-394.

Comakli, B., M. Dasci and A. Koc, 2008. The effects of traditional grazing practices on upland (yayla) rangeland vegetation and forage quality. Turk. J. Agric. For., 32: 259-265.

Gillen, R.L. and W.A. Berg, 1998. Nitrogen fertilization of a native grass planting in western Oklahoma. J. Range Manage., 51: 436-441.

Gokkus, A. and A. Koc, 2001. Mera ve Cayir Yonetimi. Ataturk Universitesi Ziraat Fakultesi Yay, No. 228, Erzurum, pp: 329.

Holechek, J.L., R.D. Pieper and C.H. Herbel, 2004. Range Management: Principles and Practicies. Prentice Hall, New Jersey, pp: 607.

Hull Jr., A.C., A.T. Bleak, R.E. Eckert, D. Gates, F. Gomm and G.J. Klomp, 1962. Progress Report, Seeding Depleted Mountain Rangelands. 1st Edn., US. Department of Agriculture, Agricultural Research Service, Crops Research Division, United States, pp: 20.

Hull, Jr. A.C., 1974. Seeding emergence and survival from different seasons and rates of seeding mountain rangelands. J. Range Manage., 27: 302-304.

Klages, K.H.W., 1942. Ecological Crop Geography. The Macmillan Co., New York.

Koc, A., B. Comakli, A. Gokkus and L. Tahtacioglu, 1994. Azot ve fosforlu gubreleme ile korumanin guzelyurt Koyu (Erzurum) mera sahasinin bitki ortusune etkileri. Proceeding of the 3rd Cayyr-Mer'a ve Yem Bitkileri Bildirileri Tarla Bitkileri Kongresi, Nisan 25-29, Izmir, pp: 78-82.

McGinnies, W.J., 1960. Effects of planting dates, seeding rates and row spacings on range seeding results in Western Colorado. J. Range Manage., 13: 37-39.

McGinnies, W.J., D.F. Hervey, J.A. Downs and A.C. Everson, 1963. A summary of range grass seeding trials in Colorado. Col. Agric. Exp. Sta. Bull., 73: 81-81.

Oner, T., 2006. Korunan, Otlatilan ve Surulup Tekedilen Mera Alanlarinin Vejetasyonlarinin Karsilastirmasi. Ataturk Universitesi Fen Bilimleri Enstitusu, Tarla Bitkileri Ana Bilim Dali (Yuksek Lisans Tezi), Erzurum.

Rumbaugh, M.D. and M.W. Pedersen, 1979. Survival of alfalfa in five semiarid range seedings. J. Range Manage., 32: 48-51.

SAS Institute, 2002. Statistics and Graphics Guide. Version 5. Sas Institute Inc., Cary, NC.

Schlesinger, W., J. Reynolds, G. Cunningham, L. Huenneke, W. Jarrell, R. Virginia and W. Whitford, 1990. Biological feedbacks in global desertification. Science, 247: 1043-1048.

Soni, B.K., 1975. Animal carrying capacity, including concepts and definition, methods for assessment and use of standard stock units, Evaluation and mapping of tropical African rangelands. Proceedings of the Seminar International Livestock Centre for Africa, March 3-8, Bamako-Mali, http://www.fao.org/wairdocs/ilri/x5543b/x5543b00.HTM.

Synman, H.A., 2002. Short-term response of rangeland botanical composition and productivity to fertilization (N and P) in a semi-arid climate of South Africa. J. Arid Environ., 50: 167-183.