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Full Length Research Paper

Average stem biomass of Gundelia (*Gundelia tournefortii* L.) in Shanjan Rangelands, East Azerbaijan, Iran

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The stem of plants can be used for animal grazing, wind erosion control, reduction of water flow, increase of evaporation and transpiration. In NW of Iran (East Azerbaijan Province), rangelands were utilized for animal grazing, but were later changed to agricultural land. Moreover, this vegetation has unsuitable vegetation coverage. We studied *Gundelia tournefortii* L. to determine its stem biomass characteristics. Data were collected with accidental sampling method (1*1 m) in this area. A total of 15 plots were collected and 75 samples were studied in this study. However, the minimum, maximum and mean stem biomass of this plant was 5.5, 22.6 and 10.5 g, respectively.

Key word: *Gundelia tournefortii* L., Iran, rangeland, stem biomass.

INTRODUCTION

Stabling of the rangeland ecosystem, and optimum and continuous utilization of the range without studying and knowing the effective factors on its segments and animal pasturage have special importance (Mozaffarian, 2007; Shadkami-Til and Bibalani, 2010, 2011). There are different methods used for evaluating range position; and all of them have special advantages and disadvantages, but each of them have different factors, such as species composition percentage, production, coverage, density, soil position (soil surface coverage and erosion), cadaver, birthing, constitution, and succulence. Plants were used (Bidlock et al., 1999; Mogaaddam, 2001), but estimation of these parameters were time consuming and expensive. Fresquez et al. (1990) reported an increase in the vegetative production and forage quality of blue grama (*Bouteloua gracilis* (H.B.K.) Lag. ex Steud.) (Mata-Gonza´lez et al., 2002), while Benton and Wester (1998) reported an increase in tobosa grass (*Hilaria mutica* (Buckl.) Benth.) yield, following applications of biosolids at levels of 7, 18 and 34 dry Mg ha^{-1} in the Chihuahuan Desert. Although, dormant season applications of biosolids seem to be more beneficial for plant growth than growing season applications during the year of biosolids application (Benton and Wester, 1998), explanations for this phenomenon have not been documented (Mata-Gonza´lez et al., 2002). Most evidence is related to its negative effect on aboveground vegetative and reproductive plant biomass (Hutchings and John, 2003; Milchunas and Lauenroth, 1993), changes in the spatial patterning of plant canopies and soil resources (Adler et al., 2001; Bertiller and Coronato, 1994; Callaway, 1995; Mazzarino et al., 1998; Schlesinger et al., 1996), the reduction of soil seed banks (Bertiller, 1996, 1998; Mayor et al., 2003), the decrease in the availability of safe microsites for plant re-establishment (Bisigato, 2000; Oesterheld and Sala, 1990) and the invasion of woody plants (Milchunas and Lauenroth, 1993; Schlesinger et al., 1990; Rodriguez et al., 2007). Aboveground defoliation can modify the partitioning of assimilates between belowground and aboveground organs and consequently the root growth of defoliated plants (Belsky, 1986; Richards and Caldwell, 1985; Snyder and Williams, 2003; Rodriguez et al., 2007).

In this study, we have studied the amount of over ground biomass and *Gundelia tournefortii* L. species (Gharaman, 2003) (Figure 1) in the rangeland area of Shanjan village, Shabestar district, NW Iran. This parameter needs more attention, but it is one of the determined factors of rangeland ecosystem stabling in that place.

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Figure 1. A part of Shanjan rangeland from Shabestar district, East Azerbayjan province, Iran.

Table 1. Scientific name for *G. tournefortii* L. classification report (USDA, 2011).

Kingdom	***Plantae* – Plant**
Subkingdom	*Tracheobionta* – Vascular plants
Superdivision	*Spermatophyta* – Seed plants
Division	*Magnoliophyta* – Flowering plants
Class	*Magnoliopsida* – Dicotyledons
Subclass	*Asteridae*
Order	*Asterales*
Family	*Asteraceae* – Aster family
Genus	*Gundelia* L. – gundelia
Species	*Gundelia tournefortii* L. – Tournefort's gundelia

MATERIALS AND METHODS

The research area is a part of Shanjan rangeland, from Shabestar district with a distance of about 5 Km from it (Figure 1). This area is hilly and we study the N aspect of it (Salimi, 2003). This region is a component flora of Iran and Turan with elation between 1700 and 1850 m (Pabot and Beck, 1990).

The Gundelia is a spiny (Table 1 and Figure 2), thistle-like flowering plant of the genus *Gundelia* L. in the sunflower family (Asteraceae). They occur in the semi-desert areas of Syria, Jordan, Palestine, Iraq, Iran, Azerbaijan, Armenia, and Anatolia (Karis et al., 2001; Cakilcioglu and Khatun, 2010). *Gundelia* species have been used as medicinal plants in folk medicine, but gundelia itself was used for diarrhea, mumps, vitiligo and diabetes disease (Özgökçe

Figure 2. *G. tournefortii* L. species.

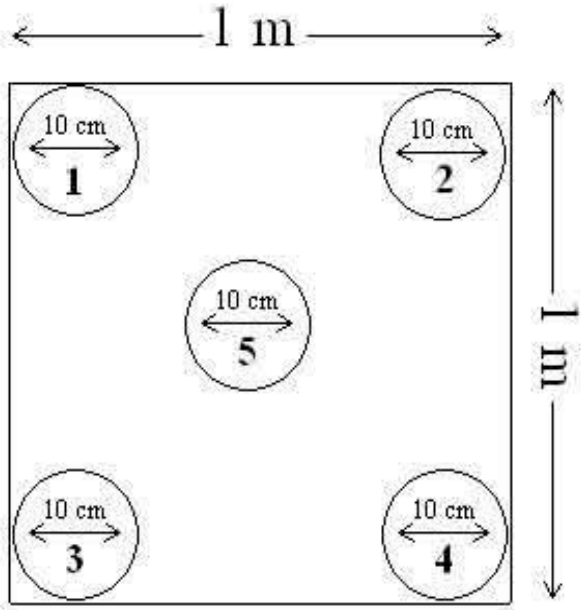

Figure 3. Sampling design in 1*1 m plot (Xiaoyan et al., 2001).

and Özçelik, 2004; Sarper et al., 2009; Cakilcioglu et al., 2010; Cakilcioglu and Turkoglu, 2010). The stem biomass was sampled in May and June, 2010. For recognition of the species used for sampling, we used accidental sampling method (1*1 m plot) and selected a total of 15 *5=75 samples (Xiaoyan et al., 2001) (Figure 3).

Sapling was produced from the study area after plants were taken to laboratories for sampling. The fresh weight of the over ground part of the plant was scaled with a careful and sensitive scale, while the dry weight of the over ground part was determined by Avon, which was set after drying in 80°C temperature during 24h (Xiaoyan et al., 2001).

RESULTS AND DISCUSSION

The results of this study showed that the maximum, minimum and medium stem biomass of *G. tournefortii* L. in the study area was 5.5, 22.6 and 10.5 g, respectively (Figure 4). However, the stem height of *G. tournefortii* L. was unsteady from 950 to 100 mm, and the average was about 670 mm.

A total of 15 plots were collected and 75 samples were studied in this research. In the 75 samples that were

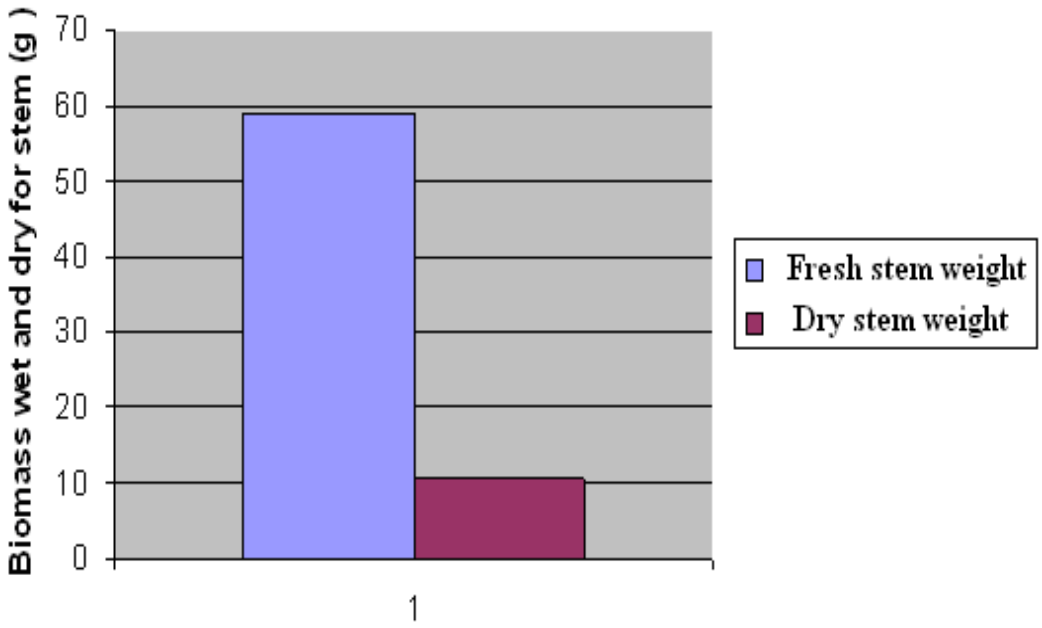

Figure 4. *G. tournefortii* L. stem weight (fresh and dry weight).

studied in this study, about 82.2% of the stem weight was lost when the samples dried.

Vegetal species can affect soil chemical and physical properties (Ardekani, 2003) in that, increasing *G. tournefortii* L. species in the study area can cause specific biological qualification. As this species increase, the density of over ground biomass will increase, and also, the amount of soil protection and stabling will increase specially as a result of wind erosion protection and soil lost with runoff (Shadkami-Til and Bibalani, 2010, 2011).

This study has revealed and quantified the stem biomass of *G. tournefortii* L. in Shanjan rangelands, due to the fact that the plant has good biomass in this research area and probably in other areas also, where *G. tournefortii* L. is growing and need to be studied separately in other areas. It is a pioneer study, and the results have given estimations of the stem biomass of *G. tournefortii* L. for the first time in Shanjan rangeland. There is need to study all shrubs and plants in this area and in other places, in order to recognize the best plant for 'rangeland ecosystem' stabling and the stabilizing surface soil erosion, especially wind erosion.

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REFERENCES

Adler PB, Raff DA, Lauenroth WK (2001). The effect of grazing on the spatial heterogeneity of vegetation Oecologia. 128: 465–479.
Ardekani M (2003). Ecology, University Tehran, Tehran.340
Belsky AJ (1986). Does herbivory benefit plants? A review of the evidence American Naturalist, 127(6): 870–892.
Benton MW, Wester DB (1998). Biosolids effects on tobosagrass and alkali sacaton in a Chihuahuan desert grassland. J. Environ. Qual. 27: 199–208.
Bertiller MB (1996). Grazing effects on sustainable semiarid rangelands in Patagonia: the state and dynamics of the soil seed bank. Environ. Manage. 20: 123–132.
Bertiller MB (1998). Spatial patterns of the germinable soil seed bank in northern Patagonia Seed Science Research 8: 39–45.
Bertiller MB, Coronato F (1994). Seed bank patterns of Festuca pallescens in semiarid Patagonia (Argentina): a possible limit to bunch reestablishment Biological Conservation 3: 57–67.
Bidlock EJ, Voughan JE, Devald CL (1999). Forage Qualtity of 10 Estern Gama Grass. J. Range Manag. 52: 661.
Bisigato AJ (2000). Dinamica de la vegetacion en a reas pastoreadas del extremo austral de la provincial fitogeografica del Monte Ph.D. pp. 163
Cakilcioglu U, Khatun S (2010). Nitrate, moisture and ash contents of edible wild plants. J. Cell Plant Sci. 2: 1-5.
Cakilcioglu U, Sengun, MT, Turkoglu İ (2010). An ethnobotanical survey of medicinal plants of Yazıkonak and Yurtbaşı districts of Elazığ province, Turkey. J. Med. Plants Res. 4: 567–572.
Cakilcioglu U, Turkoglu I (2010). An ethnobotanical survey of medicinal plants in Sivrice (Elazığ-Turkey). J. Ethnopharmacol. 132: 165–175.
Callaway RM (1995). Positive interactions among plants Botanical Review 61: 306-349.
Fresquez PR, Francis RE, and Dennis GL (1990). Soil and vegetation responses to sewage sludge on a degraded semiarid broom snakeweed/blue grama plant community J. Range Manag. 43: 325–

331.
Gharaman A (2003). Folor Colored Iran, Froest and rangland reserch Organization, Tehran. p. 2500
Hutchings MJ, John EA (2003). Distribution of roots in soil, and root foraging activity. In: de Kroon, H., Visser, E.J.W. (Eds.), Ecological Studies Ecological Studies. pp. 33–60.
Karis PO, Eldenäs P, Källersjö M (2001). New evidence for the systematic position of Gundelia L. – Taxon. 50: 105–114.
Mata-Gonza´lez R, Ronald ES, Changgui W (2002). Shoot and root biomass of desert grasses as affected by biosolids application J. of Arid Environ. 50: 477–488.
Mayor MD, Boo RM, Pelaez DV, Elja OR (2003). Seasonal variation of the soil seed bank of grasses in central Argentina as related to grazing and shrub cover. J. Arid Environ. 53: 467–477.
Milchunas DG, Lauenroth WK (1993). Quantitative effects of grazing on vegetation and soils over a global range of environments Ecological Monographs 63(4): 327-366.
Mogaaddam MR (2001). Ecology descriptive and Astistic Vegetal Coverage, Tehran University, Tehran. p. 258.
Mozaffarian V (2007). A Dicionary of Iranian, Latin, English, Persian, Farhang Moaser, Tehran. p.271
Oesterheld M, Sala OE (1990). Effects of grazing on seedling establishment: the role of seed and safe-site availability. J. Veg. Sci. 1: 353–358.
Özgökçe F, Özçelik H (2004). Ethnobotanical aspects of some taxa in East Anatolia (Turkey), Econ. Bot. 58: 697–704.
Pabot RD, Beck RF (1990). Range Condition From an Ecological Perspective: Modification to Recognize Multiple Use Objectives, J. Manag. 27(1):
Richards JH, Caldwell MM (1985). Soluble carbohydrates, concurrent photosynthesis and efficiency in regrowth following defoliation: a field study with Agropyron species. J. Appl. Ecol. 22: 907–920.
Rodriguez MV, Bertiller MB, Sain CL (2007). Spatial patterns and chemical characteristics of root biomass in ecosystems of the Patagonian Monte disturbed by grazing J. Arid Environ. 70: 137–151.
Salimi FA (2003). Look To History and Geographical Shabestar, Tasuj, Sufiyan, Tehran Sibe Sorkh. pp. 234-244.
Sarper F, Akaydın G, Şimşek I, Yeşilada E (2009). An ethnobotanical field survey in the Haymana district of Ankara province in Turkey. Turk J. Biol. 33: 79–88.
Schlesinger WH, Raykes JA, Hartley A E, Cross A F (1996). On the spatial pattern of soil nutrients in desert ecosystems. Ecology 77 (2): 364–374.
Schlesinger WH, Reynolds JF, Cunningham GL, Huennke LF, Jarrel WM, Virginia RA, Withford WG (1990). Biological feedback in global desertification Science. 247: 1043–1048.
Shadkami-Til H, Bibalani GH (2010). Under-over ground Biomass characterics of perennial Species (Teucruim polium) in northwest Iran (Till area of Shabestar) International J. Acad. Res. 2(6): 110.
Shadkami-Til H, Bibalani GH (2011). Over ground Biomass characterics of Genera single Species Iran (Cnicus benedictus) In northwest Iran (Till area of shabestar) Int. J. Acad. Res. 3(1): 698.
Snyder KA, Williams DG (2003). Defoliation alters water uptake by deep and shallow roots of Prosopis velutina (Velvet mesquite) Functional Ecology 17: 363-374.
USDA (2011). USDA: *Gundelia tournefortii*, http://plants.usda.gov/java/nameSearch, Retrieved 08, Feb. 2011.
Xiaoyan P, Zhou G, Zhuang Q, Wang Y, Zuo W, Shi G, Lin X, and Wang Y (2001). Effects of sample size and position from monolith and core methods on the estimation of total root biomass in a temperate grassland ecosystem in Inner Mongolia Geoderma 155: 262–268.